

ELECTRONICS COMPONENTS

# CURRENT SENSORS



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# Group network map

## Group Network - Overseas

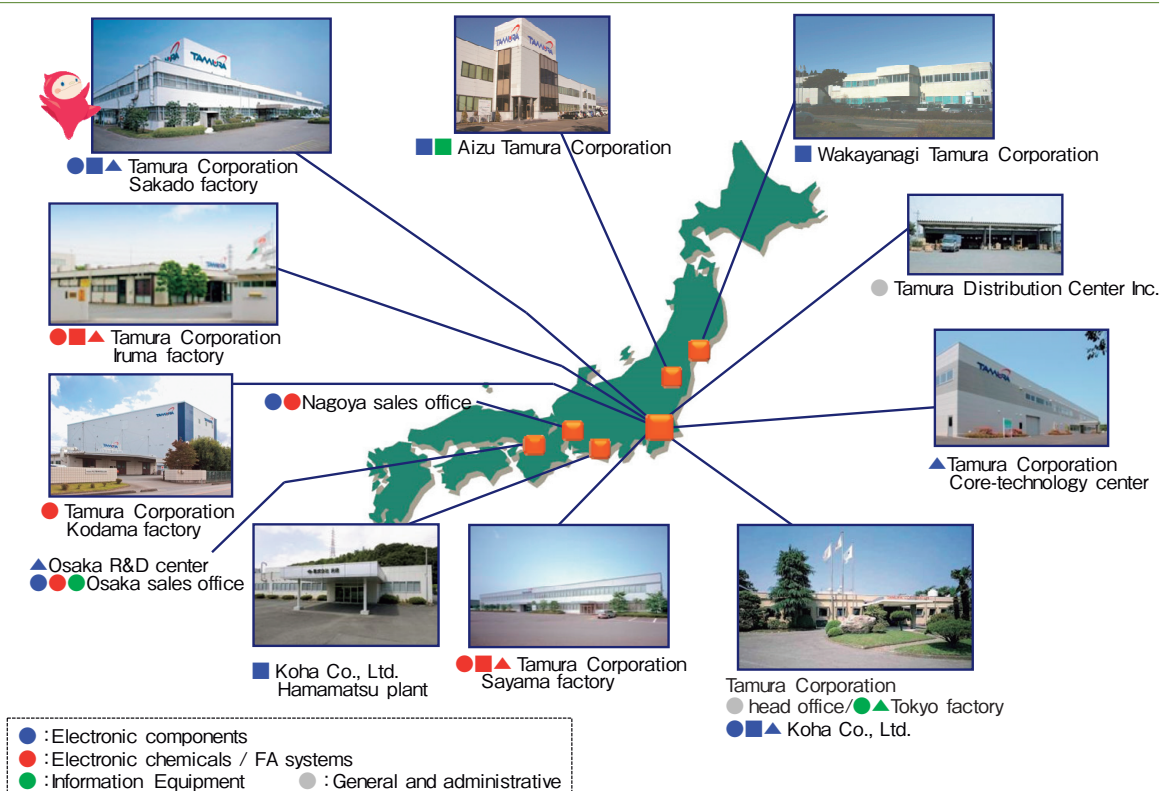
○: Sales □: Factory ▲: R&D

Factory and R&D for Current sensor



## Group Network - Japan

○: Sales □: Factory ▲: R&D



## Outline / Applications / Features

### Outlines

The current sensor is a sensor to measure the current as its name. However, The current is various. There is a current value up to 10k amperes treated in the power plant from 1mA, and the shape of current waves also has AC, DC, and AC + DC. Since a method and a structure the best in each measuring object are different, there are also various current sensors. Tamura supplies the sensor using the Hall-Effect system for measuring the current value from several amperes to several kilo-ampere.

The Hall-Effect current sensor measures the magnetic flux produced in proportion to the primary current without any direct contact with the primary circuit; the combination of the Hall element and magnetic circuit provide excellent solution for measuring AC/ DC current with galvanic isolation and zero insertion loss.

The diagram in Figure-1 depicts the Hall current sensor basic principle. The magnetic flux produced in proportion to the primary current,  $I_f$ , induced in the magnetic circuit, passes through the Hall element inserted in the gap of the magnetic circuit resulting in a potential difference,  $V_h$ , expressed by the following formula:

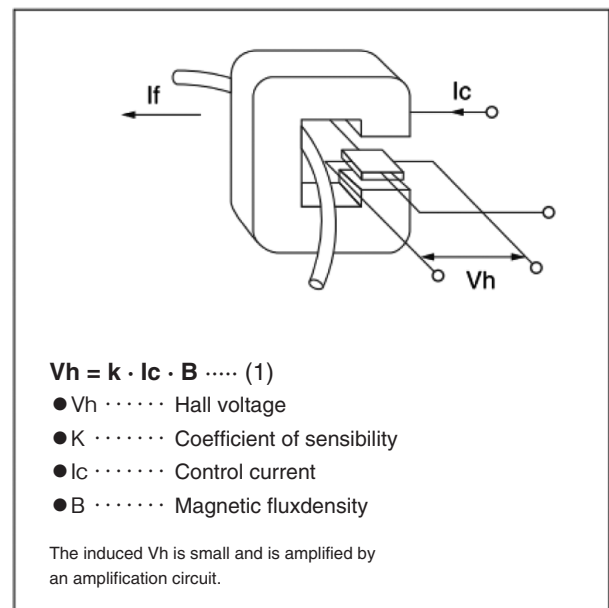


Figure-1

### Applications

Current control and detection of over-current in various types of inverters. Used for general-purpose inverter, various types of power conversion equipment to control and to detect over-current. Also used to measure DC current from the battery.

- Various types of inverters (CVCF, vector), Industrial robots, automation, devices, NC
- UPS, Elevator, Laser Cutting Machines, Welding Machines, Various types of Regulated Power Supply
- Solar power generation systems, Wind power systems, Fuel cell systems

### Features

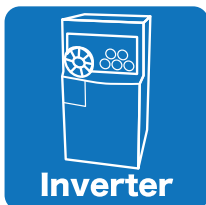
Measurement of DC, AC (kHz range), & complex current (AC+DC). Our current range is 3A to 1500A in various mechanical configurations.

- Galvanic isolation with many UL compliant configurations.
- Fast response time
- High Reliability

# Applications of Current Sensor

## Applications

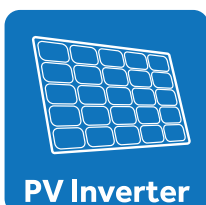
## Series (Example)



|      |      |       |
|------|------|-------|
| L18P | L07P | L06P  |
| L03S | L37S | LA01P |
| S27S | S28S | S29S  |



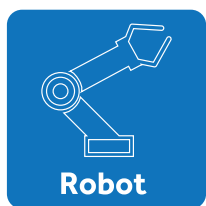
|      |      |      |
|------|------|------|
| L18P | L08P | L06P |
| L03S | L37S | S21S |
| S22S | S27S | S28S |



|       |      |      |
|-------|------|------|
| L18P  | S22P | S23P |
| LA01P | F**P |      |



|      |      |      |
|------|------|------|
| L03S | L37S | L07P |
| L08S | S22P | S23P |
| S21S | S27S | F**P |



|      |      |      |
|------|------|------|
| L03S | L37S | L08P |
| L34S | S28S | S29S |

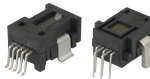
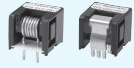


|      |      |      |
|------|------|------|
| L18P | L12P | F03P |
| S22P | S23P | S21S |
| S27S | S28S | S29S |



|      |      |      |
|------|------|------|
| L03S | L37S | L08P |
| L06P | L34S | S21S |
| S27S | S28S | S29S |

# Current Sensor / Guide map

| SERIES                                                                                              | Model                                                                                         | Main Specification |                        |                            |                   |               | UL R/C | Features                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------|------------------------|----------------------------|-------------------|---------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                     |                                                                                               | Circuit System     | Mounting Configuration | Primary Conductor          | Rated Current     | Power Voltage |        |                                                                                                                                                                                                                                                                            |
| F03P<br>           | F03PxxxS05L<br>F03PxxxS05                                                                     | Fluxgate system    | On-board               | Built-in bus-bar           | 6~50A             | +5V           | ●      | <ul style="list-style-type: none"><li>• Super precision &amp; High stability</li><li>• F02P &amp; F03P : With reference access</li><li>• F03P : Longer creepage and clearance distances</li><li>• Name end"L" ; Backward compatible, Anti-Surge current, Compact</li></ul> |
| F02P<br>           | F02PxxxS05L<br>F02PxxxS05                                                                     |                    |                        |                            |                   |               |        |                                                                                                                                                                                                                                                                            |
| F01P<br>           | F01PxxxS05L<br>F01PxxxS05                                                                     |                    |                        |                            |                   |               |        |                                                                                                                                                                                                                                                                            |
| LA02P<br>LA03P<br> | <div>NEW</div><br>LA03PxxxS05<br><br>LA02PxxxS03                                              | Open loop          | On-board (Discrete)    | Built-in bus-bar           | 21~85A<br>*1      | +5V           | ●      | <ul style="list-style-type: none"><li>• Open loop - one chip ASIC model</li><li>• Creepage distance : 13mm</li><li>• Low profile package (9.2mm on PCB)</li><li>• High-speed response</li><li>* 1 : Measurement current range</li></ul>                                    |
|                                                                                                     |                                                                                               |                    |                        |                            |                   | +3.3V         |        |                                                                                                                                                                                                                                                                            |
| LA01P(M)<br>     | LA01PxxxS05<br><br>LA01MxxxS05                                                                | Open loop          | On-board (Discrete)    | Built-in bus-bar           | 35~85, 170A<br>*1 | +5V           | ●      | <ul style="list-style-type: none"><li>• Open loop - one chip ASIC model</li><li>• Low profile package (8.5mm on PCB)</li><li>• High-speed response</li><li>* 1 : Measurement current range</li></ul>                                                                       |
|                                                                                                     |                                                                                               |                    | On-board (SMT)         |                            | 21~41A<br>*1      |               |        |                                                                                                                                                                                                                                                                            |
| L37S<br>         | L37SxxxD15M<br>L37SxxxD15J                                                                    | Open loop          | Connector (MOLEX/JST)  | Through hole<br>□20.4×10.4 | 50~600A           | ±15V          | ●      | <ul style="list-style-type: none"><li>• Design for lower dvdt noise</li><li>• Succession model of L03SxxxD15W series</li><li>• Wide electrical current range</li><li>• Compact</li></ul>                                                                                   |
| L34S<br>         | L34SxxxD15                                                                                    | Open loop          | Connector (MOLEX)      | Through hole<br>□40.5×40.5 | 200~1500A         | ±15V          | ●      | <ul style="list-style-type: none"><li>• High-Current (1500A_max)</li><li>• Wide electrical current range</li><li>• Large aperture</li></ul>                                                                                                                                |
| L32P<br>         | L32PxxxS05FS<br><br>L32PxxxS05BFS                                                             | Open loop          | On-board               | Through hole<br>□15×8      | 50~400A           | +5V           | ●      | <ul style="list-style-type: none"><li>• Ferrite core is used.</li><li>• With reference access</li><li>• Used Anti-Sulfurated resistance</li></ul>                                                                                                                          |
|                                                                                                     |                                                                                               |                    |                        | Built-in bus-bar           | 50A, 100A         |               |        |                                                                                                                                                                                                                                                                            |
| L31S<br>         | L31SxxxS05FS                                                                                  | Open loop          | Connector (MOLEX)      | Through hole<br>□20.5×10.5 | 50~600A           | +5V           | ●      | <ul style="list-style-type: none"><li>• Wide electrical current range</li><li>• Ferrite core is used.</li><li>• With reference access</li><li>• Used Anti-Sulfurated resistance</li></ul>                                                                                  |
| L18P<br>         | L18PxxxD15-OP<br>SL18PxxxD15<br>L18PxxxD15<br><br>L18PxxxS05<br>L18PxxxS05R<br><br>L18PxxxS12 | Open loop          | On-board               | Built-in coil/<br>bus-bar  | 3~60A             | ±15V          | ●      | <ul style="list-style-type: none"><li>• Low cost</li><li>• Compact, high performance</li><li>• Name First "SL18P"; Anti-Sulfurated (Coating, Anti-Sulfurated re-sistance)</li><li>• Name end "R"; Rated voltage change</li></ul>                                           |
|                                                                                                     |                                                                                               |                    |                        |                            |                   | +5V           |        |                                                                                                                                                                                                                                                                            |
|                                                                                                     |                                                                                               |                    |                        |                            |                   | +12V          |        |                                                                                                                                                                                                                                                                            |
| L12P<br>         | L12P025D15                                                                                    | Open loop          | On-board               | Built-in coil              | 25A               | ±15V          |        | <ul style="list-style-type: none"><li>• Low cost</li><li>• Compact</li></ul>                                                                                                                                                                                               |
| L08P<br>         | L08PxxxD15W/<br>IPV<br><br>L08PxxxD15                                                         | Open loop          | On-board               | Through hole<br>φ16        | 100~300A          | ±15V          |        | <ul style="list-style-type: none"><li>• Wide range of applications</li><li>• Name end"W";Saturation current up, NC pin is deleted.</li></ul>                                                                                                                               |
|                                                                                                     |                                                                                               |                    |                        |                            | 50~200A           |               |        |                                                                                                                                                                                                                                                                            |
| L07P<br>         | L07PxxxD15<br><br>L07PxxxD15S<br><br>L07PxxxS05                                               | Open loop          | On-board               | Built-in coil              | 3~30A             | ±15V          | ●      | <ul style="list-style-type: none"><li>• Low cost</li><li>• Built-in 2 circuits</li><li>• Name end "S";Anti-Sulfurated (Coating, Anti-Sulfurated resistance)</li></ul>                                                                                                      |
|                                                                                                     |                                                                                               |                    |                        |                            |                   | +5V           |        |                                                                                                                                                                                                                                                                            |
|                                                                                                     |                                                                                               |                    |                        |                            |                   |               |        |                                                                                                                                                                                                                                                                            |

# Current Sensor / Guide map

| SERIES                                                                                             | Model                                                    | Main Specification |                        |                            |               |               | UL R/C | Features                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------|------------------------|----------------------------|---------------|---------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                    |                                                          | Circuit System     | Mounting Configuration | Primary Conductor          | Rated Current | Power Voltage |        |                                                                                                                                                                                                                                                                   |
| <b>L06P</b><br>   | L06PxxxS05                                               | Open loop          | On-board               | Through hole<br>φ22        | 300~800A      | +5V           |        | <ul style="list-style-type: none"> <li>Wide range of applications</li> <li>Single power supply type</li> </ul>                                                                                                                                                    |
| <b>L05Z</b><br>   | L05Z800S15                                               | Open loop          | Connector (JST)        | Through hole<br>□20.5×10.5 | 800A          | +15V          |        | <ul style="list-style-type: none"> <li>Wide range of applications</li> <li>Single power supply type</li> </ul>                                                                                                                                                    |
| <b>L03S</b><br>   | L03SxxxD15WM<br>L03SxxxD15WJ                             | Open loop          | Connector (MOLEX/JST)  | Through hole<br>□20.5×10.5 | 50~800A       | ±15V          |        | <ul style="list-style-type: none"> <li>Wide electrical current range</li> <li>Compact</li> <li>Name end "W"; Saturation current up, Change position of CN (MOLEX or JST)</li> </ul>                                                                               |
|                                                                                                    | L03SxxxD15                                               |                    | Connector (MOLEX)      |                            | 50~600A       |               |        |                                                                                                                                                                                                                                                                   |
| <b>L01Z</b><br>   | L01ZxxxS05                                               | Open loop          | On-board               | Through hole<br>□15×8      | 50~600A       | +5V           |        | <ul style="list-style-type: none"> <li>Wide electrical current range</li> <li>Compact</li> </ul>                                                                                                                                                                  |
| <b>S29S</b><br>  | S29S1T0D24Z<br>S29S1T0D24ZM<br>S29S1T0D24ZJ              | Closed loop        | Connector (MOLEX/JST)  | Through hole<br>φ38.5      | 1000A         | ±24V          | ●      | <ul style="list-style-type: none"> <li>High-current, High accuracy</li> <li>Conversion Ratio 1:5000</li> <li>Connector: MOLEX (2 type), JST (1 type)</li> </ul>                                                                                                   |
| <b>S28S</b><br> | S28S500D24Z<br>S28S500D24ZM                              | Closed loop        | Connector (MOLEX)      | Through hole<br>φ30        | 500A          | ±24V          | ●      | <ul style="list-style-type: none"> <li>High-current, High accuracy</li> <li>Conversion Ratio 1:5000</li> <li>Connector: MOLEX (2 type)</li> </ul>                                                                                                                 |
| <b>S27S</b><br> | S27S300D15Y<br>S27S300D15YM                              | Closed loop        | Connector (MOLEX)      | Through hole<br>φ20        | 300A          | ±20V          | ●      | <ul style="list-style-type: none"> <li>High accuracy, High performance</li> <li>Conversion Ratio 1:2000</li> <li>Connector: MOLEX (2 type)</li> </ul>                                                                                                             |
| <b>S26P</b><br> | S26P200D15Y                                              | Closed loop        | On-board               | Through hole<br>□17×11     | 200A          | ±15V          | ●      | <ul style="list-style-type: none"> <li>High accuracy, High performance</li> <li>Conversion Ratio 1:2000</li> </ul>                                                                                                                                                |
| <b>S25P</b><br> | S25P050D15X<br>S25P100D15Y<br>S25P100D15X<br>S25P150D15Y | Closed loop        | On-board               | Through hole<br>□13×8.5    | 50~150A       | ±15V          | ●      | <ul style="list-style-type: none"> <li>High accuracy, High performance</li> <li>Conversion Ratio 1:1000 (Name end "X"), 1:2000 (Name end "Y")</li> </ul>                                                                                                          |
| <b>S23P</b><br> | S23PxxxD15M2<br>S23PxxxD15M1<br>S23PxxxD15               | Closed loop        | On-board               | Built-in bus-bar           | 100A          | ±15V          | ●      | <ul style="list-style-type: none"> <li>High accuracy, High performance</li> <li>Name end "M2"; Backward compatible, dv/dt improvement type</li> <li>Name end "M1": Conversion Ratio 1:1000</li> <li>Conversion Ratio - Normal &amp; M2 type are 1:2000</li> </ul> |
| <b>S22P</b><br> | S22PxxxS05M2<br>S22PxxxS05P                              | Closed loop        | On-board               | Built-in bus-bar           | 6~25A         | +5V           | ●      | <ul style="list-style-type: none"> <li>Voltage - output type</li> <li>Name end "M2"; Backward compatible of normal model, External magnetic field improvement model</li> <li>Name end "P"; Short lead model of normal model</li> </ul>                            |
| <b>S21S</b><br> | S21S180D15JN                                             | Closed loop        | Connector (JST)        | Through hole<br>R10        | 180A          | ±15V          | ●      | <ul style="list-style-type: none"> <li>Semicircle aperture</li> <li>Conversion Ratio 1:4000</li> </ul>                                                                                                                                                            |
| <b>S20S</b><br> | S20S200D15M1                                             | Closed loop        | Connector (JST)        | Through hole<br>φ20.5      | 200A          | ±15V          |        | <ul style="list-style-type: none"> <li>High accuracy, High performance</li> <li>Conversion Ratio 1:2000</li> </ul>                                                                                                                                                |

## Circuit system

Tamura offers multiple current sensor options to meet application requirements: Open Loop or Linear type (magnetic proportionality); Closed Loop or Servo-type (magnetic balance); Flux-Gate (magnetic equilibrium).

### Open loop

If the current is applied to the cable, the magnetic field proportional to the current in surroundings of the cable is generated on Ampere's rule. The magnetic core is set in surroundings of the cable to improve the sensitivity. The Magnetic field is converted into the voltage by the linear type - hall element is placed in the gap of the magnetic core. But the output voltage of hall element is several tens of milli-volt, It enlarges it to the output voltage of the product specification (several volts) by the operational amplifier.

The sensor output voltage is linearly proportional to the magnetic flux generated by the measured current. In general, the open loop sensor is voltage output. The characteristic (accuracy, linearity, response, temperature property, and high-frequency current\*1, etc.) of the current sensor is not a little better than that of other circuit methods because of the difference of the circuit configuration (magnetic circuit, magnetism-electric conversion and amplification of electrical circuit). However, the size can be reduced and it is lower-cost more than other circuit methods.

\*1-We use silicon steel and permalloy in internal magnetic core of the open-loop sensors in order to improve the measurement possible current and hysteresis error. Therefore, at the frequency of the applied current exceeds more than several KHz, there is a possibility that the internal circuit may be damaged by the heat generation of the core loss.

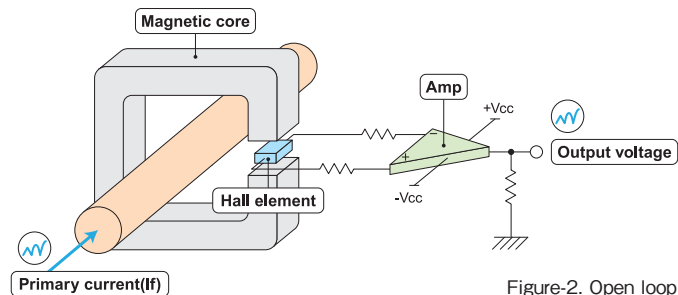


Figure-2. Open loop

### Closed loop

The closed loop type current sensor measures the applied current on the condition that the magnetic flux density in the magnetic core is extremely zero. Therefore, there is no influence on accuracy by the non-linearity and hysteresis in the core because the flux density in the magnetic core operates in the starting point of the B-H curve in the operation region\*1. The characteristic of the closed loop type is better than the open loop type current sensor.

The addition of a secondary winding (1000-5000 turns) on the magnetic core allows feedback current to be supplied in opposition to measured current to compensate or cancel the magnetic flux generated by the measured current. The output of the closed loop sensor is a current output proportional to the measured current divided by the number of secondary winding turns\*2.

\*1-At the high-frequency current (1-2kHz or more) and the pulse current, current sensor should operate at ACCT (transformer) because the loop gain of the feedback control decreases. Under such a condition, the magnetic flux in the magnetic core is generated.

\*2-Output current = (Primary current) / (Secondary winding turns)

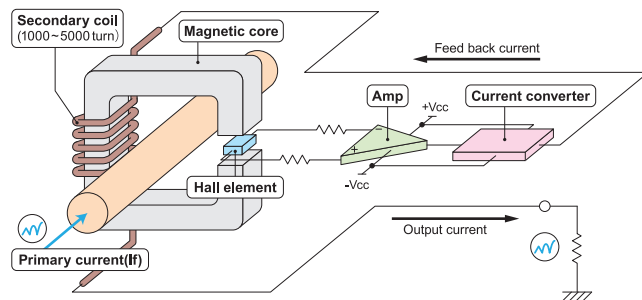


Figure-3. Closed loop

### Fluxgate system

The flux-gate current sensor replaces the Hall element with probe coil made of highly saturable material. The magnetic offset of the probe coil does not occur in order to be driven by high-frequency current. The flux-gate utilizes a magnetic balance system to achieve high accuracy, temperature stable current output typically converted to a voltage output with an internal high precision resistor.

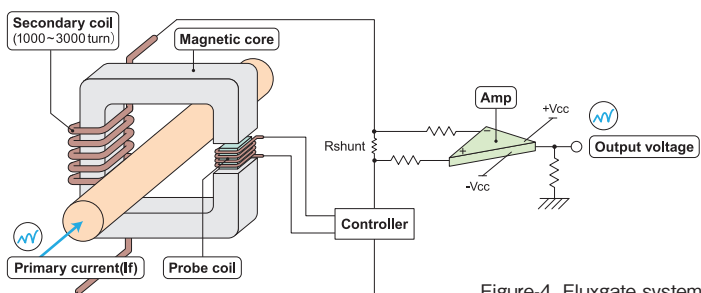


Figure-4. Fluxgate system



# Application notes

## <General Considerations>

1. The sensor uses polar electronic components. When the polarity of the power supply is mistaken, the sensor is damaged.
2. Static electricity or excessive voltage can increase an offset voltage in the Hall element, and cause offset voltage to change. Please exercise care in handling and application.
3. In order to prevent the influence of noise, the use of twisted cable or shielded cable for the output line is recommended
4. If using this device within a magnetic field generated by other devices, the specified accuracy may not be obtainable.
5. Our products (several models are excluded ) are adjusted with the trimming method by the measurement condition (Load resistance, Power supply voltage) of specification sheets. Therefore, characteristics (Offset, Output, etc.) and its deviation may be changed in different circuit conditions from the measurement condition. All change characteristic items are not indicated on specification sheets.
6. The performance of current sensors with through-hole (aperture) is dependent on the position of the primary conductor. Tamura specifications are based on a primary conductor completely filling the through-hole (aperture) area.
7. The current sensor rated current in DC Amps.
8. Please use mating connector with equivalent terminal plating material to insure proper operation and avoid possibility of 'galvanic corrosion' .
9. Please do not store in high-temperature and high-humidity storage environment. Please use it after confirming soldering when it is kept for six months or more. (product soldered with substrate)
10. We recommend performing a zero offset adjustment by measuring the offset voltage at startup. In continuously operation for a few months, or at change of ambient temperature or humidity is large, we recommend regularly performing a zero offset adjustment at being idling (it is clear that the current is not apply) .

## <Open loop>

1. High frequency primary current may result in excessive heating in iron magnetic core and cause damage to internal circuitry; for high frequency applications select current sensor with ferrite core material.
2. If the measured current exceeds the rated current, magnetic core saturation will occur and the output voltage signal will not be linearly proportional to the measured current.

## <Closed Loop>

1. For closed loop current sensors please insure the power supply voltage is balanced, symmetrical, and, applied simultaneously to avoid potential increase in DC offset error.
2. Maximum rated current measurement duration is timedependent. Maximum rated current applied in excess of the time limit can result in damage to internal electronic circuitry; please consult Tamura for assistance.
3. When using a measurement resistor to convert current output to voltage output select a resistor with stable temperature characteristic to insure accuracy of the output voltage.
4. Compensation current supplied to the secondary winding varies in proportion to the measured current based on the conversion ratio. (If/ $KN$ ;  $KN$  = secondary turns) Please insure the PSU has required current capacity to supply compensation current to the secondary winding.

## <Flux-Gate>

1. Compensation current supplied to the secondary winding varies in proportion to the measured current. Please insure the PSU has required current capacity to supply compensation current to the secondary winding.
2. There is 450kHz ripple voltage present on the output and reference output voltage signals . An external capacitor maybe added if necessary.

# Part numbering system

## Outlines

Ex)

**L03 S \*\*\* D 15**      
**S22 P \*\*\* S 05**      
**① ② ③ ④ ⑤ ⑥**

### ① Model (3 figures or 4 figures)

**L \*\*** : Open loop system (Magnetic Proportion System)  
**S \*\*** : Closed loop system (Servo system)  
**F \*\*** : Fluxgate system  
**LA \*\*** : Open loop system - One chip ASIC

### ② Mounting configuration (1 figure)

**P** : Through Hole Mounting Device  
**M** : Surface Mount Device  
**S** : Bolt-on Device

### ③ Rated current (3 figures)

Ex)

**2R5** : 2.5A    **005** : 5A  
**050** : 50A    **500** : 500A  
**1T0** : 1000A

### ④ Control power supply type (1 figure)

**S** : Single supply    **D** : Dual supply

### ⑤ Power supply voltage (2 figures)

**15** : 15V    **05** : 5V

### ⑥ Special specification (4 figures\_MAX.)

Ex)

| Figures | Special specification            |
|---------|----------------------------------|
| B       | With a busbar                    |
| C       | With a cover                     |
| J       | Connector Maker : JST            |
| M       | Connector Maker : Molex          |
| W       | Saturation current is increased. |
| X       | Secondary coil :1000 Turns       |
| Z       | Secondary coil : 5000 Turns      |
| Y       | Secondary coil : 2000 Turns      |



## Important Notice

1. The content of this information is subject to change without prior notice for the purpose of improvements, etc. Ensure that you are in possession of the most up-to-date information when using this product.
2. This product is intended to be used in general electronics applications (electric home appliances, business equipment, information equipment, communication terminal equipment, measuring devices, industrial equipment, and so on). This product is neither intended nor warranted for use in following equipment or devices:
 

Special application (such as for medical devices, transportation equipment, traffic signal control equipment, fire and crime prevention equipment, aeronautics and space devices, nuclear power control, fuel control, in-vehicle equipment, safety devices, and so on) in which extremely high quality and high reliability is required, or if the malfunction or failures of product could be cause loss of human life, bodily injury.

Tamura Corporation shall not be held responsible for any damage incurred by customers or any third party when products are used in special application, unless specifically permitted in this document.
3. Tamura Corporation constantly strives to improve quality and reliability, but malfunction or failures are bound to occur with some probability in current sensor. To ensure that failures do not cause accidents resulting in injury or death, fire accidents, social damage, and so on, users are to thoroughly verify the safety of their designs in devices and/or systems.
4. The operation examples and circuit examples shown in this information are for reference purposes only, and Tamura Corporation disclaims all responsibility for any violations of industrial property rights, intellectual property rights and any other rights owned by Tamura Corporation or third parties that these may entail.
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6. The products are designed for use in environments where consumer electronics are commonly used. It is not designed for use in special environments such as listed below, and if such use is considered, the user is to perform thorough safety and reliability checks under his/her responsibility.
7. This product is not designed to resist radiation.
  - Use in liquids such as water, oil, chemical solutions, or organic solvents, and use in locations where the product will be exposed to such liquids.
  - Use that involves exposure to direct sunlight, outdoor exposure, or dusty conditions.
  - Use in locations where corrosive gases such as sea winds, Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>2</sub>, are present. (Some product improves durability)
  - Use in environments with strong static electricity or electromagnetic radiation.
  - Use that involves placing inflammable material next to the product.
  - Use of this product either sealed with a resin filling or coated with resin.
  - Use of water or a water soluble detergent for flux cleaning.
  - Use in locations where condensation is liable to occur.
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# According to UL508 standard and CSA C22.2 No.14 standard

## Note

Models F01P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, or L, may be followed by slash and any numbers from 01 through 99 or blank. Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank.

## Power Circuit and Motor-mounted Apparatus - Component UL FILE No.E243511

| Series | Model                          | Requirements Evaluated to<br>(US and/or CN) |
|--------|--------------------------------|---------------------------------------------|
| F01P   | F01P *** S05                   | USR                                         |
| F02P   | F02P *** S05                   | USR                                         |
| F03P   | F03P *** S05                   | USR                                         |
| L07P   | L07P *** D15                   | USR, CNR                                    |
|        | L07P *** D15S                  |                                             |
|        | L07P *** S05                   |                                             |
| L18P   | L18P *** D15                   | USR, CNR                                    |
|        | L18P *** D15C                  |                                             |
|        | L18P *** D15-OP                |                                             |
|        | L18P *** S05                   |                                             |
|        | L18P *** S05R                  |                                             |
|        | L18P *** S12                   |                                             |
|        | SL18P *** D15                  |                                             |
| L31S   | L31S *** S05S                  | USR, CNR                                    |
|        | L31S *** S05FS                 | USR                                         |
| L32P   | L32P *** S05(B)FS              | USR                                         |
| L34S   | L34S *** D15                   | USR, CNR                                    |
| L37S   | L37S *** D15J<br>L37S *** D15M | USR                                         |
| S21S   | S21S180D15JN                   | USR, CNR                                    |
| S22P   | S22P *** S05                   | USR, CNR                                    |
|        | S22P *** S05P                  |                                             |
|        | S22P *** S05M2                 |                                             |
| S23P   | S23P50/100D15                  | USR, CNR                                    |
|        | S23P50/100D15M1                |                                             |
|        | S23P50/100D15M2                |                                             |
| S25P   | S25P *** D15 *                 | USR, CNR                                    |
| S26P   | S26P200D15Y                    | USR, CNR                                    |
| S27S   | S27S300D15Y                    | USR, CNR                                    |
|        | S27S300D15YM                   |                                             |
| S28S   | S28S500D24Z                    | USR                                         |
|        | S28S500D24ZM                   |                                             |
| S29S   | S29S1T0D24Z                    | USR                                         |
|        | S29S1T0D24ZM                   |                                             |
|        | S29S1T0D24ZJ                   |                                             |
| F23P   | F23P *** S05                   | USR, CNR                                    |
| LA02P  | LA02P *** S03                  | USR, CNR                                    |
| LA03P  | LA03P *** S05                  | USR, CNR                                    |

## Ratings - Environmental

| Series | Model                          | Environmental                                 |                     |
|--------|--------------------------------|-----------------------------------------------|---------------------|
|        |                                | Maximum Surrounding<br>Air Temperature rating | Pollution<br>Degree |
| F01P   | F01P *** S05                   | 105°C.                                        | 2                   |
| F02P   | F02P *** S05                   | 105°C.                                        | 2                   |
| F03P   | F03P *** S05                   | 105°C.                                        | 2                   |
| L07P   | L07P *** D15                   | 80°C.                                         | 2                   |
|        | L07P *** D15S                  |                                               |                     |
|        | L07P *** S05                   |                                               |                     |
| L18P   | L18P *** D15                   | 80°C.                                         | 2                   |
|        | L18P *** D15C                  |                                               |                     |
|        | L18P *** D15-OP                |                                               |                     |
|        | L18P *** S05                   |                                               |                     |
|        | L18P *** S05R                  |                                               |                     |
|        | L18P *** S12                   |                                               |                     |
|        | SL18P *** D15                  |                                               |                     |
| L31S   | L31S *** S05S                  | 85°C.                                         | 2                   |
|        | L31S *** S05FS                 |                                               |                     |
| L32P   | L32P *** S05(B)FS              | 85°C.                                         | 2                   |
| L34S   | L34S *** D15                   | 80°C.                                         | 2                   |
| L37S   | L37S *** D15J<br>L37S *** D15M | 85°C.                                         | 2                   |
| S21S   | S21S180D15JN                   | 80°C.                                         | 2                   |
| S22P   | S22P *** S05                   | 85°C.                                         | 2                   |
|        | S22P *** S05P                  |                                               |                     |
|        | S22P *** S05M2                 |                                               |                     |
| S23P   | S23P50/100D15                  | 85°C.                                         | 2                   |
|        | S23P50/100D15M1                |                                               |                     |
|        | S23P50/100D15M2                |                                               |                     |
| S25P   | S25P *** D15 *                 | 85°C.                                         | 2                   |
| S26P   | S26P200D15Y                    | 85°C.                                         | 2                   |
| S27S   | S27S300D15Y                    | 85°C.                                         | 2                   |
|        | S27S300D15YM                   |                                               |                     |
| S28S   | S28S500D24Z                    | 70°C.                                         | 2                   |
|        | S28S500D24ZM                   |                                               |                     |
| S29S   | S29S1T0D24Z                    | 85°C.                                         | 2                   |
|        | S29S1T0D24ZM                   |                                               |                     |
|        | S29S1T0D24ZJ                   |                                               |                     |
| F23P   | F23P *** S05                   | 85°C.                                         | 2                   |
| LA02P  | LA02P *** S03                  | 110°C.                                        | 2                   |
| LA03P  | LA03P *** S05                  | 110°C.                                        | 2                   |

## Note

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# According to UL508 standard and CSA C22.2 No.14 standard

Note

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Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank.

## Ratings - Electrical

| Series     | Model          | Primary<br>(Feed-through) | Secondary (Sensing)  |                            |
|------------|----------------|---------------------------|----------------------|----------------------------|
|            |                |                           | Input                | Output                     |
| F01P       | F01P006S05     | 6 A, 600 Vrms             | 5 Vdc, 25 mA         | 2.5 ± 2.2 Vdc,<br>± 0.5 mA |
|            | F01P015S05     | 15 A, 600 Vrms            | 5 Vdc, 30 mA         |                            |
|            | F01P025S05     | 25 A, 600 Vrms            | 5 Vdc, 35 mA         |                            |
|            | F01P050S05     | 50 A, 600 Vrms            | 5 Vdc, 55 mA         |                            |
| F02P       | F02P006S05     | 6 A, 600 Vrms             | 5 Vdc, 25 mA         | 2.5 ± 2.2 Vdc,<br>± 0.5 mA |
|            | F02P015S05     | 15 A, 600 Vrms            | 5 Vdc, 30 mA         |                            |
|            | F02P025S05     | 25 A, 600 Vrms            | 5 Vdc, 35 mA         |                            |
|            | F02P050S05     | 50 A, 600 Vrms            | 5 Vdc, 55 mA         |                            |
| F03P       | F03P006S05     | 6 A, 600 Vrms             | 5 Vdc, 25 mA         | 2.5 ± 2.2 Vdc,<br>± 0.5 mA |
|            | F03P015S05     | 15 A, 600 Vrms            | 5 Vdc, 30 mA         |                            |
|            | F03P025S05     | 25 A, 600 Vrms            | 5 Vdc, 35 mA         |                            |
|            | F03P050S05     | 50 A, 600 Vrms            | 5 Vdc, 55 mA         |                            |
| L07P       | L07P003D15     | 3 A, 600 Vrms             | ± 15 Vdc,<br>± 30 mA | 0 - 4 Vdc,<br>0.4 mA       |
|            | L07P003D15S    |                           |                      |                            |
|            | L07P005D15     | 5 A, 600 Vrms             |                      |                            |
|            | L07P005D15S    |                           |                      |                            |
|            | L07P010D15     | 10 A, 600 Vrms            |                      |                            |
|            | L07P010D15S    |                           |                      |                            |
|            | L07P015D15     | 15 A, 600 Vrms            |                      |                            |
|            | L07P015D15S    |                           |                      |                            |
|            | L07P020D15     | 20 A, 600 Vrms            |                      |                            |
|            | L07P020D15S    |                           |                      |                            |
|            | L07P025D15     | 25 A, 600 Vrms            |                      |                            |
|            | L07P025D15S    |                           |                      |                            |
|            | L07P030D15     | 30 A, 600 Vrms            |                      |                            |
|            | L07P030D15S    |                           |                      |                            |
|            | L07P003S05     | 3 A, 600 Vrms             | 5 Vdc,<br>30 mA      | 0-3.75 Vdc,<br>0.4 mA      |
|            | L07P005S05     |                           |                      |                            |
|            | L07P010S05     |                           |                      |                            |
|            | L07P015S05     |                           |                      |                            |
|            | L07P020S05     |                           |                      |                            |
|            | L07P025S05     |                           |                      |                            |
|            | L07P030S05     |                           |                      |                            |
|            | L07P030S05     |                           |                      |                            |
| L18P       | L18P003D15     | 3 A, 600 Vrms             | ± 15 Vdc,<br>± 15 mA | 0-4 Vdc,<br>0.4 mA         |
|            | L18P005D15     | 5 A, 600 Vrms             |                      |                            |
|            | L18P010D15     | 10 A, 600 Vrms            |                      |                            |
|            | L18P015D15     | 15 A, 600 Vrms            |                      |                            |
|            | L18P020D15     | 20 A, 600 Vrms            |                      |                            |
|            | L18P025D15     | 25 A, 600 Vrms            |                      |                            |
|            | L18P030D15     | 30 A, 600 Vrms            |                      |                            |
|            | L18P040D15     | 40 A, 600 Vrms            |                      |                            |
|            | L18P050D15     | 50 A, 600 Vrms            |                      |                            |
| L18P060D15 | 60 A, 600 Vrms |                           |                      |                            |

Note

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## Ratings - Electrical

| Series | Model         | Primary<br>(Feed-through) | Secondary (Sensing)  |                         |
|--------|---------------|---------------------------|----------------------|-------------------------|
|        |               |                           | Input                | Output                  |
| L18P   | L18P003D15C   | 3 A, 600 Vrms             | ± 15 Vdc,<br>± 15 mA | 0 - 4 Vdc,<br>0.4 mA    |
|        | L18P005D15C   | 5 A, 600 Vrms             |                      |                         |
|        | L18P010D15C   | 10 A, 600 Vrms            |                      |                         |
|        | L18P015D15C   | 15 A, 600 Vrms            |                      |                         |
|        | L18P020D15C   | 20 A, 600 Vrms            |                      |                         |
|        | L18P025D15C   | 25 A, 600 Vrms            |                      |                         |
|        | L18P030D15C   | 30 A, 600 Vrms            |                      |                         |
|        | L18P040D15C   | 40 A, 600 Vrms            |                      |                         |
|        | L18P050D15C   | 50 A, 600 Vrms            |                      |                         |
|        | L18P060D15C   | 60 A, 600 Vrms            |                      |                         |
| L18P   | L18P003D15-OP | 3 A, 600 Vrms             | ± 15 Vdc,<br>± 15 mA | 0 - 4 Vdc,<br>0.4 mA    |
|        | L18P005D15-OP | 5 A, 600 Vrms             |                      |                         |
|        | L18P010D15-OP | 10 A, 600 Vrms            |                      |                         |
|        | L18P015D15-OP | 15 A, 600 Vrms            |                      |                         |
|        | L18P020D15-OP | 20 A, 600 Vrms            |                      |                         |
|        | L18P025D15-OP | 25 A, 600 Vrms            |                      |                         |
|        | L18P030D15-OP | 30 A, 600 Vrms            |                      |                         |
|        | L18P040D15-OP | 40 A, 600 Vrms            |                      |                         |
|        | L18P050D15-OP | 50 A, 600 Vrms            |                      |                         |
|        | L18P060D15-OP | 60 A, 600 Vrms            |                      |                         |
| L18P   | L18P003S05    | 3 A, 600 Vrms             | 5 Vdc, 15 mA         | 0 - 4 Vdc,<br>0.4 mA    |
|        | L18P005S05    | 5 A, 600 Vrms             |                      |                         |
|        | L18P010S05    | 10 A, 600 Vrms            |                      |                         |
|        | L18P015S05    | 15 A, 600 Vrms            |                      |                         |
|        | L18P020S05    | 20 A, 600 Vrms            |                      |                         |
|        | L18P025S05    | 25 A, 600 Vrms            |                      |                         |
|        | L18P030S05    | 30 A, 600 Vrms            |                      |                         |
|        | L18P040S05    | 40 A, 600 Vrms            |                      |                         |
|        | L18P050S05    | 50 A, 600 Vrms            |                      |                         |
|        | L18P060S05    | 60 A, 600 Vrms            |                      |                         |
| L18P   | L18P003S05R   | 3 A, 600 Vrms             | 5 Vdc, 15 mA         | 0 - 3.2 Vdc,<br>0.32 mA |
|        | L18P005S05R   | 5 A, 600 Vrms             |                      |                         |
|        | L18P010S05R   | 10 A, 600 Vrms            |                      |                         |
|        | L18P015S05R   | 15 A, 600 Vrms            |                      |                         |
|        | L18P020S05R   | 20 A, 600 Vrms            |                      |                         |
|        | L18P025S05R   | 25 A, 600 Vrms            |                      |                         |
|        | L18P030S05R   | 30 A, 600 Vrms            |                      |                         |
|        | L18P040S05R   | 40 A, 600 Vrms            |                      |                         |
|        | L18P050S05R   | 50 A, 600 Vrms            |                      |                         |
|        | L18P060S05R   | 60 A, 600 Vrms            |                      |                         |

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## Ratings - Electrical

| Series | Model         | Primary<br>(Feed-through) | Secondary (Sensing)  |                                    |
|--------|---------------|---------------------------|----------------------|------------------------------------|
|        |               |                           | Input                | Output                             |
| L18P   | L18P003S12    | 3 A, 600 Vrms             | 12 Vdc,<br>15 mA     | 0 – 4 Vdc,<br>0.4 mA               |
|        | L18P005S12    | 5 A, 600 Vrms             |                      |                                    |
|        | L18P010S12    | 10 A, 600 Vrms            |                      |                                    |
|        | L18P015S12    | 15 A, 600 Vrms            |                      |                                    |
|        | L18P020S12    | 20 A, 600 Vrms            |                      |                                    |
|        | L18P025S12    | 25 A, 600 Vrms            |                      |                                    |
|        | L18P030S12    | 30 A, 600 Vrms            |                      |                                    |
|        | L18P040S12    | 40 A, 600 Vrms            |                      |                                    |
|        | L18P050S12    | 50 A, 600 Vrms            |                      |                                    |
|        | L18P060S12    | 60 A, 600 Vrms            |                      |                                    |
| L18P   | SL18P003D15   | 3 A, 600 Vrms             | ± 15 Vdc,<br>± 15 mA | 0 – 4 Vdc,<br>0.4 mA               |
|        | SL18P005D15   | 5 A, 600 Vrms             |                      |                                    |
|        | SL18P010D15   | 10 A, 600 Vrms            |                      |                                    |
|        | SL18P015D15   | 15 A, 600 Vrms            |                      |                                    |
|        | SL18P020D15   | 20 A, 600 Vrms            |                      |                                    |
|        | SL18P025D15   | 25 A, 600 Vrms            |                      |                                    |
|        | SL18P030D15   | 30 A, 600 Vrms            |                      |                                    |
|        | SL18P040D15   | 40 A, 600 Vrms            |                      |                                    |
|        | SL18P050D15   | 50 A, 600 Vrms            |                      |                                    |
|        | SL18P060D15   | 60 A, 600 Vrms            |                      |                                    |
| L31S   | L31S050S05S   | 50 A, 600 Vrms            | 5 Vdc, 15 mA         | 1.875 – 3.125<br>Vdc,<br>0.3125 mA |
|        | L31S050S05FS  |                           |                      |                                    |
|        | L31S100S05S   | 100 A, 600 Vrms           |                      |                                    |
|        | L31S100S05FS  |                           |                      |                                    |
|        | L31S200S05S   | 200 A, 600 Vrms           |                      |                                    |
|        | L31S200S05FS  |                           |                      |                                    |
|        | L31S300S05S   | 300 A, 600 Vrms           |                      |                                    |
|        | L31S300S05FS  |                           |                      |                                    |
|        | L31S400S05S   | 400 A, 600 Vrms           |                      |                                    |
|        | L31S400S05FS  |                           |                      |                                    |
|        | L31S500S05S   | 500 A, 600 Vrms           |                      |                                    |
|        | L31S500S05FS  |                           |                      |                                    |
|        | L31S600S05S   | 600 A, 600 Vrms           |                      |                                    |
|        | L31S600S05FS  |                           |                      |                                    |
| L32P   | L32P050S05FS  | 50 A, 600 Vrms            | 5 Vdc, 15 mA         | 1.875 –<br>3.125 Vdc,<br>0.3125 mA |
|        | L32S050S05BFS |                           |                      |                                    |
|        | L32P100S05FS  | 100 A, 600 Vrms           |                      |                                    |
|        | L32P100S05BFS |                           |                      |                                    |
|        | L32P150S05FS  | 150 A, 600 Vrms           |                      |                                    |
|        | L32P200S05FS  | 200 A, 600 Vrms           |                      |                                    |
|        | L32P300S05FS  | 300 A, 600 Vrms           |                      |                                    |
|        | L32P400S05FS  | 400 A, 600 Vrms           |                      |                                    |
| L34S   | L34S200D15    | 200 A, 600 Vrms           | ± 15 Vdc,<br>± 25mA  | 0 – 4 Vdc,<br>0.4 mA               |
|        | L34S300D15    | 300 A, 600 Vrms           |                      |                                    |
|        | L34S400D15    | 400 A, 600 Vrms           |                      |                                    |
|        | L34S500D15    | 500 A, 600 Vrms           |                      |                                    |
|        | L34S600D15    | 600 A, 600 Vrms           |                      |                                    |
|        | L34S1T0D15    | 1000 A, 600 Vrms          |                      |                                    |
|        | L34S1T2D15    | 1200 A, 600 Vrms          |                      |                                    |
|        | L34S1T5D15    | 1500 A, 600 Vrms          |                      |                                    |

## Ratings - Electrical

| Series       | Model                                                    | Primary<br>(Feed-through) | Secondary (Sensing)       |                              |
|--------------|----------------------------------------------------------|---------------------------|---------------------------|------------------------------|
|              |                                                          |                           | Input                     | Output                       |
| L37S         | L37S050D15J<br>L37S050D15M                               | 50 A, 600 Vrms            | ± 15 Vdc, ± 25mA          | 0 – 4 Vdc, 0.4 mA            |
|              | L37S100D15J<br>L37S100D15M                               | 100 A, 600 Vrms           |                           |                              |
|              | L37S200D15J<br>L37S200D15M                               | 200 A, 600 Vrms           |                           |                              |
|              | L37S300D15J<br>L37S300D15M                               | 300 A, 600 Vrms           |                           |                              |
|              | L37S400D15J<br>L37S400D15M                               | 400 A, 600 Vrms           |                           |                              |
|              | L37S500D15J<br>L37S500D15M                               | 500 A, 600 Vrms           |                           |                              |
|              | L37S600D15J<br>L37S600D15M                               | 600 A, 600 Vrms           |                           |                              |
| S21S         | S21S180D15JN                                             | 180 A, 600 Vrms           | ± 15 Vdc, ± 25mA          | 0 – 1.35 Vdc, 45mA           |
| S22P         | S22P006S05                                               | 6 A, 600 Vrms             | 5 Vdc, 12.5 mA            | 0 – 3.125 Vdc, 3mA           |
|              | S22P006S05P                                              |                           |                           |                              |
|              | S22P006S05M2                                             |                           |                           |                              |
|              | S22P015S05                                               | 15 A, 600 Vrms            |                           | 0 – 3.125 Vdc, 7.5mA         |
|              | S22P015S05P                                              |                           |                           |                              |
|              | S22P015S05M2                                             |                           |                           |                              |
|              | S22P025S05                                               | 25 A, 600 Vrms            |                           | 0 – 3.125 Vdc, 12.5mA        |
| S22P025S05P  |                                                          |                           |                           |                              |
| S22P025S05M2 |                                                          |                           |                           |                              |
| S23P         | S23P50/100D15                                            | 100 A, 600 Vrms           | MAX. ± 15 Vdc, ± 62.5 mA  | -2.5 – 2.5 Vdc; -50 – 50mA   |
|              | S23P50/100D15M1                                          | 100 A, 600 Vrms           | MAX. ± 15 Vdc, ± 112.5 mA | -5 – 5 Vdc; -100 – 100mA     |
|              | S23P50/100D15M2                                          | 100 A, 600 Vrms           | MAX. ± 15 Vdc, ± 62.5 mA  | -2.5 – 2.5 Vdc; -50 – 50mA   |
| S25P         | S25P050D15X                                              | 50 A, 600 Vrms            | MAX. ± 15 Vdc, ± 62.5 mA  | -5 – 5 Vdc; -50 – 50mA       |
|              | S25P100D15X                                              | 100 A, 600 Vrms           | MAX. ± 15 Vdc, ± 112.5 mA | -5 – 5 Vdc; -100 – 100mA     |
|              | S25P100D15Y                                              | 100 A, 600 Vrms           | MAX. ± 15 Vdc, ± 62.5 mA  | -5 – 5 Vdc; -50 – 50mA       |
|              | S25P150D15Y                                              | 150 A, 600 Vrms           | MAX. ± 15 Vdc, ± 87.5 mA  | -3.75 – 3.75 Vdc; -75 – 75mA |
| S26P         | S26P200D15Y                                              | 200 A, 600 Vrms           | MAX. ± 15 Vdc, ± 112.5 mA | -5 – 5 Vdc; -100 – 100mA     |
| S27S         | S27S300D15Y                                              | 300 A, 600 Vrms           | ± 15 Vdc, ± 162.5 mA      | 0 – ± 7.5 Vdc, ± 150mA       |
|              | S27S300D15YM                                             | 300 A, 600 Vrms           |                           |                              |
| S28S         | S28S500D24Z                                              | 500 A, 600 Vrms           | ± 24 Vdc, ± 130 mA        | 0 – ± 5 Vdc, ± 100mA         |
|              | S28S500D24ZM                                             | 500 A, 600 Vrms           |                           |                              |
| S29S         | S28S1T2D24Z                                              | 1000 A, 600 Vrms          | ± 24 Vdc, ± 235 mA        | 0 – ± 10 Vdc, ± 200mA        |
|              | S29S1T2D24ZM                                             | 1000 A, 600 Vrms          |                           |                              |
|              | S29S1T2D24ZJ                                             | 1000 A, 600 Vrms          |                           |                              |
| F23P         | F23P050S05                                               | 50 A, 600 Vrms            | 5 Vdc, 55mA               | 2.5 ± 2.2 Vdc, ± 0.5mA       |
|              | F23P100S05                                               | 100 A, 600 Vrms           | 5 Vdc, 110mA              |                              |
| LA02P        | LA02P021S03<br>LA02P035S03<br>LA02P054S03<br>LA02P085S03 | 50 A, 480 Vac             | 3.3Vdc, 10mA              | 3.3Vdc, 0.5mA                |
| LA03P        | LA03P021S05<br>LA03P035S05<br>LA03P054S05<br>LA03P085S05 | 50 A, 480 Vac             | 5Vdc, 10mA                | 5Vdc, 0.5mA                  |

## According to UL508 standard and CSA C22.2 No.14 standard

### Note

Models F01P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, or L, may be followed by slash and any numbers from 01 through 99 or blank. Models F02P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P0, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank. Models F03P; followed by 006, 015, 025 or 050, followed by S05, may be followed by D, L, -P1, -P2, -P3, -P4, -P5, -P6, -P7, -P8, -P9, -PA, -PB, -PC, -PD, -PE or -PF, may be followed by slash and any numbers from 01 through 99 or blank.

### CAUTION

The descriptions are directed from UL.

| Series | Model                          | CAUTION / Notice                                                                                                                                                                                                                                                      |
|--------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F01P   | F01P *** S05                   | - / Notice : The maximum temperature at top of case shall not be higher than 110° C and busbar shall not be higher than 108° C in the end-use product.                                                                                                                |
| F02P   | F02P *** S05                   |                                                                                                                                                                                                                                                                       |
| F03P   | F03P *** S05                   |                                                                                                                                                                                                                                                                       |
| L07P   | L07P *** D15                   | - / -                                                                                                                                                                                                                                                                 |
|        | L07P *** D15S                  |                                                                                                                                                                                                                                                                       |
|        | L07P *** S05                   |                                                                                                                                                                                                                                                                       |
| L18P   | L18P *** D15                   | - / -                                                                                                                                                                                                                                                                 |
|        | L18P *** D15C                  |                                                                                                                                                                                                                                                                       |
|        | L18P *** D15-OP                |                                                                                                                                                                                                                                                                       |
|        | L18P *** S05                   |                                                                                                                                                                                                                                                                       |
|        | L18P *** S05R                  |                                                                                                                                                                                                                                                                       |
|        | L18P *** S12                   |                                                                                                                                                                                                                                                                       |
|        | SL18P *** D15                  |                                                                                                                                                                                                                                                                       |
| L31S   | L31S *** S05S                  | - / Notice : Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings.                                                                                                                                    |
|        | L31S *** S05FS                 |                                                                                                                                                                                                                                                                       |
| L32P   | L32P *** S05(B)FS              | - / Notice : Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. The maximum temperature at case should not exceed 150°C by the case's insulation performance.                                      |
| L34S   | L34S *** D15                   | CAUTION : Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. / -                                                                                                                                   |
| L37S   | L37S *** D15J<br>L37S *** D15M | - / Notice: The maximum temperature of busbar shall not be higher than 102.3°C respectively at the end-use application.                                                                                                                                               |
| S21S   | S21S180D15JN                   | CAUTION : Do not wrap the primary conductor around the core part of the product to increase measured current. / -                                                                                                                                                     |
| S22P   | S22P *** S05                   | - / -                                                                                                                                                                                                                                                                 |
|        | S22P *** S05P                  |                                                                                                                                                                                                                                                                       |
|        | S22P *** S05M2                 |                                                                                                                                                                                                                                                                       |
| S23P   | S23P50/100D15                  | CAUTION : Provide two min. 100 by 85 mm, 0.5mm thick copper conductor-cum- heat sink as primary conductor of each side for safe usage. / Notice : The primary conductor temperature and PCB should not exceed 100°C by the temperature regulations of internal parts. |
|        | S23P50/100D15M1                |                                                                                                                                                                                                                                                                       |
|        | S23P50/100D15M2                |                                                                                                                                                                                                                                                                       |
| S25P   | S25P *** D15 *                 | CAUTION : Do not wrap the primary conductor around the core part of the product to increase measured current. / -                                                                                                                                                     |

**CAUTION**

The descriptions are directed from UL.

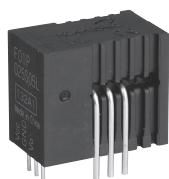
| Series       | Model         | CAUTION / Notice                                                                                                                                                                                                                             |
|--------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>S26P</b>  | S26P200D15Y   | CAUTION: Do not wrap the primary conductor around the core part of the product to increase measured current. / -                                                                                                                             |
| <b>S27S</b>  | S27S300D15Y   | - / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings.                                                                                                            |
|              | S27S300D15YM  |                                                                                                                                                                                                                                              |
| <b>S28S</b>  | S28S500D24Z   | - / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. The maximum temperature at case should not exceed 140°C by the case's insulation performance.              |
|              | S28S500D24ZM  |                                                                                                                                                                                                                                              |
| <b>S29S</b>  | S29S1T0D24Z   | - / Notice: Do not wrap the primary conductor around the core part of the product for preventing to reduce the required Spacings. The primary conductor temperature should not exceed 95°C by the temperature regulations of internal parts. |
|              | S29S1T0D24ZM  |                                                                                                                                                                                                                                              |
|              | S29S1T0D24ZJ  |                                                                                                                                                                                                                                              |
| <b>F23P</b>  | F23P *** S05  | Notice: The devices have been evaluated with the provision of the two copper conductor-cum-heat sink as the primary conductor, measured 100 by 85 mm, 0.5 mm thick.                                                                          |
| <b>LA02P</b> | LA02P *** S03 | - / -                                                                                                                                                                                                                                        |
| <b>LA03P</b> | LA03P *** S05 | - / -                                                                                                                                                                                                                                        |

**Note**

US indicates United States Standard.  
CN indicates Canadian National Standard.

### Fluxgate system / Voltage-output type, Anti-Surge current, Compact

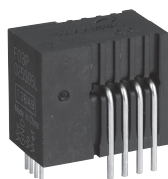
## F01P S05L, F02P S05L, F03P S05L SERIES



**F01PxxxS05L**



**F02PxxxS05L**



**F03PxxxS05L**



## RoHS

- Backward compatible to F01PxxxS05, F02PxxxS05, F03PxxxS05 Series.
- Anti-Surge current (4kAT, 8/20uS, single)
- Mounting area reduced, however, pin compatibility. Longitudinal dimension reduced.
- Super precision & High stability (Low temperature drift) .
- Unipolar power voltage; +5V. Rated Current; 6 ~ 50A. Multi-range models. MAX\_Temp.105°C . Voltage-output type.
- F01PxxxS05L series are designed by the pin compatibility as high-end models of S22PxxxS05M2 series.

## Comparison of the main features

| Series      | Features                                                                          |
|-------------|-----------------------------------------------------------------------------------|
| F01PxxxS05L | Without reference access.                                                         |
| F02PxxxS05L | With reference access, Ref_in & Ref_out.                                          |
| F03PxxxS05L | With reference access, Ref_in & Ref_out. Higher creepage and clearance distances. |

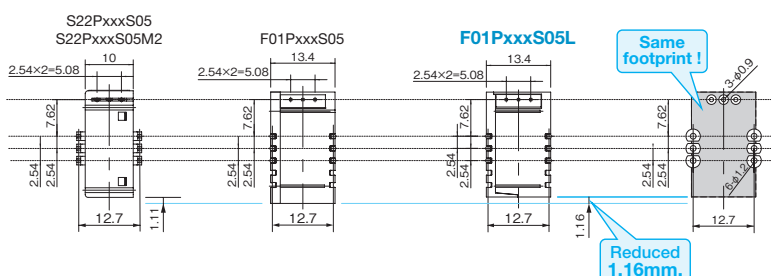
\*\*\*: Rated Current symbol

## SPECIFICATIONS

| Spec                                         | Types | Value                                                             |             |             |
|----------------------------------------------|-------|-------------------------------------------------------------------|-------------|-------------|
|                                              |       | F01PxxxS05L                                                       | F02PxxxS05L | F03PxxxS05L |
| Maximum peak current                         |       | 4kAT (2kA × 2. Number of primary tunes is two tunes.)             |             |             |
| Rated Current If (xxx: Rated Current symbol) |       | 6A (006) / 15A (015) / 25A (025) / 50A (050)                      |             |             |
| Maximum current ( At Vcc=+5V, Ta=+105℃)      |       | ± 20A (If=6A) / ± 51A (If=15A) / ± 85A (If=25A) / ± 150A (If=50A) |             |             |
| Existence of reference access                |       | No                                                                | Yes         |             |
| Number of primary busbar                     |       | 3pcs                                                              |             | 4pcs        |
| Clearance distance, Primary ⇔ Secondary      |       | 7.7mm                                                             | 7.5mm       | 8.2mm       |
| STANDARDS                                    |       | UL508 (file No E243511), EN50178, EN61010-1, EN60950-1            |             |             |
| Ambient operating temperature                |       | − 40℃ ~ +105℃                                                     |             |             |

## Mounting area

The mounting area has been reduced more than the F01P / F02P / F03PxxxS05 series. However, the F01P / F02P / F03PxxxS05L series series are 100% compatible with the F01P / F02P / F03PxxxS05series in regards to the footprint mounting.



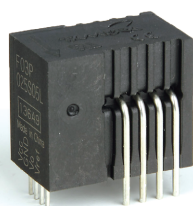
The F02P/F03PxxxS05L series also similarly reduces the mounting area.

The above-mentioned comparison tables are the auxiliary data for understanding each series. For details, please confirm the next page or subsequent ones.



Fluxgate system / Voltage-output type Anti-Surge current, Compact size

# F03P L SERIES



RoHS

## ABSOLUTE MAXIMUM RATINGS

| Parameters                    | Symbol | Unit | Value | Comment                                                                         |
|-------------------------------|--------|------|-------|---------------------------------------------------------------------------------|
| Supply voltage                | Vcc    | V    | 7     |                                                                                 |
| Primary conductor temperature | —      | °C   | 110   |                                                                                 |
| ESD (HBM: Human Body Model)   | —      | kV   | 4     | C=100pF, R=1.5k Ω                                                               |
| Maximum peak current          | —      | kAT  | 4     | Current waveform :<br>• Front time 8μs<br>• Time to half value 20μs<br>• single |

## ISOLATION CHARACTERISTICS

| Parameters                         | Symbol          | Unit | Value                                           | Comment                                                         |
|------------------------------------|-----------------|------|-------------------------------------------------|-----------------------------------------------------------------|
| Insulation voltage                 | Vd              | —    | AC4300V, for 1minute<br>(Sensing current 0.5mA) | Primary ⇔ Secondary                                             |
| Insulation Resistance              | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                            | Primary ⇔ Secondary                                             |
| Clearance distance                 | dCi             | —    | 8.2mm (TYP)                                     | Primary ⇔ Secondary                                             |
| Creepage distance                  | dCp             | —    | 8.2mm (TYP)                                     | Primary ⇔ Secondary                                             |
| Case material                      | —               | —    | UL94 V-0                                        |                                                                 |
| Comparative Tracking Index : (CTI) | CTI             | V    | 600                                             |                                                                 |
| Application example                | —               | —    | 300V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to EN61010 |
|                                    | —               | —    | 600V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to EN50178 |
|                                    | —               | —    | 1000V, CAT III, PD2                             | Simple isolation,<br>non uniform field according to EN50178     |

## ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |     |       | Comment |
|-------------------------------|----------------|------|-------|-----|-------|---------|
|                               |                |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | Ta             | °C   | − 40  |     | + 105 |         |
| Ambient storage temperature   | T <sub>s</sub> | °C   | − 40  |     | + 105 |         |
| Mass                          | m              | g    |       | 12  |       |         |



# SPECIFICATIONS

Ta=+25°C,Np=1T,RL=10kΩ,Vcc=+5V

| Parameters                                                         |             | Symbol              | Unit                    | Value      |                                       |       | Comment                                                     |
|--------------------------------------------------------------------|-------------|---------------------|-------------------------|------------|---------------------------------------|-------|-------------------------------------------------------------|
|                                                                    |             |                     |                         | MIN        | TYP                                   | MAX   |                                                             |
| Rated Current                                                      | F03P006S05L | If                  | A                       |            | 6                                     |       |                                                             |
|                                                                    | F03P015S05L |                     |                         |            | 15                                    |       |                                                             |
|                                                                    | F03P025S05L |                     |                         |            | 25                                    |       |                                                             |
|                                                                    | F03P050S05L |                     |                         |            | 50                                    |       |                                                             |
| Maximum current                                                    | F03P006S05L | I <sub>pmax</sub>   | A                       | − 20       |                                       | 20    |                                                             |
|                                                                    | F03P015S05L |                     |                         | − 51       |                                       | 51    |                                                             |
|                                                                    | F03P025S05L |                     |                         | − 85       |                                       | 85    |                                                             |
|                                                                    | F03P050S05L |                     |                         | − 150      |                                       | 150   |                                                             |
| Supply Voltage                                                     |             | V <sub>cc</sub>     | V                       | 4.75       | 5.00                                  | 5.25  |                                                             |
| Number of primary turns                                            |             | N <sub>p</sub>      | T                       | 1, 2, 3, 4 |                                       |       |                                                             |
| Number of secondary turns                                          | F03P006S05L | N <sub>s</sub>      | T                       |            | 1816                                  |       |                                                             |
|                                                                    | F03P015S05L |                     |                         |            | 1737                                  |       |                                                             |
|                                                                    | F03P025S05L |                     |                         |            | 1764                                  |       |                                                             |
|                                                                    | F03P050S05L |                     |                         |            | 1600                                  |       |                                                             |
| Consumption current (at If)                                        | F03P006S05L | I <sub>cc</sub>     | mA                      |            | 25                                    |       | I <sub>cc</sub> = 15 + I <sub>p</sub> (mA) / N <sub>s</sub> |
|                                                                    | F03P015S05L |                     |                         |            | 30                                    |       |                                                             |
|                                                                    | F03P025S05L |                     |                         |            | 35                                    |       |                                                             |
|                                                                    | F03P050S05L |                     |                         |            | 55                                    |       |                                                             |
| Internal reference voltage (at I <sub>p</sub> = 0A)                |             | V <sub>ref1</sub>   | V                       | 2.495      | 2.500                                 | 2.505 | Ref OUT mode                                                |
| External reference voltage                                         |             | V <sub>ref2</sub>   | V                       | 0          |                                       | 4     | Ref IN mode                                                 |
| Output voltage                                                     |             | V <sub>o</sub>      | V                       | 0.375      |                                       | 4.625 |                                                             |
| Output voltage (at I <sub>p</sub> = 0A)                            |             | V <sub>o</sub>      | V                       |            | V <sub>ref1</sub> , V <sub>ref2</sub> |       |                                                             |
| Electrical offset voltage * 1                                      | F03P006S05L | V <sub>oe</sub>     | mV                      | − 5.300    |                                       | 5.300 |                                                             |
|                                                                    | F03P015S05L |                     |                         | − 2.210    |                                       | 2.210 |                                                             |
|                                                                    | F03P025S05L |                     |                         | − 1.350    |                                       | 1.350 |                                                             |
|                                                                    | F03P050S05L |                     |                         | − 0.725    |                                       | 0.725 |                                                             |
| Electrical offset current referred to primary                      | F03P006S05L | I <sub>oe</sub>     | mA                      | − 51       |                                       | 51    |                                                             |
|                                                                    | F03P015S05L |                     |                         | − 53       |                                       | 53    |                                                             |
|                                                                    | F03P025S05L |                     |                         | − 54       |                                       | 54    |                                                             |
|                                                                    | F03P050S05L |                     |                         | − 58       |                                       | 58    |                                                             |
| Temperature coefficient of Internal reference voltage              |             | TCV <sub>ref1</sub> | ppm/K                   |            | ± 5.0                                 | ± 50  |                                                             |
| Temperature coefficient of Output voltage (at I <sub>p</sub> = 0A) | F03P006S05L | TCV <sub>o</sub>    | ppm/K                   |            | ± 6.0                                 | ± 14  | ppm/K of 2.5V (− 40°C~+ 105°C)                              |
|                                                                    | F03P015S05L |                     |                         |            | ± 2.3                                 | ± 6   |                                                             |
|                                                                    | F03P025S05L |                     |                         |            | ± 1.4                                 | ± 4   |                                                             |
|                                                                    | F03P050S05L |                     |                         |            | ± 0.7                                 | ± 3   |                                                             |
| Sensitivity (Theoretical value)                                    | F03P006S05L | G <sub>th</sub>     | mV/A                    |            | 104.2                                 |       | 625mV/If                                                    |
|                                                                    | F03P015S05L |                     |                         |            | 41.67                                 |       |                                                             |
|                                                                    | F03P025S05L |                     |                         |            | 25                                    |       |                                                             |
|                                                                    | F03P050S05L |                     |                         |            | 12.5                                  |       |                                                             |
| Sensitivity error                                                  |             | ε <sub>G</sub>      | %                       | − 0.7      |                                       | 0.7   |                                                             |
| Temperature coefficient of Sensitivity (at Ta = − 40°C~+ 105°C)    |             | TCG                 | ppm/K                   |            |                                       | ± 40  |                                                             |
| Output Linearity (at If)                                           |             | ε <sub>L</sub>      | %                       | − 0.1      |                                       | 0.1   |                                                             |
| Magnetic offset current referred to primary (at 10 × If)           |             | I <sub>OM</sub>     | A                       | − 0.1      |                                       | 0.1   |                                                             |
| Output current noise referred to primary (at 100Hz ~ 100kHz)       |             | I <sub>no</sub>     | μA/ (Hz) <sup>1/2</sup> |            | 20                                    |       | RL = 1k Ω                                                   |

\*1 Offset voltage value is after removal of core hysteresis.

## SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters                                                             | Symbol      | Unit           | Value |     |     | Comment                                                                         |
|------------------------------------------------------------------------|-------------|----------------|-------|-----|-----|---------------------------------------------------------------------------------|
|                                                                        |             |                | MIN   | TYP | MAX |                                                                                 |
| Peak to peak output ripple at oscillator frequency<br>(f typ = 450kHz) | F03P006S05L | —              | mV    | 40  | 160 | RL = 1kΩ                                                                        |
|                                                                        | F03P015S05L |                |       | 15  | 60  |                                                                                 |
|                                                                        | F03P025S05L |                |       | 10  | 40  |                                                                                 |
|                                                                        | F03P050S05L |                |       | 5   | 20  |                                                                                 |
| Reaction time (at 10% of If)                                           | F03P006S05L | tra            | μs    |     | 0.3 | RL = 1kΩ, di/dt = 18A/μs                                                        |
|                                                                        | F03P015S05L |                |       |     | 0.3 | RL = 1kΩ, di/dt = 44A/μs                                                        |
|                                                                        | F03P025S05L |                |       |     | 0.3 | RL = 1kΩ, di/dt = 68A/μs                                                        |
|                                                                        | F03P050S05L |                |       |     | 0.3 | RL = 1kΩ, di/dt = 100A/μs                                                       |
| Response time 1 (at 90% of If)                                         | F03P006S05L | tr             | μs    |     | 0.3 | RL = 1kΩ, di/dt = 18A/μs                                                        |
|                                                                        | F03P015S05L |                |       |     | 0.3 | RL = 1kΩ, di/dt = 44A/μs                                                        |
|                                                                        | F03P025S05L |                |       |     | 0.3 | RL = 1kΩ, di/dt = 68A/μs                                                        |
|                                                                        | F03P050S05L |                |       |     | 0.3 | RL = 1kΩ, di/dt = 100A/μs                                                       |
| Response time 2 (at 10% of If to 90% of Vo)                            | tr          | μs             |       |     | 0.6 | RL = 1kΩ, di/dt = If/μs                                                         |
| Frequency bandwidth (± 1dB)                                            | BW          | kHz            | 200   |     |     | RL = 1kΩ                                                                        |
| Frequency bandwidth (± 3dB)                                            | BW          | kHz            | 300   |     |     | RL = 1kΩ                                                                        |
| Output Voltage Accuracy (Overall)                                      | F03P006S05L | X <sub>G</sub> | %     |     | 1.7 | X <sub>G</sub> = (100 × V <sub>oe</sub> /625) + ε <sub>G</sub> + ε <sub>L</sub> |
|                                                                        | F03P015S05L |                |       |     | 1.2 |                                                                                 |
|                                                                        | F03P025S05L |                |       |     | 1.0 |                                                                                 |
|                                                                        | F03P050S05L |                |       |     | 0.9 |                                                                                 |

## STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

## Characteristic curve (TYP)

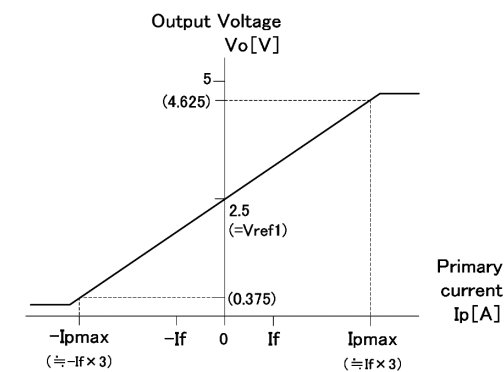


Figure 1 : Linearity curve (Internal reference voltage)

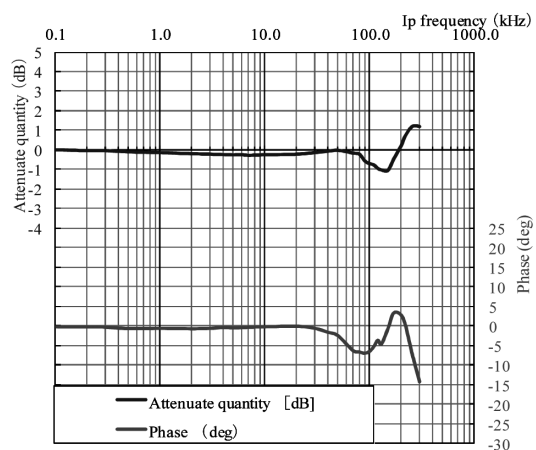


Figure 2 : Frequency response curve

ex) F03P025S05L

Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A, Vcc=+5V

## SUPPORT DOCUMENTATION

### Maximum continuous DC primary current

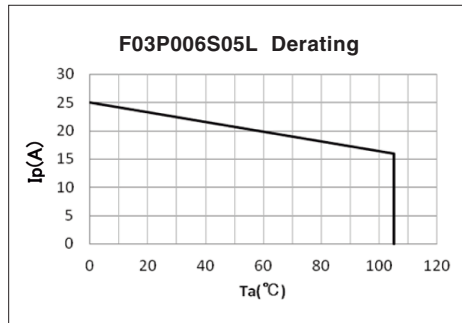


Figure 3 : Ip vs Ta for F03P006S05L

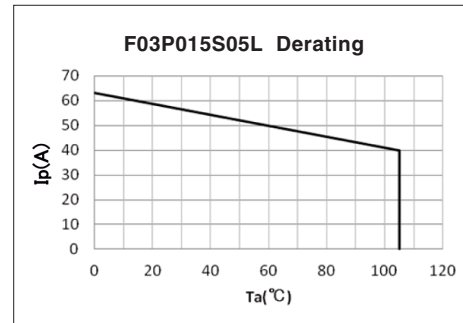


Figure 4 : Ip vs Ta for F03P015S05L

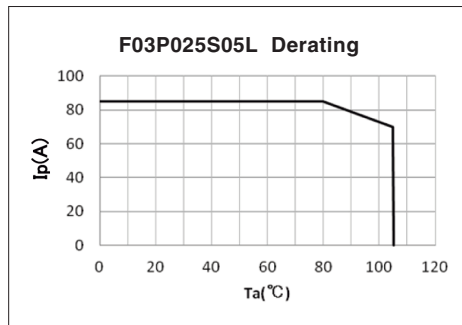


Figure 5 : Ip vs Ta for F03P025S05L

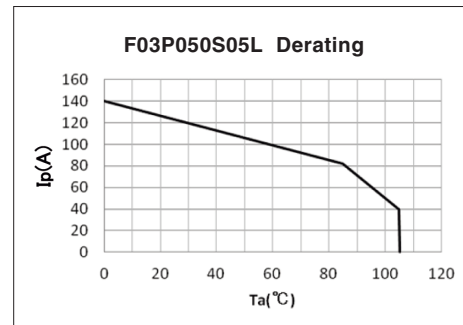


Figure 6 : Ip vs Ta for F03P050S05L

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ①  $I_p < I_{pmax}$
- ② Junction temperature  $T_j < 125^\circ\text{C}$
- ③ Primary conductor temperature  $< 110^\circ\text{C}$
- ④ Resistor power dissipation  $< 0.5 \times \text{rated power}$

### Frequency derating

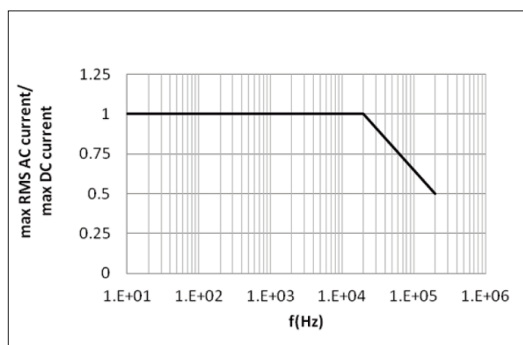


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

## Reference voltage

The Ref pin has two modes Ref IN and Ref OUT :

< Ref OUT mode >

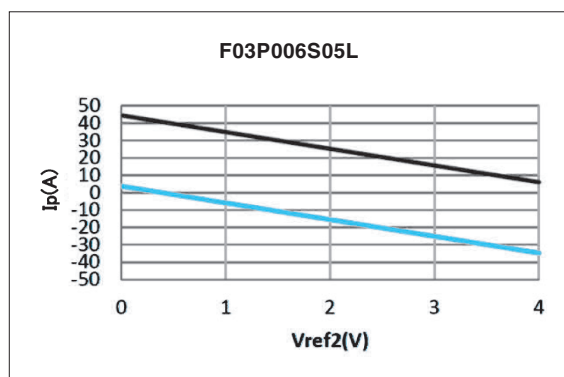
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< Ref IN mode >

An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V, its voltage is used as the reference voltage at the time of measurement.

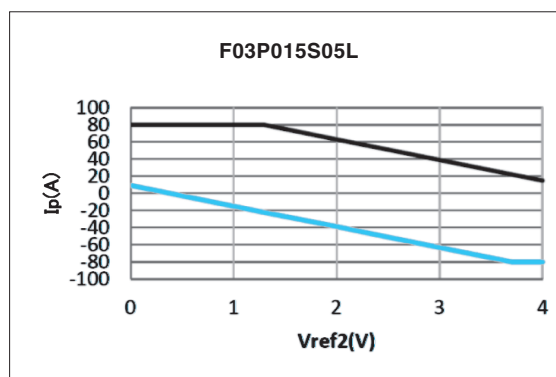
- either to source a typical current of  $(V_{ref} - 2.5) / 680$ , the maximum value will be 2.2mA typ.when  $V_{ref2} = 4V$ .
- or to sink a typical current of  $(2.5 - V_{ref2}) / 680$ , the maximum value will be 3.68mA typ.when  $V_{ref2} = 0V$ .

The following graphs show how the measuring range of each transducer version depends on external reference voltage value  $V_{ref2}$ .

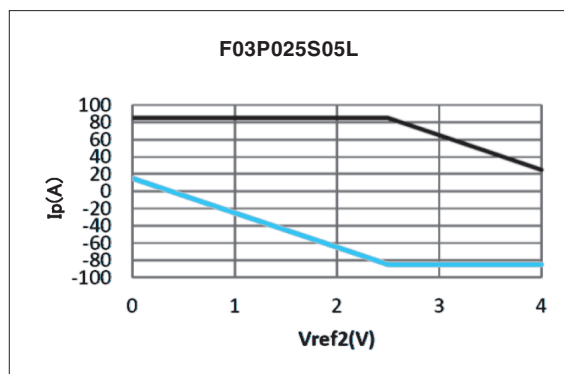


Upper limit :  $I_p = -9.6 \times V_{ref2} + 44.4$  ( $V_{ref2} = 0 \dots 4V$ )

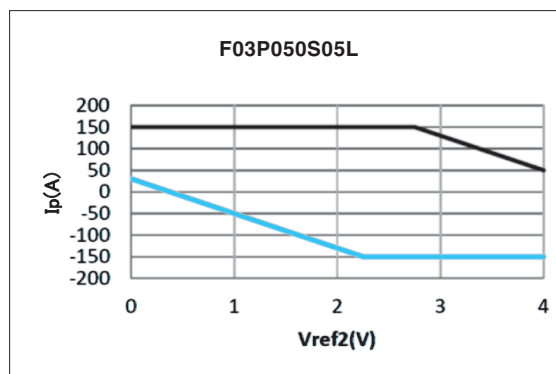
Lower limit :  $I_p = -9.6 \times V_{ref2} + 3.6$  ( $V_{ref2} = 0 \dots 4V$ )



Upper limit :  $I_p = 80$  ( $V_{ref2} = 0 \dots 1.29V$ )  
 $I_p = -24 \times V_{ref2} + 111$  ( $V_{ref2} = 1.29 \dots 4V$ )  
 Lower limit :  $I_p = -24 \times V_{ref2} + 9$  ( $V_{ref2} = 0 \dots 3.7V$ )  
 $I_p = -80$  ( $V_{ref2} = 3.7 \dots 4V$ )



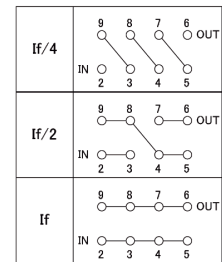
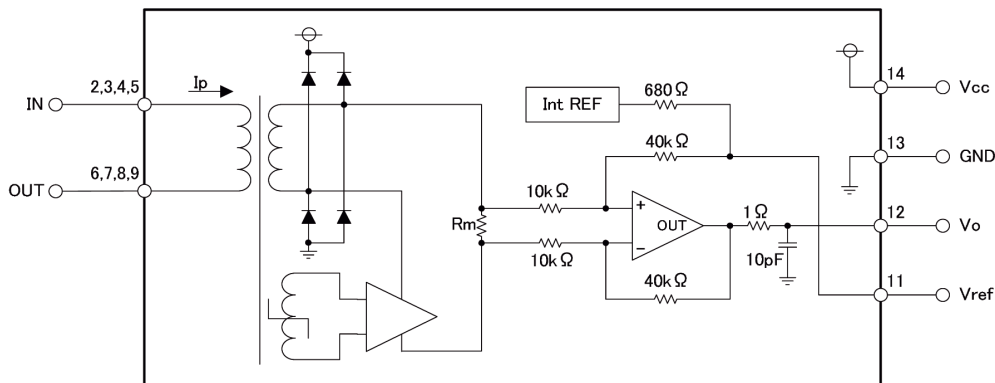
Upper limit :  $I_p = 85$  ( $V_{ref2} = 0 \dots 2.5V$ )  
 $I_p = -40 \times V_{ref2} + 185$  ( $V_{ref2} = 2.5 \dots 4V$ )  
 Lower limit :  $I_p = -40 \times V_{ref2} + 15$  ( $V_{ref2} = 0 \dots 2.5V$ )  
 $I_p = -85$  ( $V_{ref2} = 2.5 \dots 4V$ )



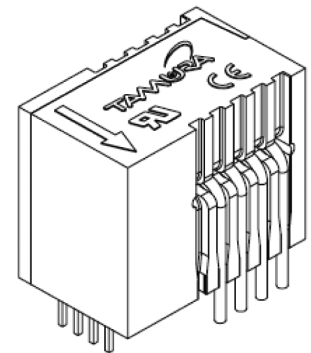
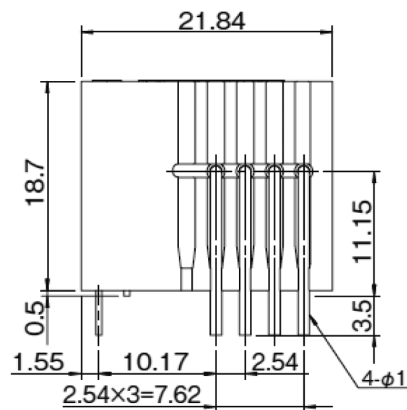
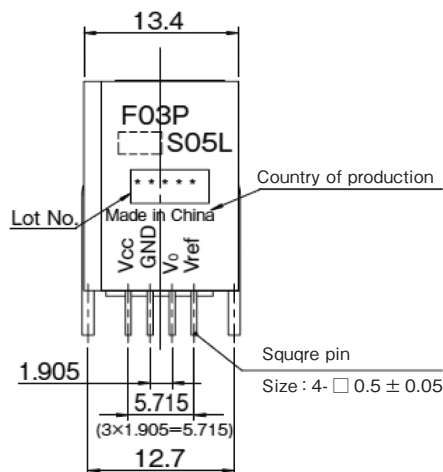
Upper limit :  $I_p = 150$  ( $V_{ref2} = 0 \dots 2.25V$ )  
 $I_p = -80 \times V_{ref2} + 370$  ( $V_{ref2} = 2.25 \dots 4V$ )  
 Lower limit :  $I_p = -80 \times V_{ref2} + 30$  ( $V_{ref2} = 0 \dots 2.25V$ )  
 $I_p = -150$  ( $V_{ref2} = 2.25 \dots 4V$ )

If you do not want to use the Ref pin, please unconnected.

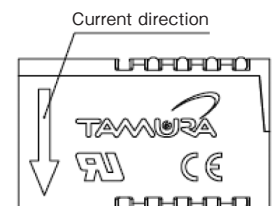
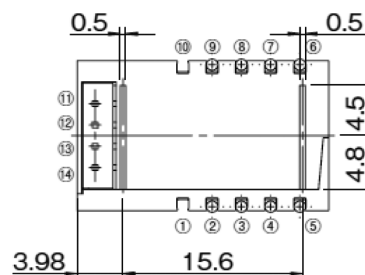
## CONNECTION



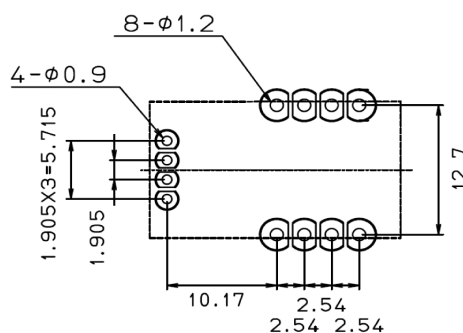
## DIMENSIONS (mm)



| Terminal number  | Note                                                             |
|------------------|------------------------------------------------------------------|
| ① — ⑧ Output     | 1. Unless otherwise specified, tolerances shall be $\pm 0.25$ mm |
| ② Input ⑨ Output | 2. Unit is [mm]                                                  |
| ③ Input ⑩ —      |                                                                  |
| ④ Input ⑪ Vref   |                                                                  |
| ⑤ Input ⑫ Vo     |                                                                  |
| ⑥ Output ⑬ GND   |                                                                  |
| ⑦ Output ⑭ Vcc   |                                                                  |



## RECOMMENDED HOLE DIAMETER (mm)



## Identification marking

The top side of product is marked for identification with the previous model.

Rated current 6A ... Blue color  
 Rated current 15A ... White color  
 Rated current 25A ... Orange color  
 Rated current 50A ... Green color

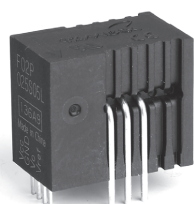
Ex) Marking example



↑ Mark shape : L

Fluxgate system / Voltage-output type Anti-Surge current, Compact size

# F02P L SERIES



RoHS

## ABSOLUTE MAXIMUM RATINGS

| Parameters                    | Symbol          | Unit | Value | Comment                                                                         |
|-------------------------------|-----------------|------|-------|---------------------------------------------------------------------------------|
| Supply voltage                | V <sub>cc</sub> | V    | 7     |                                                                                 |
| Primary conductor temperature | —               | °C   | 110   |                                                                                 |
| ESD (HBM: Human Body Model)   | —               | kV   | 4     | C=100pF, R=1.5k Ω                                                               |
| Maximum peak current          | —               | kAT  | 4     | Current waveform :<br>• Front time 8μs<br>• Time to half value 20μs<br>• single |

## ISOLATION CHARACTERISTICS

| Parameters                        | Symbol          | Unit | Value                                           | Comment                                                                     |
|-----------------------------------|-----------------|------|-------------------------------------------------|-----------------------------------------------------------------------------|
| Insulation voltage                | V <sub>d</sub>  | —    | AC4100V, for 1minute<br>(Sensing current 0.5mA) | Primary ⇔ Secondary                                                         |
| Insulation Resistance             | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                            | Primary ⇔ Secondary                                                         |
| Clearance distance                | d <sub>Ci</sub> | —    | 7.5mm (TYP)                                     | Primary ⇔ Secondary                                                         |
| Creepage distance                 | d <sub>Cp</sub> | —    | 7.5mm (TYP)                                     | Primary ⇔ Secondary                                                         |
| Case material                     | —               | —    | UL94 V-0                                        |                                                                             |
| Comparative Tracking Index: (CTI) | CTI             | V    | 600                                             |                                                                             |
| Application example               | —               | —    | 300V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to<br>EN50178, EN61010 |
|                                   | —               | —    | 600V, CAT III, PD2                              | Simple isolation,<br>non uniform field according to<br>EN50178, EN61010     |

## ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |     |       | Comment |
|-------------------------------|----------------|------|-------|-----|-------|---------|
|                               |                |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | T <sub>a</sub> | °C   | − 40  |     | + 105 |         |
| Ambient storage temperature   | T <sub>s</sub> | °C   | − 40  |     | + 105 |         |
| Mass                          | m              | g    |       | 12  |       |         |

# SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10k Ω, Vcc=+5V

| Parameters                                                               |             | Symbol              | Unit                   | Value   |                                       |       | Comment                                        |
|--------------------------------------------------------------------------|-------------|---------------------|------------------------|---------|---------------------------------------|-------|------------------------------------------------|
|                                                                          |             |                     |                        | MIN     | TYP                                   | MAX   |                                                |
| Rated Current                                                            | F02P006S05L | If                  | A                      |         | 6                                     |       |                                                |
|                                                                          | F02P015S05L |                     |                        |         | 15                                    |       |                                                |
|                                                                          | F02P025S05L |                     |                        |         | 25                                    |       |                                                |
|                                                                          | F02P050S05L |                     |                        |         | 50                                    |       |                                                |
| Maximum current<br>(at Vcc= + 5V, Ta= + 105°C)                           | F02P006S05L | I <sub>pmax</sub>   | A                      | − 20    |                                       | 20    |                                                |
|                                                                          | F02P015S05L |                     |                        | − 51    |                                       | 51    |                                                |
|                                                                          | F02P025S05L |                     |                        | − 85    |                                       | 85    |                                                |
|                                                                          | F02P050S05L |                     |                        | − 150   |                                       | 150   |                                                |
| Supply Voltage                                                           |             | Vcc                 | V                      | 4.75    | 5.00                                  | 5.25  |                                                |
| Number of primary turns                                                  |             | Np                  | T                      | 1, 2, 3 |                                       |       |                                                |
| Number of secondary turns                                                | F02P006S05L | Ns                  | T                      |         | 1816                                  |       |                                                |
|                                                                          | F02P015S05L |                     |                        |         | 1737                                  |       |                                                |
|                                                                          | F02P025S05L |                     |                        |         | 1764                                  |       |                                                |
|                                                                          | F02P050S05L |                     |                        |         | 1600                                  |       |                                                |
| Consumption current (at If)                                              | F02P006S05L | I <sub>cc</sub>     | mA                     |         | 25                                    |       | I <sub>cc</sub> =15 + I <sub>p</sub> (mA) / Ns |
|                                                                          | F02P015S05L |                     |                        |         | 30                                    |       |                                                |
|                                                                          | F02P025S05L |                     |                        |         | 35                                    |       |                                                |
|                                                                          | F02P050S05L |                     |                        |         | 55                                    |       |                                                |
| Internal reference voltage (at I <sub>p</sub> =0A)                       |             | V <sub>ref1</sub>   | V                      | 2.495   | 2.500                                 | 2.505 | Ref OUT mode                                   |
| External reference voltage                                               |             | V <sub>ref2</sub>   | V                      | 0       |                                       | 4     | Ref IN mode                                    |
| Output voltage                                                           |             | V <sub>o</sub>      | V                      | 0.375   |                                       | 4.625 |                                                |
| Output voltage (at I <sub>p</sub> =0A)                                   |             | V <sub>o</sub>      | V                      |         | V <sub>ref1</sub> , V <sub>ref2</sub> |       |                                                |
| Electrical offset voltage * 1                                            | F02P006S05L | V <sub>oe</sub>     | mV                     | − 5.300 |                                       | 5.300 |                                                |
|                                                                          | F02P015S05L |                     |                        | − 2.210 |                                       | 2.210 |                                                |
|                                                                          | F02P025S05L |                     |                        | − 1.350 |                                       | 1.350 |                                                |
|                                                                          | F02P050S05L |                     |                        | − 0.725 |                                       | 0.725 |                                                |
| Electrical offset current referred to primary                            | F02P006S05L | I <sub>oe</sub>     | mA                     | − 51    |                                       | 51    |                                                |
|                                                                          | F02P015S05L |                     |                        | − 53    |                                       | 53    |                                                |
|                                                                          | F02P025S05L |                     |                        | − 54    |                                       | 54    |                                                |
|                                                                          | F02P050S05L |                     |                        | − 58    |                                       | 58    |                                                |
| Temperature coefficient of Internal reference voltage                    |             | TCV <sub>ref1</sub> | ppm/K                  |         | ± 5.0                                 | ± 50  |                                                |
| Temperature coefficient of Output voltage<br>(at I <sub>p</sub> =0A)     | F02P006S05L | TCV <sub>o</sub>    | ppm/K                  |         | ± 6.0                                 | ± 14  | ppm/K of 2.5V<br>(− 40°C~+ 105°C)              |
|                                                                          | F02P015S05L |                     |                        |         | ± 2.3                                 | ± 6   |                                                |
|                                                                          | F02P025S05L |                     |                        |         | ± 1.4                                 | ± 4   |                                                |
|                                                                          | F02P050S05L |                     |                        |         | ± 0.7                                 | ± 3   |                                                |
| Sensitivity (Theoretical value)                                          | F02P006S05L | G <sub>th</sub>     | mV/A                   |         | 104.2                                 |       | 625mV/If                                       |
|                                                                          | F02P015S05L |                     |                        |         | 41.67                                 |       |                                                |
|                                                                          | F02P025S05L |                     |                        |         | 25                                    |       |                                                |
|                                                                          | F02P050S05L |                     |                        |         | 12.5                                  |       |                                                |
| Sensitivity error                                                        |             | ε <sub>G</sub>      | %                      | − 0.7   |                                       | 0.7   |                                                |
| Temperature coefficient of Sensitivity<br>(at Ta= − 40°C~+ 105°C)        |             | TCG                 | ppm/K                  |         |                                       | ± 40  |                                                |
| Output Linearity                                                         |             | ε <sub>L</sub>      | %                      | − 0.1   |                                       | 0.1   |                                                |
| Magnetic offset current referred to primary<br>(at 10 × I <sub>f</sub> ) |             | I <sub>OM</sub>     | A                      | − 0.1   |                                       | 0.1   |                                                |
| Output current noise referred to primary (at 100Hz ~ 100kHz)             |             | I <sub>no</sub>     | μA/(Hz) <sup>1/2</sup> |         | 20                                    |       | RL=1k Ω                                        |

\*1 Offset voltage value is after removal of core hysteresis.

## SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters                                                             | Symbol      | Unit | Value |     |     | Comment                                                         |
|------------------------------------------------------------------------|-------------|------|-------|-----|-----|-----------------------------------------------------------------|
|                                                                        |             |      | MIN   | TYP | MAX |                                                                 |
| Peak to peak output ripple at oscillator frequency<br>(f t yp =450kHz) | F02P006S05L | —    | mV    | 40  | 160 | RL=1kΩ                                                          |
|                                                                        | F02P015S05L |      |       | 15  | 60  |                                                                 |
|                                                                        | F02P025S05L |      |       | 10  | 40  |                                                                 |
|                                                                        | F02P050S05L |      |       | 5   | 20  |                                                                 |
| Reaction time (at 10% of If )                                          | F02P006S05L | tra  | μs    |     | 0.3 | RL=1kΩ, di/dt=18A/μs                                            |
|                                                                        | F02P015S05L |      |       |     | 0.3 | RL=1kΩ, di/dt=44A/μs                                            |
|                                                                        | F02P025S05L |      |       |     | 0.3 | RL=1kΩ, di/dt=68A/μs                                            |
|                                                                        | F02P050S05L |      |       |     | 0.3 | RL=1kΩ, di/dt=100A/μs                                           |
| Response time 1 (at 90% of If )                                        | F02P006S05L | tr   | μs    |     | 0.3 | RL=1kΩ, di/dt=18A/μs                                            |
|                                                                        | F02P015S05L |      |       |     | 0.3 | RL=1kΩ, di/dt=44A/μs                                            |
|                                                                        | F02P025S05L |      |       |     | 0.3 | RL=1kΩ, di/dt=68A/μs                                            |
|                                                                        | F02P050S05L |      |       |     | 0.3 | RL=1kΩ, di/dt=100A/μs                                           |
| Response time 2 (at 10% of If to 90% of Vo )                           |             | tr   | μs    |     | 0.6 | RL=1kΩ, di/dt=If/μs                                             |
| Frequency bandwidth (± 1dB)                                            | BW          | kHz  | 200   |     |     | RL=1kΩ                                                          |
| Frequency bandwidth (± 3dB)                                            | BW          | kHz  | 300   |     |     | RL=1kΩ                                                          |
| Output Voltage Accuracy (Overall)                                      | F02P006S05L | XG   | %     |     | 1.7 | $X_G = (100 \times V_{oe}/625) + \varepsilon_G + \varepsilon_L$ |
|                                                                        | F02P015S05L |      |       |     | 1.2 |                                                                 |
|                                                                        | F02P025S05L |      |       |     | 1.0 |                                                                 |
|                                                                        | F02P050S05L |      |       |     | 0.9 |                                                                 |

## STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No.E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

## Characteristic curve (TYP)

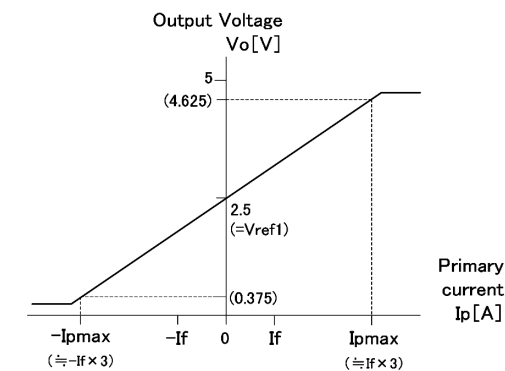


Figure 1 : Linearity curve (Internal reference voltage)

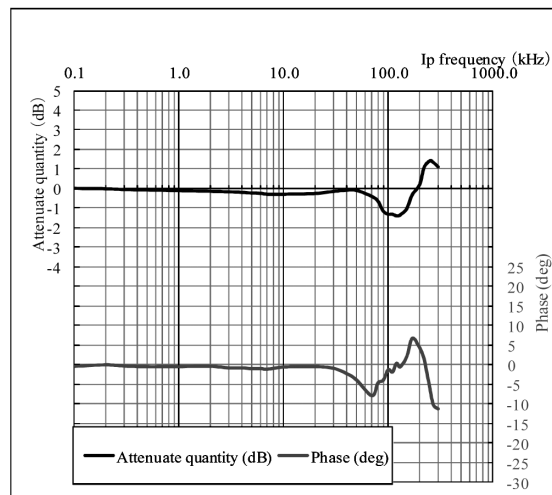


Figure 2 : Frequency response curve

ex) F02P025S05L

Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A, Vcc=+5V



## SUPPORT DOCUMENTATION

### Maximum continuous DC primary current

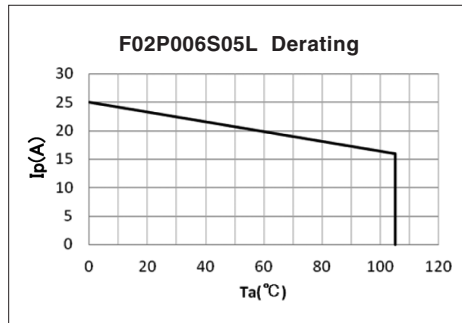


Figure 3 : Ip vs Ta for F02P006S05L

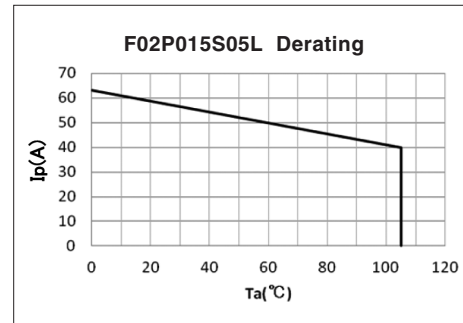


Figure 4 : Ip vs Ta for F02P015S05L

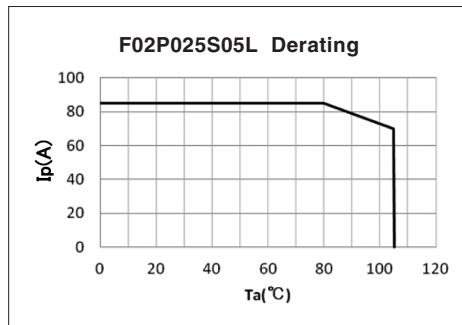


Figure 5 : Ip vs Ta for F02P025S05L

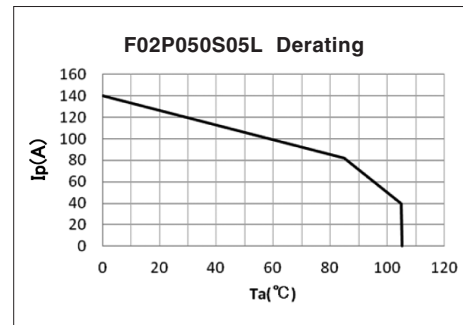


Figure 6 : Ip vs Ta for F02P050S05L

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ①  $I_p < I_{pmax}$
- ② Junction temperature  $T_j < 125^{\circ}\text{C}$
- ③ Primary conductor temperature  $< 110^{\circ}\text{C}$
- ④ Resistor power dissipation  $< 0.5 \times \text{rated power}$

### Frequency derating

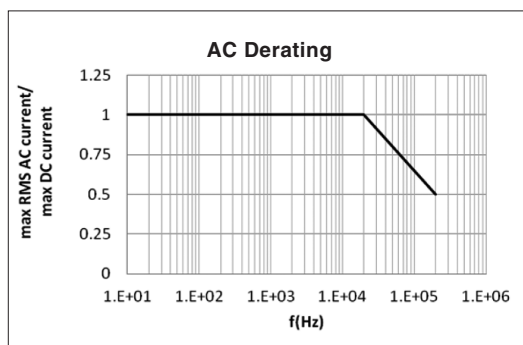


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

## Reference voltage

The Ref pin has two modes Ref IN and Ref OUT :

< Ref OUT mode >

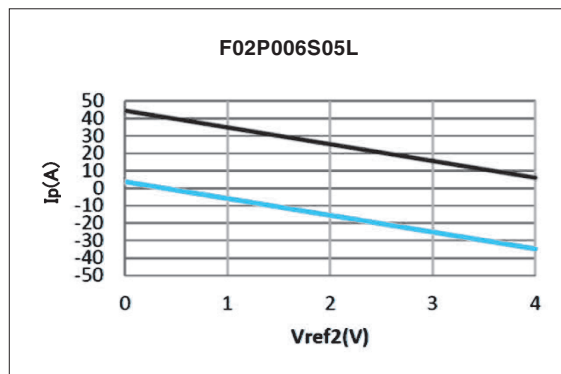
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< Ref IN mode >

An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V , its voltage is used as the reference voltage at the time of measurement.

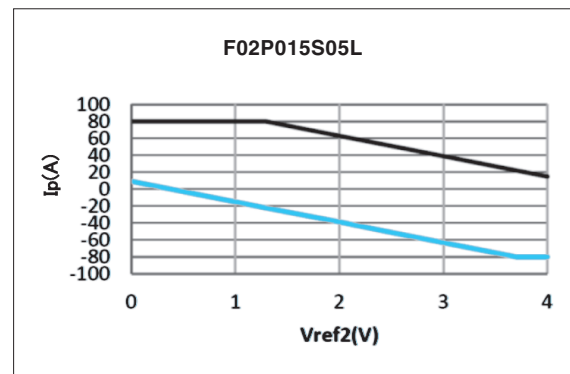
- either to source a typical current of  $(V_{ref} - 2.5) / 680$ , the maximum value will be 2.2mA typ.when  $V_{ref2} = 4V$ .
- or to sink a typical current of  $(2.5 - V_{ref2}) / 680$ , the maximum value will be 3.68mA typ.when  $V_{ref2} = 0V$ .

The following graphs show how the measuring range of each transducer version depends on external reference voltage value  $V_{ref2}$ .



Upper limit :  $I_p = -9.6 \times V_{ref2} + 44.4$  ( $V_{ref2} = 0 \dots 4V$ )

Lower limit :  $I_p = -9.6 \times V_{ref2} + 3.6$  ( $V_{ref2} = 0 \dots 4V$ )

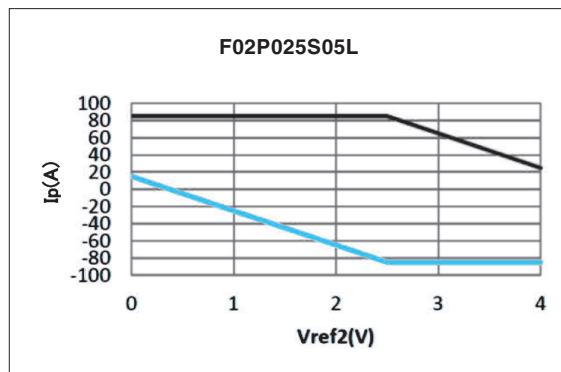


Upper limit :  $I_p = 80$  ( $V_{ref2} = 0 \dots 1.29V$ )

$I_p = -24 \times V_{ref2} + 111$  ( $V_{ref2} = 1.29 \dots 4V$ )

Lower limit :  $I_p = -24 \times V_{ref2} + 9$  ( $V_{ref2} = 0 \dots 3.7V$ )

$I_p = -80$  ( $V_{ref2} = 3.7 \dots 4V$ )

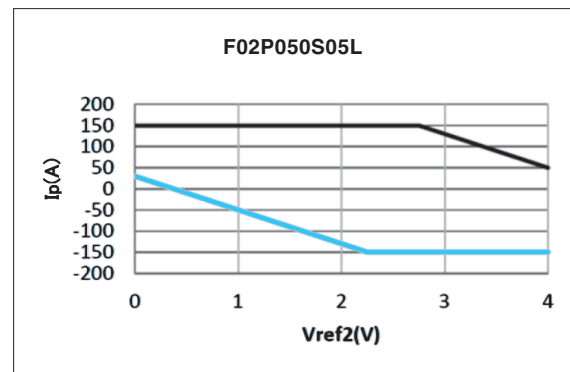


Upper limit :  $I_p = 85$  ( $V_{ref2} = 0 \dots 2.5V$ )

$I_p = -40 \times V_{ref2} + 185$  ( $V_{ref2} = 2.5 \dots 4V$ )

Lower limit :  $I_p = -40 \times V_{ref2} + 15$  ( $V_{ref2} = 0 \dots 2.5V$ )

$I_p = -85$  ( $V_{ref2} = 2.5 \dots 4V$ )



Upper limit :  $I_p = 150$  ( $V_{ref2} = 0 \dots 2.75V$ )

$I_p = -80 \times V_{ref2} + 370$  ( $V_{ref2} = 2.75 \dots 4V$ )

Lower limit :  $I_p = -80 \times V_{ref2} + 30$  ( $V_{ref2} = 0 \dots 2.25V$ )

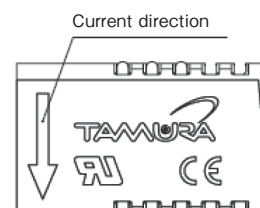
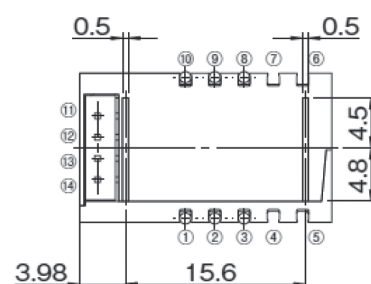
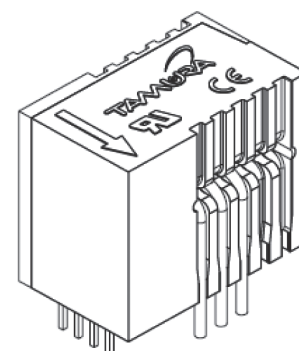
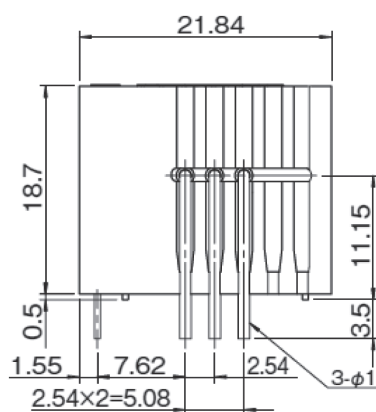
$I_p = -150$  ( $V_{ref2} = 2.25 \dots 4V$ )

If you do not want to use the Ref pin, please unconnected.

|      |  |
|------|--|
| If/3 |  |
| If/2 |  |
| If   |  |

Figure 1: Dimensions of the F02P S05L package. The diagram shows a rectangular package with a width of 13.4 and a height of 12.7. The top section contains the text "F02P" and "S05L" (in a dashed box). Below this is a row of four pins labeled "VCC", "GND", "Vo", and "Vref". The bottom section contains three pins labeled "Squre pin". Dimensions are given in millimeters: 1.905 for the pin pitch, 5.715 for the pin width, and 12.7 for the total height. A note indicates "Size: 4- □ 0.5 ± 0.05". Other labels include "Lot No.", "Country of production", and "Made in China".

| Terminal number | Note                                                                                         |
|-----------------|----------------------------------------------------------------------------------------------|
| ① Input         | 1. Unless otherwise specified,<br>tolerances shall be $\pm 0.25\text{mm}$<br>2. Unit is [mm] |
| ② Input         |                                                                                              |
| ③ Input         |                                                                                              |
| ④ —             |                                                                                              |
| ⑤ —             |                                                                                              |
| ⑥ —             |                                                                                              |
| ⑦ —             |                                                                                              |
| ⑧ Output        |                                                                                              |
| ⑨ Output        |                                                                                              |
| ⑩ Output        |                                                                                              |
| ⑪ Vref          |                                                                                              |
| ⑫ Vo            |                                                                                              |
| ⑬ GND           |                                                                                              |
| ⑭ Vcc           |                                                                                              |



Technical drawing of a rectangular plate with the following specifications:

- Overall dimensions: 12.7 (width) x 19.05 (height).
- Hole patterns:
  - Top edge: 6 holes, 3 on each side, labeled  $6-\phi 1.2$ .
  - Left edge: 4 holes, 2 on each side, labeled  $4-\phi 0.9$ .
- Dimensions for hole placement:
  - Vertical spacing on the left: 1.905 (between hole pairs), 1.905 (from bottom edge to first hole pair), and 5.715 (total height of hole pattern).
  - Horizontal spacing: 7.62 (from left edge to first hole pair), 2.54 (between hole pairs), and 2.54 (from last hole pair to right edge).

The top side of product is marked for identification with the previous model.

Rated current 6A ··· Blue color  
Rated current 15A ··· White color  
Rated current 25A ··· Orange color  
Rated current 50A ··· Green color

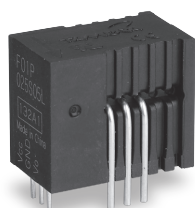
Ex) Marking exeample



↑ Mark shape : L

Fluxgate system / Voltage-output type Anti-Surge current, Compact size

# F01P L SERIES



RoHS

## ABSOLUTE MAXIMUM RATINGS

| Parameters                    | Symbol | Unit | Value | Comment                                                                         |
|-------------------------------|--------|------|-------|---------------------------------------------------------------------------------|
| Supply voltage                | Vcc    | V    | 7     |                                                                                 |
| Primary conductor temperature | —      | °C   | 110   |                                                                                 |
| ESD (HBM: Human Body Model)   | —      | kV   | 4     | C=100pF, R=1.5k Ω                                                               |
| Maximum peak current          | —      | kAT  | 4     | Current waveform :<br>• Front time 8μs<br>• Time to half value 20μs<br>• single |

## ISOLATION CHARACTERISTICS

| Parameters                         | Symbol          | Unit | Value                                           | Comment                                                                     |
|------------------------------------|-----------------|------|-------------------------------------------------|-----------------------------------------------------------------------------|
| Insulation voltage                 | Vd              | —    | AC4200V, for 1minute<br>(Sensing current 0.5mA) | Primary ⇔ Secondary                                                         |
| Insulation Resistance              | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                            | Primary ⇔ Secondary                                                         |
| Clearance distance                 | dCi             | —    | 7.7mm (TYP)                                     | Primary ⇔ Secondary                                                         |
| Creepage distance                  | dCp             | —    | 7.7mm (TYP)                                     | Primary ⇔ Secondary                                                         |
| Case material                      | —               | —    | UL94 V-0                                        |                                                                             |
| Comparative Tracking Index : (CTI) | CTI             | V    | 600                                             |                                                                             |
| Application example                | —               | —    | 300V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to<br>EN50178, EN61010 |
|                                    | —               | —    | 600V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to<br>EN50178, EN61010 |

## ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |     |       | Comment |
|-------------------------------|----------------|------|-------|-----|-------|---------|
|                               |                |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | Ta             | °C   | − 40  |     | + 105 |         |
| Ambient storage temperature   | T <sub>S</sub> | °C   | − 40  |     | + 105 |         |
| Mass                          | m              | g    |       | 12  |       |         |

# SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters                                                           |             | Symbol            | Unit                    | Value   |        |        | Comment                                                    |
|----------------------------------------------------------------------|-------------|-------------------|-------------------------|---------|--------|--------|------------------------------------------------------------|
|                                                                      |             |                   |                         | MIN     | TYP    | MAX    |                                                            |
| Rated Current                                                        | F01P006S05L | If                | A                       |         | 6      |        |                                                            |
|                                                                      | F01P015S05L |                   |                         |         | 15     |        |                                                            |
|                                                                      | F01P025S05L |                   |                         |         | 25     |        |                                                            |
|                                                                      | F01P050S05L |                   |                         |         | 50     |        |                                                            |
| Maximum current<br>(at Vcc= + 5V, Ta= + 105°C)                       | F01P006S05L | I <sub>pmax</sub> | A                       | − 20    |        | 20     |                                                            |
|                                                                      | F01P015S05L |                   |                         | − 51    |        | 51     |                                                            |
|                                                                      | F01P025S05L |                   |                         | − 85    |        | 85     |                                                            |
|                                                                      | F01P050S05L |                   |                         | − 150   |        | 150    |                                                            |
| Supply Voltage                                                       |             | V <sub>cc</sub>   | V                       | 4.75    | 5.00   | 5.25   |                                                            |
| Number of primary turns                                              |             | N <sub>p</sub>    | T                       | 1, 2, 3 |        |        |                                                            |
| Number of secondary turns                                            | F01P006S05L | N <sub>s</sub>    | T                       |         | 1816   |        |                                                            |
|                                                                      | F01P015S05L |                   |                         |         | 1737   |        |                                                            |
|                                                                      | F01P025S05L |                   |                         |         | 1764   |        |                                                            |
|                                                                      | F01P050S05L |                   |                         |         | 1600   |        |                                                            |
| Consumption current (at If)                                          | F01P006S05L | I <sub>cc</sub>   | mA                      |         | 25     |        | I <sub>cc</sub> =15 + I <sub>p</sub> (mA) / N <sub>s</sub> |
|                                                                      | F01P015S05L |                   |                         |         | 30     |        |                                                            |
|                                                                      | F01P025S05L |                   |                         |         | 35     |        |                                                            |
|                                                                      | F01P050S05L |                   |                         |         | 55     |        |                                                            |
| Output voltage                                                       |             | V <sub>o</sub>    | V                       | 0.375   |        | 4.625  |                                                            |
| Output voltage (at I <sub>p</sub> =0A)                               |             | V <sub>o</sub>    | V                       |         | 2.5    |        |                                                            |
| Electrical offset voltage * 1                                        | F01P006S05L | V <sub>oe</sub>   | mV                      | − 10.40 |        | 10.40  |                                                            |
|                                                                      | F01P015S05L |                   |                         | − 7.10  |        | 7.10   |                                                            |
|                                                                      | F01P025S05L |                   |                         | − 6.25  |        | 6.25   |                                                            |
|                                                                      | F01P050S05L |                   |                         | − 5.80  |        | 5.80   |                                                            |
| Electrical offset current referred to primary                        | F01P006S05L | I <sub>oe</sub>   | A                       | − 0.10  |        | 0.10   |                                                            |
|                                                                      | F01P015S05L |                   |                         | − 0.17  |        | 0.17   |                                                            |
|                                                                      | F01P025S05L |                   |                         | − 0.25  |        | 0.25   |                                                            |
|                                                                      | F01P050S05L |                   |                         | − 0.46  |        | 0.46   |                                                            |
| Temperature coefficient of Output voltage<br>(at I <sub>p</sub> =0A) | F01P006S05L | TCV <sub>o</sub>  | ppm/K                   |         | ± 10.0 | ± 80.0 | ppm/K of 2.5V<br>(− 40°C~+ 105°C)                          |
|                                                                      | F01P015S05L |                   |                         |         | ± 7.5  | ± 70.0 |                                                            |
|                                                                      | F01P025S05L |                   |                         |         | ± 6.5  | ± 60.0 |                                                            |
|                                                                      | F01P050S05L |                   |                         |         | ± 6.0  | ± 60.0 |                                                            |
| Sensitivity (Theoretical value)                                      | F01P006S05L | G <sub>th</sub>   | mV/A                    |         | 104.2  |        | 625mV/If                                                   |
|                                                                      | F01P015S05L |                   |                         |         | 41.67  |        |                                                            |
|                                                                      | F01P025S05L |                   |                         |         | 25     |        |                                                            |
|                                                                      | F01P050S05L |                   |                         |         | 12.5   |        |                                                            |
| Sensitivity error                                                    |             | ε <sub>G</sub>    | %                       | − 0.7   |        | 0.7    |                                                            |
| Temperature coefficient of Sensitivity<br>(at Ta= − 40°C~+ 105°C)    |             | TCG               | ppm/K                   |         |        | ± 40   |                                                            |
| Output Linearity                                                     |             | ε <sub>L</sub>    | %                       | − 0.1   |        | 0.1    |                                                            |
| Magnetic offset current referred to primary (at 10 × If)             |             | I <sub>OM</sub>   | A                       | − 0.1   |        | 0.1    |                                                            |
| Output current noise referred to primary<br>(at 100Hz ~ 100kHz)      | F01P006S05L | I <sub>no</sub>   | μA/ (Hz) <sup>1/2</sup> |         | 36     |        | RL=1k Ω                                                    |
|                                                                      | F01P015S05L |                   |                         |         | 90     |        |                                                            |
|                                                                      | F01P025S05L |                   |                         |         | 150    |        |                                                            |
|                                                                      | F01P050S05L |                   |                         |         | 300    |        |                                                            |

\*1 Offset voltage value is after removal of core hysteresis.

## SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters                                                            | Symbol      | Unit           | Value |     |     | Comment                                                                         |
|-----------------------------------------------------------------------|-------------|----------------|-------|-----|-----|---------------------------------------------------------------------------------|
|                                                                       |             |                | MIN   | TYP | MAX |                                                                                 |
| Peak to peak output ripple at oscillator frequency<br>(f typ =450kHz) | F01P006S05L | —              | mV    | 40  | 160 | RL=1k Ω                                                                         |
|                                                                       | F01P015S05L |                |       | 15  | 60  |                                                                                 |
|                                                                       | F01P025S05L |                |       | 10  | 40  |                                                                                 |
|                                                                       | F01P050S05L |                |       | 5   | 20  |                                                                                 |
| Reaction time (at 10% of If )                                         | F01P006S05L | tra            | μs    |     | 0.3 | RL=1k Ω, di/dt=18A/μs                                                           |
|                                                                       | F01P015S05L |                |       |     | 0.3 | RL=1k Ω, di/dt=44A/μs                                                           |
|                                                                       | F01P025S05L |                |       |     | 0.3 | RL=1k Ω, di/dt=68A/μs                                                           |
|                                                                       | F01P050S05L |                |       |     | 0.3 | RL=1k Ω, di/dt=100A/μs                                                          |
| Response time 1 (at 90% of If )                                       | F01P006S05L | tr             | μs    |     | 0.3 | RL=1k Ω, di/dt=18A/μs                                                           |
|                                                                       | F01P015S05L |                |       |     | 0.3 | RL=1k Ω, di/dt=44A/μs                                                           |
|                                                                       | F01P025S05L |                |       |     | 0.3 | RL=1k Ω, di/dt=68A/μs                                                           |
|                                                                       | F01P050S05L |                |       |     | 0.3 | RL=1k Ω, di/dt=100A/μs                                                          |
| Response time 2 (at 10% of If to 90% of Vo )                          | tr          | μs             |       |     | 0.6 | RL=1k Ω, di/dt=If/μs                                                            |
| Frequency bandwidth (± 1dB)                                           | BW          | kHz            | 200   |     |     | RL=1k Ω                                                                         |
| Frequency bandwidth (± 3dB)                                           | BW          | kHz            | 300   |     |     | RL=1k Ω                                                                         |
| Output Voltage Accuracy (Overall)                                     | F01P006S05L | X <sub>G</sub> | %     |     | 2.5 | X <sub>G</sub> = (100 × V <sub>oe</sub> /625) + ε <sub>G</sub> + ε <sub>L</sub> |
|                                                                       | F01P015S05L |                |       |     | 1.9 |                                                                                 |
|                                                                       | F01P025S05L |                |       |     | 1.8 |                                                                                 |
|                                                                       | F01P050S05L |                |       |     | 1.7 |                                                                                 |

## STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

## Characteristic curve TYP

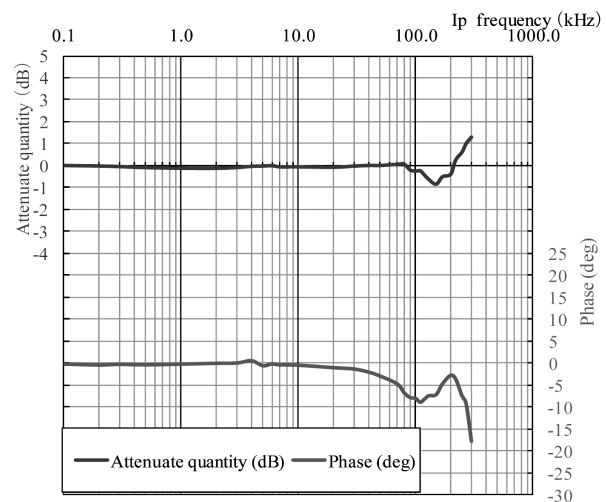
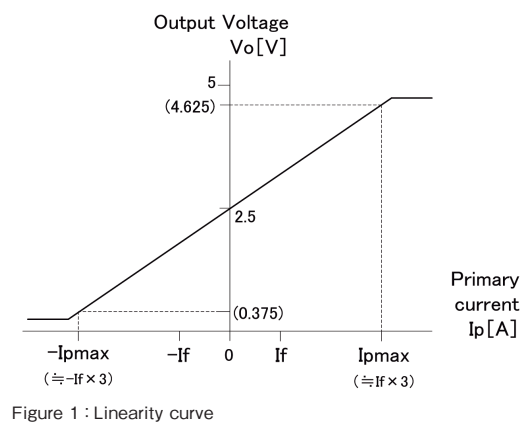


Figure 2 : Frequency response curve

ex) F01P025S05L

Measurement condition Ta=+25°C, RL=1k Ω, Ip=3A, Vcc=+5V

## SUPPORT DOCUMENTATION

### Maximum continuous DC primary current

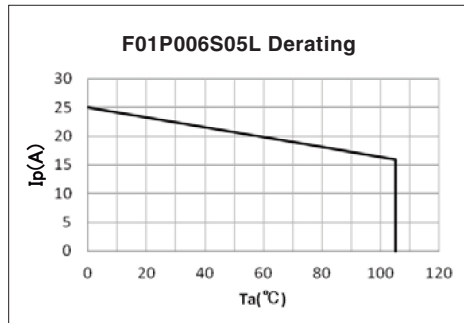


Figure 3 : Ip vs Ta for F01P006S05L

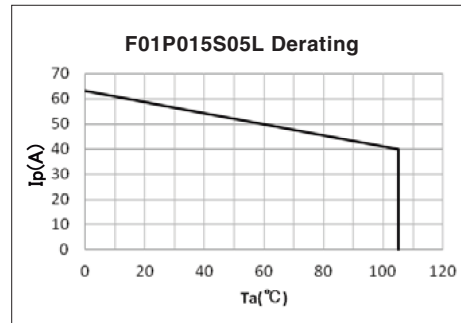


Figure 4 : Ip vs Ta for F01P015S05L

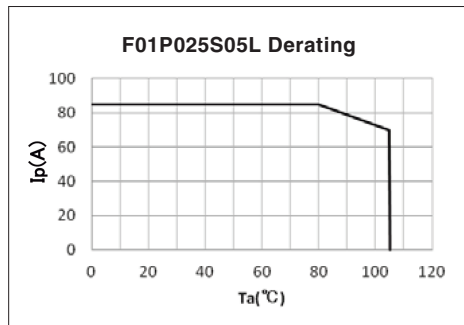


Figure 5 : Ip vs Ta for F01P025S05L

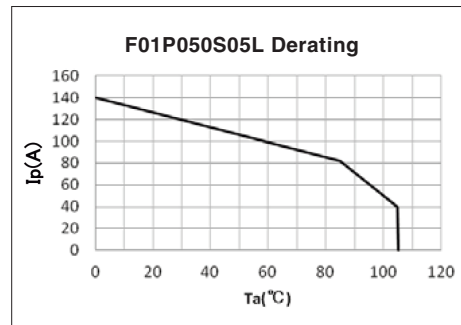


Figure 6 : Ip vs Ta for F01P050S05L

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ①  $I_p < I_{pmax}$
- ② Junction temperature  $T_j < 125^\circ\text{C}$
- ③ Primary conductor temperature  $< 110^\circ\text{C}$
- ④ Resistor power dissipation  $< 0.5 \times \text{rated power}$

### Frequency derating

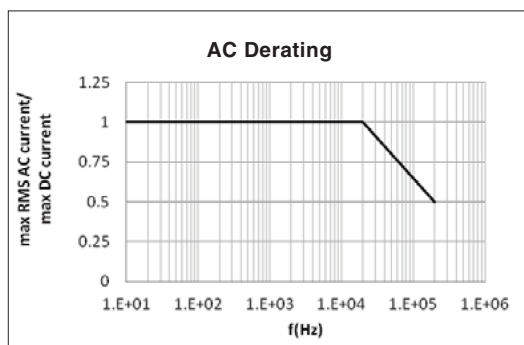
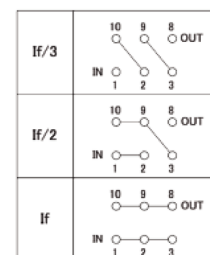
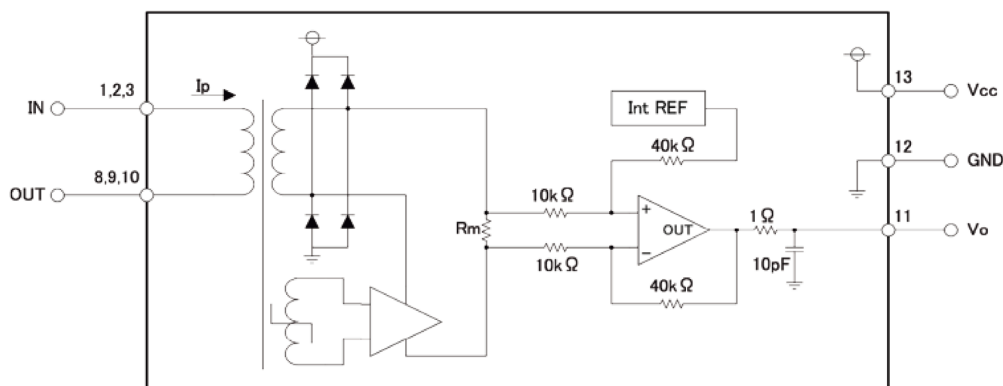
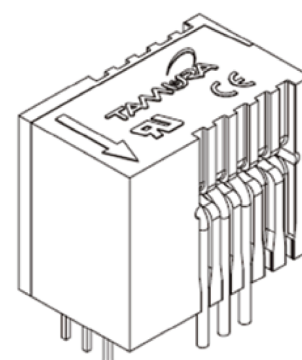
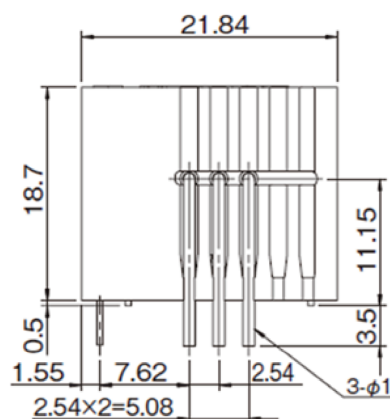
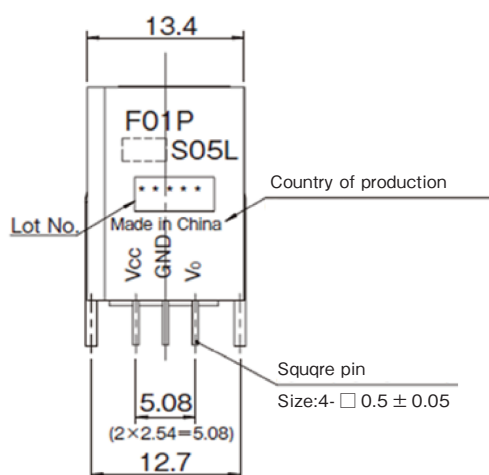


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

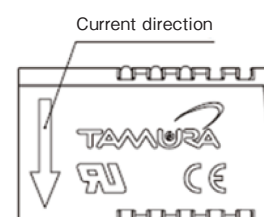
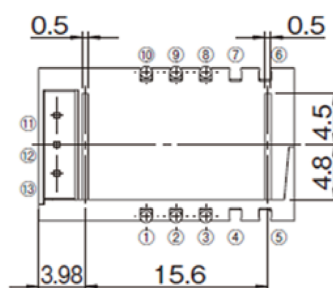
## CURRENT SENSORS



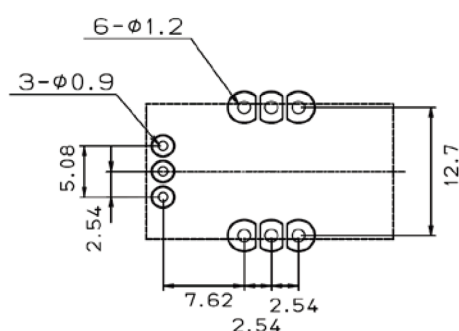
## DIMENSIONS (mm)



| Terminal number | Note                                                                   |
|-----------------|------------------------------------------------------------------------|
| ① Input         | 1. Unless otherwise specified, tolerances shall be $\pm 0.25\text{mm}$ |
| ② Input         |                                                                        |
| ③ Input         | 2. Unit is [mm]                                                        |
| ④ —             |                                                                        |
| ⑤ —             | ⑪ Vo                                                                   |
| ⑥ —             | ⑫ GND                                                                  |
| ⑦ —             | ⑬ Vcc                                                                  |



## RECOMMENDED HOLE DIAMETER (mm)

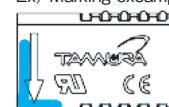


## Identification marking

The top side of product is marked for identification with the previous model.

Rated current 6A ... Blue color  
 Rated current 15A ... White color  
 Rated current 25A ... Orange color  
 Rated current 50A ... Green color

Ex) Marking example

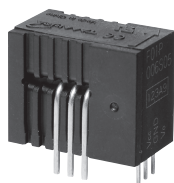


↑ Mark shape : L

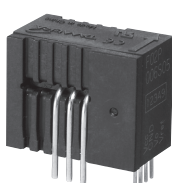


## Fluxgate system / Voltage-output type

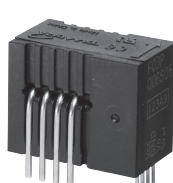
# F01P\*\*\*S05, F02P\*\*\*S05, F03P\*\*\*S05 SERIES



F01P SERIES



F02P SERIES



F03P SERIES



RoHS

- Super precision & High stability (Low temperature drift) .
- Unipolar power voltage; +5V. Rated Current; 6 ~ 50A.  
Multi-range models. MAX\_Temp.105°C . Voltage-output type.

### Comparison of the main features

| Series     | Features                                                        |
|------------|-----------------------------------------------------------------|
| F01P***S05 | Without reference access.                                       |
| F02P***S05 | With reference access.                                          |
| F03P***S05 | With reference access. Higher creepage and clearance distances. |

\*\*\* : Rated Current symbol

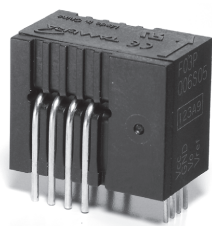
### SPECIFICATIONS

| Spec                                                                                                                                                                        | Types  | F01P***S05                                                        | F02P***S05 | F03P***S05 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------|------------|------------|
| Rated Current If (*** : Rated Current symbol)                                                                                                                               |        | 6A (006) / 15A (015) / 25A (025) / 50A (050)                      |            |            |
| Maximum current (At Vcc=+5V, Ta=+105°C)                                                                                                                                     |        | ± 20A (If=6A) / ± 51A (If=15A) / ± 85A (If=25A) / ± 150A (If=25A) |            |            |
| Supply Voltage                                                                                                                                                              |        | +5.00V ± 0.25V                                                    |            |            |
| Output Voltage Accuracy (Overall)<br><Accuracy of F02P series & F03P series><br>When the accuracy of output voltage is calculated on the basis of reference output voltage. | If=6A  | ≤ 2.5%                                                            | ≤ 1.7%     |            |
|                                                                                                                                                                             | If=15A | ≤ 1.9%                                                            | ≤ 1.2%     |            |
|                                                                                                                                                                             | If=25A | ≤ 1.8%                                                            | ≤ 1.0%     |            |
|                                                                                                                                                                             | If=50A | ≤ 1.7%                                                            | ≤ 0.9%     |            |
| Existence of reference access                                                                                                                                               |        | No                                                                | Yes        |            |
| Number of primary busbar                                                                                                                                                    |        | 3pcs                                                              |            | 4pcs       |
| Number of secondary pin                                                                                                                                                     |        | 3pcs                                                              | 4pcs       |            |
| Clearance distance, Primary ⇄ Secondary                                                                                                                                     |        | 7.7mm                                                             | 7.5mm      | 8.2mm      |
| Creepage distance, Primary ⇄ Secondary                                                                                                                                      |        | 7.7mm                                                             | 7.5mm      | 8.2mm      |
| for 1minute (Sensing current 0.5mA)<br>Insulation voltage, Primary ⇄ Secondary                                                                                              |        | AC4200V                                                           | AC4100V    | AC4300V    |
| Case material (Flame Rating) / Comparative Tracking Index;                                                                                                                  |        | UL94 V-0 / CTI 600V                                               |            |            |
| STANDARDS                                                                                                                                                                   |        | UL508 (file No. E243511) ,EN50178, EN61010-1, EN60950-1           |            |            |
| Ambient operating temperature                                                                                                                                               |        | - 40°C ~ +105°C                                                   |            |            |

The above-mentioned comparison tables are the auxiliary data for understanding each series. For details, please confirm the next page or subsequent ones. >>>

## Fluxgate system / Voltage-output type

# F03P SERIES



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                                                                  | Symbol          | Unit | Value               | Comment           |
|-----------------------------------------------------------------------------|-----------------|------|---------------------|-------------------|
| Supply voltage                                                              | V <sub>cc</sub> | V    | 7                   |                   |
| Primary conductor temperature                                               | —               | °C   | 110                 |                   |
| Non repetitive primary current pulse (20μS), in powered or unpowered state. | i <sub>p</sub>  | A    | 20 × I <sub>f</sub> |                   |
| ESD (HBM: Human Body Model)                                                 | —               | kV   | 4                   | C=100pF, R=1.5k Ω |

### ISOLATION CHARACTERISTICS

| Parameters                         | Symbol          | Unit | Value                                           | Comment                                                         |
|------------------------------------|-----------------|------|-------------------------------------------------|-----------------------------------------------------------------|
| Insulation voltage                 | V <sub>d</sub>  | —    | AC4300V, for 1minute<br>(Sensing current 0.5mA) | Primary ⇔ Secondary                                             |
| Insulation Resistance              | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                            | Primary ⇔ Secondary                                             |
| Clearance distance                 | d <sub>ci</sub> | —    | 8.2mm (TYP)                                     | Primary ⇔ Secondary                                             |
| Creepage distance                  | d <sub>cp</sub> | —    | 8.2mm (TYP)                                     | Primary ⇔ Secondary                                             |
| Case material                      | —               | —    | UL94 V-0                                        |                                                                 |
| Comparative Tracking Index : (CTI) | CTI             | V    | 600                                             |                                                                 |
| Application example                | —               | —    | 300V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to EN61010 |
|                                    | —               | —    | 600V, CAT III, PD2                              | Reinforced isolation,<br>non uniform field according to EN50178 |
|                                    | —               | —    | 1000V, CAT III, PD2                             | Simple isolation,<br>non uniform field according to EN50178     |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |     |       | Comment |
|-------------------------------|----------------|------|-------|-----|-------|---------|
|                               |                |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | T <sub>a</sub> | °C   | − 40  |     | + 105 |         |
| Ambient storage temperature   | T <sub>s</sub> | °C   | − 40  |     | + 105 |         |
| Mass                          | m              | g    |       | 12  |       |         |

**SPECIFICATIONS**

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters                                                        |            | Symbol              | Unit                    | Value      |                                       |       | Comment                                                |
|-------------------------------------------------------------------|------------|---------------------|-------------------------|------------|---------------------------------------|-------|--------------------------------------------------------|
|                                                                   |            |                     |                         | MIN        | TYP                                   | MAX   |                                                        |
| Rated Current                                                     | F03P006S05 | If                  | A                       |            | 6                                     |       |                                                        |
|                                                                   | F03P015S05 |                     |                         |            | 15                                    |       |                                                        |
|                                                                   | F03P025S05 |                     |                         |            | 25                                    |       |                                                        |
|                                                                   | F03P050S05 |                     |                         |            | 50                                    |       |                                                        |
| Maximum current                                                   | F03P006S05 | I <sub>pmax</sub>   | A                       | − 20       |                                       | 20    |                                                        |
|                                                                   | F03P015S05 |                     |                         | − 51       |                                       | 51    |                                                        |
|                                                                   | F03P025S05 |                     |                         | − 85       |                                       | 85    |                                                        |
|                                                                   | F03P050S05 |                     |                         | − 150      |                                       | 150   |                                                        |
| Supply Voltage                                                    |            | V <sub>cc</sub>     | V                       | 4.75       | 5.00                                  | 5.25  |                                                        |
| Number of primary turns                                           |            | N <sub>p</sub>      | T                       | 1, 2, 3, 4 |                                       |       |                                                        |
| Number of secondary turns                                         | F03P006S05 | N <sub>s</sub>      | T                       |            | 1816                                  |       |                                                        |
|                                                                   | F03P015S05 |                     |                         |            | 1737                                  |       |                                                        |
|                                                                   | F03P025S05 |                     |                         |            | 1764                                  |       |                                                        |
|                                                                   | F03P050S05 |                     |                         |            | 1600                                  |       |                                                        |
| Consumption current (at If)                                       | F03P006S05 | I <sub>cc</sub>     | mA                      |            | 25                                    |       | I <sub>cc</sub> =15+I <sub>p</sub> (mA)/N <sub>s</sub> |
|                                                                   | F03P015S05 |                     |                         |            | 30                                    |       |                                                        |
|                                                                   | F03P025S05 |                     |                         |            | 35                                    |       |                                                        |
|                                                                   | F03P050S05 |                     |                         |            | 55                                    |       |                                                        |
| Internal reference voltage (at I <sub>p</sub> =0A)                |            | V <sub>ref1</sub>   | V                       | 2.495      | 2.500                                 | 2.505 | Ref OUT mode                                           |
| External reference voltage                                        |            | V <sub>ref2</sub>   | V                       | 0          |                                       | 4     | Ref IN mode                                            |
| Output voltage                                                    |            | V <sub>o</sub>      | V                       | 0.375      |                                       | 4.625 |                                                        |
| Output voltage (at I <sub>p</sub> =0A)                            |            | V <sub>o</sub>      | V                       |            | V <sub>ref1</sub> , V <sub>ref2</sub> |       |                                                        |
| Electrical offset voltage * 1                                     | F03P006S05 | V <sub>oe</sub>     | mV                      | − 5.300    |                                       | 5.300 |                                                        |
|                                                                   | F03P015S05 |                     |                         | − 2.210    |                                       | 2.210 |                                                        |
|                                                                   | F03P025S05 |                     |                         | − 1.350    |                                       | 1.350 |                                                        |
|                                                                   | F03P050S05 |                     |                         | − 0.725    |                                       | 0.725 |                                                        |
| Electrical offset current referred to primary                     | F03P006S05 | I <sub>oe</sub>     | mA                      | − 51       |                                       | 51    |                                                        |
|                                                                   | F03P015S05 |                     |                         | − 53       |                                       | 53    |                                                        |
|                                                                   | F03P025S05 |                     |                         | − 54       |                                       | 54    |                                                        |
|                                                                   | F03P050S05 |                     |                         | − 58       |                                       | 58    |                                                        |
| Temperature coefficient of Internal reference voltage             |            | TCV <sub>ref1</sub> | ppm/K                   |            | ± 5.0                                 | ± 50  |                                                        |
| Temperature coefficient of Output voltage (at I <sub>p</sub> =0A) | F03P006S05 | TCV <sub>o</sub>    | ppm/K                   |            | ± 6.0                                 | ± 14  | ppm/K of 2.5V<br>(− 40°C~+ 105°C)                      |
|                                                                   | F03P015S05 |                     |                         |            | ± 2.3                                 | ± 6   |                                                        |
|                                                                   | F03P025S05 |                     |                         |            | ± 1.4                                 | ± 4   |                                                        |
|                                                                   | F03P050S05 |                     |                         |            | ± 0.7                                 | ± 3   |                                                        |
| Sensitivity (Theoretical value)                                   | F03P006S05 | G <sub>th</sub>     | mV/A                    |            | 104.2                                 |       | 625mV/If                                               |
|                                                                   | F03P015S05 |                     |                         |            | 41.67                                 |       |                                                        |
|                                                                   | F03P025S05 |                     |                         |            | 25                                    |       |                                                        |
|                                                                   | F03P050S05 |                     |                         |            | 12.5                                  |       |                                                        |
| Sensitivity error                                                 |            | ε <sub>G</sub>      | %                       | − 0.7      |                                       | 0.7   |                                                        |
| Temperature coefficient of Sensitivity (at Ta= − 40°C~+ 105°C)    |            | TCG                 | ppm/K                   |            |                                       | ± 40  |                                                        |
| Output Linearity (at If)                                          |            | ε <sub>L</sub>      | %                       | − 0.1      |                                       | 0.1   |                                                        |
| Magnetic offset current referred to primary (at 10 × If)          |            | I <sub>OM</sub>     | A                       | − 0.1      |                                       | 0.1   |                                                        |
| Output current noise referred to primary (at 100Hz ~ 100kHz)      |            | I <sub>no</sub>     | μ A/(Hz) <sup>1/2</sup> |            | 20                                    |       | RL=1k Ω                                                |

\*1 Offset voltage value is after removal of core hysteresis.

## SPECIFICATIONS

Ta=+25°C, Np=1T, RL=10kΩ, Vcc=+5V

| Parameters                                                            | Symbol     | Unit           | Value |     |     | Comment                                                                   |
|-----------------------------------------------------------------------|------------|----------------|-------|-----|-----|---------------------------------------------------------------------------|
|                                                                       |            |                | MIN   | TYP | MAX |                                                                           |
| Peak to peak output ripple at oscillator frequency<br>(f typ =450kHz) | F03P006S05 | —              | mV    | 40  | 160 | RL=1kΩ                                                                    |
|                                                                       | F03P015S05 |                |       | 15  | 60  |                                                                           |
|                                                                       | F03P025S05 |                |       | 10  | 40  |                                                                           |
|                                                                       | F03P050S05 |                |       | 5   | 20  |                                                                           |
| Reaction time (at 10% of If)                                          | F03P006S05 | tra            | μs    |     | 0.3 | RL=1kΩ, di/dt=18A/μs                                                      |
|                                                                       | F03P015S05 |                |       |     | 0.3 | RL=1kΩ, di/dt=44A/μs                                                      |
|                                                                       | F03P025S05 |                |       |     | 0.3 | RL=1kΩ, di/dt=68A/μs                                                      |
|                                                                       | F03P050S05 |                |       |     | 0.3 | RL=1kΩ, di/dt=100A/μs                                                     |
| Response time 1 (at 90% of If)                                        | F03P006S05 | tr             | μs    |     | 0.3 | RL=1kΩ, di/dt=18A/μs                                                      |
|                                                                       | F03P015S05 |                |       |     | 0.3 | RL=1kΩ, di/dt=44A/μs                                                      |
|                                                                       | F03P025S05 |                |       |     | 0.3 | RL=1kΩ, di/dt=68A/μs                                                      |
|                                                                       | F03P050S05 |                |       |     | 0.3 | RL=1kΩ, di/dt=100A/μs                                                     |
| Response time 2 (at 10% of If to 90% of Vo)                           | tr         | μs             |       |     | 0.6 | RL=1kΩ, di/dt=If/μs                                                       |
| Frequency bandwidth (±1dB)                                            | BW         | kHz            | 200   |     |     | RL=1kΩ                                                                    |
| Frequency bandwidth (±3dB)                                            | BW         | kHz            | 300   |     |     | RL=1kΩ                                                                    |
| Output Voltage Accuracy (Overall)                                     | F03P006S05 | X <sub>G</sub> | %     |     | 1.7 | X <sub>G</sub> =(100×V <sub>oe</sub> /625)+ε <sub>G</sub> +ε <sub>L</sub> |
|                                                                       | F03P015S05 |                |       |     | 1.2 |                                                                           |
|                                                                       | F03P025S05 |                |       |     | 1.0 |                                                                           |
|                                                                       | F03P050S05 |                |       |     | 0.9 |                                                                           |

## STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

## Characteristic curve (TYP)

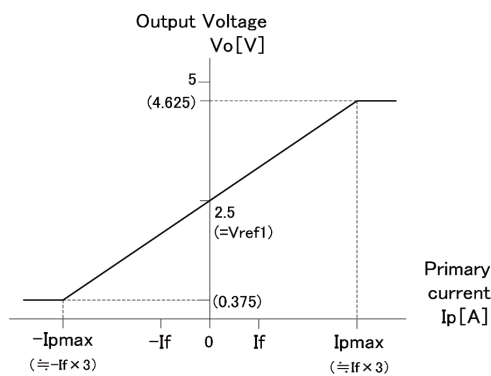


Figure 1: Linearity curve (Internal reference voltage)

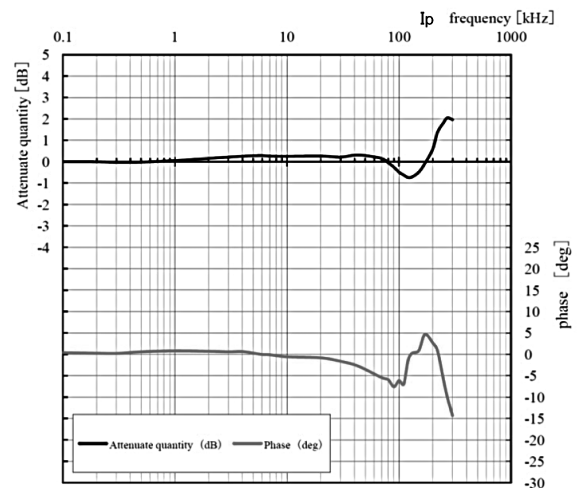


Figure 2: Frequency response curve

ex) F03P025S05L

Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A, Vcc=+5V

## SUPPORT DOCUMENTATION

### Maximum continuous DC primary current

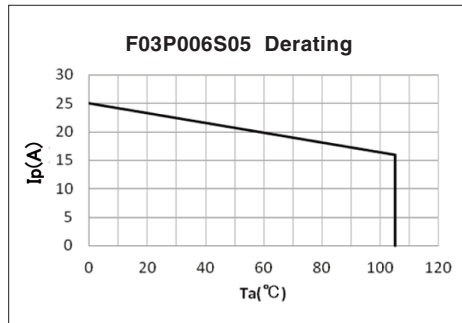


Figure 3 : Ip vs Ta for F03P006S05

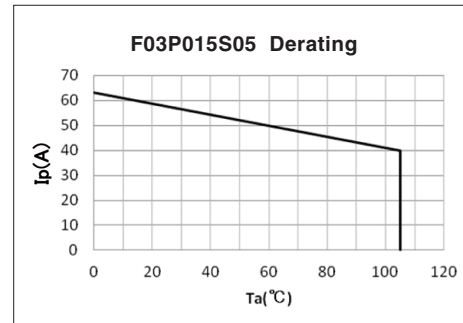


Figure 4 : Ip vs Ta for F03P015S05

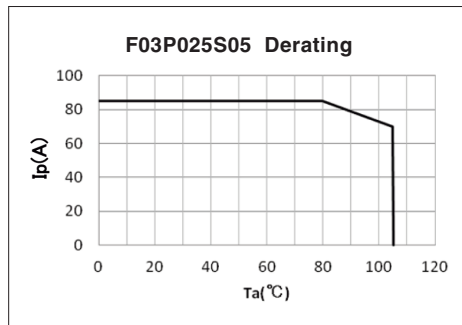


Figure 5 : Ip vs Ta for F03P025S05

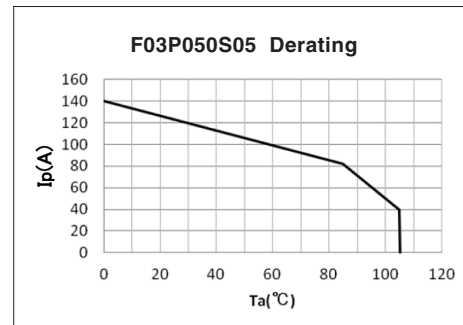


Figure 6 : Ip vs Ta for F03P050S05

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ①  $I_p < I_{pmax}$
- ② Junction temperature  $T_j < 125^{\circ}\text{C}$
- ③ Primary conductor temperature  $< 110^{\circ}\text{C}$
- ④ Resistor power dissipation  $< 0.5 \times \text{rated power}$

### Frequency derating

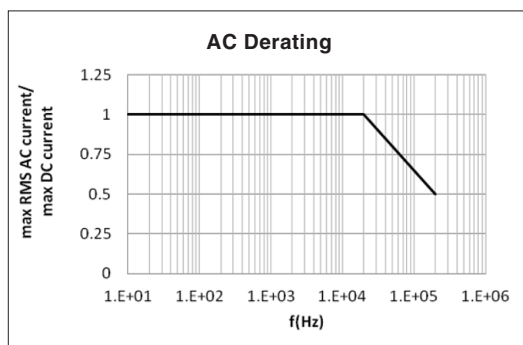


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

## Reference voltage

The Ref pin has two modes Ref IN and Ref OUT :

< Ref OUT mode >

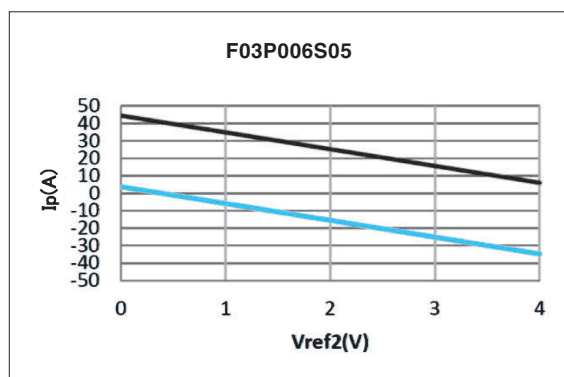
The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

< Ref IN mode >

An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V, its voltage is used as the reference voltage at the time of measurement.

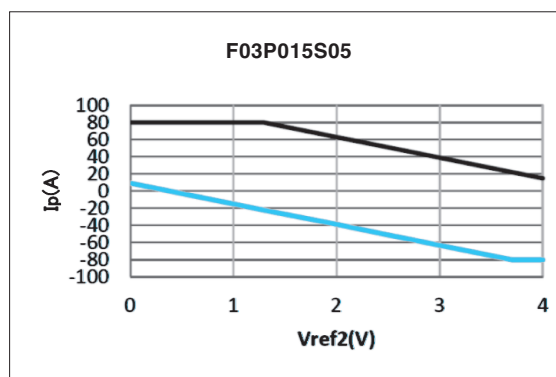
- either to source a typical current of  $(V_{ref} - 2.5) / 680$ , the maximum value will be 2.2mA typ. when  $V_{ref2} = 4V$ .
- or to sink a typical current of  $(2.5 - V_{ref2}) / 680$ , the maximum value will be 3.68mA typ. when  $V_{ref2} = 0V$ .

The following graphs show how the measuring range of each transducer version depends on external reference voltage value  $V_{ref2}$ .



Upper limit :  $I_p = -9.6 \times V_{ref2} + 44.4$  ( $V_{ref2} = 0 \dots 4V$ )

Lower limit :  $I_p = -9.6 \times V_{ref2} + 3.6$  ( $V_{ref2} = 0 \dots 4V$ )

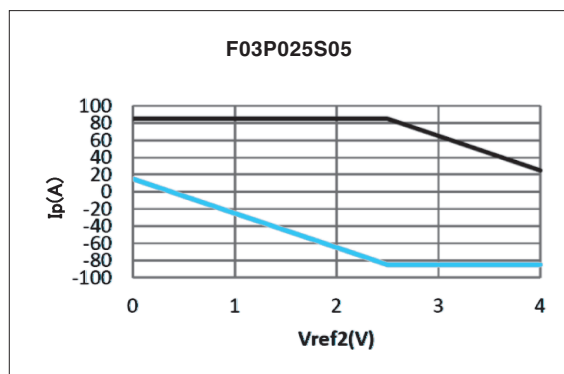


Upper limit :  $I_p = 80$  ( $V_{ref2} = 0 \dots 1.29V$ )

$I_p = -24 \times V_{ref2} + 111$  ( $V_{ref2} = 1.29 \dots 4V$ )

Lower limit :  $I_p = -24 \times V_{ref2} + 9$  ( $V_{ref2} = 0 \dots 3.7V$ )

$I_p = -80$  ( $V_{ref2} = 3.7 \dots 4V$ )

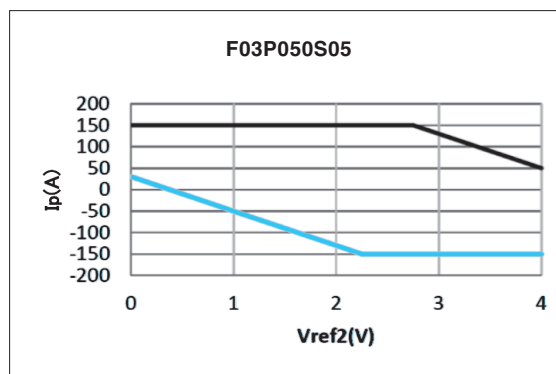


Upper limit :  $I_p = 85$  ( $V_{ref2} = 0 \dots 2.5V$ )

$I_p = -40 \times V_{ref2} + 185$  ( $V_{ref2} = 2.5 \dots 4V$ )

Lower limit :  $I_p = -40 \times V_{ref2} + 15$  ( $V_{ref2} = 0 \dots 2.5V$ )

$I_p = -85$  ( $V_{ref2} = 2.5 \dots 4V$ )



Upper limit :  $I_p = 150$  ( $V_{ref2} = 0 \dots 2.75V$ )

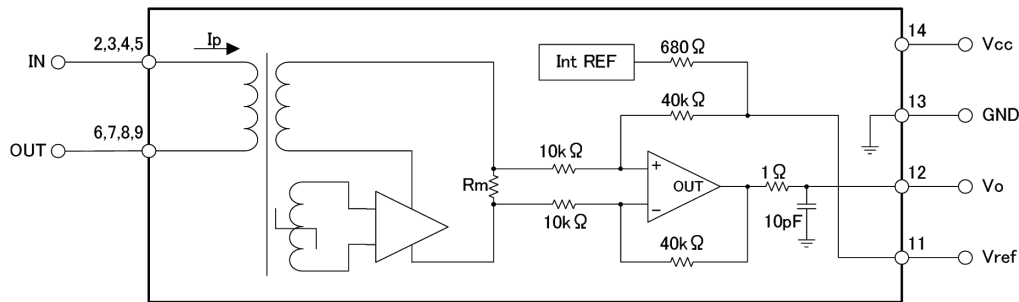
$I_p = -80 \times V_{ref2} + 370$  ( $V_{ref2} = 2.75 \dots 4V$ )

Lower limit :  $I_p = -80 \times V_{ref2} + 30$  ( $V_{ref2} = 0 \dots 2.25V$ )

$I_p = -150$  ( $V_{ref2} = 2.25 \dots 4V$ )

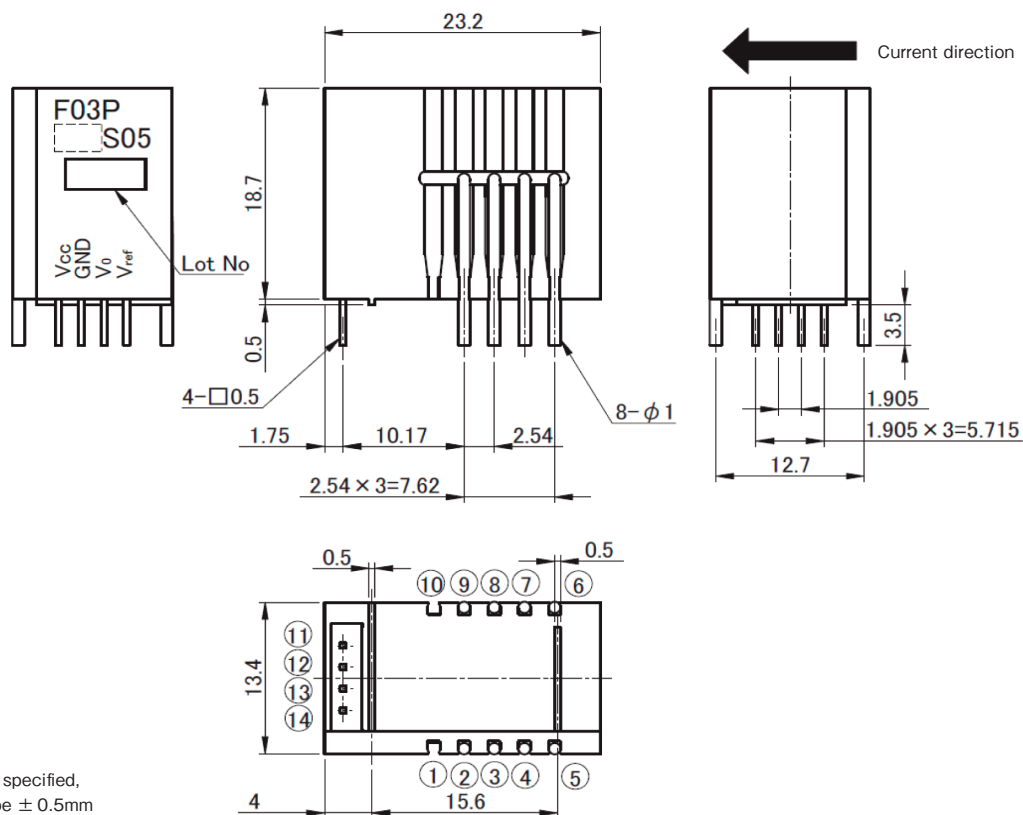
If you do not want to use the Ref pin, please unconnected.

## CONNECTION

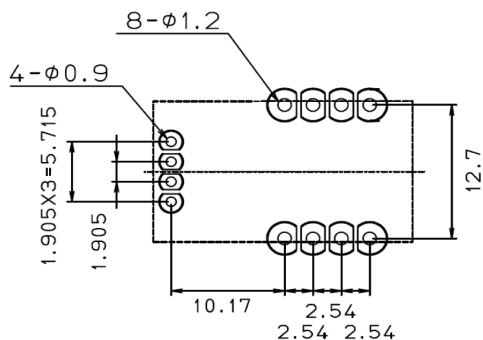


|      |   |   |   |   |     |
|------|---|---|---|---|-----|
| If/4 | 9 | 8 | 7 | 6 | OUT |
| IN   | 2 | 3 | 4 | 5 |     |
| If/2 | 9 | 8 | 7 | 6 | OUT |
| IN   | 2 | 3 | 4 | 5 |     |
| If   | 9 | 8 | 7 | 6 | OUT |
| IN   | 2 | 3 | 4 | 5 |     |

## DIMENSIONS (mm)

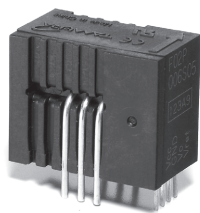


## RECOMMENDED HOLE DIAMETER (mm)



## Fluxgate system / Voltage-output type

# F02P SERIES



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                                                                  | Symbol | Unit | Value   | Comment           |
|-----------------------------------------------------------------------------|--------|------|---------|-------------------|
| Supply voltage                                                              | Vcc    | V    | 7       |                   |
| Primary conductor temperature                                               | —      | °C   | 110     |                   |
| Non repetitive primary current pulse (20μS), in powered or unpowered state. | Ip     | A    | 20 × If |                   |
| ESD (HBM: Human Body Model)                                                 | —      | kV   | 4       | C=100pF, R=1.5k Ω |

### ISOLATION CHARACTERISTICS

| Parameters                         | Symbol          | Unit | Value                                           | Comment                                                                 |
|------------------------------------|-----------------|------|-------------------------------------------------|-------------------------------------------------------------------------|
| Insulation voltage                 | Vd              | —    | AC4100V, for 1minute<br>(Sensing current 0.5mA) | Primary ⇔ Secondary                                                     |
| Insulation Resistance              | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                            | Primary ⇔ Secondary                                                     |
| Clearance distance                 | dCi             | —    | 7.5mm (TYP)                                     | Primary ⇔ Secondary                                                     |
| Creepage distance                  | dCp             | —    | 7.5mm (TYP)                                     | Primary ⇔ Secondary                                                     |
| Case material                      | —               | —    | UL94 V-0                                        |                                                                         |
| Comparative Tracking Index : (CTI) | CTI             | V    | 600                                             |                                                                         |
| Application example                | —               | —    | 300V, CAT III, PD2                              | Reinforced isolation,non<br>uniform field according to EN50178, EN61010 |
|                                    | —               | —    | 600V, CAT III, PD2                              | Simple isolation,non<br>uniform field according to EN50178, EN61010     |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |     |       | Comment |
|-------------------------------|----------------|------|-------|-----|-------|---------|
|                               |                |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | Ta             | °C   | − 40  |     | + 105 |         |
| Ambient storage temperature   | T <sub>s</sub> | °C   | − 40  |     | + 105 |         |
| Mass                          | m              | g    |       | 12  |       |         |



## SPECIFICATIONS

Ta=+25°C, RL=10kΩ, Vcc=+5V

| Parameters                                                            |            | Symbol              | Unit                    | Value   |                                       |       | Comment                                                     |
|-----------------------------------------------------------------------|------------|---------------------|-------------------------|---------|---------------------------------------|-------|-------------------------------------------------------------|
|                                                                       |            |                     |                         | MIN     | TYP                                   | MAX   |                                                             |
| Rated Current                                                         | F02P006S05 | If                  | A                       |         | 6                                     |       |                                                             |
|                                                                       | F02P015S05 |                     |                         |         | 15                                    |       |                                                             |
|                                                                       | F02P025S05 |                     |                         |         | 25                                    |       |                                                             |
|                                                                       | F02P050S05 |                     |                         |         | 50                                    |       |                                                             |
| Maximum current<br>(at Vcc= + 5V, Ta= + 105°C)                        | F02P006S05 | I <sub>pmax</sub>   | A                       | − 20    |                                       | 20    |                                                             |
|                                                                       | F02P015S05 |                     |                         | − 51    |                                       | 51    |                                                             |
|                                                                       | F02P025S05 |                     |                         | − 85    |                                       | 85    |                                                             |
|                                                                       | F02P050S05 |                     |                         | − 150   |                                       | 150   |                                                             |
| Supply Voltage                                                        |            | Vcc                 | V                       | 4.75    | 5.00                                  | 5.25  |                                                             |
| Number of primary turns                                               |            | N <sub>p</sub>      | T                       | 1, 2, 3 |                                       |       |                                                             |
| Number of secondary turns                                             | F02P006S05 | N <sub>s</sub>      | T                       |         | 1816                                  |       |                                                             |
|                                                                       | F02P015S05 |                     |                         |         | 1737                                  |       |                                                             |
|                                                                       | F02P025S05 |                     |                         |         | 1764                                  |       |                                                             |
|                                                                       | F02P050S05 |                     |                         |         | 1600                                  |       |                                                             |
| Consumption current (at If)                                           | F02P006S05 | I <sub>cc</sub>     | mA                      |         | 25                                    |       | I <sub>cc</sub> = 15 + I <sub>p</sub> (mA) / N <sub>s</sub> |
|                                                                       | F02P015S05 |                     |                         |         | 30                                    |       |                                                             |
|                                                                       | F02P025S05 |                     |                         |         | 35                                    |       |                                                             |
|                                                                       | F02P050S05 |                     |                         |         | 55                                    |       |                                                             |
| Internal reference voltage (at I <sub>p</sub> = 0A)                   |            | V <sub>ref1</sub>   | V                       | 2.495   | 2.500                                 | 2.505 | Ref OUT mode                                                |
| External reference voltage                                            |            | V <sub>ref2</sub>   | V                       | 0       |                                       | 4     | Ref IN mode                                                 |
| Output voltage                                                        |            | V <sub>o</sub>      | V                       | 0.375   |                                       | 4.625 |                                                             |
| Output voltage (at I <sub>p</sub> = 0A)                               |            | V <sub>o</sub>      | V                       |         | V <sub>ref1</sub> , V <sub>ref2</sub> |       |                                                             |
| Electrical offset voltage * 1                                         | F02P006S05 | V <sub>oe</sub>     | mV                      | − 5.300 |                                       | 5.300 |                                                             |
|                                                                       | F02P015S05 |                     |                         | − 2.210 |                                       | 2.210 |                                                             |
|                                                                       | F02P025S05 |                     |                         | − 1.350 |                                       | 1.350 |                                                             |
|                                                                       | F02P050S05 |                     |                         | − 0.725 |                                       | 0.725 |                                                             |
| Electrical offset current referred to primary                         | F02P006S05 | I <sub>oe</sub>     | mA                      | − 51    |                                       | 51    |                                                             |
|                                                                       | F02P015S05 |                     |                         | − 53    |                                       | 53    |                                                             |
|                                                                       | F02P025S05 |                     |                         | − 54    |                                       | 54    |                                                             |
|                                                                       | F02P050S05 |                     |                         | − 58    |                                       | 58    |                                                             |
| Temperature coefficient of Internal reference voltage                 |            | TCV <sub>ref1</sub> | ppm/K                   |         | ± 5.0                                 | ± 50  |                                                             |
| Temperature coefficient of Output voltage<br>(at I <sub>p</sub> = 0A) | F02P006S05 | TCV <sub>o</sub>    | ppm/K                   |         | ± 6.0                                 | ± 14  | ppm/K of 2.5V<br>(− 40°C ~ + 105°C)                         |
|                                                                       | F02P015S05 |                     |                         |         | ± 2.3                                 | ± 6   |                                                             |
|                                                                       | F02P025S05 |                     |                         |         | ± 1.4                                 | ± 4   |                                                             |
|                                                                       | F02P050S05 |                     |                         |         | ± 0.7                                 | ± 3   |                                                             |
| Sensitivity (Theoretical value)                                       | F02P006S05 | G <sub>th</sub>     | mV/A                    |         | 104.2                                 |       | 625mV/If                                                    |
|                                                                       | F02P015S05 |                     |                         |         | 41.67                                 |       |                                                             |
|                                                                       | F02P025S05 |                     |                         |         | 25                                    |       |                                                             |
|                                                                       | F02P050S05 |                     |                         |         | 12.5                                  |       |                                                             |
| Sensitivity error                                                     |            | ε <sub>G</sub>      | %                       | − 0.7   |                                       | 0.7   |                                                             |
| Temperature coefficient of Sensitivity (at Ta = − 40°C ~ + 105°C)     |            | TCG                 | ppm/K                   |         |                                       | ± 40  |                                                             |
| Output Linearity                                                      |            | ε <sub>L</sub>      | %                       | − 0.1   |                                       | 0.1   |                                                             |
| Magnetic offset current referred to primary (at 10 × If)              |            | I <sub>OM</sub>     | A                       | − 0.1   |                                       | 0.1   |                                                             |
| Output current noise referred to primary (at 100Hz ~ 100kHz)          |            | I <sub>no</sub>     | μA/ (Hz) <sup>1/2</sup> |         | 20                                    |       | RL = 1k Ω                                                   |

\*1 Offset voltage value is after removal of core hysteresis.

## SPECIFICATIONS

Ta=+25°C, RL=10kΩ, Vcc=+5V

| Parameters                                                             | Symbol     | Unit           | Value |     |     | Comment                                                                         |
|------------------------------------------------------------------------|------------|----------------|-------|-----|-----|---------------------------------------------------------------------------------|
|                                                                        |            |                | MIN   | TYP | MAX |                                                                                 |
| Peak to peak output ripple at oscillator frequency<br>(f typ = 450kHz) | F02P006S05 | mV             |       | 40  | 160 | RL = 1k Ω                                                                       |
|                                                                        | F02P015S05 |                |       | 15  | 60  |                                                                                 |
|                                                                        | F02P025S05 |                |       | 10  | 40  |                                                                                 |
|                                                                        | F02P050S05 |                |       | 5   | 20  |                                                                                 |
| Reaction time (at 10% of If)                                           | F02P006S05 | μs             |       |     | 0.3 | RL = 1k Ω, di/dt = 18A/μs                                                       |
|                                                                        | F02P015S05 |                |       |     | 0.3 | RL = 1k Ω, di/dt = 44A/μs                                                       |
|                                                                        | F02P025S05 |                |       |     | 0.3 | RL = 1k Ω, di/dt = 68A/μs                                                       |
|                                                                        | F02P050S05 |                |       |     | 0.3 | RL = 1k Ω, di/dt = 100A/μs                                                      |
| Response time 1 (at 90% of If)                                         | F02P006S05 | μs             |       |     | 0.3 | RL = 1k Ω, di/dt = 18A/μs                                                       |
|                                                                        | F02P015S05 |                |       |     | 0.3 | RL = 1k Ω, di/dt = 44A/μs                                                       |
|                                                                        | F02P025S05 |                |       |     | 0.3 | RL = 1k Ω, di/dt = 68A/μs                                                       |
|                                                                        | F02P050S05 |                |       |     | 0.3 | RL = 1k Ω, di/dt = 100A/μs                                                      |
| Response time 2 (at 10% of If to 90% of Vo)                            | tr         | μs             |       |     | 0.6 | RL = 1k Ω, di/dt = If/μs                                                        |
| Frequency bandwidth (± 1dB)                                            | BW         | kHz            | 200   |     |     | RL = 1k Ω                                                                       |
| Frequency bandwidth (± 3dB)                                            | BW         | kHz            | 300   |     |     | RL = 1k Ω                                                                       |
| Output Voltage Accuracy (Overall)                                      | F02P006S05 | X <sub>G</sub> |       |     | 1.7 | X <sub>G</sub> = (100 × V <sub>oe</sub> /625) + ε <sub>G</sub> + ε <sub>L</sub> |
|                                                                        | F02P015S05 |                |       |     | 1.2 |                                                                                 |
|                                                                        | F02P025S05 |                |       |     | 1.0 |                                                                                 |
|                                                                        | F02P050S05 |                |       |     | 0.9 |                                                                                 |

## STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

## Characteristic curve (TYP)

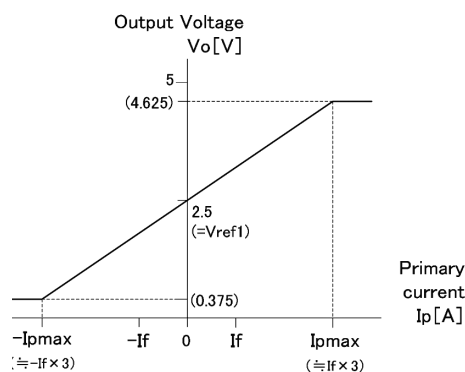


Figure 1 : Linearity curve (Internal reference voltage)

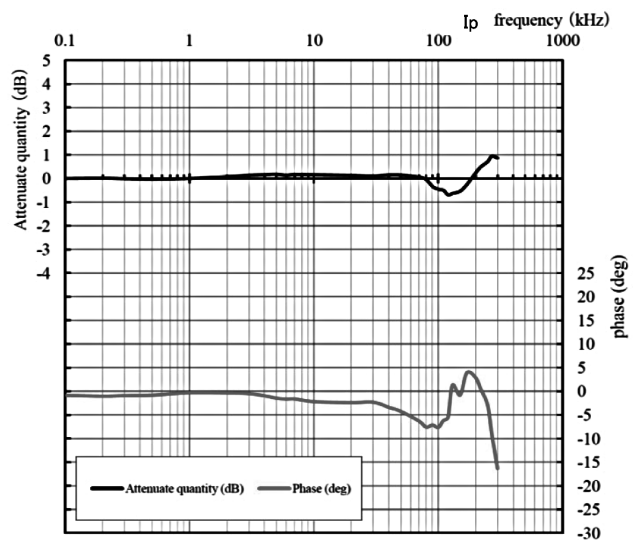


Figure 2 : Frequency response curve

ex) F02P025S05

Measurement condition Ta=+25°C, RL=1k Ω, Ip=3A, Vcc=+5V

## SUPPORT DOCUMENTATION

### Maximum continuous DC primary current

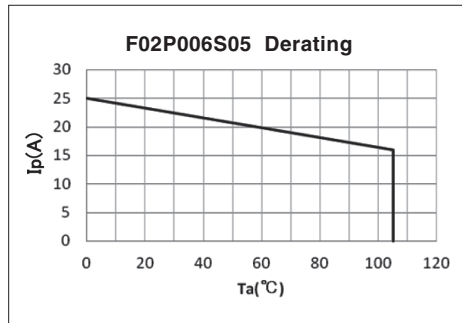


Figure 3 : Ip vs Ta for F02P006S05

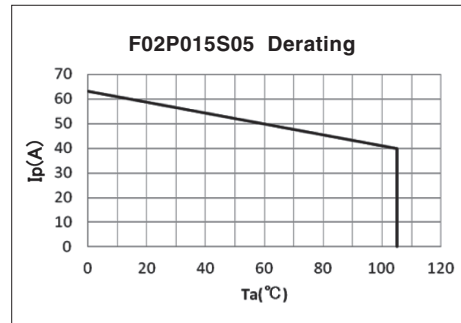


Figure 4 : Ip vs Ta for F02P015S05

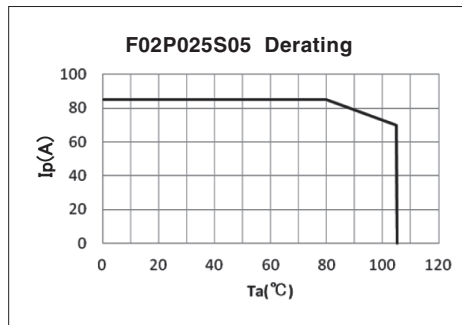


Figure 5 : Ip vs Ta for F02P025S05

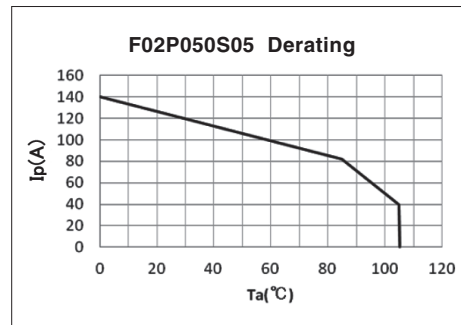


Figure 6 : Ip vs Ta for F02P050S05

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ①  $I_p < I_{pmax}$
- ② Junction temperature  $T_j < 125^{\circ}\text{C}$
- ③ Primary conductor temperature  $< 110^{\circ}\text{C}$
- ④ Resistor power dissipation  $< 0.5 \times \text{rated power}$

### Frequency derating

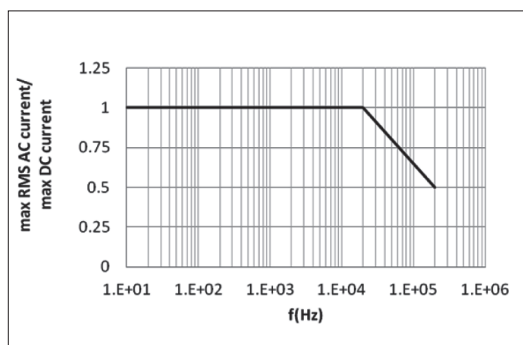


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

## Reference voltage

The Ref pin has two modes Ref IN and Ref OUT:

< Ref OUT mode >

The 2.5V internal precision reference is used by the transducer as the reference point for bipolar measurements;

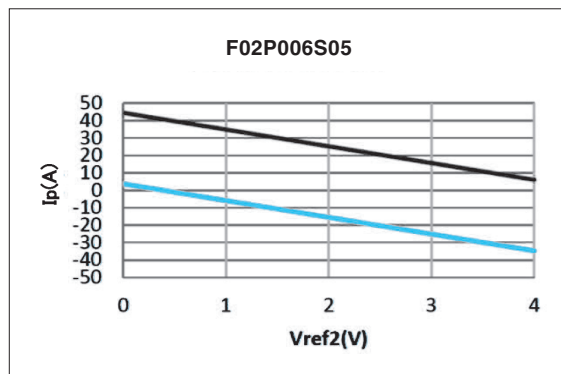
< Ref IN mode >

An external reference voltage is connected to the Ref pin; this voltage is specified in the range 0 to 4 V , its voltage is used as the reference voltage at the time of measurement.

-either to source a typical current of  $(V_{ref} - 2.5) / 680$ , the maximum value will be 2.2mA typ.when  $V_{ref2} = 4V$ .

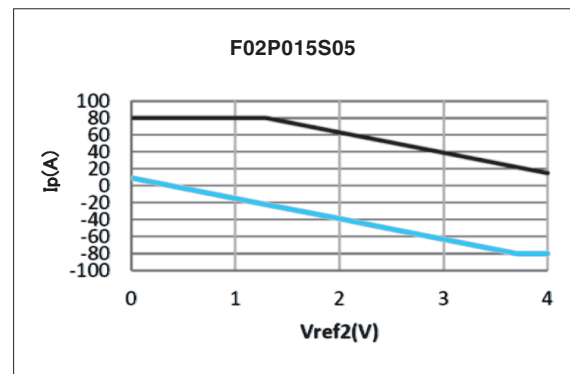
-or to sink a typical current of  $(2.5 - V_{ref2}) / 680$ , the maximum value will be 3.68mA typ.when  $V_{ref2} = 0V$ .

The following graphs show how the measuring range of each transducer version depends on external reference voltage value  $V_{ref2}$ .



Upper limit :  $I_p = -9.6 \times V_{ref2} + 44.4$  ( $V_{ref2} = 0 \dots 4V$ )

Lower limit :  $I_p = -9.6 \times V_{ref2} + 3.6$  ( $V_{ref2} = 0 \dots 4V$ )

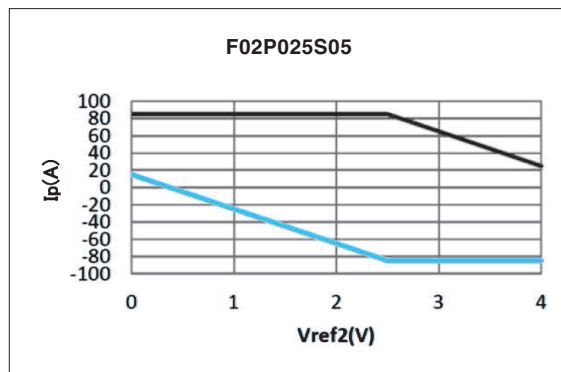


Upper limit :  $I_p = 80$  ( $V_{ref2} = 0 \dots 1.29V$ )

$I_p = -24 \times V_{ref2} + 111$  ( $V_{ref2} = 1.29 \dots 4V$ )

Lower limit :  $I_p = -24 \times V_{ref2} + 9$  ( $V_{ref2} = 0 \dots 3.7V$ )

$I_p = -80$  ( $V_{ref2} = 3.7 \dots 4V$ )

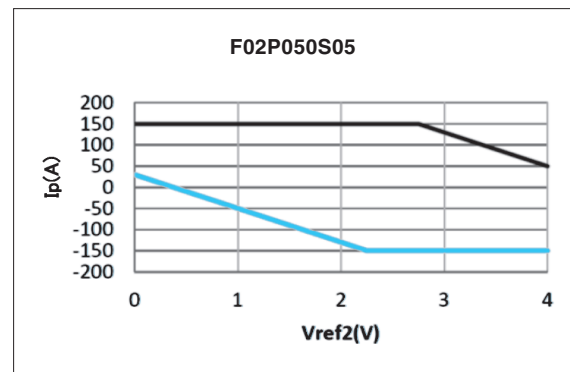


Upper limit :  $I_p = 85$  ( $V_{ref2} = 0 \dots 2.5V$ )

$I_p = -40 \times V_{ref2} + 185$  ( $V_{ref2} = 2.5 \dots 4V$ )

Lower limit :  $I_p = -40 \times V_{ref2} + 15$  ( $V_{ref2} = 0 \dots 2.5V$ )

$I_p = -85$  ( $V_{ref2} = 2.5 \dots 4V$ )



Upper limit :  $I_p = 150$  ( $V_{ref2} = 0 \dots 2.75V$ )

$I_p = -80 \times V_{ref2} + 370$  ( $V_{ref2} = 2.75 \dots 4V$ )

Lower limit :  $I_p = -80 \times V_{ref2} + 30$  ( $V_{ref2} = 0 \dots 2.25V$ )

$I_p = -150$  ( $V_{ref2} = 2.25 \dots 4V$ )

If you do not want to use the Ref pin, please unconnected.

|      |  |
|------|--|
| If/3 |  |
| If/2 |  |
| If   |  |

The drawing illustrates the mechanical specifications of the F02P S05 package. It includes three views: a top view, a side view, and a bottom view.

**Top View Dimensions:**

- Overall width: 23.2
- Overall height: 18.7
- Pin pitch (between groups of 4): 1.75
- Pin pitch (within groups of 4): 0.5
- Distance from left edge to first group of pins: 1.75
- Distance between the two groups of pins: 7.62
- Distance from second group of pins to right edge: 2.54
- Pin diameter:  $6-\phi 1$
- Distance between pin groups:  $2.54 \times 2 = 5.08$

**Side View Dimensions:**

- Pin height: 3.5
- Pin pitch: 1.905
- Overall pin width:  $1.905 \times 3 = 5.715$
- Overall width: 12.7

**Bottom View Dimensions:**

- Overall width: 15.6
- Overall height: 13.4
- Pin pitch: 0.5
- Distance from left edge to first pin: 4
- Distance from last pin to right edge: 0.5

**Terminal Numbering:**

- ① ② ③ INPUT
- ⑧ ⑨ ⑩ OUTPUT
- ⑪ Vref
- ⑫ V<sub>0</sub>
- ⑬ GND
- ⑭ Vcc

**Other Labels:**

- F02P S05
- Lot No
- Vcc GND V<sub>0</sub> Vref
- Current direction (indicated by an arrow pointing left)

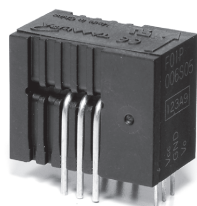
※ Unless otherwise specified tolerances shall be  $\pm 0.5$

Technical drawing of a rectangular plate with the following specifications:

- Overall dimensions: 12.7 (width) x 7.62 (length).
- Hole patterns:
  - Top edge: 4 -  $\phi 0.9$  (4 holes, 1.905 spacing).
  - Bottom edge: 6 -  $\phi 1.2$  (6 holes, 2.54 spacing).
- Internal dimensions: 1.905 (vertical offset from top edge), 2.54 (horizontal offset from left edge), and 2.54 (horizontal offset from right edge).

## Fluxgate system / Voltage-output type

# F01P SERIES



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                                                                  | Symbol          | Unit | Value               | Comment           |
|-----------------------------------------------------------------------------|-----------------|------|---------------------|-------------------|
| Supply voltage                                                              | V <sub>cc</sub> | V    | 7                   |                   |
| Primary conductor temperature                                               | —               | °C   | 110                 |                   |
| Non repetitive primary current pulse (20μS), in powered or unpowered state. | i <sub>p</sub>  | A    | 20 × I <sub>f</sub> |                   |
| ESD (HBM: Human Body Model)                                                 | —               | kV   | 4                   | C=100pF, R=1.5k Ω |

### ISOLATION CHARACTERISTICS

| Parameters                        | Symbol          | Unit | Value                                           | Comment                                                                 |
|-----------------------------------|-----------------|------|-------------------------------------------------|-------------------------------------------------------------------------|
| Insulation voltage                | V <sub>d</sub>  | —    | AC4200V, for 1minute<br>(Sensing current 0.5mA) | Primary ⇔ Secondary                                                     |
| Insulation Resistance             | R <sub>IS</sub> | —    | ≥ 500M Ω (at DC500V)                            | Primary ⇔ Secondary                                                     |
| Clearance distance                | d <sub>ci</sub> | —    | 7.7mm (TYP)                                     | Primary ⇔ Secondary                                                     |
| Creepage distance                 | d <sub>cp</sub> | —    | 7.7mm (TYP)                                     | Primary ⇔ Secondary                                                     |
| Case material                     | —               | —    | UL94 V-0                                        |                                                                         |
| Comparative Tracking Index; (CTI) | CTI             | V    | 600                                             |                                                                         |
| Application example               | —               | —    | 300V, CAT III, PD2                              | Reinforced isolation,non<br>uniform field according to EN50178, EN61010 |
|                                   | —               | —    | 600V, CAT III, PD2                              | Simple isolation,non<br>uniform field according to EN50178, EN61010     |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol         | Unit | Value |     |       | Comment |
|-------------------------------|----------------|------|-------|-----|-------|---------|
|                               |                |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | T <sub>a</sub> | °C   | − 40  |     | + 105 |         |
| Ambient storage temperature   | T <sub>s</sub> | °C   | − 40  |     | + 105 |         |
| Mass                          | m              | g    |       | 12  |       |         |

**SPECIFICATIONS**

Ta=+25°C, RL=10kΩ, Vcc=+5V

| Parameters                                                            |            | Symbol            | Unit                    | Value   |        |        | Comment                                         |
|-----------------------------------------------------------------------|------------|-------------------|-------------------------|---------|--------|--------|-------------------------------------------------|
|                                                                       |            |                   |                         | MIN     | TYP    | MAX    |                                                 |
| Rated Current                                                         | F01P006S05 | If                | A                       |         | 6      |        |                                                 |
|                                                                       | F01P015S05 |                   |                         |         | 15     |        |                                                 |
|                                                                       | F01P025S05 |                   |                         |         | 25     |        |                                                 |
|                                                                       | F01P050S05 |                   |                         |         | 50     |        |                                                 |
| Maximum current<br>(at Vcc= + 5V, Ta= + 105°C)                        | F01P006S05 | I <sub>pmax</sub> | A                       | − 20    |        | 20     |                                                 |
|                                                                       | F01P015S05 |                   |                         | − 51    |        | 51     |                                                 |
|                                                                       | F01P025S05 |                   |                         | − 85    |        | 85     |                                                 |
|                                                                       | F01P050S05 |                   |                         | − 150   |        | 150    |                                                 |
| Supply Voltage                                                        |            | Vcc               | V                       | 4.75    | 5.00   | 5.25   |                                                 |
| Number of primary turns                                               |            | Np                | T                       | 1, 2, 3 |        |        |                                                 |
| Number of secondary turns                                             | F01P006S05 | Ns                | T                       |         | 1816   |        |                                                 |
|                                                                       | F01P015S05 |                   |                         |         | 1737   |        |                                                 |
|                                                                       | F01P025S05 |                   |                         |         | 1764   |        |                                                 |
|                                                                       | F01P050S05 |                   |                         |         | 1600   |        |                                                 |
| Consumption current (at If)                                           | F01P006S05 | I <sub>cc</sub>   | mA                      |         | 25     |        | I <sub>cc</sub> = 15 + I <sub>p</sub> (mA) / Ns |
|                                                                       | F01P015S05 |                   |                         |         | 30     |        |                                                 |
|                                                                       | F01P025S05 |                   |                         |         | 35     |        |                                                 |
|                                                                       | F01P050S05 |                   |                         |         | 55     |        |                                                 |
| Output voltage                                                        |            | V <sub>o</sub>    | V                       | 0.375   |        | 4.625  |                                                 |
| Output voltage (at I <sub>p</sub> = 0A)                               |            | V <sub>o</sub>    | V                       |         | 2.5    |        |                                                 |
| Electrical offset voltage * 1                                         | F01P006S05 | V <sub>oe</sub>   | mV                      | − 10.40 |        | 10.40  |                                                 |
|                                                                       | F01P015S05 |                   |                         | − 7.10  |        | 7.10   |                                                 |
|                                                                       | F01P025S05 |                   |                         | − 6.25  |        | 6.25   |                                                 |
|                                                                       | F01P050S05 |                   |                         | − 5.80  |        | 5.80   |                                                 |
| Electrical offset current referred to primary                         | F01P006S05 | I <sub>oe</sub>   | A                       | − 0.10  |        | 0.10   |                                                 |
|                                                                       | F01P015S05 |                   |                         | − 0.17  |        | 0.17   |                                                 |
|                                                                       | F01P025S05 |                   |                         | − 0.25  |        | 0.25   |                                                 |
|                                                                       | F01P050S05 |                   |                         | − 0.46  |        | 0.46   |                                                 |
| Temperature coefficient of Output voltage<br>(at I <sub>p</sub> = 0A) | F01P006S05 | TCV <sub>o</sub>  | ppm/K                   |         | ± 10.0 | ± 80.0 | ppm/K of 2.5V<br>(− 40°C~+ 105°C)               |
|                                                                       | F01P015S05 |                   |                         |         | ± 7.5  | ± 70.0 |                                                 |
|                                                                       | F01P025S05 |                   |                         |         | ± 6.5  | ± 60.0 |                                                 |
|                                                                       | F01P050S05 |                   |                         |         | ± 6.0  | ± 60.0 |                                                 |
| Sensitivity (Theoretical value)                                       | F01P006S05 | G <sub>th</sub>   | mV/A                    |         | 104.2  |        | 625mV/If                                        |
|                                                                       | F01P015S05 |                   |                         |         | 41.67  |        |                                                 |
|                                                                       | F01P025S05 |                   |                         |         | 25     |        |                                                 |
|                                                                       | F01P050S05 |                   |                         |         | 12.5   |        |                                                 |
| Sensitivity error                                                     |            | ε <sub>G</sub>    | %                       | − 0.7   |        | 0.7    |                                                 |
| Temperature coefficient of Sensitivity (at Ta = − 40°C~+ 105°C)       |            | TCG               | ppm/K                   |         |        | ± 40   |                                                 |
| Output Linearity                                                      |            | ε <sub>L</sub>    | %                       | − 0.1   |        | 0.1    |                                                 |
| Magnetic offset current referred to primary (at 10 × If)              |            | I <sub>OM</sub>   | A                       | − 0.1   |        | 0.1    |                                                 |
| Output current noise referred to primary<br>(at 100Hz ~ 100kHz)       | F01P006S05 | I <sub>no</sub>   | μA/ (Hz) <sup>1/2</sup> |         | 36     |        | RL = 1k Ω                                       |
|                                                                       | F01P015S05 |                   |                         |         | 90     |        |                                                 |
|                                                                       | F01P025S05 |                   |                         |         | 150    |        |                                                 |
|                                                                       | F01P050S05 |                   |                         |         | 300    |        |                                                 |

\*1 Offset voltage value is after removal of core hysteresis.

## SPECIFICATIONS

Ta=+25°C, RL=1kΩ, Vcc=+5V

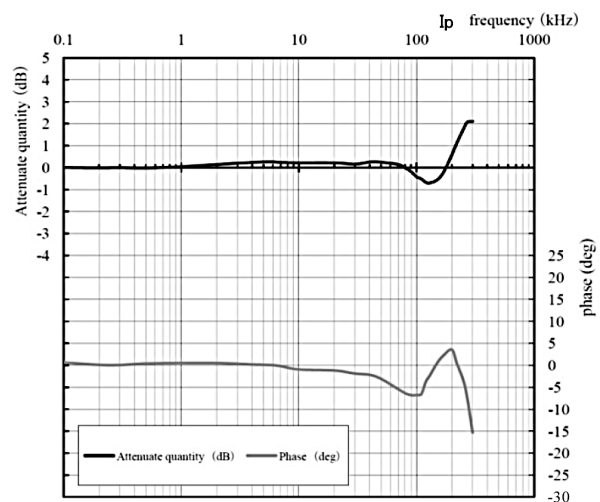
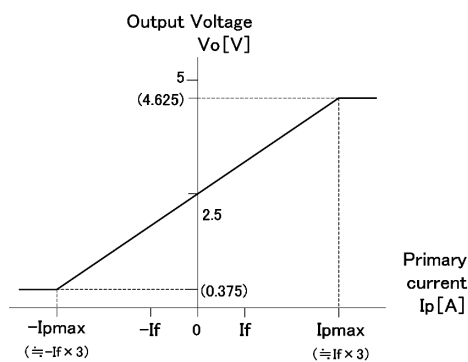
| Parameters                                                             | Symbol     | Unit           | Value |     |     | Comment                                                                         |
|------------------------------------------------------------------------|------------|----------------|-------|-----|-----|---------------------------------------------------------------------------------|
|                                                                        |            |                | MIN   | TYP | MAX |                                                                                 |
| Peak to peak output ripple at oscillator frequency<br>(f typ = 450kHz) | F01P006S05 | —              | mV    | 40  | 160 | RL = 1kΩ                                                                        |
|                                                                        | F01P015S05 |                |       | 15  | 60  |                                                                                 |
|                                                                        | F01P025S05 |                |       | 10  | 40  |                                                                                 |
|                                                                        | F01P050S05 |                |       | 5   | 20  |                                                                                 |
| Reaction time (at 10% of If)                                           | F01P006S05 | tra            | μs    |     | 0.3 | RL = 1kΩ, di/dt = 18A/μs                                                        |
|                                                                        | F01P015S05 |                |       |     | 0.3 | RL = 1kΩ, di/dt = 44A/μs                                                        |
|                                                                        | F01P025S05 |                |       |     | 0.3 | RL = 1kΩ, di/dt = 68A/μs                                                        |
|                                                                        | F01P050S05 |                |       |     | 0.3 | RL = 1kΩ, di/dt = 100A/μs                                                       |
| Response time 1 (at 90% of If)                                         | F01P006S05 | tr             | μs    |     | 0.3 | RL = 1kΩ, di/dt = 18A/μs                                                        |
|                                                                        | F01P015S05 |                |       |     | 0.3 | RL = 1kΩ, di/dt = 44A/μs                                                        |
|                                                                        | F01P025S05 |                |       |     | 0.3 | RL = 1kΩ, di/dt = 68A/μs                                                        |
|                                                                        | F01P050S05 |                |       |     | 0.3 | RL = 1kΩ, di/dt = 100A/μs                                                       |
| Response time 2 (at 10% of If to 90% of Vo)                            | tr         | μs             |       |     | 0.6 | RL = 1kΩ, di/dt = If/μs                                                         |
| Frequency bandwidth (± 1dB)                                            | BW         | kHz            | 200   |     |     | RL = 1kΩ                                                                        |
| Frequency bandwidth (± 3dB)                                            | BW         | kHz            | 300   |     |     | RL = 1kΩ                                                                        |
| Output Voltage Accuracy (Overall)                                      | F01P006S05 | X <sub>G</sub> | %     |     | 2.5 | X <sub>G</sub> = (100 × V <sub>oe</sub> /625) + ε <sub>G</sub> + ε <sub>L</sub> |
|                                                                        | F01P015S05 |                |       |     | 1.9 |                                                                                 |
|                                                                        | F01P025S05 |                |       |     | 1.8 |                                                                                 |
|                                                                        | F01P050S05 |                |       |     | 1.7 |                                                                                 |

## STANDARDS

EN50178, EN61010-1, EN60950-1, UL508 (file No. E243511)

※ Please refer to the another sheet about conditions of UL Recognition.

## Characteristic curve (TYP)



ex) F01P025S05

Measurement condition Ta=+25°C, RL=1kΩ, Ip=3A, Vcc=+5V



## SUPPORT DOCUMENTATION

### Maximum continuous DC primary current

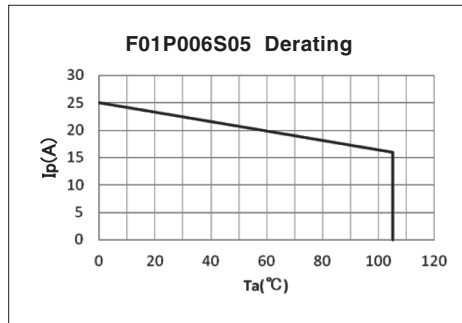


Figure 3 : Ip vs Ta for F01P006S05

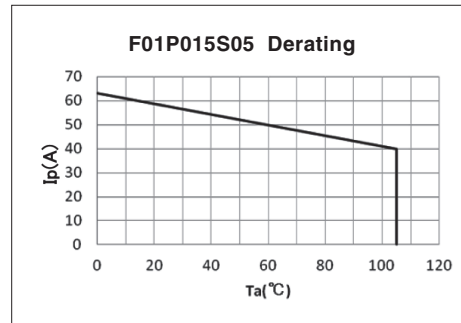


Figure 4 : Ip vs Ta for F01P015S05

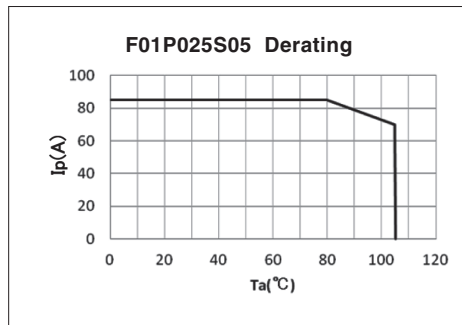


Figure 5 : Ip vs Ta for F01P025S05

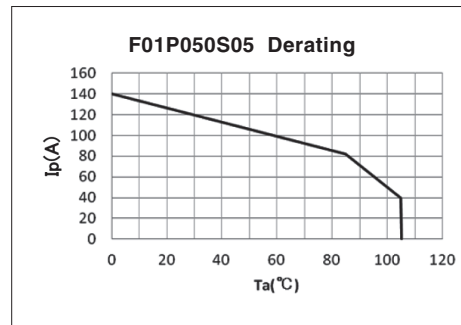


Figure 6 : Ip vs Ta for F01P050S05

According to which the following conditions are true the maximum continuous DC primary current plot shows the boundary of the area.

- ①  $I_p < I_{pmax}$
- ② Junction temperature  $T_j < 125^{\circ}\text{C}$
- ③ Primary conductor temperature  $< 110^{\circ}\text{C}$
- ④ Resistor power dissipation  $< 0.5 \times \text{rated power}$

### Frequency derating

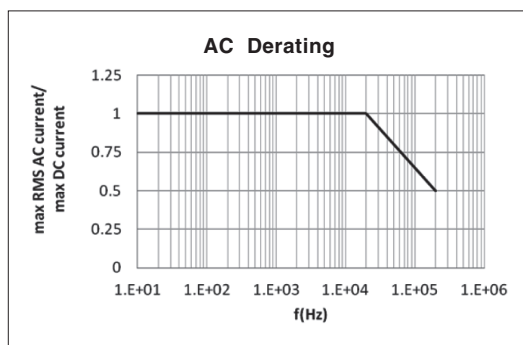


Figure 7 : Maximum RMS AC primary current/maximum DC primary current vs frequency

|      |  |
|------|--|
| If/3 |  |
| If/2 |  |
| If   |  |

The drawing illustrates the mechanical specifications of the F01P S05 package. It includes three views: a top view, a side view, and a detail view of the terminal area.

**Top View Dimensions:**

- Overall width: 23.2
- Overall height: 18.7
- Terminal pitch: 2.54
- Terminal width: 0.5
- Distance from package edge to terminal center: 1.75
- Distance between terminal groups: 7.62
- Distance from terminal center to package edge: 2.54
- Terminal diameter:  $6-\phi 1$
- Distance between terminal groups:  $2.54 \times 2 = 5.08$

**Side View Dimensions:**

- Package height: 3.5
- Terminal pitch: 2.54
- Distance between terminal groups: 5.08
- Overall width: 12.7

**Detail View Dimensions:**

- Terminal pitch: 0.5
- Overall height: 13.4
- Terminal width: 0.5
- Distance from package edge to terminal center: 4
- Distance between terminal groups: 15.6

**Terminal Numbering:**

- ① ② ③ INPUT
- ⑧ ⑨ ⑩ OUTPUT
- ⑪  $V_0$
- ⑫ GND
- ⑬  $V_{CC}$

**Other Labels:**

- F01P S05
- Lot No
- $V_{CC}$
- GND
- $V_0$
- Current direction

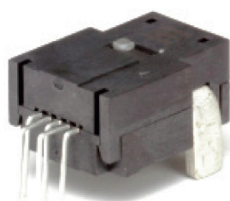
**Note:** \* Unless otherwise specified tolerances shall be  $\pm 0.5$

Technical drawing of a rectangular plate with the following specifications:

- Overall width: 12.7
- Overall height: 7.62
- Top edge features 6 holes, labeled  $6-\phi 1.2$ . They are arranged in two rows of three. The horizontal distance between the center of the first and third holes in the top row is 2.54.
- Left edge features 3 holes, labeled  $3-\phi 0.9$ . The vertical distance between the center of the first and third holes is 5.08.
- Bottom edge features 3 holes. The horizontal distance between the center of the first and third holes is 2.54.
- The distance from the left edge to the center of the first hole in the bottom row is 7.62.

Magnetic Proportion System / Compact size and High-speed response.  $V_{CC} = +3.3V$

## LA02P Series



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                            | Symbol    | Unit | Value   | Comment                    |
|---------------------------------------|-----------|------|---------|----------------------------|
| Supply voltage                        | $V_{DD}$  | V    | 6.5     |                            |
| Jumper temperature                    | —         | °C   | 120     |                            |
| Output current                        | $I_{out}$ | mA   | $\pm 1$ | Recommend ; $< \pm 0.5mA$  |
| ESD rating<br>(HBM: Human Body Model) | —         | kV   | 2       | $C=100pF$ , $R=1.5k\Omega$ |

### ISOLATION CHARACTERISTICS

| Parameters                         | Symbol   | Unit | Value                                                            | Comment                                                                                                                            |
|------------------------------------|----------|------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Insulation voltage                 | $V_d$    | V    | $\geq AC3000V$ , 50/60Hz, for 1minute<br>(Sensing current 0.5mA) | Primary $\leftrightarrow$ Secondary                                                                                                |
| Impulse withstand voltage          | $V_w$    | kV   | 6                                                                | Primary $\leftrightarrow$ Secondary<br>Input waveform :<br>• Front time 1.2 $\mu s$<br>• Time to half value 50 $\mu s$<br>• single |
| Clearance distance                 | $d_{Ci}$ | mm   | 13.3                                                             | Primary $\leftrightarrow$ Secondary                                                                                                |
| Creepage distance                  | $d_{Cp}$ | mm   | 13.3                                                             | Primary $\leftrightarrow$ Secondary                                                                                                |
| Case material                      | —        | —    | UL94 V-0                                                         |                                                                                                                                    |
| Comparative Tracking Index : (CTI) | CTI      | V    | 150                                                              |                                                                                                                                    |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol | Unit | Value   |     |       | Comment |
|-------------------------------|--------|------|---------|-----|-------|---------|
|                               |        |      | MIN     | TYP | MAX   |         |
| Ambient operating temperature | $T_a$  | °C   | - 40    |     | + 110 |         |
| Ambient storage temperature   | $T_s$  | °C   | - 40    |     | + 150 |         |
| Mass                          | $m$    | g    |         | 5.5 |       |         |
| Internal magnetic core        | —      | —    | Ferrite |     |       |         |

### SPECIFICATIONS

$T_a = +25^\circ C$ ,  $V_{DD} = +3.3V$ ,  $R_L \geq 10M\Omega$

| Parameters                |             | Symbol | Unit | Value |     |     | Comment |
|---------------------------|-------------|--------|------|-------|-----|-----|---------|
|                           |             |        |      | MIN   | TYP | MAX |         |
| Measurement current range | LA02P021S03 | $I_f$  | A    | - 21  |     | 21  |         |
|                           | LA02P035S03 |        |      | - 35  |     | 35  |         |
|                           | LA02P054S03 |        |      | - 54  |     | 54  |         |
|                           | LA02P085S03 |        |      | - 85  |     | 85  |         |

## SPECIFICATIONS

Ta=+25°C, V<sub>DD</sub>=+3.3V, R<sub>L</sub>≥10MΩ

| Parameters                                                                                          |             | Symbol           | Unit  | Value   |       |         | Comment                                                                         |
|-----------------------------------------------------------------------------------------------------|-------------|------------------|-------|---------|-------|---------|---------------------------------------------------------------------------------|
|                                                                                                     |             |                  |       | MIN     | TYP   | MAX     |                                                                                 |
| Maximum primary current (RMS)                                                                       |             | $I_{p(RMS)}$ max | A     |         |       | 50      | * 1                                                                             |
| Supply Voltage                                                                                      |             | $V_{DD}$         | V     | 2.97    | 3.3   | 3.63    |                                                                                 |
| Number of primary turns                                                                             |             | $N_p$            | T     | 1       |       |         |                                                                                 |
| Primary Jumper resistance                                                                           |             | $R_p$            | mΩ    |         | 0.1   |         |                                                                                 |
| Current consumption (at If)                                                                         |             | $I_{DD}$         | mA    |         |       | 10      |                                                                                 |
| Offset voltage (at If=0A)                                                                           | —           | $V_{of}$         | V     | 1.636   | 1.650 | 1.664   | At factory shipment                                                             |
|                                                                                                     | LA02P021S03 |                  |       | (1.565) | 1.650 | (1.735) | Reference value after the flow soldering and over the lifetime of this product. |
|                                                                                                     | LA02P035S03 |                  |       | (1.593) | 1.650 | (1.707) |                                                                                 |
|                                                                                                     | LA02P054S03 |                  |       | (1.608) | 1.650 | (1.692) |                                                                                 |
|                                                                                                     | LA02P085S03 |                  |       | (1.618) | 1.650 | (1.682) |                                                                                 |
| Temperature drift of offset voltage<br>(at Ta= − 40 ~+ 110℃, Variation from Vof<br>(Ta=35℃), Ip=0A) | LA02P021S03 | TCVof            | mV    |         | ± 9.0 |         |                                                                                 |
|                                                                                                     | LA02P035S03 |                  |       |         | ± 5.5 |         |                                                                                 |
|                                                                                                     | LA02P054S03 |                  |       |         | ± 3.5 |         |                                                                                 |
|                                                                                                     | LA02P085S03 |                  |       |         | ± 2.5 |         |                                                                                 |
| Sensitivity                                                                                         | LA02P021S03 | G                | mV/A  | 61.1    | 62.5  | 63.9    |                                                                                 |
|                                                                                                     | LA02P035S03 |                  |       | 36.7    | 37.5  | 38.3    |                                                                                 |
|                                                                                                     | LA02P054S03 |                  |       | 23.9    | 24.5  | 25.1    |                                                                                 |
|                                                                                                     | LA02P085S03 |                  |       | 15.1    | 15.5  | 15.9    |                                                                                 |
| Temperature coefficient 1 of Sensitivity<br>(at Ta= − 40 ~+ 110℃, Variation ratio to G (Ta=35℃))    |             | TCG1             | %     |         | ± 0.4 |         |                                                                                 |
| Output Linearity (at 0... If)                                                                       |             | $\varepsilon_L$  | %F.S. | − 1     |       | 1       |                                                                                 |
| Output noise voltage                                                                                |             | $V_{NRMS}$       | mVrms |         | 1.7   |         |                                                                                 |
| Ratiometric error of sensitivity                                                                    |             | $V_{G-R}$        | %     | − 1     |       | 1       |                                                                                 |
| Ratiometric error of offset voltage                                                                 | LA02P021S03 | $V_{of-R}$       | %F.S. | − 0.8   |       | 0.8     |                                                                                 |
|                                                                                                     | LA02P035S03 |                  |       | − 0.6   |       | 0.6     |                                                                                 |
|                                                                                                     | LA02P054S03 |                  |       | − 0.6   |       | 0.6     |                                                                                 |
|                                                                                                     | LA02P085S03 |                  |       | − 0.6   |       | 0.6     |                                                                                 |
| Response time 1 (at 90% of If )                                                                     |             | $t_r$            | μs    |         | 1     |         | CL=100pF                                                                        |
| Frequency bandwidth (− 3dB)                                                                         |             | BW               | kHz   |         | 300   |         | CL=100pF                                                                        |

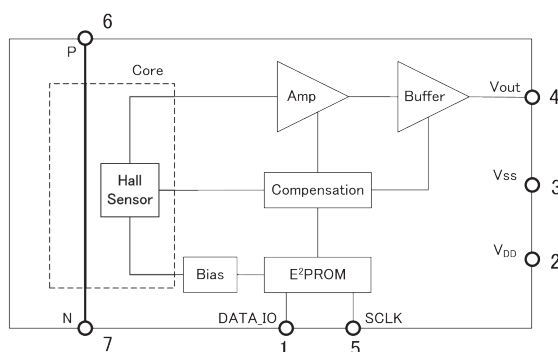
\* 1 When I<sub>p (RMS)</sub> max is bigger than the value of I<sub>f</sub>, I<sub>p (RMS)</sub> max restricts it to the value of I<sub>f</sub>.

## STANDARDS

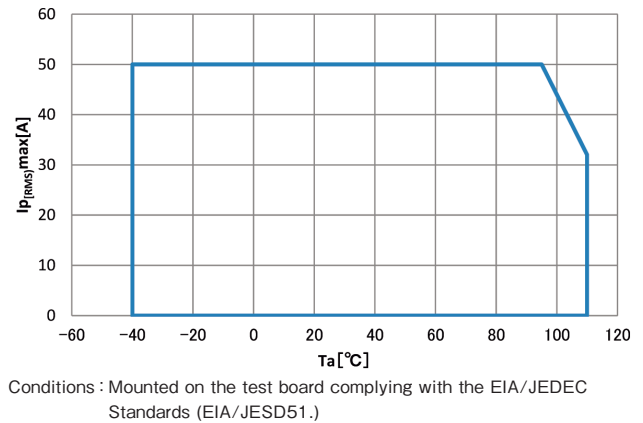
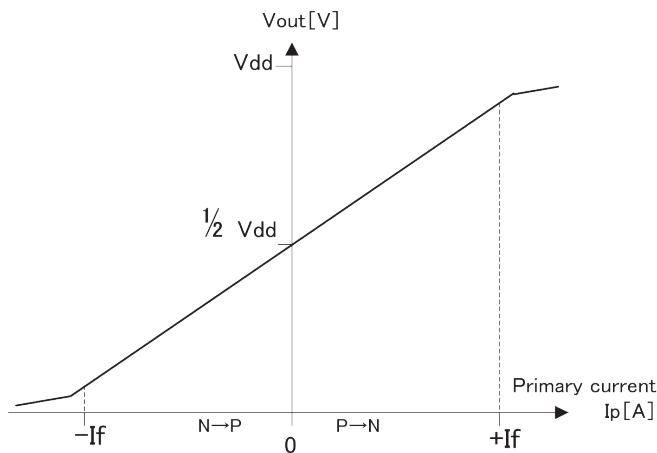
IEC60950 , UL508 , CSA C22.2 No. 14

※ Please refer to the another sheet about conditions of UL Recognition.

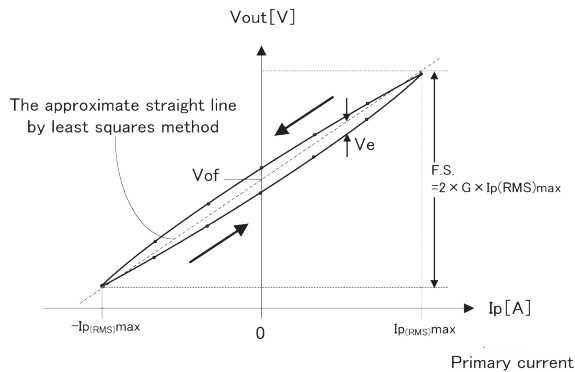
## FUNCTIONAL BLOCK DIAGRAM



## CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



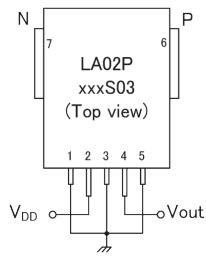
## CHARACTERISTICS DEFINITIONS



- When  $I_{p(rms)max}$  is bigger than the value of  $I_f$ ,  $I_{p(rms)max}$  restricts it to the value of  $I_f$ .

- Sensitivity  $G$  [mV/A], Offset voltage  $V_{of}$  [V]  
Sensitivity ( $G$ ) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage ( $V_{out}$ ) when sweeping the measured current  $I_p$  at rated current range.  
Also Offset voltage ( $V_{of}$ ) is defined as the intercept of the approximate straight line.
- Output linearity  $\epsilon_L$  [%]  
Output linearity ( $\epsilon_L$ ) is defined as the ratio of maximum error voltage ( $V_e$ ) to the full scale (F.S.), where  $V_d$  is maximum difference between the Output voltage ( $V_{out}$ ) and the approximate straight line calculated in the sensitivity and offset voltage definition;  
$$\epsilon_L = V_e / F.S. \times 100$$
- Ratiometric error of sensitivity  $V_{G-R}$  [%], ratiometric error of Offset voltage  $V_{of-R}$  [%]  
Output of LA02P Series is ratiometric.  
Sensitivity ( $G$ ) and Offset voltage ( $V_{of}$ ) are proportional to Supply voltage ( $V_{DD}$ ).
- Ratiometric error is defined as follows in the supply voltage range ( $2.97V < V_{DD1} < 3.63V$ );  
$$V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=3.3V)) - (V_{DD1} / 3.3)] / (V_{DD1} / 3.3)$$
  
$$V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=3.3V) \times (V_{DD1} / 3.3)] / F.S.$$

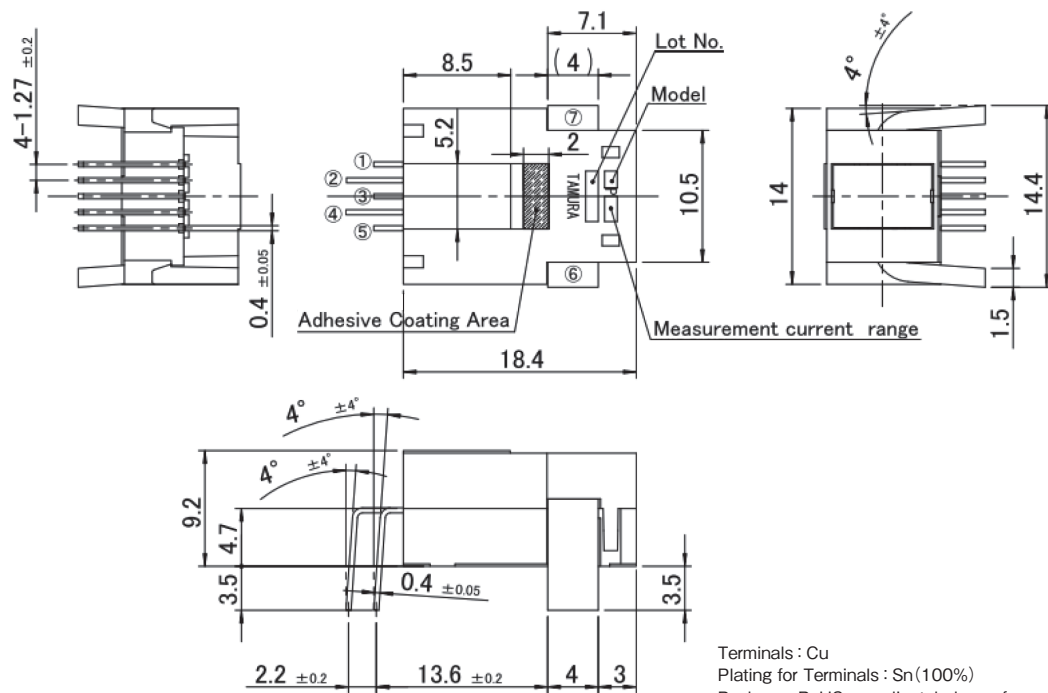
## TERMINAL DESCRIPTIONS



### Terminal number

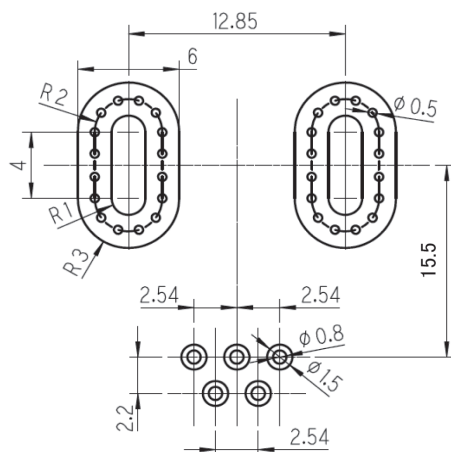
- |                   |                           |
|-------------------|---------------------------|
| ① DATA_IO         | Test pin (connect to GND) |
| ② V <sub>DD</sub> | Power supply (3.3V)       |
| ③ V <sub>SS</sub> | GND (0V)                  |
| ④ Vout            | Analog output             |
| ⑤ SCLK            | Test pin (connect to GND) |
| ⑥ P               | Input                     |
| ⑦ N               | Output                    |

## DIMENSIONS (mm)



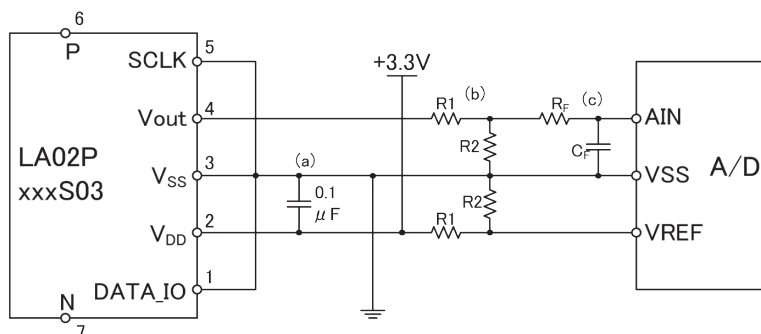
Note1) The tolerances of dimensions without any mention are  $\pm 0.1$ mm.

## RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

## TYPICAL APPLICATION



- (a) Please be placed the bypass capacitor  $0.1 \mu F$  as close as possible to the  $V_{DD}$  and  $V_{SS}$  pins of LA02P Series.
- (b) LA02P Series have a ratiometric output. When received output by the A / D converter, it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with  $R1$  and  $R2$  is required, if the reference voltage of the A / D converter is lower than + 3.3V.
- (c) If necessary, please insert a low-pass filter to  $V_{out}$ .

## TYPE DESIGNATION

**LA02 P \* \* \* S 03**

①      ②      ③      ④      ⑤

- ① Model (4 figures)  
LA02 : Series
- ② Mounting configuration (1 figure)  
P : PCB Mounting type
- ③ Measurement current range (3 figures)  
Ex) 035 : 35A    085 : 85A
- ④ Control power supply type (1 figure)  
S : Single supply
- ⑤ Power supply voltage (2 digits)

## RELIABILITY TEST

| No. | Item                               | Test Conditions                                                                                                                              | n  | Test Time             |
|-----|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------|
| 1   | High Temp. High Humidity Bias Test | 【JEITA EIAJ ED-4701 102】<br>$T_a=85^{\circ}\text{C}$ , 85%RH, continuous operation                                                           | 22 | 1000h                 |
| 2   | High Temperature Bias Test         | 【JEITA EIAJ ED-4701 101】<br>$T_a=125^{\circ}\text{C}$ , continuous operation                                                                 | 22 | 1000h                 |
| 3   | High Temperature Storage Test      | 【JEITA EIAJ ED-4701 201】<br>$T_a=150^{\circ}\text{C}$                                                                                        | 22 | 1000h                 |
| 4   | Low Temperature Storage Test       | 【JEITA EIAJ ED-4701 202】<br>$T_a=-55^{\circ}\text{C}$                                                                                        | 22 | 1000h                 |
| 5   | Heat Cycle Test                    | 【JEITA EIAJ ED-4701 105】<br>$-65^{\circ}\text{C}/(30\text{min}) \leftrightarrow 150^{\circ}\text{C}/(30\text{min})$<br>Tested in vapor phase | 22 | 500 cycles            |
| 6   | Vibration Test                     | 【JEITA EIAJ ED-4701 403】<br>Vibration frequency: 10~55Hz(1 min.)<br>Vibration amplitude: 1.5mm(x,y,z directions)                             | 5  | 2h for each direction |

Tested samples are pretreated as below before each reliability test:

Desiccation :  $125^{\circ}\text{C} / 24\text{h} \rightarrow$  Moisture Absorption :  $85^{\circ}\text{C} / 85\%\text{RH} / 168\text{h} \rightarrow$  Flow : 1 time ( $260^{\circ}\text{C}$  , 10s)

Criterion for determining

Products whose drifts before and after the reliability tests do not exceed the values below are considered to be in spec.

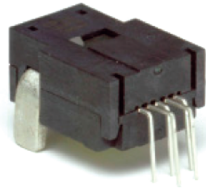
Sensitivity  $G$  ( $T_a=25^{\circ}\text{C}$ ) : Within  $\pm 1.5\%$  (All model)

Offset Voltage  $V_{of}$  ( $T_a=25^{\circ}\text{C}$ ) : Within  $\pm 100\text{mV}$  (LA02P021S03), Within  $\pm 66\text{mV}$  (Other model)

Output Linearity  $\varepsilon_L$  ( $T_a=25^{\circ}\text{C}$ ) : Within  $\pm 1\%$  (All model)

Magnetic Proportion System / Compact size and High-speed response.  $V_{CC} = +5.0V$

## LA03P Series



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                            | Symbol    | Unit | Value   | Comment                    |
|---------------------------------------|-----------|------|---------|----------------------------|
| Supply voltage                        | $V_{DD}$  | V    | 6.5     |                            |
| Jumper temperature                    | —         | °C   | 120     |                            |
| Output current                        | $I_{out}$ | mA   | $\pm 1$ | Recommend ; $< \pm 0.5mA$  |
| ESD rating<br>(HBM: Human Body Model) | —         | kV   | 2       | $C=100pF$ , $R=1.5k\Omega$ |

### ISOLATION CHARACTERISTICS

| Parameters                         | Symbol   | Unit | Value                                                            | Comment                                                                                                                            |
|------------------------------------|----------|------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Insulation voltage                 | $V_d$    | V    | $\geq AC3000V$ , 50/60Hz, for 1minute<br>(Sensing current 0.5mA) | Primary $\leftrightarrow$ Secondary                                                                                                |
| Impulse withstand voltage          | $V_w$    | kV   | 6                                                                | Primary $\leftrightarrow$ Secondary<br>Input waveform :<br>• Front time 1.2 $\mu s$<br>• Time to half value 50 $\mu s$<br>• single |
| Clearance distance                 | $d_{Ci}$ | mm   | 13.3                                                             | Primary $\leftrightarrow$ Secondary                                                                                                |
| Creepage distance                  | $d_{Cp}$ | mm   | 13.3                                                             | Primary $\leftrightarrow$ Secondary                                                                                                |
| Case material                      | —        | —    | UL94 V-0                                                         |                                                                                                                                    |
| Comparative Tracking Index : (CTI) | CTI      | V    | 150                                                              |                                                                                                                                    |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol | Unit | Value   |     |       | Comment |
|-------------------------------|--------|------|---------|-----|-------|---------|
|                               |        |      | MIN     | TYP | MAX   |         |
| Ambient operating temperature | $T_a$  | °C   | - 40    |     | + 110 |         |
| Ambient storage temperature   | $T_s$  | °C   | - 40    |     | + 150 |         |
| Mass                          | $m$    | g    |         | 5.5 |       |         |
| Internal magnetic core        | —      | —    | Ferrite |     |       |         |

### SPECIFICATIONS

$T_a = +25^\circ C$ ,  $V_{DD} = +5V$ ,  $R_L \geq 10M\Omega$

| Parameters                |             | Symbol | Unit | Value |     |     | Comment |
|---------------------------|-------------|--------|------|-------|-----|-----|---------|
|                           |             |        |      | MIN   | TYP | MAX |         |
| Measurement current range | LA03P021S05 | $I_f$  | A    | - 21  |     | 21  |         |
|                           | LA03P035S05 |        |      | - 35  |     | 35  |         |
|                           | LA03P054S05 |        |      | - 54  |     | 54  |         |
|                           | LA03P085S05 |        |      | - 85  |     | 85  |         |



## SPECIFICATIONS

Ta=+25°C, V<sub>DD</sub>=+5V, RL≥10MΩ

| Parameters                                                                                                                     |             | Symbol                   | Unit  | Value   |        |         | Comment                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------|-------|---------|--------|---------|---------------------------------------------------------------------------------|
|                                                                                                                                |             |                          |       | MIN     | TYP    | MAX     |                                                                                 |
| Maximum primary current (RMS)                                                                                                  |             | I <sub>p (RMS)</sub> max | A     |         |        | 50      | * 1                                                                             |
| Supply Voltage                                                                                                                 |             | V <sub>DD</sub>          | V     | 4.5     | 5.0    | 5.5     |                                                                                 |
| Number of primary turns                                                                                                        |             | N <sub>p</sub>           | T     | 1       |        |         |                                                                                 |
| Primary Jumper resistance                                                                                                      |             | R <sub>p</sub>           | m Ω   |         | 0.1    |         |                                                                                 |
| Current consumption (at I <sub>f</sub> )                                                                                       |             | I <sub>DD</sub>          | mA    |         |        | 11      |                                                                                 |
| Offset voltage (at I <sub>f</sub> =0A)                                                                                         | —           | V <sub>of</sub>          | V     | 2.480   | 2.500  | 2.520   | At factory shipment                                                             |
|                                                                                                                                | LA03P021S05 |                          |       | (2.350) | 2.500  | (2.650) | Reference value after the flow soldering and over the lifetime of this product. |
|                                                                                                                                | LA03P035S05 |                          |       | (2.400) | 2.500  | (2.600) |                                                                                 |
|                                                                                                                                | LA03P054S05 |                          |       | (2.425) | 2.500  | (2.575) |                                                                                 |
|                                                                                                                                | LA03P085S05 |                          |       | (2.445) | 2.500  | (2.555) |                                                                                 |
| Temperature drift of offset voltage<br>(at Ta= − 40 ~+ 110°C, Variation from V <sub>of</sub><br>(Ta=35°C), I <sub>p</sub> =0A) | LA03P021S05 | TCV <sub>of</sub>        | mV    |         | ± 23.0 |         |                                                                                 |
|                                                                                                                                | LA03P035S05 |                          |       |         | ± 12.0 |         |                                                                                 |
|                                                                                                                                | LA03P054S05 |                          |       |         | ± 8.0  |         |                                                                                 |
|                                                                                                                                | LA03P085S05 |                          |       |         | ± 6.0  |         |                                                                                 |
| Sensitivity                                                                                                                    | LA03P021S05 | G                        | mV/A  | 98.0    | 100.0  | 102.0   |                                                                                 |
|                                                                                                                                | LA03P035S05 |                          |       | 58.8    | 60.0   | 61.2    |                                                                                 |
|                                                                                                                                | LA03P054S05 |                          |       | 39.2    | 40.0   | 40.8    |                                                                                 |
|                                                                                                                                | LA03P085S05 |                          |       | 24.4    | 25.0   | 25.6    |                                                                                 |
| Temperature coefficient 1 of Sensitivity<br>(at Ta= − 40 ~+ 110°C, Variation ratio to G (Ta=35°C))                             |             | TCG1                     | %     |         | ± 0.5  |         |                                                                                 |
| Output Linearity (at 0... I <sub>f</sub> )                                                                                     |             | ε <sub>L</sub>           | %F.S. | − 1     |        | 1       |                                                                                 |
| Output noise voltage                                                                                                           |             | V <sub>NRMS</sub>        | mVrms |         | 1.7    |         |                                                                                 |
| Ratiometric error of sensitivity                                                                                               |             | V <sub>G-R</sub>         | %     | − 1     |        | 1       |                                                                                 |
| Ratiometric error of offset voltage                                                                                            | LA03P021S05 | V <sub>of-R</sub>        | %F.S. | − 0.7   |        | 0.7     |                                                                                 |
|                                                                                                                                | LA03P035S05 |                          |       | − 0.5   |        | 0.5     |                                                                                 |
|                                                                                                                                | LA03P054S05 |                          |       | − 0.5   |        | 0.5     |                                                                                 |
|                                                                                                                                | LA03P085S05 |                          |       | − 0.5   |        | 0.5     |                                                                                 |
| Response time 1 (at 90% of I <sub>f</sub> )                                                                                    |             | tr                       | μs    |         | 1      |         | CL=100pF                                                                        |
| Frequency bandwidth (− 3dB)                                                                                                    |             | BW                       | kHz   |         | 300    |         | CL=100pF                                                                        |

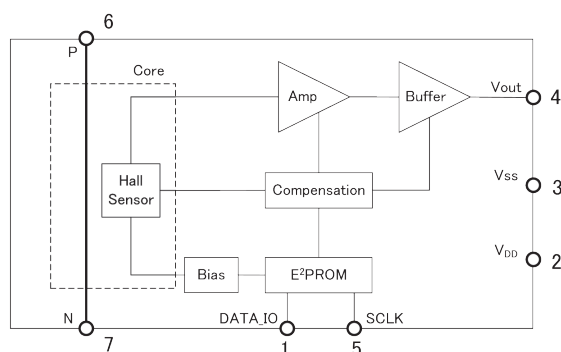
\* 1 When I<sub>p(RMS)</sub>max is bigger than the value of I<sub>f</sub>, I<sub>p(RMS)</sub>max restricts it to the value of I<sub>f</sub>.

## STANDARDS

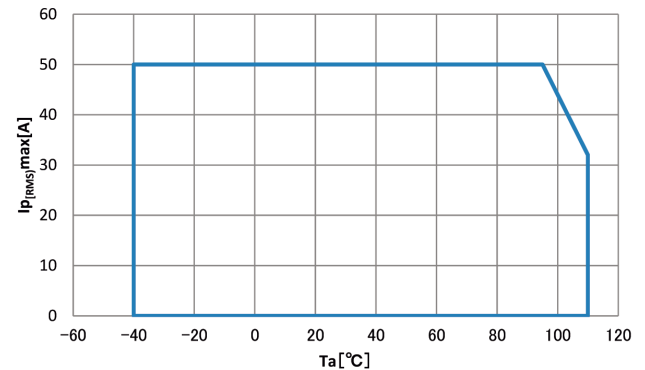
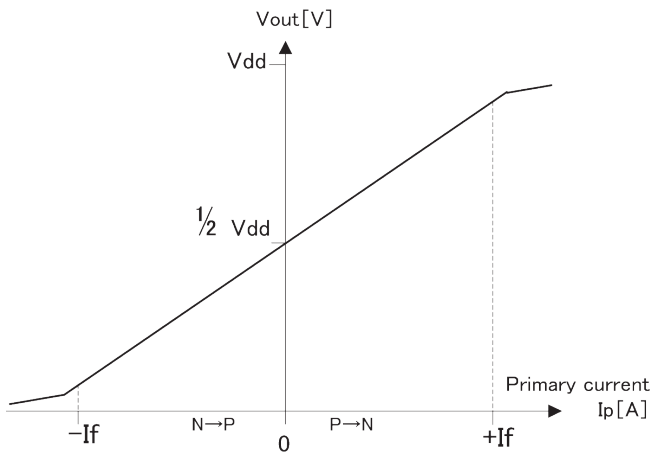
IEC60950 , UL508 , CSA C22.2 No. 14

※ Please refer to the another sheet about conditions of UL Recognition.

## FUNCTIONAL BLOCK DIAGRAM

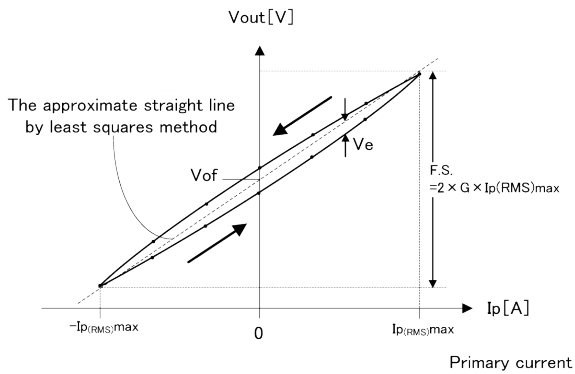


## CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

## CHARACTERISTICS DEFINITIONS



- When  $I_{p(RMS)max}$  is bigger than the value of  $I_f$ ,  $I_{p(RMS)max}$  restricts it to the value of  $I_f$ .

- Sensitivity  $G$  [mV/A], Offset voltage  $V_{of}$  [V]  
Sensitivity ( $G$ ) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage ( $V_{out}$ ) when sweeping the measured current  $I_p$  at rated current range.  
Also Offset voltage ( $V_{of}$ ) is defined as the intercept of the approximate straight line.

- Output linearity  $\epsilon_L$  [%]  
Output linearity ( $\epsilon_L$ ) is defined as the ratio of maximum error voltage ( $V_e$ ) to the full scale (F.S.), where  $V_d$  is maximum difference between the Output voltage ( $V_{out}$ ) and the approximate straight line calculated in the sensitivity and offset voltage definition;

$$\epsilon_L = V_e / F.S. \times 100$$

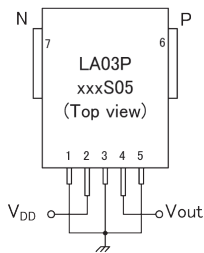
- Ratiometric error of sensitivity  $V_{G-R}$  [%], ratiometric error of Offset voltage  $V_{of-R}$  [%]  
Output of LA03P Series is ratiometric.  
Sensitivity ( $G$ ) and Offset voltage ( $V_{of}$ ) are proportional to Supply voltage ( $V_{DD}$ ).

- Ratiometric error is defined as follows in the supply voltage range ( $4.5V < V_{DD1} < 5.5V$ );

$$V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$$

$$V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$$

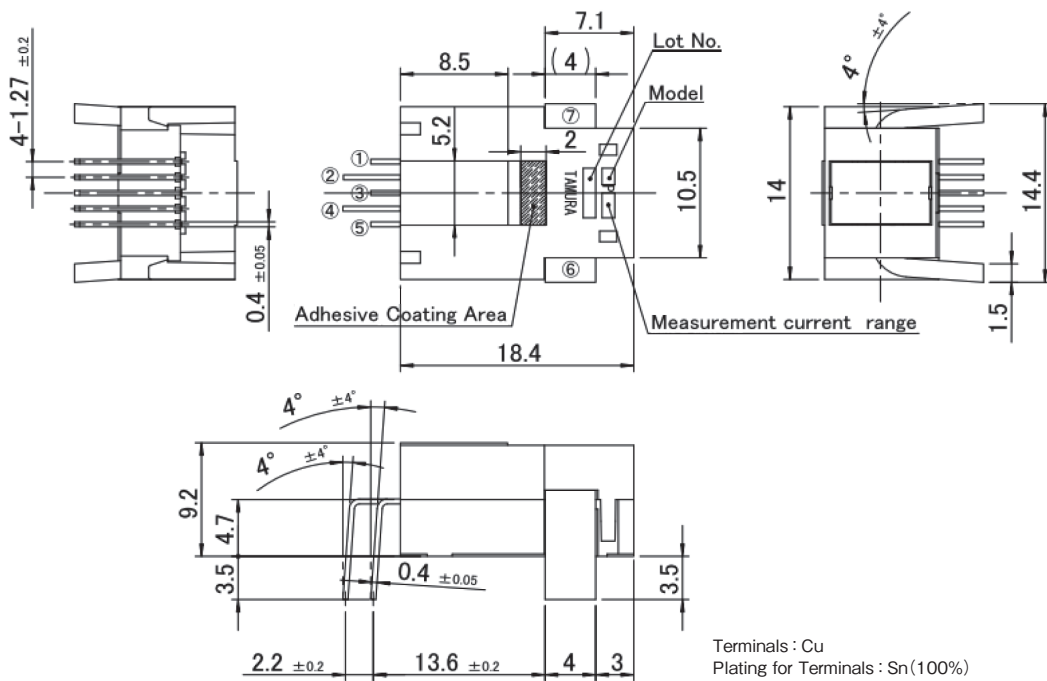
## TERMINAL DESCRIPTIONS



### Terminal number

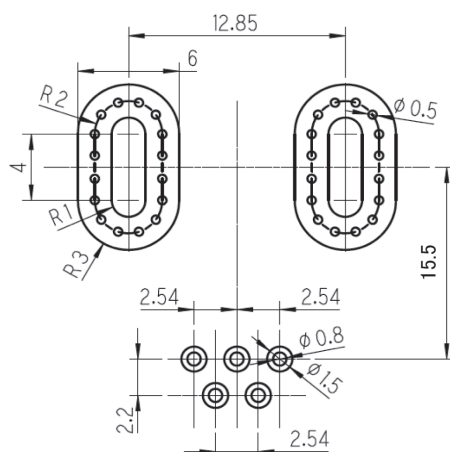
- |                   |                           |
|-------------------|---------------------------|
| ① DATA_IO         | Test pin (connect to GND) |
| ② V <sub>DD</sub> | Power supply (5V)         |
| ③ V <sub>SS</sub> | GND (0V)                  |
| ④ Vout            | Analog output             |
| ⑤ SCLK            | Test pin (connect to GND) |
| ⑥ P               | Input                     |
| ⑦ N               | Output                    |

## DIMENSIONS (mm)



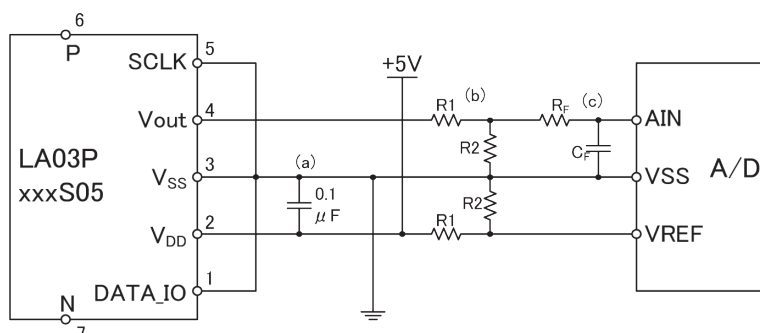
Note1) The tolerances of dimensions without any mention are  $\pm 0.1$ mm.

## RECOMMENDED THROUGH-HOLE LAYOUTS (mm)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.

## TYPICAL APPLICATION



- (a) Please be placed the bypass capacitor 0.1  $\mu$  F as close as possible to the VDD and VSS pins of LA03P Series.
- (b) LA03P Series have a ratiometric output. When received output by the A / D converter, it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A / D converter is lower than + 5V.
- (c) If necessary, please insert a low-pass filter to Vout.

## TYPE DESIGNATION

**LA03 P \* \* \* S 05**

①

②

③

④

⑤

- ① Model (4 figures)  
LA03 : Series
- ② Mounting configuration (1 figure)  
P : PCB Mounting type
- ③ Measurement current range (3 figures)  
Ex) 035 : 35A 085 : 85A
- ④ Control power supply type (1 figure)  
S : Single supply
- ⑤ Power supply voltage (2 digits)

## RELIABILITY TEST

| No. | Item                               | Test Conditions                                                                                                  | n  | Test Time             |
|-----|------------------------------------|------------------------------------------------------------------------------------------------------------------|----|-----------------------|
| 1   | High Temp. High Humidity Bias Test | 【JEITA EIAJ ED-4701 102】<br>Ta=85°C, 85%RH, continuous operation                                                 | 22 | 1000h                 |
| 2   | High Temperature Bias Test         | 【JEITA EIAJ ED-4701 101】<br>Ta=125°C, continuous operation                                                       | 22 | 1000h                 |
| 3   | High Temperature Storage Test      | 【JEITA EIAJ ED-4701 201】<br>Ta=150°C                                                                             | 22 | 1000h                 |
| 4   | Low Temperature Storage Test       | 【JEITA EIAJ ED-4701 202】<br>Ta=-55°C                                                                             | 22 | 1000h                 |
| 5   | Heat Cycle Test                    | 【JEITA EIAJ ED-4701 105】<br>-65°C(30min) $\leftrightarrow$ 150°C(30min)<br>Tested in vapor phase                 | 22 | 500 cycles            |
| 6   | Vibration Test                     | 【JEITA EIAJ ED-4701 403】<br>Vibration frequency: 10~55Hz(1 min.)<br>Vibration amplitude: 1.5mm(x,y,z directions) | 5  | 2h for each direction |

Tested samples are pretreated as below before each reliability test:

Desiccation : 125°C /24h  $\rightarrow$  Moisture Absorption : 85°C /85%RH/168h  $\rightarrow$  Flow : 1 time (260°C , 10s)

Criterion for determining

Products whose drifts before and after the reliability tests do not exceed the values below are considered to be in spec.

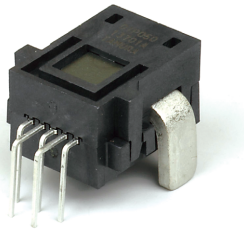
Sensitivity G (Ta=25°C) : Within  $\pm$  1.5% (All model)

Offset Voltage Vof (Ta=25°C) : Within  $\pm$  150mV (LA03P021S05), Within  $\pm$  100mV (Other model)

Output Linearity  $\epsilon_L$  (Ta=25°C) : Within  $\pm$  1% (All model)

## Magnetic Proportion System / Compact size and High-speed response

# LA01P SERIES



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                            | Symbol    | Unit | Value   | Comment                          |
|---------------------------------------|-----------|------|---------|----------------------------------|
| Supply voltage                        | $V_{DD}$  | V    | 6       |                                  |
| Jumper temperature                    | —         | °C   | 120     |                                  |
| Output current                        | $I_{out}$ | mA   | $\pm 1$ | Recommend ; $< \pm 0.5\text{mA}$ |
| ESD rating<br>(HBM: Human Body Model) | —         | kV   | 2       | C=100pF, R=1.5k $\Omega$         |

### ISOLATION CHARACTERISTICS

| Parameters                         | Symbol | Unit | Value                                                                  | Comment                                                                                                                                        |
|------------------------------------|--------|------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Insulation voltage                 | $V_d$  | V    | $\geq \text{AC2500V, 50/60Hz, for 1minute}$<br>(Sensing current 0.5mA) | Primary $\leftrightarrow$ Secondary                                                                                                            |
| Impulse withstand voltage          | $V_w$  | kV   | 2.5                                                                    | Primary $\leftrightarrow$ Secondary<br>Input waveform :<br>• Front time 1.2 $\mu\text{s}$<br>• Time to half value 50 $\mu\text{s}$<br>• single |
| Clearance distance                 | dCi    | mm   | 2.7                                                                    | Primary $\leftrightarrow$ Secondary                                                                                                            |
| Creepage distance                  | dCp    | mm   | 2.7                                                                    | Primary $\leftrightarrow$ Secondary                                                                                                            |
| Case material                      | —      | —    | UL94 V-0                                                               |                                                                                                                                                |
| Comparative Tracking Index : (CTI) | CTI    | V    | 200                                                                    |                                                                                                                                                |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol | Unit | Value |     |       | Comment |
|-------------------------------|--------|------|-------|-----|-------|---------|
|                               |        |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | $T_a$  | °C   | - 40  |     | + 90  |         |
| Ambient storage temperature   | $T_s$  | °C   | - 40  |     | + 125 |         |
| Mass                          | m      | g    |       | 12  |       |         |

### SPECIFICATIONS

$T_a = +25^\circ\text{C}, V_{DD} = +5\text{V}, R_L \geq 10\text{M}\Omega$

| Parameters                |             | Symbol | Unit | Value |     |     | Comment |
|---------------------------|-------------|--------|------|-------|-----|-----|---------|
|                           |             |        |      | MIN   | TYP | MAX |         |
| Measurement current range | LA01P035S05 | $I_f$  | A    | - 35  |     | 35  |         |
|                           | LA01P046S05 |        |      | - 46  |     | 46  |         |
|                           | LA01P054S05 |        |      | - 54  |     | 54  |         |
|                           | LA01P085S05 |        |      | - 85  |     | 85  |         |
|                           | LA01P170S05 |        |      | - 170 |     | 170 |         |

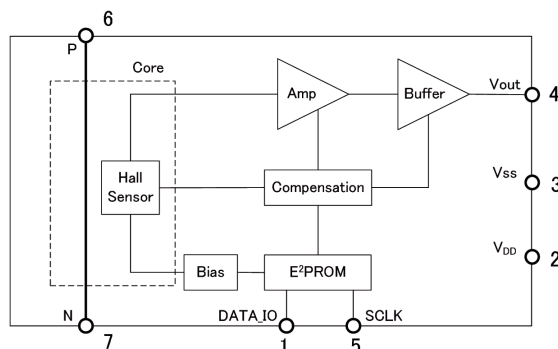
## SPECIFICATIONS

Ta=+25°C, V<sub>DD</sub>=+5V, R<sub>L</sub>≥10MΩ

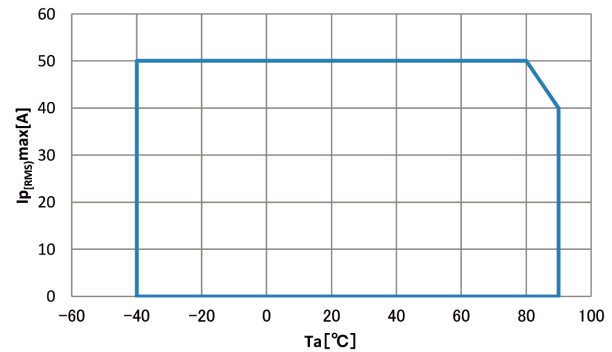
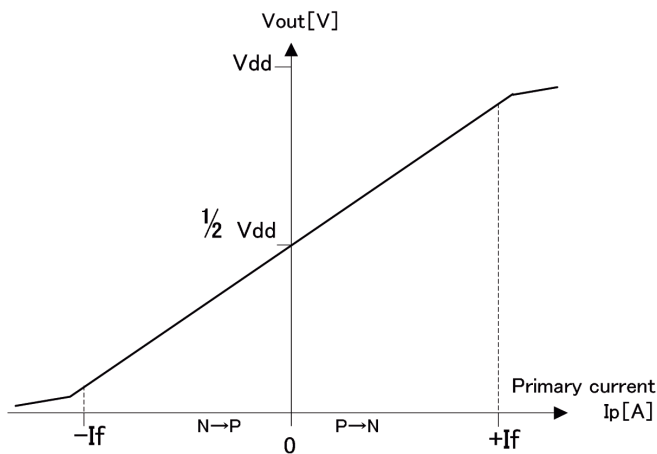
| Parameters                                                                                                                   |             | Symbol                   | Unit              | Value |        |       | Comment  |
|------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------|-------------------|-------|--------|-------|----------|
|                                                                                                                              |             |                          |                   | MIN   | TYP    | MAX   |          |
| Maximum primary current (RMS)                                                                                                |             | I <sub>p (RMS)</sub> max | A                 |       |        | 50    | * 1      |
| Supply Voltage                                                                                                               |             | V <sub>DD</sub>          | V                 | 4.5   | 5.0    | 5.5   |          |
| Number of primary turns                                                                                                      |             | N <sub>p</sub>           | T                 | 1     |        |       |          |
| Primary Jumper resistance                                                                                                    |             | R <sub>p</sub>           | mΩ                |       | 0.10   |       |          |
| Current consumption (at I <sub>p</sub> =0A)                                                                                  |             | I <sub>DD</sub>          | mA                |       |        | 10    |          |
| Offset voltage                                                                                                               | LA01P035S05 | V <sub>of</sub>          | V                 | 2.408 | 2.500  | 2.592 |          |
|                                                                                                                              | LA01P046S05 |                          |                   | 2.423 | 2.500  | 2.577 |          |
|                                                                                                                              | LA01P054S05 |                          |                   | 2.432 | 2.500  | 2.568 |          |
|                                                                                                                              | LA01P085S05 |                          |                   | 2.451 | 2.500  | 2.549 |          |
|                                                                                                                              | LA01P170S05 |                          |                   | 2.465 | 2.500  | 2.535 |          |
| Temperature drift of offset voltage<br>(at Ta= -40 ~ +90°C, Variation from V <sub>of</sub><br>(Ta=35°C), I <sub>p</sub> =0A) | LA01P035S05 | TCV <sub>o</sub>         | mV                |       | ± 21.5 |       |          |
|                                                                                                                              | LA01P046S05 |                          |                   |       | ± 17.0 |       |          |
|                                                                                                                              | LA01P054S05 |                          |                   |       | ± 14.0 |       |          |
|                                                                                                                              | LA01P085S05 |                          |                   |       | ± 9.0  |       |          |
|                                                                                                                              | LA01P170S05 |                          |                   |       | ± 4.5  |       |          |
| Sensitivity                                                                                                                  | LA01P035S05 | G                        | mV/A              | 58.8  | 60.0   | 61.2  |          |
|                                                                                                                              | LA01P046S05 |                          |                   | 44.1  | 45.0   | 45.9  |          |
|                                                                                                                              | LA01P054S05 |                          |                   | 39.2  | 40.0   | 40.8  |          |
|                                                                                                                              | LA01P085S05 |                          |                   | 24.5  | 25.0   | 25.5  |          |
|                                                                                                                              | LA01P170S05 |                          |                   | 11.7  | 12.0   | 12.3  |          |
| Temperature coefficient 1 of Sensitivity<br>(at Ta= +35 ~ +90°C, Variation ratio to G<br>(Ta=35°C))                          | LA01P035S05 | TCG <sub>1</sub>         | %                 |       | ± 1    |       |          |
|                                                                                                                              | LA01P046S05 |                          |                   |       | ± 2    |       |          |
|                                                                                                                              | LA01P054S05 |                          |                   |       | ± 1    |       |          |
|                                                                                                                              | LA01P085S05 |                          |                   |       | ± 1    |       |          |
|                                                                                                                              | LA01P170S05 |                          |                   |       | ± 2    |       |          |
| Temperature coefficient 2 of Sensitivity<br>(at Ta= -40 ~ +35°C, Variation ratio to G (Ta=35°C))                             |             | TCG <sub>2</sub>         | %                 |       | ± 2    |       |          |
| Output Linearity (at 0... I <sub>f</sub> )                                                                                   |             | ε <sub>L</sub>           | %                 | - 1   |        | 1     |          |
| Output noise voltage                                                                                                         |             | V <sub>NRMS</sub>        | mV <sub>rms</sub> |       |        | 2.1   |          |
| Ratiometric error of sensitivity                                                                                             |             | V <sub>G-R</sub>         | %                 | - 1   |        | 1     |          |
| Ratiometric error of offset voltage                                                                                          |             | V <sub>of-R</sub>        | %                 | - 1   |        | 1     |          |
| Response time 1 (at 90% of I <sub>f</sub> )                                                                                  |             | t <sub>r</sub>           | μs                |       | 1      |       | CL=100pF |
| Frequency bandwidth (-3dB)                                                                                                   |             | BW                       | kHz               |       | 400    |       | CL=100pF |

\* 1 When I<sub>p(RMS)</sub>max is bigger than the value of I<sub>f</sub>, I<sub>p(RMS)</sub>max restricts it to the value of I<sub>f</sub>.

## FUNCTIONAL BLOCK DIAGRAM

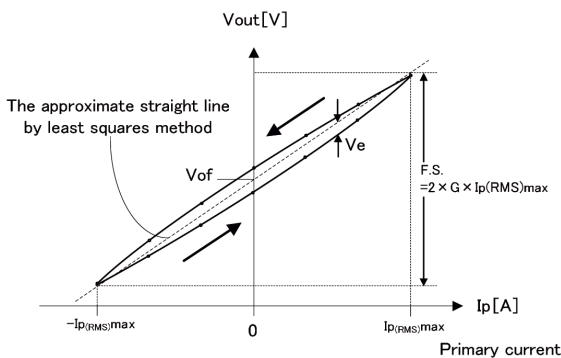


## CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

## CHARACTERISTICS DEFINITIONS



- When  $I_{p(RMS)max}$  is bigger than the value of  $I_f$ ,  $I_{p(RMS)max}$  restricts it to the value of  $I_f$ .

- Sensitivity  $G$  [mV/A], Offset voltage  $V_{of}$  [V]  
Sensitivity ( $G$ ) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage ( $V_{out}$ ) when sweeping the measured current  $I_p$  at rated current range.  
Also Offset voltage ( $V_{of}$ ) is defined as the intercept of the approximate straight line.

- Output linearity  $\epsilon_L$  [%]  
Output linearity ( $\epsilon_L$ ) is defined as the ratio of maximum error voltage ( $V_e$ ) to the full scale (F.S.), where  $V_d$  is maximum difference between the Output voltage ( $V_{out}$ ) and the approximate straight line calculated in the sensitivity and offset voltage definition;

$$\epsilon_L = V_e / F.S. \times 100$$

- Ratiometric error of sensitivity  $V_{G-R}$  [%], ratiometric error of Offset voltage  $V_{of-R}$  [%]

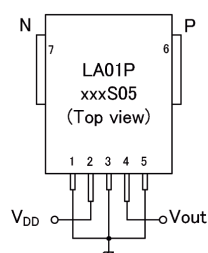
Output of LA01P Series is ratiometric.

Sensitivity ( $G$ ) and Offset voltage ( $V_{of}$ ) are proportional to Supply voltage ( $V_{DD}$ ).

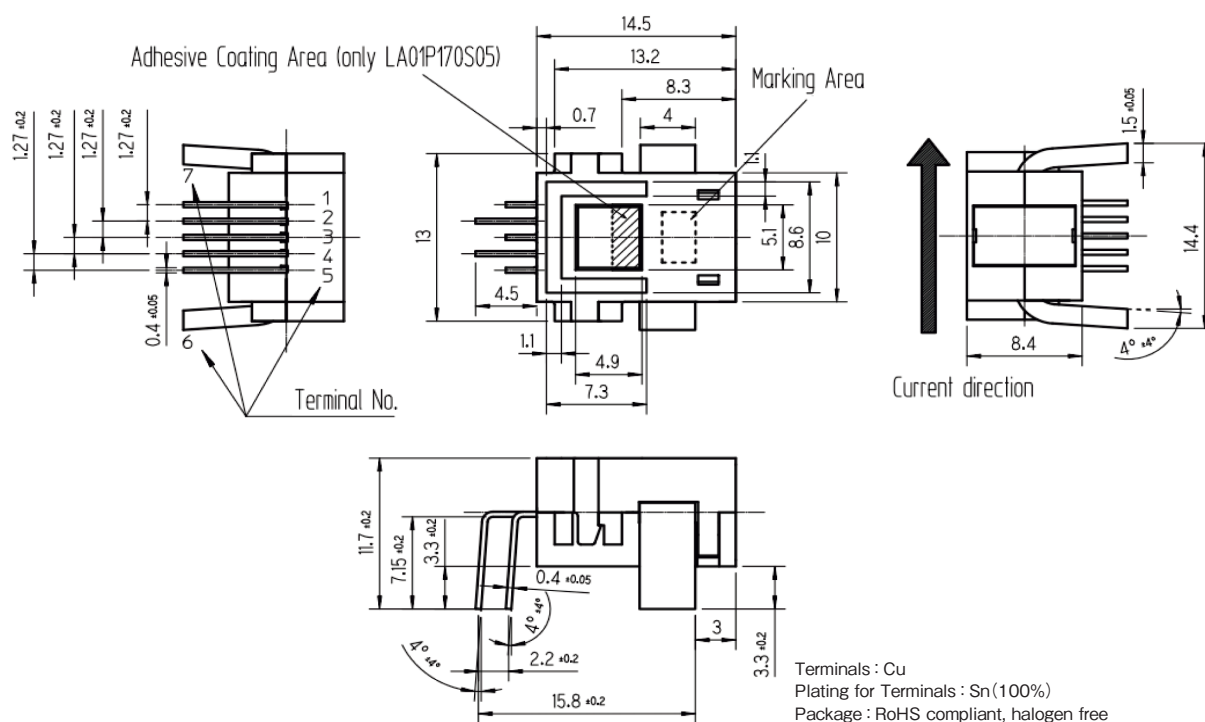
- Ratiometric error is defined as follows in the supply voltage range ( $4.5V < V_{DD1} < 5.5V$ );

$$V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$$

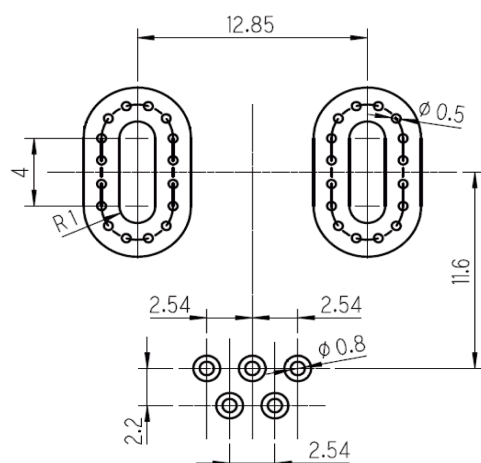
$$V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$$



| Terminal number    |                           |
|--------------------|---------------------------|
| ① DATA_IO          | Test pin (connect to GND) |
| ② V <sub>DD</sub>  | Power supply (5V)         |
| ③ V <sub>SS</sub>  | GND (0V)                  |
| ④ V <sub>out</sub> | Analog output             |
| ⑤ SCLK             | Test pin (connect to GND) |
| ⑥ P                | Input                     |
| ⑦ N                | Output                    |



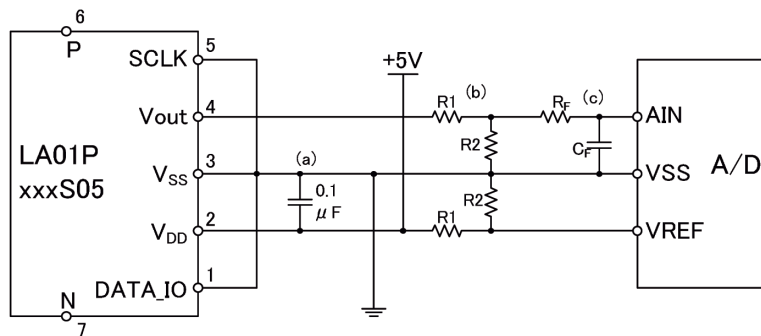
Note2) The adhesive material (RoHS compliant, halogen free) is used for holding the magnetic core. (Only LA01P170S05)



Note) If 2 or more trace layers are used as the current path, please make enough number of through-holes to flow current between the trace layers.



## TYPICAL APPLICATION



- (a) Please be placed the bypass capacitor  $0.1 \mu F$  as close as possible to the  $V_{DD}$  and  $V_{SS}$  pins of LA01P Series.
- (b) LA01P Series have a ratiometric output. When received output by the A / D converter, it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with  $R1$  and  $R2$  is required, if the reference voltage of the A / D converter is lower than + 5V.
- (c) If necessary, please insert a low-pass filter to Vout.

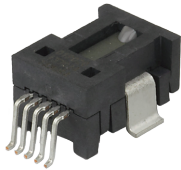
## TYPE DESIGNATION

**LA01 P \* \* \* S 05**  
 ① ② ③ ④ ⑤

- ① Model (4 figures)  
 LA01 : Series
- ② Mounting configuration (1 figure)  
 P : PCB Mounting type
- ③ Measurement current range (3 figures)  
 Ex) 035 : 35A 100 : 100A
- ④ Control power supply type (1 figure)  
 S : Single supply
- ⑤ Power supply voltage (2 digits)

## Magnetic Proportion System / Compact size and High-speed response

# LA01M SERIES



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters                            | Symbol    | Unit | Value   | Comment                                  |
|---------------------------------------|-----------|------|---------|------------------------------------------|
| Supply voltage                        | $V_{DD}$  | V    | 6       |                                          |
| Jumper temperature                    | —         | °C   | 120     |                                          |
| Output current                        | $I_{out}$ | mA   | $\pm 1$ | Recommend ; $< \pm 0.5\text{mA}$         |
| ESD rating<br>(HBM: Human Body Model) | —         | kV   | 2       | $C=100\text{pF}$ , $R=1.5\text{k}\Omega$ |

### ISOLATION CHARACTERISTICS

| Parameters                         | Symbol   | Unit | Value                                                                          | Comment                                                                                                                                        |
|------------------------------------|----------|------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Insulation voltage                 | $V_d$    | V    | $\geq \text{AC}2500\text{V}$ , 50/60Hz, for 1minute<br>(Sensing current 0.5mA) | Primary $\leftrightarrow$ Secondary                                                                                                            |
| Impulse withstand voltage          | $V_w$    | kV   | 2.5                                                                            | Primary $\leftrightarrow$ Secondary<br>Input waveform :<br>• Front time 1.2 $\mu\text{s}$<br>• Time to half value 50 $\mu\text{s}$<br>• single |
| Clearance distance                 | $d_{Ci}$ | mm   | 2.0                                                                            | Primary $\leftrightarrow$ Secondary                                                                                                            |
| Creepage distance                  | $d_{Cp}$ | mm   | 2.0                                                                            | Primary $\leftrightarrow$ Secondary                                                                                                            |
| Case material                      | —        | —    | UL94 V-0                                                                       |                                                                                                                                                |
| Comparative Tracking Index : (CTI) | CTI      | V    | 200                                                                            |                                                                                                                                                |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol | Unit | Value |     |       | Comment |
|-------------------------------|--------|------|-------|-----|-------|---------|
|                               |        |      | MIN   | TYP | MAX   |         |
| Ambient operating temperature | $T_a$  | °C   | - 40  |     | + 90  |         |
| Ambient storage temperature   | $T_s$  | °C   | - 40  |     | + 125 |         |
| Mass                          | m      | g    |       | 2   |       |         |

### SPECIFICATIONS

$T_a = +25^\circ\text{C}$ ,  $V_{DD} = +5\text{V}$ ,  $R_L \geq 10\text{M}\Omega$

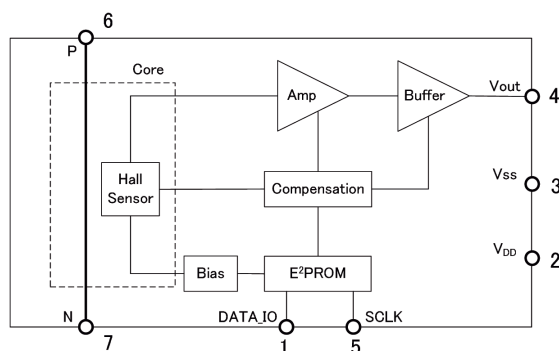
| Parameters                    |             | Symbol            | Unit | Value  |     |      | Comment |
|-------------------------------|-------------|-------------------|------|--------|-----|------|---------|
|                               |             |                   |      | MIN    | TYP | MAX  |         |
| Measurement current range     | LA01M021S05 | $I_f$             | A    | - 21   |     | 21   |         |
|                               | LA01M032S05 |                   |      | - 31.8 |     | 31.8 |         |
|                               | LA01M035S05 |                   |      | - 35   |     | 35   |         |
|                               | LA01M041S05 |                   |      | - 41   |     | 41   |         |
| Maximum primary current (RMS) |             | $I_{p(RMS) \max}$ | A    |        |     | 20   |         |

## SPECIFICATIONS

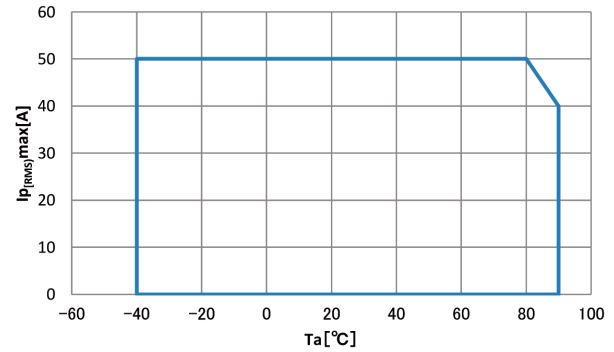
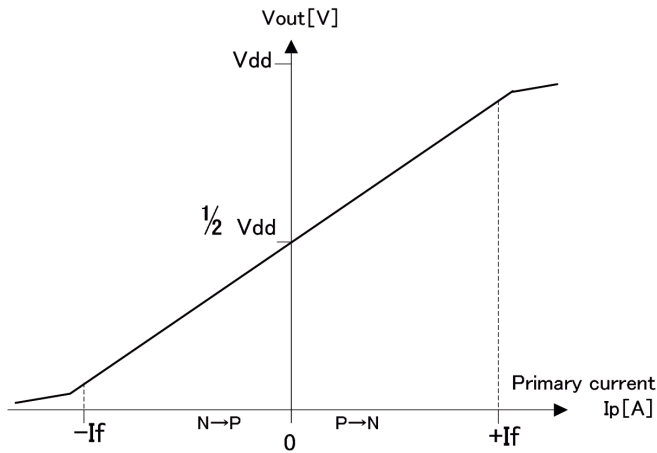
Ta=+25°C, V<sub>DD</sub>=+5V, R<sub>L</sub>≥10MΩ

| Parameters                                                                                                                  |             | Symbol            | Unit              | Value |        |       | Comment  |
|-----------------------------------------------------------------------------------------------------------------------------|-------------|-------------------|-------------------|-------|--------|-------|----------|
|                                                                                                                             |             |                   |                   | MIN   | TYP    | MAX   |          |
| Supply Voltage                                                                                                              |             | V <sub>DD</sub>   | V                 | 4.5   | 5.0    | 5.5   |          |
| Number of primary turns                                                                                                     |             | N <sub>p</sub>    | T                 | 1     |        |       |          |
| Primary Jumper resistance                                                                                                   |             | R <sub>p</sub>    | m Ω               |       | 0.34   |       |          |
| Current consumption (at I <sub>p</sub> =0A)                                                                                 |             | I <sub>DD</sub>   | mA                |       |        | 10    |          |
| Offset voltage                                                                                                              | LA01M021S05 | V <sub>of</sub>   | V                 | 2.390 | 2.500  | 2.610 |          |
|                                                                                                                             | LA01M032S05 |                   |                   | 2.408 | 2.500  | 2.592 |          |
|                                                                                                                             | LA01M035S05 |                   |                   | 2.423 | 2.500  | 2.577 |          |
|                                                                                                                             | LA01M041S05 |                   |                   | 2.432 | 2.500  | 2.568 |          |
| Temperature drift of offset voltage<br>(at Ta= − 40 ~+ 90℃, Variation from V <sub>of</sub><br>(Ta=35℃), I <sub>p</sub> =0A) | LA01M021S05 | TCV <sub>o</sub>  | mV                |       | ± 26.0 |       |          |
|                                                                                                                             | LA01M032S05 |                   |                   |       | ± 22.0 |       |          |
|                                                                                                                             | LA01M035S05 |                   |                   |       | ± 17.5 |       |          |
|                                                                                                                             | LA01M041S05 |                   |                   |       | ± 14.5 |       |          |
| Sensitivity                                                                                                                 | LA01M021S05 | G                 | mV/A              | 98.0  | 100.0  | 102.0 |          |
|                                                                                                                             | LA01M032S05 |                   |                   | 64.7  | 66.0   | 67.3  |          |
|                                                                                                                             | LA01M035S05 |                   |                   | 58.8  | 60.0   | 61.2  |          |
|                                                                                                                             | LA01M041S05 |                   |                   | 49.0  | 50.0   | 51.0  |          |
| Temperature coefficient 1 of Sensitivity<br>(at Ta= + 35 ~+ 90℃, Variation ratio to G<br>(Ta=35℃))                          | LA01M021S05 | TCG1              | %                 |       | ± 1.0  |       |          |
|                                                                                                                             | LA01M032S05 |                   |                   |       | ± 1.0  |       |          |
|                                                                                                                             | LA01M035S05 |                   |                   |       | ± 1.0  |       |          |
|                                                                                                                             | LA01M041S05 |                   |                   |       | ± 2.0  |       |          |
| Temperature coefficient 2 of Sensitivity<br>(at Ta= − 40 ~+ 35℃, Variation ratio to G (Ta=35℃))                             |             | TCG2              | %                 |       | ± 2.0  |       |          |
| Output Linearity (at 0... I <sub>f</sub> )                                                                                  |             | ε <sub>L</sub>    | %                 | − 1   |        | 1     |          |
| Output noise voltage                                                                                                        |             | V <sub>NRMS</sub> | mV <sub>rms</sub> |       |        | 2.1   |          |
| Ratiometric error of sensitivity                                                                                            |             | V <sub>G-R</sub>  | %                 | − 1   |        | 1     |          |
| Ratiometric error of offset voltage                                                                                         |             | V <sub>of-R</sub> | %                 | − 1   |        | 1     |          |
| Response time 1 (at 90% of I <sub>f</sub> )                                                                                 |             | t <sub>r</sub>    | μs                |       | 1      |       | CL=100pF |
| Frequency bandwidth (− 3dB)                                                                                                 |             | BW                | kHz               |       | 400    |       | CL=100pF |

## FUNCTIONAL BLOCK DIAGRAM

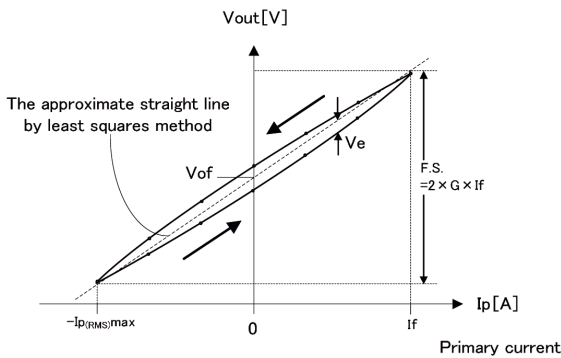


## CHARACTERISTIC CURVE (TYP) AND PRIMARY CURRENT DERATING CURVE



Conditions : Mounted on the test board complying with the EIA/JEDEC Standards (EIA/JESD51.)

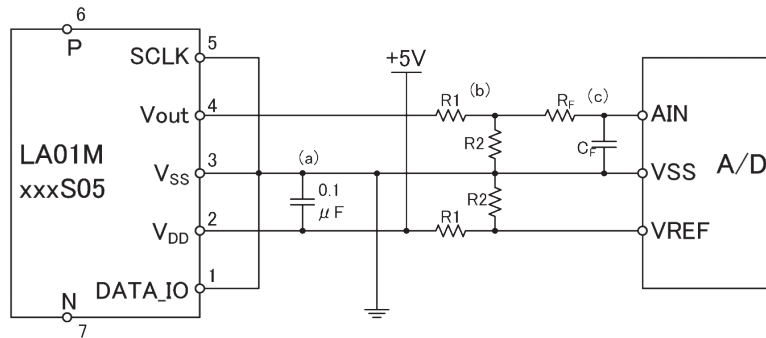
## CHARACTERISTICS DEFINITIONS



- Sensitivity  $G$  [mV/A], Offset voltage  $V_{of}$  [V]  
Sensitivity ( $G$ ) is defined as slope of the approximate straight line by least squares method, using the data of the output voltage ( $V_{out}$ ) when sweeping the measured current  $I_p$  at rated current range.  
Also Offset voltage ( $V_{of}$ ) is defined as the intercept of the approximate straight line.
- Output linearity  $\varepsilon_L$  [%]  
Output linearity ( $\varepsilon_L$ ) is defined as the ratio of maximum error voltage ( $V_e$ ) to the full scale (F.S.), where  $V_d$  is maximum difference between the Output voltage ( $V_{out}$ ) and the approximate straight line calculated in the sensitivity and offset voltage definition;  
$$\varepsilon_L = V_e / F.S. \times 100$$
- Ratiometric error of sensitivity  $V_{G-R}$  [%], ratiometric error of Offset voltage  $V_{of-R}$  [%]  
Output of LA01M Series is ratiometric.  
Sensitivity ( $G$ ) and Offset voltage ( $V_{of}$ ) are proportional to Supply voltage ( $V_{DD}$ ).
- Ratiometric error is defined as follows in the supply voltage range ( $4.5V < V_{DD1} < 5.5V$ );  
$$V_{G-R} = 100 \times [(G(V_{DD}=V_{DD1}) / G(V_{DD}=5V)) - (V_{DD1} / 5)] / (V_{DD1} / 5)$$
  
$$V_{of-R} = 100 \times [V_{of}(V_{DD}=V_{DD1}) - V_{of}(V_{DD}=5V) \times (V_{DD1} / 5)] / F.S.$$



## TYPICAL APPLICATION



- (a) Please be placed the bypass capacitor  $0.1 \mu F$  as close as possible to the VDD and VSS pins of LA01M Series.
- (b) LA01M Series have a ratiometric output. When received output by the A / D converter , it is possible to reduce the A / D conversion error due to supply voltage fluctuations by setting a common voltage level of the A / D converter and supply voltage. The resistive divider with R1 and R2 is required, if the reference voltage of the A / D converter is lower than + 5V.
- (c) If necessary, please insert a low-pass filter to Vout.

## TYPE DESIGNATION

**LA01 M \* \* \* S 05**  
 ① ② ③ ④ ⑤

- ① Model (4 figures)  
LA01 : Series
- ② Mounting configuration (1 figure)  
M : Surface mount type
- ③ Measurement current range (3 figures)  
Ex) 035 : 35A 100 : 100A
- ④ Control power supply type (1 figure)  
S : Single supply
- ⑤ Power supply voltage (2 digits)

## Magnetic Proportion System / Through Type

# L37S D15 SERIES



RoHS

### ABSOLUTE MAXIMUM RATINGS

| Parameters     | Symbol   | Unit | Value     | Comment |
|----------------|----------|------|-----------|---------|
| Supply voltage | $V_{CC}$ | V    | $\pm 18V$ |         |

### ISOLATION CHARACTERISTICS

| Parameters                        | Symbol   | Unit | Value                                        | Comment                                                                                                                            |
|-----------------------------------|----------|------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Insulation voltage                | Vd       | —    | AC3600V, for 1minute (Sensing current 0.5mA) | Primary $\leftrightarrow$ Secondary                                                                                                |
| Impulse withstand voltage         | Vw       | kV   | 6.6                                          | Primary $\leftrightarrow$ Secondary<br>Input waveform :<br>• Front time 1.2 $\mu$ s<br>• Time to half value 50 $\mu$ s<br>• single |
| Insulation resistance             | $R_{IS}$ | —    | $\geq 1000M \Omega$ (at DC500V)              | Primary $\leftrightarrow$ Secondary                                                                                                |
| Clearance distance                | dCi      | —    | 6.5mm (MIN)                                  | Primary $\leftrightarrow$ Secondary                                                                                                |
| Creepage distance                 | dCp      | —    | 6.5mm (MIN)                                  | Primary $\leftrightarrow$ Secondary                                                                                                |
| Case material                     | —        | —    | UL94 V-0                                     |                                                                                                                                    |
| Comparative tracking index; (CTI) | CTI      | V    | 200 ( group IIIa )                           |                                                                                                                                    |
| Application example               | —        | —    | 300V, CAT III, PD2                           | Reinforced isolation, non uniform field according to EN50178, IEC/EN 61010-1                                                       |
|                                   | —        | —    | 600V, CAT III, PD2                           | Basic isolation, non uniform field according to EN50178, IEC/EN 61010-1                                                            |

### ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameters                    | Symbol | Unit        | Value |     |      | Comment |
|-------------------------------|--------|-------------|-------|-----|------|---------|
|                               |        |             | MIN   | TYP | MAX  |         |
| Ambient operating temperature | $T_a$  | $^{\circ}C$ | - 40  |     | + 85 |         |
| Ambient storage temperature   | $T_s$  | $^{\circ}C$ | - 40  |     | + 85 |         |
| Mass                          | m      | g           |       | 62  |      |         |

## SPECIFICATIONS

Ta=+25°C, RL=10kΩ, V<sub>CC</sub>=±15V

| Parameters                 |              | Symbol            | Unit  | Value       |             |         | Comment                   |
|----------------------------|--------------|-------------------|-------|-------------|-------------|---------|---------------------------|
|                            |              |                   |       | MIN         | TYP         | MAX     |                           |
| Primary nominal current    | L37S050D15 * | If                | A     |             | Ifmax       |         |                           |
|                            | L37S100D15 * |                   |       |             | 100         |         |                           |
|                            | L37S200D15 * |                   |       |             | 200         |         |                           |
|                            | L37S300D15 * |                   |       |             | 300         |         |                           |
|                            | L37S400D15 * |                   |       |             | 400         |         |                           |
|                            | L37S500D15 * |                   |       |             | 500         |         |                           |
|                            | L37S600D15 * |                   |       |             | 600         |         |                           |
| Saturation current *1      | L37S050D15 * | Ifmax             | A     | 150         |             |         |                           |
|                            | L37S100D15 * |                   |       | 300         |             |         |                           |
|                            | L37S200D15 * |                   |       | 600         |             |         |                           |
|                            | L37S300D15 * |                   |       | 900         |             |         |                           |
|                            | L37S400D15 * |                   |       | 1000        |             |         |                           |
|                            | L37S500D15 * |                   |       | 1000        |             |         |                           |
|                            | L37S600D15 * |                   |       | 1000        |             |         |                           |
| Power supply voltage *2    |              | V <sub>CC</sub>   | V     | ± 12 (± 5%) | ± 15 (± 5%) |         |                           |
| Consumption current        |              | I <sub>CC</sub>   | mA    |             | 15          | 20      |                           |
| Rated output voltage       |              | V <sub>O</sub>    | V     | 3.960       | 4.000       | 4.040   | at If                     |
| Offset voltage             | L37S050D15 * | V <sub>OF</sub>   | V     | − 0.030     | 0.000       | + 0.030 | at If = 0A                |
|                            | L37S100D15 * |                   |       | − 0.020     | 0.000       | + 0.020 |                           |
|                            | L37S200D15 * |                   |       | − 0.020     | 0.000       | + 0.020 |                           |
|                            | L37S300D15 * |                   |       | − 0.020     | 0.000       | + 0.020 |                           |
|                            | L37S400D15 * |                   |       | − 0.020     | 0.000       | + 0.020 |                           |
|                            | L37S500D15 * |                   |       | − 0.020     | 0.000       | + 0.020 |                           |
|                            | L37S600D15 * |                   |       | − 0.020     | 0.000       | + 0.020 |                           |
| Hysteresis error           |              | V <sub>OH</sub>   | mV    |             |             | ± 20    | at 0A → If → 0A           |
| Thermal drift of gain      |              | TcV <sub>O</sub>  | %/°C  |             |             | ± 0.1   | Without TcV <sub>OF</sub> |
| Thermal drift of offset    | L37S050D15 * | TcV <sub>OF</sub> | mV/°C |             |             | ± 2     | at If = 0A                |
|                            | L37S100D15 * |                   |       |             |             | ± 1     |                           |
|                            | L37S200D15 * |                   |       |             |             | ± 1     |                           |
|                            | L37S300D15 * |                   |       |             |             | ± 1     |                           |
|                            | L37S400D15 * |                   |       |             |             | ± 1     |                           |
|                            | L37S500D15 * |                   |       |             |             | ± 1     |                           |
|                            | L37S600D15 * |                   |       |             |             | ± 1     |                           |
| Output linearity (0A ~ If) |              | ε <sub>L</sub>    | %     | − 1         |             | + 1     |                           |
| Response time (@90% of If) |              | tr                | μs    |             |             | 3       | di/dt=100A/μs             |

\* 1 If the product of 300A or less operate at V<sub>CC</sub> = ± 12V power supplies, measuring range reduced to 2.5 x If.

\* 2 The power on rise time should be less than 45ms at time from 0 to + 11V.

Current sensor may not operate normally because EEPROM in sensor does not work normally.

\* 3 Offset voltage value is after removal of core hysteresis.

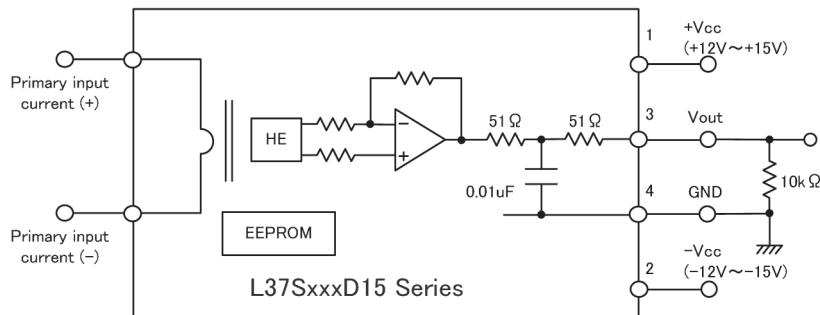


## STANDARDS

EN50178 , IEC/EN 61010-1 , IEC/EN 62109-1 , UL508 (file No. E243511)

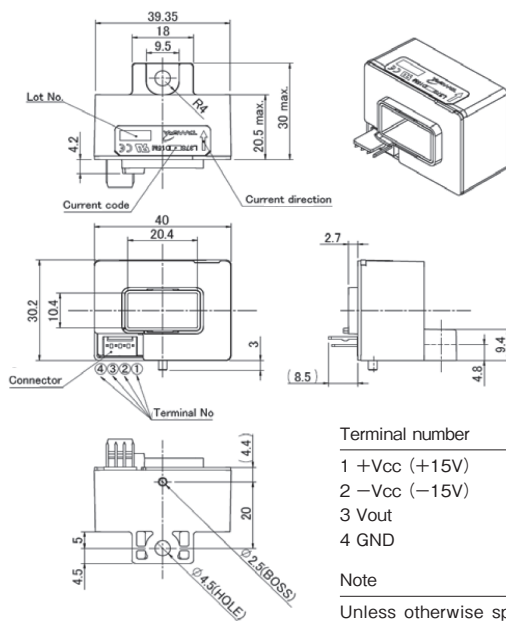
※ Please refer to the another sheet about conditions of UL Recognition.

## CONNECTION



## DIMENSIONS (mm)

L37SxxxD15M



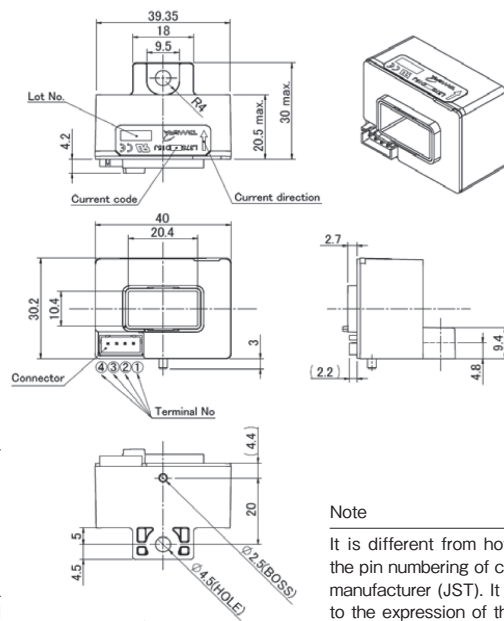
Terminal number

- 1 +Vcc (+15V)
- 2 -Vcc (-15V)
- 3 Vout
- 4 GND

Note

Unless otherwise specified tolerances shall be  $\pm 0.5\text{mm}$ .

L37SxxxD15J



Note

It is different from how to put the pin numbering of connector manufacturer (JST). It changes to the expression of the Molex product.

## Order number and Connector number (terminal plating)

| Types         |                | Connector    |             |                 |                     |
|---------------|----------------|--------------|-------------|-----------------|---------------------|
|               |                | Manufacturer | Part Number | Old Part Number | Plating of terminal |
| L37SxxxD15J   | Standard       | JST          | B4B-XH-A-G  | —               | Gold                |
| L37SxxxD15M   | Standard       | Molex        | 22-04-1041  | 5045-04A        | Sn                  |
| L37SxxxD15M-A | Build to Order |              | 22-11-1041  | 5045-04AG       | Gold                |

As for the L37SxxxD15M series of a gold-plated connector, '-A' attaches to the end of the product name.

## Magnetic Proportion System

# L34S D15 SERIES



RoHS

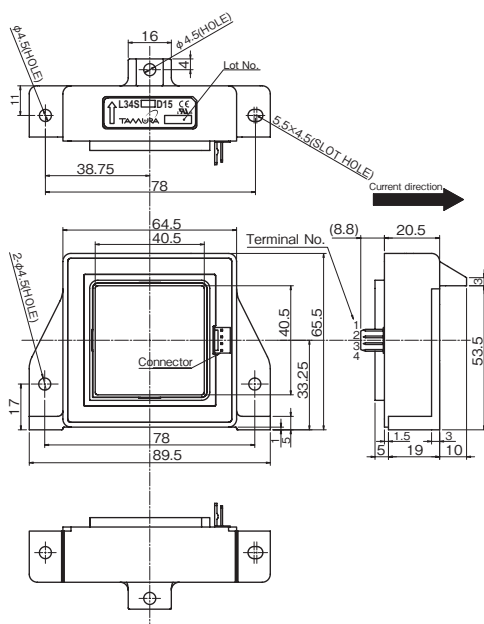
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5.0V

| Spec                              | Types | Symbol | L34S200D15                                                                      | L34S300D15 | L34S400D15 | L34S500D15 | L34S600D15 | L34S800D15 | L34S1T0D15 | L34S1T2D15 | L34S1T5D15 |
|-----------------------------------|-------|--------|---------------------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Primary nominal current           |       | If     | 200A                                                                            | 300A       | 400A       | 500A       | 600A       | 800A       | 1000A      | 1200A      | 1500A      |
| Saturation current *1             |       | If max | ± 600A                                                                          | ± 900A     | ± 1200A    | ± 1500A    | ± 1800A    | ± 2400A    | ± 2500A    | ± 2500A    | ± 2500A    |
| Rated Output Voltage              |       | Vo     | 4V ± 0.040V (at If)                                                             |            |            |            |            |            |            |            |            |
| Offset voltage                    |       | Vof    | ≤ ± 0.020V (at If = 0A) *2                                                      |            |            |            |            |            |            |            |            |
| Output linearity (without offset) |       | εL     | ≤ ± 0.5% (at 0A, 1/2If, If)                                                     |            |            |            |            |            |            |            |            |
| Power supply voltage              |       | Vcc    | ± 12V (± 5%) ~ ± 15V (± 5%)                                                     |            |            |            |            |            |            |            |            |
| Consumption current               |       | Icc    | 16mA (TYP) ≤ 25mA                                                               |            |            |            |            |            |            |            |            |
| di/dt (@90% of If) Response time  |       | tr     | ≤ 5μs (di/dt = 100A / μs) *3                                                    |            |            |            |            |            |            |            |            |
| Thermal drift of gain             |       | TcVO   | ≤ ± 0.05%/°C (Without TcVof)                                                    |            |            |            |            |            |            |            |            |
| Thermal drift of offset           |       | TcVof  | ≤ ± 1.0mV/°C (at If=0A)                                                         |            |            |            |            |            |            |            |            |
| Hysteresis error                  |       | VOH    | ≤ ± 10mV (at 0A → If → 0A)                                                      |            |            |            |            |            |            |            |            |
| Insulation voltage                |       | Vd     | AC3000V, for 1minute (Sensing current 0.5mA), inside of through hole ⇔ terminal |            |            |            |            |            |            |            |            |
| Insulation resistance             |       | RIS    | ≥ 500MΩ (at DC500V) inside of through hole ⇔ terminal                           |            |            |            |            |            |            |            |            |
| Ambient Operating temperature     |       | TA     | - 30°C ~ + 80°C                                                                 |            |            |            |            |            |            |            |            |
| Ambient storage temperature       |       | TS     | - 40°C ~ + 85°C                                                                 |            |            |            |            |            |            |            |            |

\* 1 If the product of 800A or less operate at Vcc = ± 12V power supplies, measuring range reduced to 2.5 x If. \* 2 Offset voltage value is after removal of core hysteresis. \* 3 Measurement condition : Primary conductor cross sectional area is as same as through hole, and penetration with 1 turn in through hole. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



| Types        |                | Connector    |             |                 |                     |
|--------------|----------------|--------------|-------------|-----------------|---------------------|
|              |                | Manufacturer | Part Number | Old Part Number | Plating of terminal |
| L34SxxxD15   | Standard       | Molex        | 22-04-1041  | 5045-04A        | Sn                  |
| L34SxxxD15-A | Build to Order |              | 22-11-1041  | 5045-04AG       | Gold                |

As for the product of a gold-plated connector, '-A' attaches to the end of the product name.

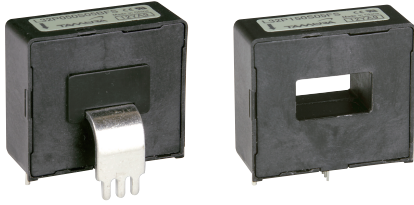
Terminal number  
 1 +Vcc (+15V)  
 2 -Vcc (-15V)  
 3 Vout  
 4 GND

Weight  
 165g

Note  
 1. Unless otherwise specified, tolerances shall be ±0.5mm

## Magnetic Proportion System / Through Type and Busbar Type

# L32P S05(B)FS SERIES



RoHS

Anti-Sulfurated

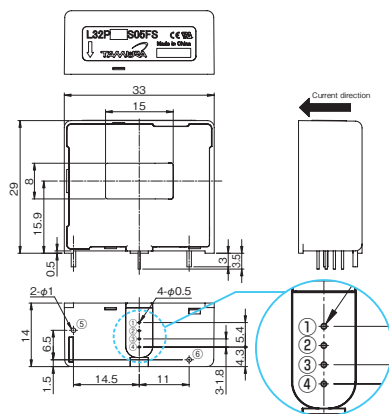
### SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5.0V

| Spec                                 | Types             | Symbol | L32P050S05(B)FS                                                     | L32P100S05(B)FS | L32P150S05FS      | L32P200S05FS | L32P300S05FS | L32P400S05FS |
|--------------------------------------|-------------------|--------|---------------------------------------------------------------------|-----------------|-------------------|--------------|--------------|--------------|
| Primary nominal current              | If                |        | 50A                                                                 | 100A            | 150A              | 200A         | 300A         | 400A         |
| Saturation current                   | If max            |        | ≥ ± 150A                                                            | ≥ ± 300A        | ≥ ± 450A          | ≥ ± 600A     | ≥ ± 600A     | ≥ ± 600A     |
| Type                                 | —                 |        | Through hole type : L32PxxxS05FS<br>Bus bar type : L32PxxxS05BFS    |                 | Through hole type |              |              |              |
| Reference Voltage                    | V ref             |        | + 2.495V ± 0.020V *1 (at Rref ≥ 1M Ω . Ouput impedance : typ 200 Ω) |                 |                   |              |              |              |
| Rated output voltage                 | Vo                |        | Vof + 0.625V ± 0.015 (at If)                                        |                 |                   |              |              |              |
| Offset voltage                       | Vof               |        | Vref ± 0.025V (at If=0A) *2                                         |                 |                   |              |              |              |
| Output linearity (0A ~ If)           | ε <sub>L</sub>    |        | ± 0.5% (at 0A, 1/2If, If)                                           |                 |                   |              |              |              |
| Power supply voltage                 | Vcc               |        | + 5V ± 5%                                                           |                 |                   |              |              |              |
| Consumption current                  | Icc               |        | ≤ 20mA                                                              |                 |                   |              |              |              |
| di/dt Response time                  | tr                |        | ≤ 5μs (at di/dt=100A/μs)                                            |                 |                   |              |              |              |
| Reference Temperature Characteristic | TcVref            |        | ≤ ± 0.012%/°C                                                       |                 |                   |              |              |              |
| Thermal drift of gain                | T <sub>C</sub> VO |        | ≤ ± 1.5mV/°C (Without TcVof)                                        |                 |                   |              |              |              |
| Thermal drift of offset (at If=0A)   | TcVof             |        | ≤± 1.0mV/°C                                                         |                 | ≤± 0.6mV/°C       |              | ≤± 0.3mV/°C  |              |
| Hysteresis error (at 0A → If → 0A)   | V <sub>OH</sub>   |        | ≤± 10mV                                                             |                 | ≤± 5.0mV          |              | ≤± 2.5mV     |              |
| Insulation voltage                   | Vd                |        | AC2500V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary    |                 |                   |              |              |              |
| Insulation resistance                | R <sub>IS</sub>   |        | ≥ 500M Ω (at DC500V) Primary ⇔ Secondary                            |                 |                   |              |              |              |
| Ambient Operating temperature        | T <sub>A</sub>    |        | − 40 ~+ 85°C                                                        |                 |                   |              |              |              |
| Ambient storage temperature          | Ts                |        | − 40 ~+ 85°C                                                        |                 |                   |              |              |              |

\* 1 It is possible to change Vof with an external reference voltage (between 1.5V - 2.8V providing its ability to sink or source approximately 5 mA.) . If the external reference voltage is not used, the Vref pin should be left unconnected. \* 2 Offset voltage value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition. \* Anti-Sulfurated (Used resistors : Gold internal Electrodes) \* Ferrite core is used.

### DIMENSIONS (mm)



Terminal number

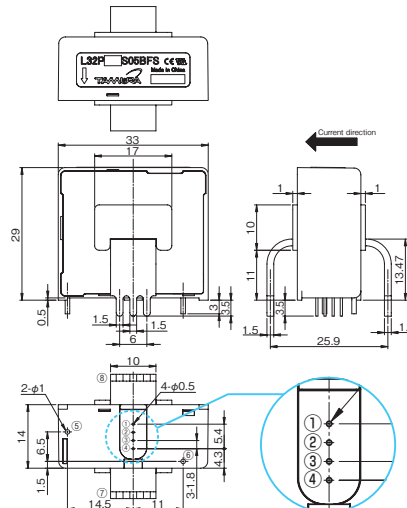
- ① Vcc (+5V)
- ② GND
- ③ Vout
- ④ Vref (IN/OUT)
- ⑤⑥ NC

Weight

22g

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]



Terminal number

- ① Vcc (+5V)
- ② GND
- ③ Vout
- ④ Vref (IN/OUT)
- ⑤⑥ NC
- ⑦ Primary input current (+)
- ⑧ Primary input current (-)

Weight

30g

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm
2. Unit is [mm]

## Magnetic Proportion System / Through Type

# L31S S05FS SERIES



## RoHS

## Anti-Sulfurad

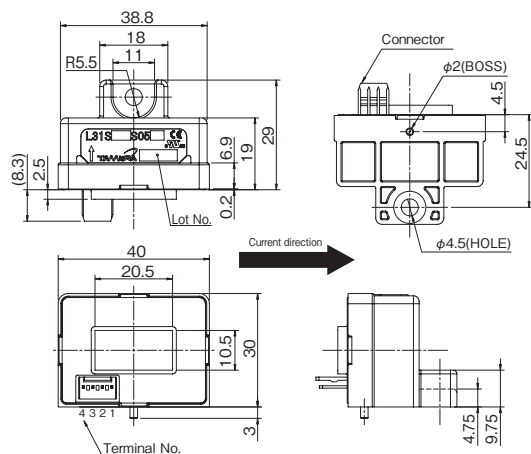
## SPECIFICATIONS

$T_a=25^{\circ}\text{C}$ ,  $R_L=10\text{k}\Omega$ ,  $V_{CC}=+5.0\text{V}$

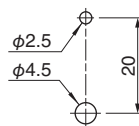
[illegible]

\* 1 It is possible to change Vof with an external reference voltage (between 1.5V - 2.8V providing its ability to sink or source approximately 5 mA.) . If the external reference voltage is not used, the Vref pin should be left unconnected. \* 2 Offset voltage value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition. \* Anti-Sulfurated (Used resistors : Gold internal Electrodes) \* Ferrite core is used.

### DIMENSIONS (mm)



### Recommended PCB holes



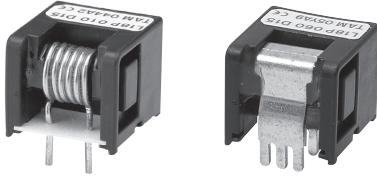
| Types          |                | Connector    |             |                 |                     |
|----------------|----------------|--------------|-------------|-----------------|---------------------|
|                |                | Manufacturer | Part Number | Old Part Number | Plating of terminal |
| L31SxxxS05FS   | Standard       | Molex        | 22-04-1041  | 5045-04A        | Sn                  |
| L31SxxxS05FS-A | Build to Order |              | 22-11-1041  | 5045-04AG       | Gold                |

As for the product of a gold-plated connector, 'A' attaches to the end of the product name.

| Terminal number | Note                                   |
|-----------------|----------------------------------------|
| 1 Vref (IN/OUT) | 1. Unless otherwise specified,         |
| 2 Vout          | tolerances shall be $\pm 0.5\text{mm}$ |
| 3 GND           | 2. Unit is [mm]                        |
| 4 +Vcc (+5V)    |                                        |
| Weight          |                                        |
| 38g             |                                        |

## Magnetic Proportion System

# L18P D15-OP SERIES



RoHS

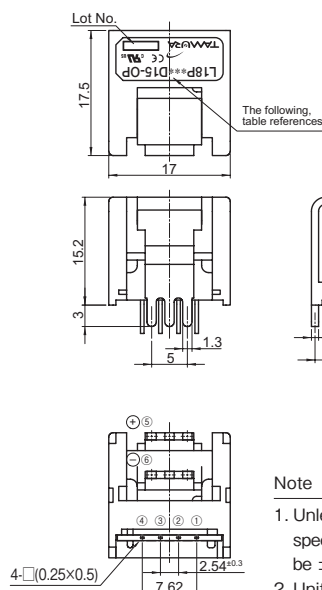
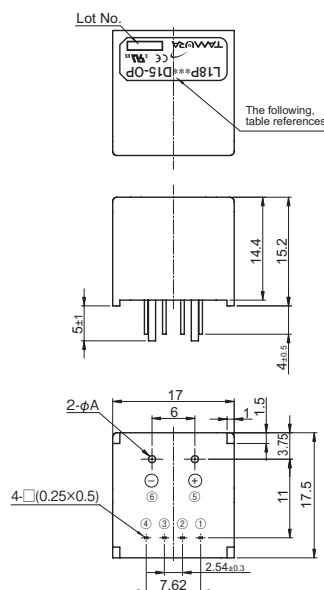
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc= ±15V

| Spec                              | Types              | L18P***D15-OP ***: Primary current code                          |       |       |       |       |     |     |                               |     |     |
|-----------------------------------|--------------------|------------------------------------------------------------------|-------|-------|-------|-------|-----|-----|-------------------------------|-----|-----|
|                                   | *** :              | 003                                                              | 005   | 010   | 015   | 020   | 025 | 030 | 040                           | 050 | 060 |
| Primary nominal current           | If                 | 3A                                                               | 5A    | 10A   | 15A   | 20A   | 25A | 30A | 40A                           | 50A | 60A |
| Primary wire                      | φ                  | 0.6mm                                                            | 0.8mm | 1.1mm | 1.4mm | 1.6mm |     |     | bus-bar<br>1.0 × 6.3          |     |     |
| Saturation current                | If max             | If × 3 *1                                                        |       |       |       |       |     |     |                               |     |     |
| Rated output voltage              | Vo                 | 4V ± 0.040V (at If)                                              |       |       |       |       |     |     | 4V ± 0.050V (at If)           |     |     |
| Offset voltage *2                 | Vof                | ≤± 0.040V (at If = 0A)                                           |       |       |       |       |     |     | ≤± 0.050V (at If = 0A)        |     |     |
| Output linearity (without offset) | ε <sub>L</sub>     | ≤± 1% (at If)                                                    |       |       |       |       |     |     |                               |     |     |
| Power supply voltage              | Vcc                | ± 12V (± 5%) ~ ± 15V (± 5%)                                      |       |       |       |       |     |     |                               |     |     |
| Consumption current               | Icc                | ± 14mA (typ) , ≤± 18mA                                           |       |       |       |       |     |     |                               |     |     |
| di/dt Response time               | tr                 | ≤ 5μs (di/dt = If / μs)                                          |       |       |       |       |     |     |                               |     |     |
| Thermal drift of gain             | T <sub>c</sub> Vo  | ≤± 0.1% / °C (Without Tc Vof)                                    |       |       |       |       |     |     |                               |     |     |
| Thermal drift of offset           | T <sub>c</sub> Vof | ≤± 1.5mV / °C                                                    |       |       |       |       |     |     |                               |     |     |
| Hysteresis error                  | V <sub>OH</sub>    | ≤ 25mV (at If = 0A → If → 0A)                                    |       |       |       |       |     |     | ≤ 40mV (at If = 0A → If → 0A) |     |     |
| Insulation voltage                | Vd                 | AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |       |       |       |       |     |     |                               |     |     |
| Insulation resistance             | R <sub>is</sub>    | ≥ 500M Ω (at DC500V) Primary ⇔ Secondary                         |       |       |       |       |     |     |                               |     |     |
| Ambient Operating temperature     | T <sub>A</sub>     | - 30°C~-+ 80°C                                                   |       |       |       |       |     |     |                               |     |     |
| Ambient storage temperature       | T <sub>S</sub>     | - 40°C~-+ 85°C                                                   |       |       |       |       |     |     |                               |     |     |

\* 1 Also operate at Vcc = ± 12V power supplies, measuring range reduced to 2.5 x If. \* 2 Offset voltage value is after removal of core hysteresis.  
\* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



### Terminal number

- ① - Vcc ( - 15V)
- ② GND
- ③ + Vcc ( + 15V)
- ④ Vout
- ⑤ Primary input current ( + )
- ⑥ Primary input current ( - )

| Current | *** | φA     |
|---------|-----|--------|
| 3A      | 003 | φ0.6   |
| 5A      | 005 | φ0.8   |
| 10A     | 010 | φ1.1   |
| 15A     | 015 | φ1.4   |
| 20A     | 020 | φ1.6   |
| 25A     | 025 | φ1.6   |
| 30A     | 030 | φ1.6   |
| 40A     | 040 | Busbar |
| 50A     | 050 | Busbar |
| 60A     | 060 | Busbar |

Weight:

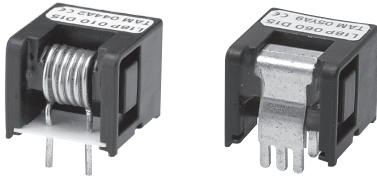
8g

### Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm
- 2. Unit is [mm]

## Magnetic Proportion System

# L18P D15 SERIES



RoHS

TAMURA recommends L18P D15-OP series as a succession model.

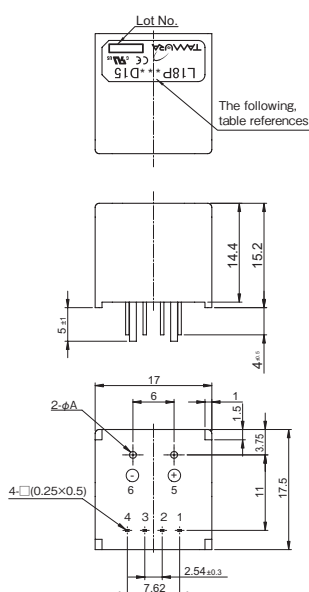
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Spec                              |                    | Types                                                            |       | L18P003D15 | L18P005D15 | L18P010D15 | L18P015D15 | L18P020D15 | L18P025D15           | L18P030D15 | L18P040D15                    | L18P050D15 | L18P060D15 |
|-----------------------------------|--------------------|------------------------------------------------------------------|-------|------------|------------|------------|------------|------------|----------------------|------------|-------------------------------|------------|------------|
| Primary nominal current           | If                 | 3A                                                               | 5A    | 10A        | 15A        | 20A        | 25A        | 30A        | 40A                  | 50A        | 60A                           |            |            |
| Primary wire                      | φ                  | 0.6mm                                                            | 0.8mm | 1.1mm      | 1.4mm      | 1.6mm      |            |            | bus-bar<br>1.0 × 6.3 |            |                               |            |            |
| Saturation current                | If max             | If × 3                                                           |       |            |            |            |            |            |                      |            |                               |            |            |
| Rated output voltage              | Vo                 | 4V ± 0.040V (at If)                                              |       |            |            |            |            |            |                      |            | 4V ± 0.050V (at If)           |            |            |
| Offset voltage                    | Vof                | ≒± 0.040V (at If = 0A) * 1                                       |       |            |            |            |            |            |                      |            | ≒± 0.050V (at If = 0A) * 1    |            |            |
| Output linearity (without offset) | ε <sub>L</sub>     | ≒± 1% (at If)                                                    |       |            |            |            |            |            |                      |            |                               |            |            |
| Power supply voltage              | Vcc                | ± 15V ± 5%                                                       |       |            |            |            |            |            |                      |            |                               |            |            |
| Consumption current               | Icc                | ± 12mA (typ) , ≒± 15mA                                           |       |            |            |            |            |            |                      |            |                               |            |            |
| di/dt Response time               | tr                 | ≒ 5μs (di/dt = If / μs)                                          |       |            |            |            |            |            |                      |            |                               |            |            |
| Thermal drift of gain             | T <sub>C</sub> Vo  | ≒± 0.1% / °C (Without Tc Vof)                                    |       |            |            |            |            |            |                      |            |                               |            |            |
| Thermal drift of offset           | T <sub>C</sub> Vof | ≒± 1.5mV / °C                                                    |       |            |            |            |            |            |                      |            |                               |            |            |
| Hysteresis error                  | V <sub>OH</sub>    | ≒ 25mV (at If = 0A → If → 0A)                                    |       |            |            |            |            |            |                      |            | ≒ 40mV (at If = 0A → If → 0A) |            |            |
| Insulation voltage                | Vd                 | AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |       |            |            |            |            |            |                      |            |                               |            |            |
| Insulation resistance             | R <sub>IS</sub>    | ≧ 500MΩ (at DC500V) Primary ⇔ Secondary                          |       |            |            |            |            |            |                      |            |                               |            |            |
| Ambient Operating temperature     | T <sub>A</sub>     | - 30°C ~ + 80°C                                                  |       |            |            |            |            |            |                      |            |                               |            |            |
| Ambient storage temperature       | T <sub>S</sub>     | - 40°C ~ + 85°C                                                  |       |            |            |            |            |            |                      |            |                               |            |            |

\* 1 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



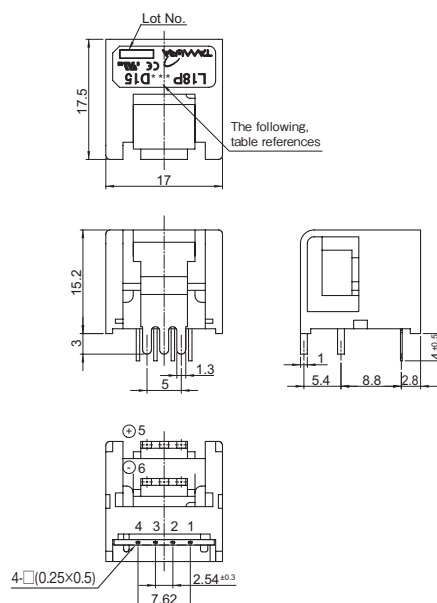
### Terminal number

- 1 - Vcc
- 2 GND
- 3 + Vcc
- 4 OUT
- 5 + IN
- 6 - IN

| Current | *** | φA   |
|---------|-----|------|
| 3A      | 003 | φ0.6 |
| 5A      | 005 | φ0.8 |
| 10A     | 010 | φ1.1 |
| 15A     | 015 | φ1.4 |
| 20A     | 020 | φ1.6 |
| 25A     | 025 | φ1.6 |
| 30A     | 030 | φ1.6 |

### Note

- Unless otherwise specified, tolerances shall be ±0.5mm
- Unit is [mm]



### Terminal number

- 1 - Vcc
- 2 GND
- 3 + Vcc
- 4 OUT
- 5 + IN
- 6 - IN

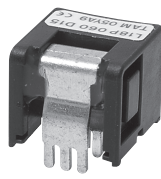
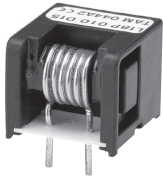
| Current | *** |
|---------|-----|
| 40A     | 040 |
| 50A     | 050 |
| 60A     | 060 |

### Note

- Unless otherwise specified, tolerances shall be ±0.5mm
- Unit is [mm]

## Magnetic Proportion System

# SL18P D15 SERIES



RoHS

Anti-Sulfurated

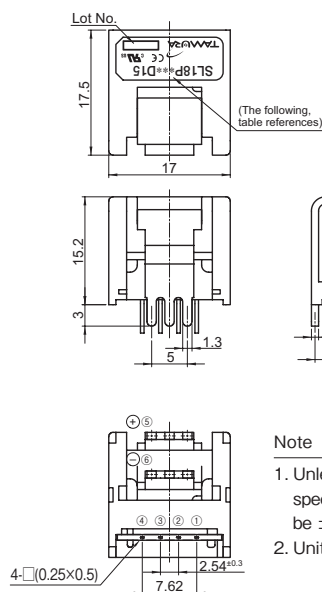
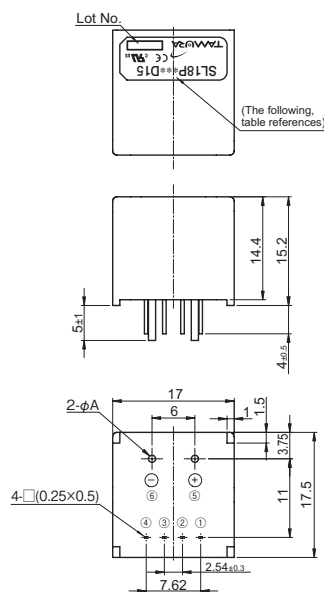
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Types                             |                    | SL18P *** D15***: Primary current code                           |       |       |       |       |     |     |                               |     |     |
|-----------------------------------|--------------------|------------------------------------------------------------------|-------|-------|-------|-------|-----|-----|-------------------------------|-----|-----|
| Spec                              | *** :              | 003                                                              | 005   | 010   | 015   | 020   | 025 | 030 | 040                           | 050 | 060 |
| Primary nominal current           | If                 | 3A                                                               | 5A    | 10A   | 15A   | 20A   | 25A | 30A | 40A                           | 50A | 60A |
| Primary wire                      | φ                  | 0.6mm                                                            | 0.8mm | 1.1mm | 1.4mm | 1.6mm |     |     | bus-bar<br>1.0 × 6.3          |     |     |
| Saturation current                | If max             | If × 3 *1                                                        |       |       |       |       |     |     |                               |     |     |
| Rated output voltage              | Vo                 | 4V ± 0.040V (at If)                                              |       |       |       |       |     |     | 4V ± 0.050V (at If)           |     |     |
| Offset voltage *2                 | Vof                | ≒± 0.040V (at If = 0A)                                           |       |       |       |       |     |     | ≒± 0.050V (at If = 0A)        |     |     |
| Output linearity (without offset) | ε <sub>L</sub>     | ≒± 1% (at If)                                                    |       |       |       |       |     |     |                               |     |     |
| Power supply voltage              | Vcc                | ± 12V (± 5%) ~ ± 15V (± 5%)                                      |       |       |       |       |     |     |                               |     |     |
| Consumption current               | Icc                | ± 12mA (typ) , ≒ 15mA                                            |       |       |       |       |     |     |                               |     |     |
| di/dt Response time               | tr                 | ≒ 5μs (di/dt = If /μs)                                           |       |       |       |       |     |     |                               |     |     |
| Thermal drift of gain             | T <sub>C</sub> Vo  | ≒± 0.1% / °C (Without Tc Vof)                                    |       |       |       |       |     |     |                               |     |     |
| Thermal drift of offset           | T <sub>C</sub> Vof | ≒± 1.5mV / °C                                                    |       |       |       |       |     |     |                               |     |     |
| Hysteresis error                  | V <sub>OH</sub>    | ≒ 25mV (at If = 0A → If → 0A)                                    |       |       |       |       |     |     | ≒ 40mV (at If = 0A → If → 0A) |     |     |
| Insulation voltage                | Vd                 | AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |       |       |       |       |     |     |                               |     |     |
| Insulation resistance             | R <sub>IS</sub>    | ≧ 500MΩ (at DC500V) Primary ⇔ Secondary                          |       |       |       |       |     |     |                               |     |     |
| Ambient Operating temperature     | T <sub>A</sub>     | - 30°C~+ 80°C                                                    |       |       |       |       |     |     |                               |     |     |
| Ambient storage temperature       | T <sub>S</sub>     | - 40°C~+ 85°C                                                    |       |       |       |       |     |     |                               |     |     |

\* 1 Also operate at Vcc = ± 12V power supplies, measuring range reduced to 2.5 x If. \* 2 Offset voltage value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition. \* Anti-Sulfurated (Used resistors : Gold internal Electrodes, PCB coating : HumiSeal®) \* Reliability test High Temperature and High Humidity Operation Test (85°C, 85%RH, 1000h, N=11, Pass)

## DIMENSIONS



### Terminal number

- ① - Vcc ( - 15V)
- ② GND
- ③ + Vcc ( + 15V)
- ④ Vout
- ⑤ Primary input current ( + )
- ⑥ Primary input current ( - )

| Current | *** | φA     |
|---------|-----|--------|
| 3A      | 003 | φ0.6   |
| 5A      | 005 | φ0.8   |
| 10A     | 010 | φ1.1   |
| 15A     | 015 | φ1.4   |
| 20A     | 020 | φ1.6   |
| 25A     | 025 | φ1.6   |
| 30A     | 030 | φ1.6   |
| 40A     | 040 | Busbar |
| 50A     | 050 | Busbar |
| 60A     | 060 | Busbar |

Weight:

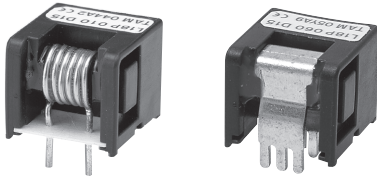
8g

### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

# Magnetic Proportion System

## L18P S05 SERIES



RoHS

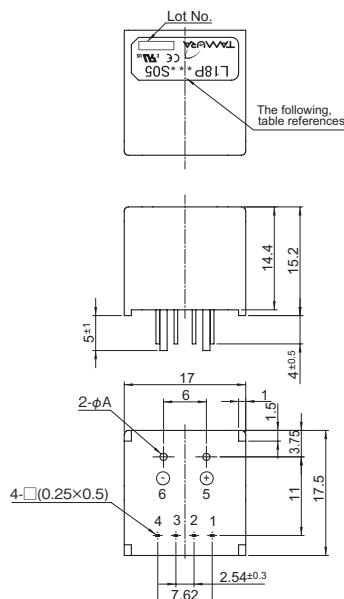
### SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc= +5V

| Spec                              |                    | Types                                                            |       | L18P003S05 | L18P005S05 | L18P010S05 | L18P015S05 | L18P020S05 | L18P025S05 | L18P030S05           | L18P040S05 | L18P050S05 | L18P060S05 |
|-----------------------------------|--------------------|------------------------------------------------------------------|-------|------------|------------|------------|------------|------------|------------|----------------------|------------|------------|------------|
| Primary nominal current           | If                 | 3A                                                               | 5A    | 10A        | 15A        | 20A        | 25A        | 30A        | 40A        | 50A                  | 60A        |            |            |
| Primary wire                      | φ                  | 0.6mm                                                            | 0.8mm | 1.1mm      | 1.4mm      | 1.6mm      |            |            |            | bus-bar<br>1.0 × 6.3 |            |            |            |
| Saturation current                | If max             | If × 1.5 *1                                                      |       |            |            |            |            |            |            |                      |            |            |            |
| Rated output voltage              | Vo                 | Vof + 1.5V ± 0.045V (at If)                                      |       |            |            |            |            |            |            |                      |            |            |            |
| Offset voltage                    | Vof                | Vcc/2 ± 0.035V (at If = 0A) *2                                   |       |            |            |            |            |            |            |                      |            |            |            |
| Output linearity (without offset) | ε <sub>L</sub>     | ≤± 1% (at If)                                                    |       |            |            |            |            |            |            |                      |            |            |            |
| Power supply voltage              | Vcc                | + 5V ± 5%                                                        |       |            |            |            |            |            |            |                      |            |            |            |
| Consumption current               | Icc                | ≤ 15mA                                                           |       |            |            |            |            |            |            |                      |            |            |            |
| di/dt Response time               | tr                 | ≤ 5μs (di/dt = If /μs)                                           |       |            |            |            |            |            |            |                      |            |            |            |
| Thermal drift of gain             | T <sub>c</sub> Vo  | ≤± 2.0mV / °C (Without T <sub>c</sub> Vof)                       |       |            |            |            |            |            |            |                      |            |            |            |
| Thermal drift of offset           | T <sub>c</sub> Vof | ≤± 2.0mV / °C                                                    |       |            |            |            |            |            |            |                      |            |            |            |
| Hysteresis error                  | V <sub>oh</sub>    | ≤ 25mV (at If = 0A → If → 0A)                                    |       |            |            |            |            |            |            |                      |            |            |            |
| Insulation voltage                | Vd                 | AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary |       |            |            |            |            |            |            |                      |            |            |            |
| Insulation resistance             | R <sub>is</sub>    | ≥ 500M Ω (at DC500V) Primary ⇔ Sacondary                         |       |            |            |            |            |            |            |                      |            |            |            |
| Ambient Operating temperature     | T <sub>A</sub>     | − 30℃~+ 80℃                                                      |       |            |            |            |            |            |            |                      |            |            |            |
| Ambient storage temperature       | T <sub>S</sub>     | − 40℃~+ 85℃                                                      |       |            |            |            |            |            |            |                      |            |            |            |

\* 1 Vcc= + 5.0V (depending on Vcc) \* 2 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

### DIMENSIONS (mm)



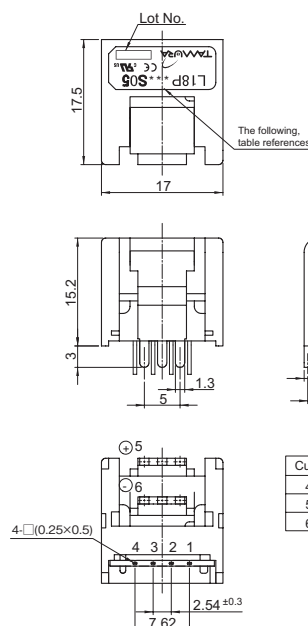
#### Terminal number

1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. - IN

| Current | *** | φA   |
|---------|-----|------|
| 3A      | 003 | φ0.6 |
| 5A      | 005 | φ0.8 |
| 10A     | 010 | φ1.1 |
| 15A     | 015 | φ1.4 |
| 20A     | 020 | φ1.6 |
| 25A     | 025 | φ1.6 |
| 30A     | 030 | φ1.6 |

#### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



#### Terminal number

1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. - IN

| Current | *** |
|---------|-----|
| 40A     | 040 |
| 50A     | 050 |
| 60A     | 060 |

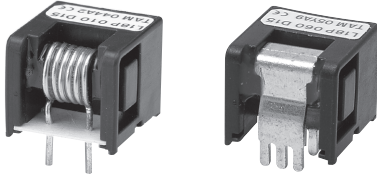
#### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



## Magnetic Proportion System

# L18P S05R SERIES



RoHS

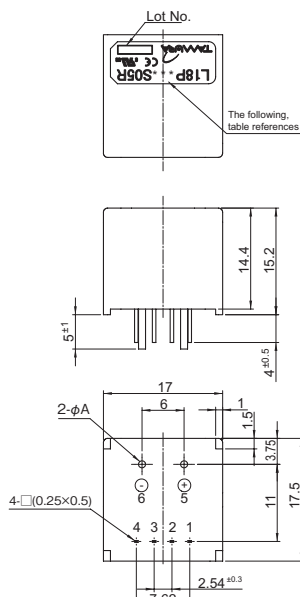
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc= +5V

| Spec                              |                    | Types                                                            | L18P003<br>S05R | L18P005<br>S05R | L18P010<br>S05R | L18P015<br>S05R | L18P020<br>S05R | L18P025<br>S05R | L18P030<br>S05R   | L18P040<br>S05R | L18P050<br>S05R | L18P060<br>S05R |
|-----------------------------------|--------------------|------------------------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------|-----------------|-----------------|-----------------|
| Primary nominal current           | If                 | 3A                                                               | 5A              | 10A             | 15A             | 20A             | 25A             | 30A             | 40A               | 50A             | 60A             |                 |
| Primary wire                      | φ                  | 0.6mm                                                            | 0.8mm           | 1.1mm           | 1.4mm           | 1.6mm           |                 |                 | bus-bar 1.0 × 6.3 |                 |                 |                 |
| Saturation current                | If max             | If × 3                                                           |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Rated output voltage              | Vo                 | Vof + 0.625V ± 0.045V (at If)                                    |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Offset voltage                    | Vof                | 2.5V ± 0.035V (at If = 0A) *1                                    |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Output linearity (without offset) | ε <sub>L</sub>     | ± 1% (at If)                                                     |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Power supply voltage              | Vcc                | + 5V ± 5%                                                        |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Consumption current               | Icc                | ≤ 15mA                                                           |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| di / dt Response time             | tr                 | ≤ 5 μs (di/dt = If / μs)                                         |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Thermal drift of gain             | T <sub>c</sub> Vo  | ± 0.1% / °C (Without Tc Vof)                                     |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Thermal drift of offset           | T <sub>c</sub> Vof | ± 1.0mV / °C                                                     |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Hysteresis error                  | V <sub>oh</sub>    | ≤ 25mV (at If = 0A → If → 0A)                                    |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Insulation voltage                | Vd                 | AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Insulation resistance             | R <sub>is</sub>    | ≥ 500M Ω (at DC500V) Primary ⇔ Secondary                         |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Ambient Operating temperature     | T <sub>A</sub>     | − 30°C~+ 80°C                                                    |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |
| Ambient storage temperature       | T <sub>S</sub>     | − 40°C~+ 85°C                                                    |                 |                 |                 |                 |                 |                 |                   |                 |                 |                 |

\* 1 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



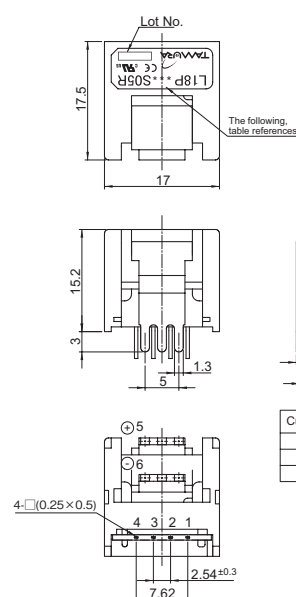
### Terminal number

1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. - IN

| Current | *** | φA   |
|---------|-----|------|
| 3A      | 003 | φ0.6 |
| 5A      | 005 | φ0.8 |
| 10A     | 010 | φ1.1 |
| 15A     | 015 | φ1.4 |
| 20A     | 020 | φ1.6 |
| 25A     | 025 | φ1.6 |
| 30A     | 030 | φ1.6 |

### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



### Terminal number

1. GND
2. GND
3. + Vcc
4. OUT
5. + IN
6. - IN

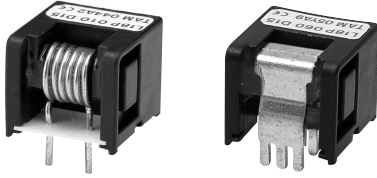
| Current | *** |
|---------|-----|
| 40A     | 040 |
| 50A     | 050 |
| 60A     | 060 |

### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

## Magnetic Proportion System

# L18P S12 SERIES



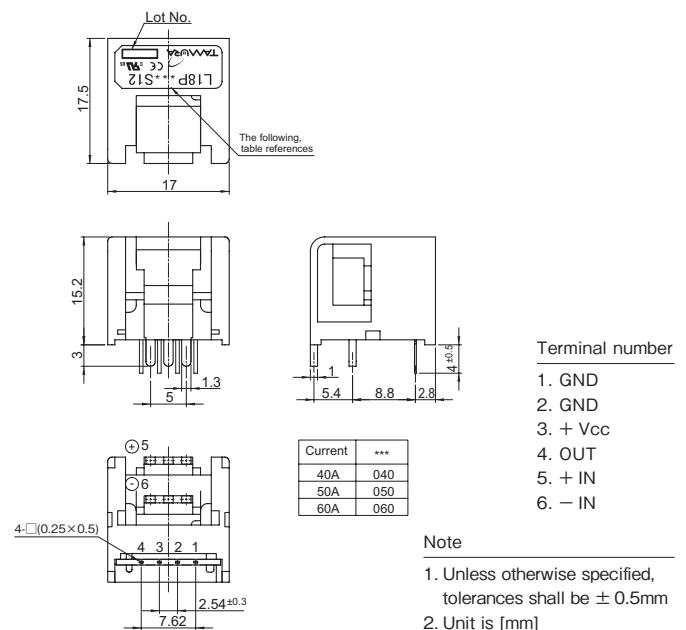
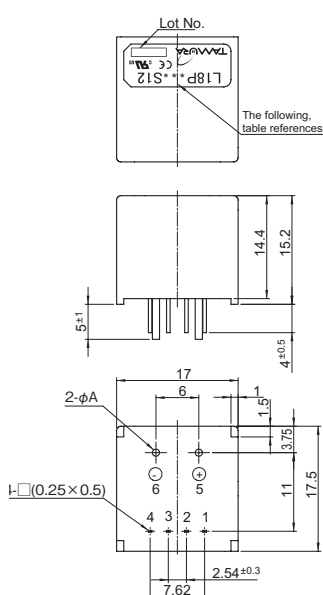
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+12V

| Spec                              |                    | Types                                                            |       | L18P003S12 | L18P005S12 | L18P010S12 | L18P015S12 | L18P020S12 | L18P025S12        | L18P030S12 | L18P040S12 | L18P050S12 | L18P060S12 |
|-----------------------------------|--------------------|------------------------------------------------------------------|-------|------------|------------|------------|------------|------------|-------------------|------------|------------|------------|------------|
| Primary nominal current           | If                 | 3A                                                               | 5A    | 10A        | 15A        | 20A        | 25A        | 30A        | 40A               | 50A        | 60A        |            |            |
| Primary wire                      | φ                  | 0.6mm                                                            | 0.8mm | 1.1mm      | 1.4mm      | 1.6mm      |            |            | bus-bar 1.0 × 6.3 |            |            |            |            |
| Saturation current                | If max             | If × 1.25                                                        |       |            |            |            |            |            |                   |            |            |            |            |
| Rated output voltage              | Vo                 | Vof + 1.5V ± 0.045V (at If)                                      |       |            |            |            |            |            |                   |            |            |            |            |
| Offset voltage                    | Vof                | 2.5V ± 0.035V (at If = 0A) * 1                                   |       |            |            |            |            |            |                   |            |            |            |            |
| Output linearity (without offset) | ε <sub>L</sub>     | ≤ ± 1% (at If)                                                   |       |            |            |            |            |            |                   |            |            |            |            |
| Power supply voltage              | Vcc                | + 12V ± 5%                                                       |       |            |            |            |            |            |                   |            |            |            |            |
| Consumption current               | Icc                | ≤ 15mA                                                           |       |            |            |            |            |            |                   |            |            |            |            |
| di/dt Response time               | tr                 | ≤ 5μs (di/dt = If / μs)                                          |       |            |            |            |            |            |                   |            |            |            |            |
| Thermal drift of gain             | T <sub>C</sub> Vo  | ≤ ± 2.0mV / °C (Without T <sub>C</sub> Vof)                      |       |            |            |            |            |            |                   |            |            |            |            |
| Thermal drift of offset           | T <sub>C</sub> Vof | ≤ ± 2.0mV / °C                                                   |       |            |            |            |            |            |                   |            |            |            |            |
| Hysteresis error                  | V <sub>OH</sub>    | ≤ 25mV (at If = 0A → If → 0A)                                    |       |            |            |            |            |            |                   |            |            |            |            |
| Insulation voltage                | Vd                 | AC3000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |       |            |            |            |            |            |                   |            |            |            |            |
| Insulation resistance             | R <sub>IS</sub>    | ≥ 500M Ω (at DC500V) Primary ⇔ Secondary                         |       |            |            |            |            |            |                   |            |            |            |            |
| Ambient Operating temperature     | T <sub>A</sub>     | − 30℃~+ 80℃                                                      |       |            |            |            |            |            |                   |            |            |            |            |
| Ambient storage temperature       | T <sub>S</sub>     | − 40℃~+ 85℃                                                      |       |            |            |            |            |            |                   |            |            |            |            |

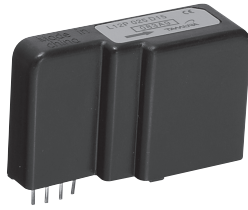
\*1 Offset voltage value is after removal of core hysteresis. Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



## Magnetic Proportion System

# L12P D15 SERIES



RoHS

## SPECIFICATIONS

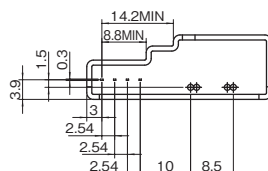
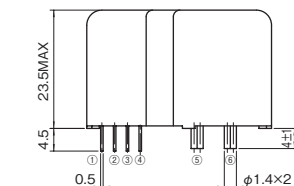
Ta=25°C, RL=10kΩ, Vcc=±15V

| Spec                            | Types | Symbol                         | L12P025D15                                                       |
|---------------------------------|-------|--------------------------------|------------------------------------------------------------------|
| Primary nominal current         |       | If                             | 25A                                                              |
| Primary conductor specification |       | —                              | Φ 1.4 × 2 *1                                                     |
| Continuous DC current           |       | I <sub>con</sub>               | 25A                                                              |
| Saturation current              |       | If max                         | If × 3 *2                                                        |
| Rated output voltage            |       | ε <sub>L</sub>                 | 4V ± 0.040V (at If)                                              |
| Offset voltage                  |       | V <sub>of</sub>                | ≤ ± 0.040V (at If = 0A) *3                                       |
| Output linearity (0A ~ If)      |       | V <sub>cc</sub>                | ≤ ± 1% (at If)                                                   |
| Power supply voltage            |       | V <sub>cc</sub>                | ± 12V (± 5%) ~ ± 15V (± 5%)                                      |
| Consumption current             |       | I <sub>cc</sub>                | ≤ 15mA                                                           |
| di/dt Response time             |       | t <sub>r</sub>                 | ≤ 3μs (di/dt = If / μs)                                          |
| Thermal drift of gain           |       | T <sub>c</sub> V <sub>o</sub>  | ≤ ± 0.1% / °C (Without T <sub>c</sub> V <sub>of</sub> )          |
| Thermal drift of offset         |       | T <sub>c</sub> V <sub>of</sub> | ≤ ± 3.0mV / °C                                                   |
| Hysteresis error                |       | V <sub>OH</sub>                | ≤ 25mV (at If = 0A → If → 0A)                                    |
| Insulation voltage              |       | V <sub>d</sub>                 | AC2500V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |
| Insulation resistance           |       | R <sub>is</sub>                | ≥ 500M Ω (at DC500V) Primary ⇔ Secondary                         |
| Ambient Operating temperature   |       | T <sub>A</sub>                 | − 30°C ~ + 80°C                                                  |
| Ambient storage temperature     |       | T <sub>S</sub>                 | − 40°C ~ + 85°C                                                  |

\* 1 Conductor terminals are soldered together. \* 2 Also operate at V<sub>cc</sub> = ± 12V power supplies, measuring range reduced to 2.5 x If.

\* 3 Offset voltage value is after removal of core hysteresis.

## DIMENSIONS (mm)



Terminal number

- ① + V<sub>cc</sub> (+ 15V)
- ② − V<sub>cc</sub> (− 15V)
- ③ V<sub>out</sub>
- ④ GND
- ⑤ Primary input current (+)
- ⑥ Primary input current (−)

Weight:

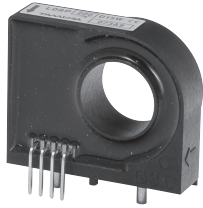
20g

Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm
- 2. Unit is [mm]

## Magnetic Proportion System / Through Type

# L08P W/IPV SERIES



RoHS

### SPECIFICATIONS

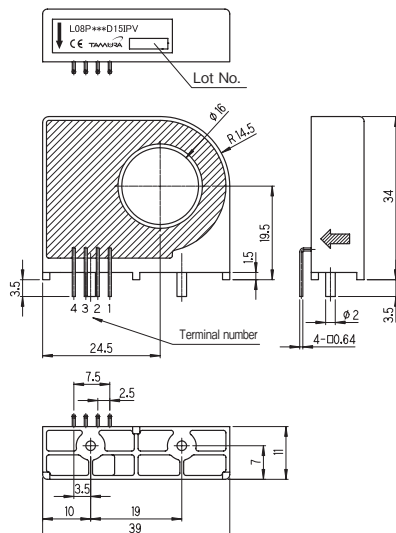
Ta=25°C, RL=10kΩ, Vcc=±15V

| Types                                   |                                | L08P100D15IPV                                                                                                                                    | L08P200D15W | L08P300D15IPVW |
|-----------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|
| Spec                                    |                                |                                                                                                                                                  |             |                |
| Primary nominal current                 | I <sub>f</sub>                 | 100AT                                                                                                                                            | 200AT       | 300AT          |
| Saturation current                      | I <sub>f</sub> max             | ≥ ± 300AT                                                                                                                                        | ≥ ± 600AT   | ≥ ± 600AT      |
| Rated output voltage                    | V <sub>o</sub>                 | 4V ± 0.040V (at I <sub>f</sub> )                                                                                                                 |             |                |
| Offset voltage                          | V <sub>of</sub>                | ≤± 0.030V (at I <sub>f</sub> = 0A) ※1                                                                                                            |             |                |
| Output linearity (0A ~ I <sub>f</sub> ) | ε <sub>L</sub>                 | ≤± 1% (at I <sub>f</sub> )                                                                                                                       |             |                |
| Power supply voltage                    | V <sub>cc</sub>                | ± 15V ± 5%                                                                                                                                       |             |                |
| Consumption current                     | I <sub>cc</sub>                | ≤± 20mA                                                                                                                                          |             |                |
| di/dt Response time                     | t <sub>r</sub>                 | ≤ 3μs at 70% of I <sub>f</sub> - 70% of V <sub>o</sub> (di/dt=100A/μs)    ≤ 5μs at 10% of I <sub>f</sub> - 90% of V <sub>o</sub> (di/dt=100A/μs) |             |                |
| Thermal drift of gain                   | T <sub>c</sub> V <sub>o</sub>  | ≤± 0.05% / °C (Without T <sub>c</sub> V <sub>of</sub> )                                                                                          |             |                |
| Thermal drift of offset                 | T <sub>c</sub> V <sub>of</sub> | ≤± 1.0mV / °C (at I <sub>f</sub> =0A)                                                                                                            |             |                |
| Hysteresis error                        | V <sub>oH</sub>                | ≤ 20mV (at 0A → I <sub>f</sub> → 0A)                                                                                                             |             |                |
| Insulation voltage                      | V <sub>d</sub>                 | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal                                                                   |             |                |
| Insulation resistance                   | R <sub>iS</sub>                | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                                                                                           |             |                |
| Ambient Operating temperature           | T <sub>A</sub>                 | − 40°C~+ 80°C                                                                                                                                    |             |                |
| Ambient storage temperature             | T <sub>S</sub>                 | − 40°C~+ 85°C                                                                                                                                    |             |                |

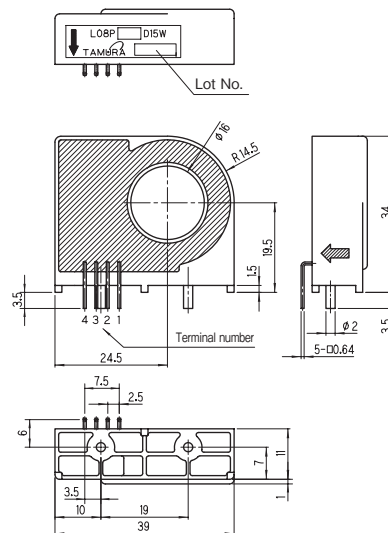
\* 1 Offset voltage value is after removal of core hysteresis.

### DIMENSIONS (mm)

L08P100D15IPV



L08P200D15W, L08P300D15IPVW



Terminal number

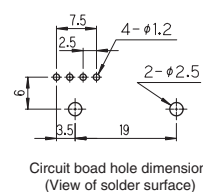
- 1 + Vcc (+ 15V)
- 2 - Vcc (- 15V)
- 3 Vout
- 4 GND

Weight:

20g

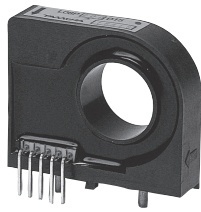
Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm



## Magnetic Proportion System / Through Type

# L08P SERIES



RoHS

TAMURA recommends L08P W/IPV series as a succession model.

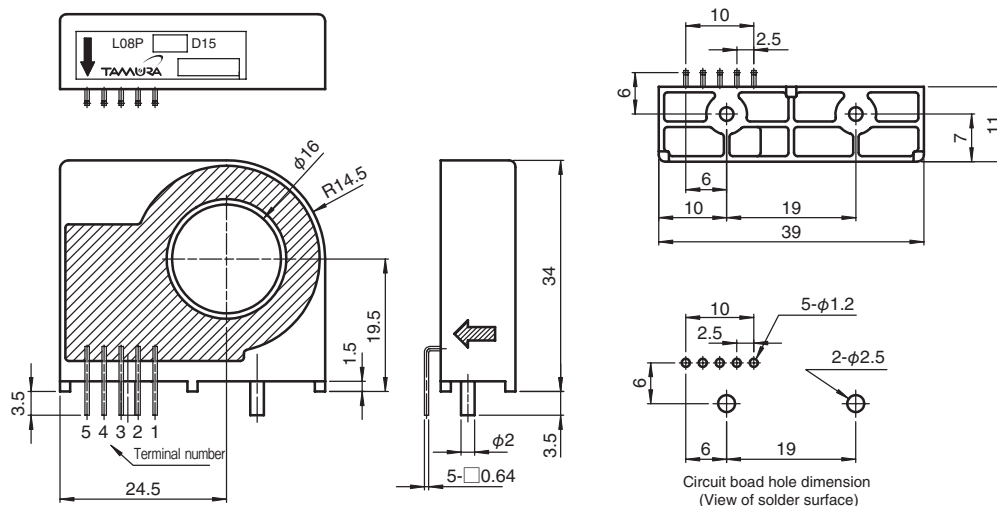
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Types                                   |                                | L08P050D15                                                                     | L08P100D15                                              | L08P150D15 | L08P200D15 |
|-----------------------------------------|--------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------|------------|------------|
| Spec                                    |                                |                                                                                |                                                         |            |            |
| Primary nominal current                 | I <sub>f</sub>                 | 50AT                                                                           | 100AT                                                   | 150AT      | 200AT      |
| Saturation current                      | I <sub>f</sub> max             | ≥± 150AT                                                                       | ≥± 300AT                                                | ≥± 450AT   | ≥± 450AT   |
| Rated output voltage                    | V <sub>o</sub>                 | 4V ± 0.040V (at I <sub>f</sub> )                                               |                                                         |            |            |
| Offset voltage                          | V <sub>of</sub>                | ≤ ± 0.030V (at I <sub>f</sub> = 0A) * <sup>1</sup>                             |                                                         |            |            |
| Output linearity (0A ~ I <sub>f</sub> ) | ε <sub>L</sub>                 | ≤ ± 1% (at I <sub>f</sub> )                                                    |                                                         |            |            |
| Power supply voltage                    | V <sub>cc</sub>                | ± 15V ± 5%                                                                     |                                                         |            |            |
| Consumption current                     | I <sub>cc</sub>                | ± 12mA (typ) , ≤ ± 20mA                                                        |                                                         |            |            |
| di/dt Response time                     | t <sub>r</sub>                 | ≤ 10μs * <sup>2</sup>                                                          |                                                         |            |            |
| Thermal drift of gain                   | T <sub>C</sub> V <sub>o</sub>  | ≤± 0.1% / °C (Without T <sub>C</sub> V <sub>of</sub> )                         | ≤± 0.05% / °C (Without T <sub>C</sub> V <sub>of</sub> ) |            |            |
| Thermal drift of offset                 | T <sub>C</sub> V <sub>of</sub> | ≤± 2mV / °C                                                                    | ≤± 1mV / °C                                             |            |            |
| Hysteresis error                        | V <sub>OH</sub>                | ≤ 30mV (at I <sub>f</sub> = 0A → I <sub>f</sub> → 0A)                          | ≤ 20mV (at I <sub>f</sub> = 0A → I <sub>f</sub> → 0A)   |            |            |
| Insulation voltage                      | V <sub>d</sub>                 | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |                                                         |            |            |
| Insulation resistance                   | R <sub>IS</sub>                | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                         |                                                         |            |            |
| Ambient Operating temperature           | T <sub>A</sub>                 | − 40℃~+ 80℃                                                                    |                                                         |            |            |
| Ambient storage temperature             | T <sub>S</sub>                 | − 40℃~+ 85℃                                                                    |                                                         |            |            |

\* 1 Offset voltage value is after removal of core hysteresis. \* 2 The smaller one on either at di/dt = 100A/us or at di/dt = If/us.

## DIMENSIONS (mm)



### Terminal number

- 1 + Vcc (+ 15V)
- 2 - Vcc (- 15V)
- 3 Vout
- 4 GND
- 5 NC (No connection)

### Weight:

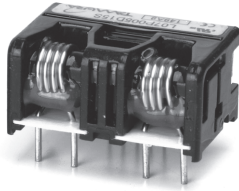
20g

### Note

Unless otherwise specified, tolerances shall be ± 0.5mm

## Magnetic Proportion System, 2 Circuits Type

# L07P D15 SERIES



RoHS

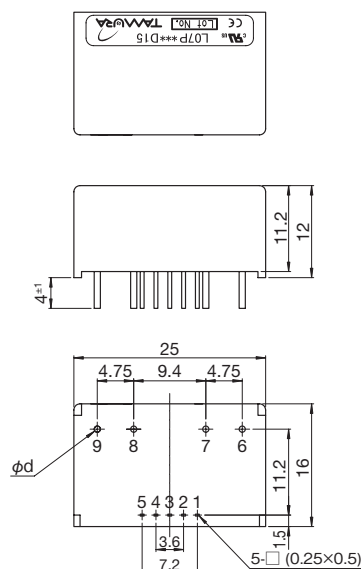
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Types                         |        | L07P003D15                                                       | L07P005D15 | L07P010D15 | L07P015D15 | L07P020D15 | L07P025D15 | L07P030D15 |
|-------------------------------|--------|------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|
| Spec                          |        |                                                                  |            |            |            |            |            |            |
| Primary nominal current       | If     | 3A                                                               | 5A         | 10A        | 15A        | 20A        | 25A        | 30A        |
| Saturation current            | If max | If × 3                                                           |            |            |            |            |            |            |
| Rated output voltage          | Vo     | 4V ± 0.060V (at If)                                              |            |            |            |            |            |            |
| Offset voltage                | Vof    | ≤ ± 0.060V (at If = 0A) *1                                       |            |            |            |            |            |            |
| Output linearity (0A ~ If)    | εL     | ≤ ± 1% (at If)                                                   |            |            |            |            |            |            |
| Power supply voltage          | Vcc    | ± 15V ± 5%                                                       |            |            |            |            |            |            |
| Consumption current           | Icc    | ≤ ± 30mA                                                         |            |            |            |            |            |            |
| di/dt<br>Response time        | tr     | ≤ 5μs (di / dt = If / μs) *2                                     |            |            |            |            |            |            |
| Thermal drift of gain         | TcVo   | ≤ 0.1% / °C (Without Tc Vof)                                     |            |            |            |            |            |            |
| Thermal drift of offset       | TcVof  | ≤ ± 2.5mV / °C                                                   |            |            |            |            |            |            |
| Hysteresis error              | Voh    | ≤ 30mV (at If = 0A → If → 0A)                                    |            |            |            |            |            |            |
| Insulation voltage            | Vd     | AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |            |            |            |            |            |            |
| Insulation resistance         | Ris    | ≥ 500MΩ (at DC500V) Primary ⇔ Secondary                          |            |            |            |            |            |            |
| Ambient Operating temperature | TA     | - 30°C ~ + 80°C                                                  |            |            |            |            |            |            |
| Ambient storage temperature   | TS     | - 40°C ~ + 85°C                                                  |            |            |            |            |            |            |

\* 1 Offset voltage value is after removal of core hysteresis. \*2 Shall be each channel's value. Other channel's input current to be 0A. \*Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



| A       | φd   |
|---------|------|
| 3A      | φ0.6 |
| 5A      | φ0.8 |
| 10A~15A | φ1.4 |
| 20A~30A | φ1.6 |

### Terminal number

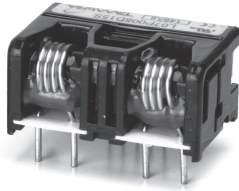
- 1 15V
- 2 - 15V
- 3 OUT1
- 4 OUT2
- 5 GND
- 6 + IN1
- 7 - IN1
- 8 + IN2
- 9 - IN2

### Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm
- 2. Unit is [mm]

## Magnetic Proportion System, 2 Circuits Type, Anti-Sulfurated

# L07P D15S SERIES



RoHS

Anti-Sulfurated

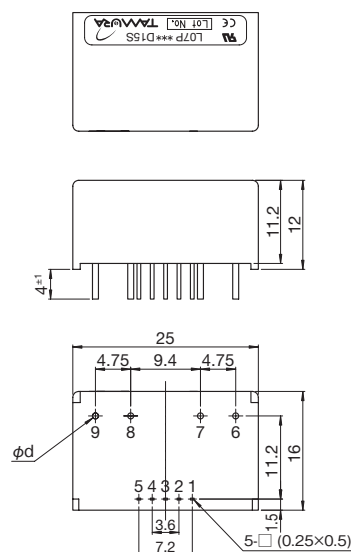
### SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Spec                          | Types              | L07P003D15S                                                      | L07P005D15S | L07P010D15S | L07P015D15S | L07P020D15S | L07P025D15S | L07P030D15S |
|-------------------------------|--------------------|------------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Primary nominal current       | If                 | 3A                                                               | 5A          | 10A         | 15A         | 20A         | 25A         | 30A         |
| Saturation current            | If max             | If × 3                                                           |             |             |             |             |             |             |
| Rated output voltage          | Vo                 | 4V ± 0.060V (at If)                                              |             |             |             |             |             |             |
| Offset voltage                | Vof                | ≤ ± 0.060V (at If = 0A) * 1                                      |             |             |             |             |             |             |
| Output linearity (0A ~ If)    | ε <sub>L</sub>     | ≤ ± 1% (at If)                                                   |             |             |             |             |             |             |
| Power supply voltage          | Vcc                | ± 15V ± 5%                                                       |             |             |             |             |             |             |
| Consumption current           | Icc                | ≤ ± 30mA                                                         |             |             |             |             |             |             |
| di/dt Response time           | tr                 | ≤ 5μs (di / dt = If / μs) * 2                                    |             |             |             |             |             |             |
| Thermal drift of gain         | T <sub>C</sub> Vo  | ≤ 0.1% / °C (Without T <sub>C</sub> Vof)                         |             |             |             |             |             |             |
| Thermal drift of offset       | T <sub>C</sub> Vof | ≤ ± 2.5mV / °C                                                   |             |             |             |             |             |             |
| Hysteresis error              | V <sub>OH</sub>    | ≤ 30mV (at If = 0A → If → 0A)                                    |             |             |             |             |             |             |
| Insulation voltage            | Vd                 | AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |             |             |             |             |             |             |
| Insulation resistance         | R <sub>IS</sub>    | ≥ 500MΩ (at DC500V) Primary ⇔ Secondary                          |             |             |             |             |             |             |
| Ambient Operating temperature | T <sub>A</sub>     | - 30°C ~ + 80°C                                                  |             |             |             |             |             |             |
| Ambient storage temperature   | T <sub>S</sub>     | - 40°C ~ + 85°C                                                  |             |             |             |             |             |             |

\* 1 Offset voltage value is after removal of core hysteresis. \* 2 Shall be each channel's value. Other channel's input current to be 0A. \* Please refer to the another sheet about conditions of UL Recognition. \* Anti-Sulfurated (Used resistors : Gold internal Electrodes, PCB coating : HumiSeal®) \*Reliability test High Temperature and High Humidity Operation Test (85°C, 85%RH, 1500h, N=11, Pass)

### DIMENSIONS (mm)



| A       | φd   |
|---------|------|
| 3A      | φ0.6 |
| 5A      | φ0.8 |
| 10A~15A | φ1.4 |
| 20A~30A | φ1.6 |

#### Terminal number

1. + Vcc (+ 15V)
2. - Vcc (- 15V)
3. Vout 1
4. Vout 2
5. GND
6. Primary input current 1 (+)
7. Primary input current 1 (-)
8. Primary input current 2 (+)
9. Primary input current 2 (-)

Weight:

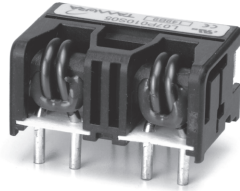
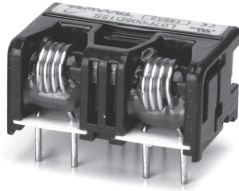
8g

#### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]

## Magnetic Proportion System, 2 Circuits Type

# L07P S05 SERIES



RoHS

## SPECIFICATIONS

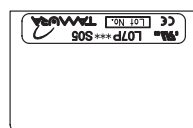
Ta=25°C, RL=10kΩ, Vcc=+5V

| Types                         |        | L07P003S05                                                       | L07P005S05 | L07P010S05 | L07P015S05 | L07P020S05 | L07P025S05 | L07P030S05 |
|-------------------------------|--------|------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|
| Spec                          |        |                                                                  |            |            |            |            |            |            |
| Primary nominal current       | If     | 3A                                                               | 5A         | 10A        | 15A        | 20A        | 25A        | 30A        |
| Saturation current            | If max | If × 1.5                                                         |            |            |            |            |            |            |
| Rated output voltage          | Vo     | Vof + 1.250V ± 0.040V (at If)                                    |            |            |            |            |            |            |
| Offset voltage                | Vof    | Vcc/2 ± 0.040V *1 (at If = 0A)                                   |            |            |            |            |            |            |
| Output linearity (0A ~ If)    | εL     | ≤ ± 1% (at If)                                                   |            |            |            |            |            |            |
| Power supply voltage          | Vcc    | + 5V ± 5%                                                        |            |            |            |            |            |            |
| Consumption current           | Icc    | ≤ 30mA                                                           |            |            |            |            |            |            |
| di/dt Response time           | tr     | ≤ 5μs (di / dt = If / μs) *2                                     |            |            |            |            |            |            |
| Thermal drift of gain         | TcVo   | ≤ 2mV / °C (Without Tc Vof)                                      |            |            |            |            |            |            |
| Thermal drift of offset       | TcVof  | ≤ ± 2.0mV / °C MAX.                                              |            |            |            |            |            |            |
| Hysteresis error              | Voh    | ≤ 15mV (at If = 0A → If → 0A)                                    |            |            |            |            |            |            |
| Insulation voltage            | Vd     | AC2000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |            |            |            |            |            |            |
| Insulation resistance         | Ris    | ≥ 500MΩ (at DC500V) Primary ⇔ Secondary                          |            |            |            |            |            |            |
| Ambient Operating temperature | TA     | - 30°C ~ + 80°C                                                  |            |            |            |            |            |            |
| Ambient storage temperature   | TS     | - 40°C ~ + 85°C                                                  |            |            |            |            |            |            |

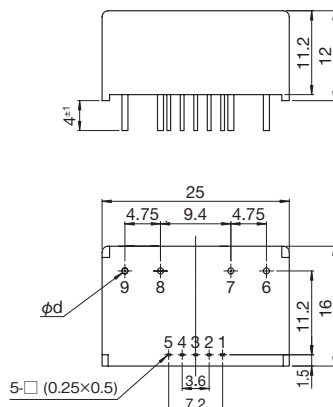
\* 1 Offset voltage value is after removal of core hysteresis.

\* 2 Shall be each channel's value. Other channel's input current to be 0A. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



| A       | φd   |
|---------|------|
| 3A      | φ0.6 |
| 5A      | φ0.8 |
| 10A~15A | φ1.4 |
| 20A~30A | φ1.6 |



### Terminal number

1. + 5V
2. NC
3. OUT1
4. OUT2
5. GND
6. + IN1
7. - IN1
8. + IN2
9. - IN2

### Note

1. Unless otherwise specified, tolerances shall be ± 0.5mm
2. Unit is [mm]



## Magnetic Proportion System / Through Type

# L06P S05 SERIES



RoHS

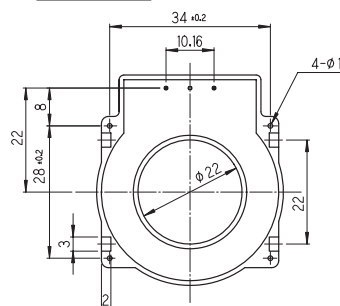
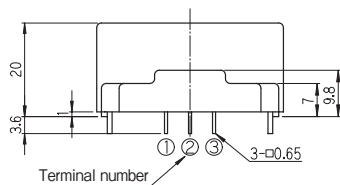
### SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

| Types                         |              | L06P300S05                                                       | L06P400S05 | L06P600S05 | L06P800S05 |
|-------------------------------|--------------|------------------------------------------------------------------|------------|------------|------------|
| Spec                          |              |                                                                  |            |            |            |
| Primary nominal current       | If           | 300AT                                                            | 400AT      | 600AT      | 800AT      |
| Saturation current            | If max       | $\geq I_f \times 1.33$                                           |            |            |            |
| Rated output voltage          | Vo           | $V_{ref} + 1.5V \pm 0.035V$ (at If) *1                           |            |            |            |
| Offset voltage                | Vof          | $V_{ref} \pm 30mV$ *2                                            |            |            |            |
| Output linearity (0A ~ If)    | $\epsilon_L$ | $\leq \pm 1\%$ (at If)                                           |            |            |            |
| Power supply voltage          | Vcc          | $+5V \pm 0.1V$                                                   |            |            |            |
| Consumption current           | Icc          | $\leq 15mA$                                                      |            |            |            |
| di/dt Response time           | tr           | $\leq 5\mu s$ (at di/dt = 100A /μs)                              |            |            |            |
| Thermal drift of gain         | TcVo         | $\leq \pm 1.5mV/^\circ C$ (Without Tc Vof)                       |            |            |            |
| Thermal drift of offset       | TcVof        | $\leq \pm 1.0mV/^\circ C$ (at If = 0A)                           |            |            |            |
| Hysteresis error              | VOH          | $\leq 10mV$ (at If = 0A → If → 0A)                               |            |            |            |
| Insulation voltage            | Vd           | AC2500V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary |            |            |            |
| Insulation resistance         | RIS          | $\geq 500M\Omega$ (at DC500V) Primary ⇔ Secondary                |            |            |            |
| Ambient Operating temperature | TA           | $-40^\circ C \sim +85^\circ C$                                   |            |            |            |
| Ambient storage temperature   | TS           | $-40^\circ C \sim +85^\circ C$                                   |            |            |            |

\* 1 Vref=Vcc/2 \* 2 Offset voltage value is after removal of core hysteresis.

### DIMENSIONS (mm)



#### Terminal number

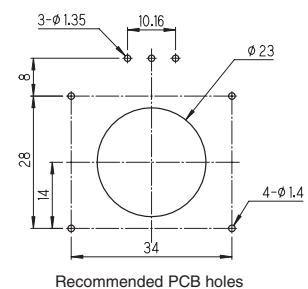
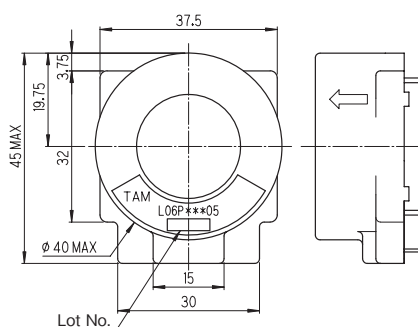
- 1 OUTPUT
- 2 GND
- 3 + 5V

#### Weight:

65 ± 5g

#### Note

- 1. Unless otherwise specified, tolerances shall be ±0.5mm



## Magnetic Proportion System / Through Type

# L05Z SERIES



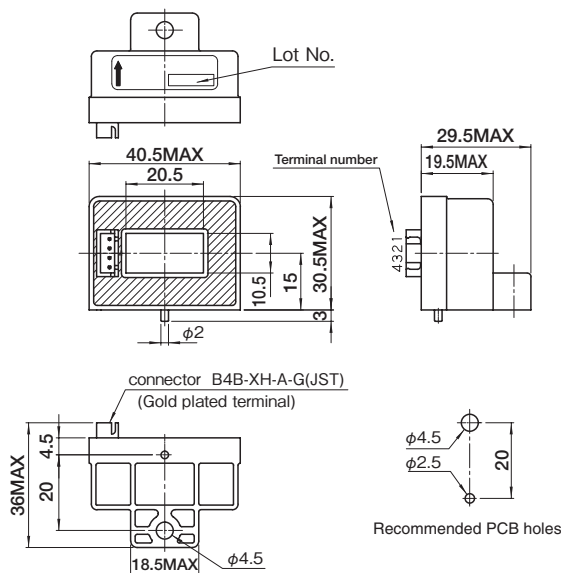
RoHS

## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Spec                          | Types              | L05Z800S15                                                                     |
|-------------------------------|--------------------|--------------------------------------------------------------------------------|
| Primary nominal current       | If                 | 800AT                                                                          |
| Saturation current            | If max             | ≥ ± 900AT                                                                      |
| Rated output voltage          | Vo                 | 11V ± 0.11V (at If)                                                            |
| Offset voltage                | Vof                | + 7V ± 50mV (If = 0A)                                                          |
| Output linearity (0A ~ If)    | ε <sub>L</sub>     | ± 1% (at If)                                                                   |
| Power supply voltage          | Vcc                | + 15V ± 5%                                                                     |
| Consumption current           | Icc                | ≤ 20mA                                                                         |
| di/dt Response time           | tr                 | ≤ 10μs (at di/dt = 100A / μs)                                                  |
| Thermal drift of gain         | T <sub>C</sub> Vo  | ± 0.1% / °C (Without T <sub>C</sub> Vof)                                       |
| Thermal drift of offset       | T <sub>C</sub> Vof | ± 1.0mV / °C                                                                   |
| Hysteresis error              | V <sub>OH</sub>    | ≤ 20mV (at If = 0A → If → 0A)                                                  |
| Insulation voltage            | Vd                 | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |
| Insulation resistance         | R <sub>IS</sub>    | ≥ 500MΩ (at DC500V) inside of through hole ⇔ terminal                          |
| Ambient Operating temperature | T <sub>A</sub>     | - 40°C ~ + 85°C                                                                |
| Ambient storage temperature   | T <sub>S</sub>     | - 40°C ~ + 85°C                                                                |

## DIMENSIONS (mm)



Terminal number

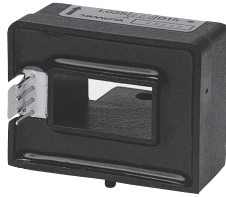
- 1 + Vcc
- 2 GND
- 3 OUT
- 4 GND

Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm
- 2. Mass is 50 ± 5g.

## Magnetic Proportion System / Through Type

# L03S SERIES



RoHS

TAMURA recommends L37S series as a succession model.

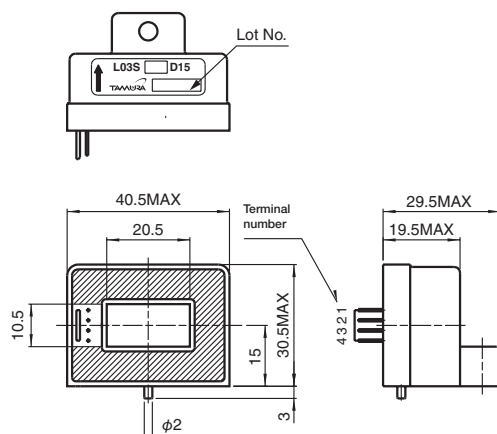
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=±15V

| Types                             |                    | L03S050D15                                                                     | L03S100D15           | L03S200D15 | L03S300D15 | L03S400D15 | L03S500D15 | L03S600D15 |
|-----------------------------------|--------------------|--------------------------------------------------------------------------------|----------------------|------------|------------|------------|------------|------------|
| Spec                              |                    |                                                                                |                      |            |            |            |            |            |
| Primary nominal current           | If                 | 50AT                                                                           | 100AT                | 200AT      | 300AT      | 400AT      | 500AT      | 600AT      |
| Saturation current                | If max             | ≥± 150AT                                                                       | ≥± 300AT             | ≥± 600AT   | ≥± 700AT   | ≥± 700AT   | ≥± 700AT   | ≥± 700AT   |
| Output voltage                    | Vo                 | 4V ± 0.040V (at If)                                                            |                      |            |            |            |            |            |
| Offset voltage *1                 | Vof                | ≤± 0.040V<br>(at If=0A)                                                        | ≤± 0.030V (at If=0A) |            |            |            |            |            |
| Output linearity (without offset) | ε <sub>L</sub>     | ≤± 1% (at If)                                                                  |                      |            |            |            |            |            |
| Power supply voltage              | Vcc                | ± 15V ± 5%                                                                     |                      |            |            |            |            |            |
| Consumption current               | Icc                | ± 12mA (typ) , ≤± 20mA                                                         |                      |            |            |            |            |            |
| di/dt Response time *2            | tr                 | ≤ 10μs                                                                         |                      |            |            |            |            |            |
| Thermal drift of gain             | T <sub>C</sub> Vo  | ≤± 0.1% / °C (without Tc Vof)                                                  |                      |            |            |            |            |            |
| Thermal drift of offset           | T <sub>C</sub> Vof | ≤± 2mV / °C                                                                    | ≤± 1mV / °C          |            |            |            |            |            |
| Hysteresis error                  | V <sub>OH</sub>    | ≤ 20mV (at If = 0A → If → 0A)                                                  |                      |            |            |            |            |            |
| Insulation voltage                | Vd                 | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |                      |            |            |            |            |            |
| Insulation resistance             | R <sub>IS</sub>    | ≥ 500M Ω (at DC500V) , inside of through hole ⇔ terminal                       |                      |            |            |            |            |            |
| Ambient Operating temperature     | T <sub>A</sub>     | - 20℃~+ 80℃                                                                    |                      |            |            |            |            |            |
| Ambient storage temperature       | T <sub>S</sub>     | - 40℃~+ 90℃                                                                    |                      |            |            |            |            |            |

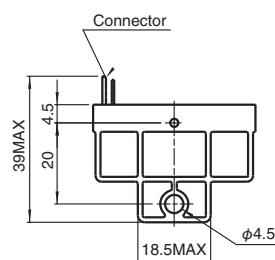
\* 1 Offset voltage value is after removal of core hysteresis. \* 2 The smaller one on either at di/dt = 100A/us or at di/dt = If/us.

## DIMENSIONS (mm)

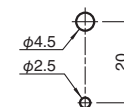


| Types        |                | Connector    |             |                 |                     |
|--------------|----------------|--------------|-------------|-----------------|---------------------|
|              |                | Manufacturer | Part Number | Old Part Number | Plating of terminal |
| L03SxxxD15   | Standard       | Molex        | 22-04-1041  | 5045-04A        | Sn                  |
| L03SxxxD15-A | Build to Order |              | 22-11-1041  | 5045-04AG       | Gold                |

As for the product of a gold-plated connector, 'A' attaches to the end of the product name.



Recommended PCB holes



Terminal number

- 1 + Vcc (+ 15V)
- 2 - Vcc (- 15V)
- 3 Vout
- 4 GND

Weight:

50g

Note

- 1. Unless otherwise specified, tolerances shall be 0.5mm

## Magnetic Proportion System / Through Type

# L03S D15W SERIES



RoHS

TAMURA recommends L37S series as a succession model.

## SPECIFICATIONS

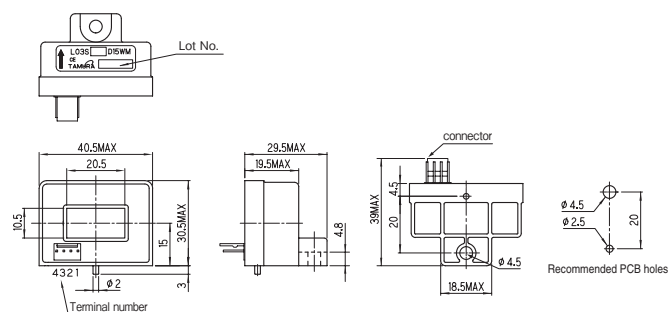
Ta=25°C, RL=10kΩ, Vcc=±15V

| Types                             |                    | L03S050D15W                                                                    | L03S100D15W            | L03S200D15W | L03S300D15W | L03S400D15W | L03S500D15W | L03S600D15W | L03S700D15W | L03S800D15W |
|-----------------------------------|--------------------|--------------------------------------------------------------------------------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Spec                              |                    |                                                                                |                        |             |             |             |             |             |             |             |
| Primary nominal current           | If                 | 50AT                                                                           | 100AT                  | 200AT       | 300AT       | 400AT       | 500AT       | 600AT       | 700AT       | 800AT       |
| Saturation current * 1            | If max             | ≥± 150AT                                                                       | ≥± 300AT               | ≥± 600AT    | ≥± 900AT    | ≥± 1000AT   |             |             |             |             |
| Output voltage                    | Vo                 | 4V ± 0.040V (at If)                                                            |                        |             |             |             |             |             |             |             |
| Offset voltage * 2                | Vof                | ≤± 0.040V<br>(at If=0A)                                                        | ≤± 0.030V (at If = 0A) |             |             |             |             |             |             |             |
| Output linearity (without offset) | ε <sub>L</sub>     | ≤± 1% (at If)                                                                  |                        |             |             |             |             |             |             |             |
| Power supply voltage              | Vcc                | ± 12V (± 5%) ~± 15V (± 5%)                                                     |                        |             |             |             |             |             |             |             |
| Consumption current               | Icc                | ≤± 20mA                                                                        |                        |             |             |             |             |             |             |             |
| di/dt Response time * 3           | tr                 | ≤ 5us (at 90% of If - 90% of Vo) , ≤ 10us (at 10% of If - 90% of Vo)           |                        |             |             |             |             |             |             |             |
| Thermal drift of gain             | T <sub>C</sub> Vo  | ≤ 0.1% / °C (Without Tc Vof)                                                   |                        |             |             |             |             |             |             |             |
| Thermal drift of offset           | T <sub>C</sub> Vof | ≤± 2mV / °C                                                                    | ≤± 1mV / °C            |             |             |             |             |             |             |             |
| Hysteresis error                  | V <sub>OH</sub>    | ≤ 20mV (at If = 0A → If → 0A)                                                  |                        |             |             |             |             |             |             |             |
| Insulation voltage                | Vd                 | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |                        |             |             |             |             |             |             |             |
| Insulation resistance             | R <sub>IS</sub>    | ≥ 500M Ω (at DC500V) , inside of through hole ⇔ terminal                       |                        |             |             |             |             |             |             |             |
| Ambient Operating temperature     | T <sub>A</sub>     | - 20°C~+ 80°C                                                                  |                        |             |             |             |             |             |             |             |
| Ambient storage temperature       | T <sub>S</sub>     | - 40°C~+ 85°C                                                                  |                        |             |             |             |             |             |             |             |

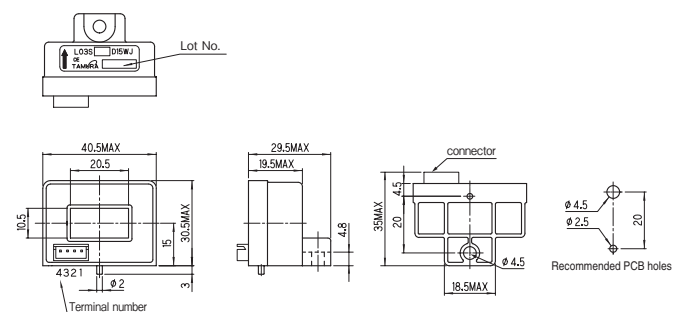
\* 1 If the product of 300A or less operate at Vcc = ± 12V power supplies, measuring range reduced to 2.5 x If. \* 2 Offset voltage value is after removal of core hysteresis.  
\* 3 The smaller one on either at di/dt = 100A/us or at di/dt = If/us.

## DIMENSIONS (mm)

### L03S\*\*\*D15WM



### L03S\*\*\*D15WJ



| Types          |                | Connector    |             |                 |                     |
|----------------|----------------|--------------|-------------|-----------------|---------------------|
|                |                | Manufacturer | Part Number | Old Part Number | Plating of terminal |
| L03SxxxD15WJ   | Standard       | JST          | B4B-XH-A-G  | -               | Gold                |
| L03SxxxD15WM   | Standard       | Molex        | 22-04-1041  | 5045-04A        | Sn                  |
| L03SxxxD15WM-A | Build to Order |              | 22-11-1041  | 5045-04AG       | Gold                |

As for L03SxxxD15WM of a gold-plated connector, 'A' attaches to the end of the product name.

Terminal number

1 + Vcc (+ 15V)  
2 - Vcc (- 15V)  
3 Vout  
4 GND  
Note

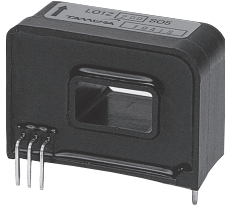
Weight

50g

1. Unless otherwise specified, tolerances shall be ± 0.5mm

## Magnetic Proportion System / Through Type

# L01Z SERIES



RoHS

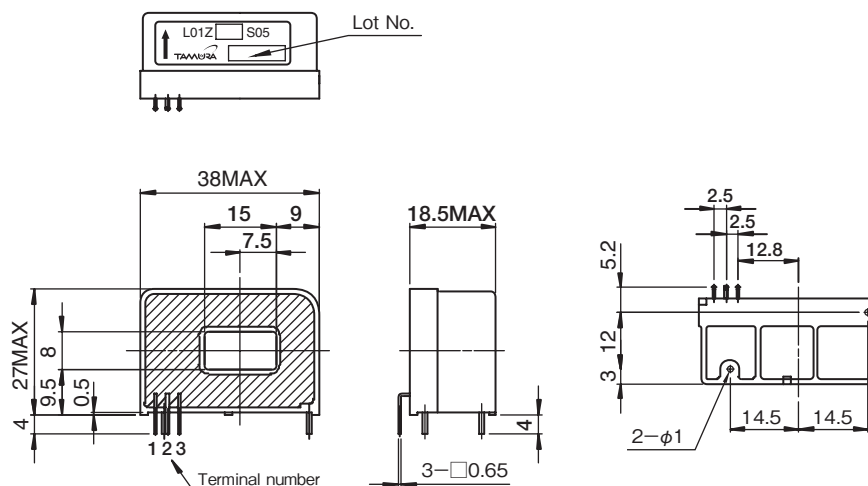
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

| Spec                          |                    | Types                                                                          |                                 | L01Z050S05 | L01Z100S05 | L01Z150S05 | L01Z200S05                   | L01Z300S05 | L01Z400S05                   | L01Z500S05 | L01Z600S05 |
|-------------------------------|--------------------|--------------------------------------------------------------------------------|---------------------------------|------------|------------|------------|------------------------------|------------|------------------------------|------------|------------|
| Primary nominal current       | If                 | 50AT                                                                           | 100AT                           | 150AT      | 200AT      | 300AT      | 400AT                        | 500AT      | 600AT                        |            |            |
| Saturation current            | If max             | If × 1.25                                                                      |                                 |            |            |            |                              |            |                              |            |            |
| Rated output voltage          | Vo                 | Vref + 1.5V ± 0.045V<br>(at If)                                                | Vref + 1.5V ± 0.035V (at If)    |            |            |            |                              |            |                              |            |            |
| Saturation output voltage     | Vo min/max         | Vo min ≤ 0.5V, 4.5V ≤ Vo max                                                   |                                 |            |            |            |                              |            |                              |            |            |
| Offset voltage * 1            | Vof                | Vref ± 0.035V<br>(at If = 0A)                                                  | Vref ± 0.030V (at If = 0A)      |            |            |            |                              |            |                              |            |            |
| Output linearity (0A ~ If)    | ε <sub>L</sub>     | ≤ ± 1% (at If)                                                                 |                                 |            |            |            |                              |            |                              |            |            |
| Power supply voltage          | Vcc                | + 5V ± 2%                                                                      |                                 |            |            |            |                              |            |                              |            |            |
| Consumption current           | Icc                | ≤ 15mA                                                                         |                                 |            |            |            |                              |            |                              |            |            |
| di/dt Response time           | tr                 | ≤ 10μs (di/dt = 100A /μs)                                                      |                                 |            |            |            |                              |            |                              |            |            |
| Thermal drift of gain         | T <sub>c</sub> Vo  | ≤ ± 2mV / °C<br>(Without Tc Vof)                                               | ≤ ± 1.5mV / °C (Without Tc Vof) |            |            |            |                              |            |                              |            |            |
| Thermal drift of offset       | T <sub>c</sub> Vof | ≤ ± 2mV / °C                                                                   | ≤ ± 1mV / °C                    |            |            |            |                              |            |                              |            |            |
| Hysteresis error              | V <sub>OH</sub>    | ≤ 8mV (at If = 0A → If → 0A)                                                   |                                 |            |            |            | ≤ 4mV (at If = 0A → If → 0A) |            | ≤ 6mV (at If = 0A → If → 0A) |            |            |
| Insulation voltage            | Vd                 | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |                                 |            |            |            |                              |            |                              |            |            |
| Insulation resistance         | R <sub>IS</sub>    | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                         |                                 |            |            |            |                              |            |                              |            |            |
| Ambient Operating temperature | T <sub>A</sub>     | − 20°C ~ + 80°C                                                                |                                 |            |            |            |                              |            |                              |            |            |
| Ambient storage temperature   | T <sub>S</sub>     | − 40°C ~ + 85°C                                                                |                                 |            |            |            |                              |            |                              |            |            |

\* 1 Vref=Vcc/2

## DIMENSIONS (mm)



Terminal number

- 1 Vout
- 2 GND
- 3 + Vcc (+ 5V)

Weight:

45g

Note

Unless otherwise specified, tolerances shall be ± 0.5mm

## Servo system Current-output type

# S29S D24 SERIES



RoHS

## SPECIFICATIONS

Ta=25°C, Vcc=±15V

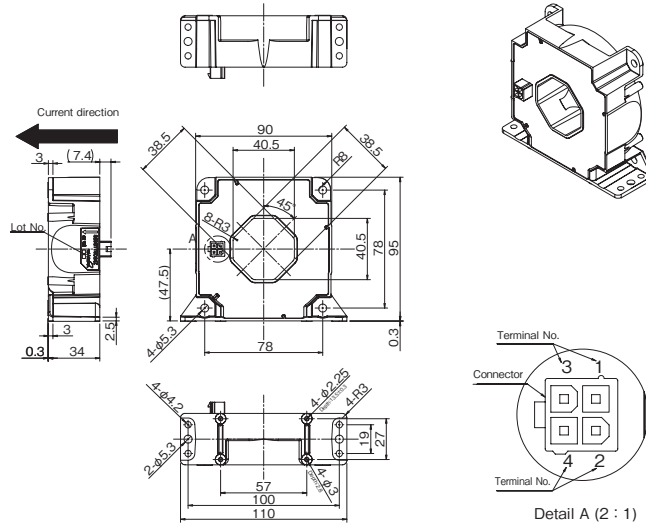
| Spec                             | Types          | Symbol            | S29S1T0D24Z                                                                      |                                                        |  | S29S1T0D24ZM                        |  |  | S29S1T0D24ZJ    |  |  |
|----------------------------------|----------------|-------------------|----------------------------------------------------------------------------------|--------------------------------------------------------|--|-------------------------------------|--|--|-----------------|--|--|
| Connector                        |                | —                 | 39-28-8040 [5566-04A-210] (Molex)                                                |                                                        |  | 38-00-6293 [6410-03C (102)] (Molex) |  |  | BH3P-VH-1 (JST) |  |  |
| Rated current                    |                | If                | 1000A                                                                            |                                                        |  |                                     |  |  |                 |  |  |
| Maximum current 3sec             |                | If max            | ± 2100A                                                                          |                                                        |  |                                     |  |  |                 |  |  |
| Measuring resistance             | R <sub>L</sub> | ± 15V             | 70℃                                                                              | 1000A 0 Ω~ 21 Ω<br>1200A 0 Ω~ 9 Ω<br>1300A 0 Ω~ 5 Ω    |  |                                     |  |  |                 |  |  |
|                                  |                |                   | 85℃                                                                              | 1000A 0 Ω~ 18 Ω<br>1200A 0 Ω~ 7 Ω                      |  |                                     |  |  |                 |  |  |
|                                  |                | ± 24V             | 70℃                                                                              | 1000A 0 Ω~ 60.5 Ω<br>1800A 0 Ω~ 14 Ω<br>2100A 0 Ω~ 4 Ω |  |                                     |  |  |                 |  |  |
|                                  |                |                   | 85℃                                                                              | 1000A 10 Ω~ 58.5 Ω<br>1800A 10 Ω~ 12 Ω                 |  |                                     |  |  |                 |  |  |
| Output current                   |                | I <sub>o</sub>    | 200mA (Conversion Ratio 1:5000)                                                  |                                                        |  |                                     |  |  |                 |  |  |
| Output current accuracy          |                | X <sub>G</sub>    | I <sub>o</sub> ± 0.4% (without I <sub>of</sub> )                                 |                                                        |  |                                     |  |  |                 |  |  |
| Offset current                   |                | I <sub>of</sub>   | ≤± 0.4mA (at If=0A) * 1                                                          |                                                        |  |                                     |  |  |                 |  |  |
| Output linearity                 |                | ε <sub>L</sub>    | ≤± 0.1% (at If)                                                                  |                                                        |  |                                     |  |  |                 |  |  |
| Power supply voltage             |                | V <sub>cc</sub>   | ± 15V (± 5%) ~± 24V (± 5%)                                                       |                                                        |  |                                     |  |  |                 |  |  |
| Consumption current              |                | I <sub>cc</sub>   | ≤± 35mA (Without I <sub>o</sub> )                                                |                                                        |  |                                     |  |  |                 |  |  |
| di/dt response time (@90% of If) |                | t <sub>r</sub>    | ≤ 1us (di/dt=100A/us)                                                            |                                                        |  |                                     |  |  |                 |  |  |
| Thermal drift of gain            |                | TC <sub>lo</sub>  | ≤± 0.01%/℃ (without TC <sub>lof</sub> )                                          |                                                        |  |                                     |  |  |                 |  |  |
| Thermal drift of offset          |                | TC <sub>lof</sub> | ≤± 0.5mA max (at - 10℃~+ 70℃)<br>≤± 0.8mA max (at - 40℃~+ 85℃)                   |                                                        |  |                                     |  |  |                 |  |  |
| Hysteresis error                 |                | I <sub>oH</sub>   | ≤± 0.2mA (at If=0A ⇒ 3 × If ⇒ 0A )                                               |                                                        |  |                                     |  |  |                 |  |  |
| Insulation withstanding          |                | V <sub>d</sub>    | AC4,000V, for 1minute (sensing current 0.5mA) ,inside of through hole ⇔ terminal |                                                        |  |                                     |  |  |                 |  |  |
| Insulation resistance            |                | R <sub>iS</sub>   | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                           |                                                        |  |                                     |  |  |                 |  |  |
| Ambient Operating temperature    |                | T <sub>A</sub>    | - 40℃~+ 85℃                                                                      |                                                        |  |                                     |  |  |                 |  |  |
| Ambient storage temperature      |                | T <sub>S</sub>    | - 40℃~+ 90℃                                                                      |                                                        |  |                                     |  |  |                 |  |  |
| Secondary coil resistance        |                | R <sub>s</sub>    | 48 Ω (Ta=70℃)<br>50 Ω (Ta=85℃)                                                   |                                                        |  |                                     |  |  |                 |  |  |

\* 1 Offset current value is after removal of core hysteresis. \* Temperature of the primary conductor(busbar) should not exceed 100°C .

\* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)

### S29S1T0D24Z



Terminal number

- 1 NC (No connection)
- 2 +Vcc (+24V)
- 3 -Vcc (-24V)
- 4 Iout

| Connector    |             |                 |
|--------------|-------------|-----------------|
| Manufacturer | Part Number | Old Part Number |
| Molex        | 39-28-8040  | 5566-04A-210    |

Plating of terminal; Sn

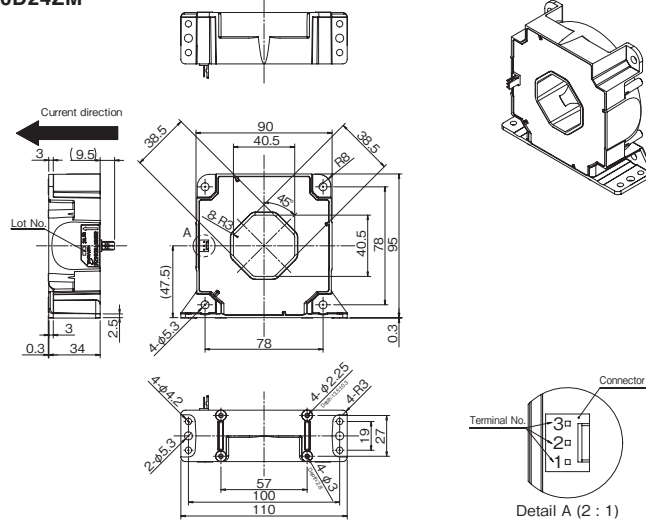
Weight

560g typ

Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5\text{mm}$
- 2. Unit is [mm]

### S29S1T0D24ZM



Terminal number

- 1 +Vcc (+24V)
- 2 Iout
- 3 -Vcc (-24V)

| Connector    |             |                 |
|--------------|-------------|-----------------|
| Manufacturer | Part Number | Old Part Number |
| Molex        | 38-00-6293  | 6410-03C (102)  |

Plating of terminal; Sn

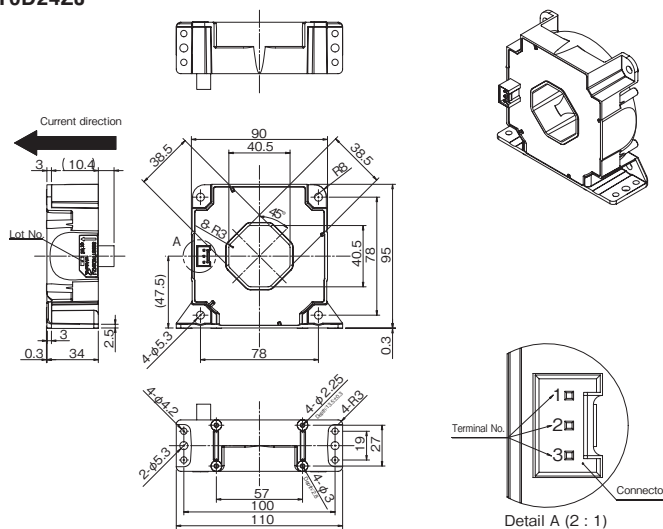
Weight

560g typ

Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5\text{mm}$
- 2. Unit is [mm]

### S29S1T0D24ZJ



Terminal number

- 1 -Vcc (-24V)
- 2 Iout
- 3 +Vcc (+24V)

| Connector    |             |
|--------------|-------------|
| Manufacturer | Part Number |
| JST          | BH3P-VH-1   |

Plating of terminal; Sn

Weight

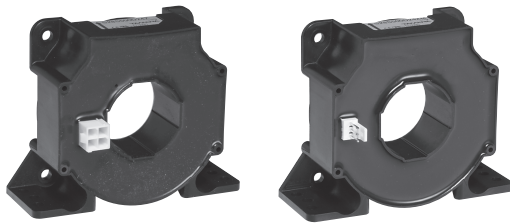
560g typ

Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5\text{mm}$
- 2. Unit is [mm]

## Servo system Current-output type

# S28S SERIES



RoHS

## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Spec                              | Types           | Symbol | S28S500D24Z                                                                     | S28S500D24ZM                        |
|-----------------------------------|-----------------|--------|---------------------------------------------------------------------------------|-------------------------------------|
| Connector                         | —               | —      | 39-28-8040 [5566-04A-210] (Molex)                                               | 38-00-6293 [6410-03C (102)] (Molex) |
| Rated Current                     | If              | —      | 500A                                                                            |                                     |
| Maximum Current                   | If max          | —      | ± 800A                                                                          |                                     |
| Measuring resistance              | R <sub>L</sub>  | ± 15V  | 500A 0 Ω ~ 60 Ω<br>800A 0 Ω ~ 11 Ω                                              |                                     |
|                                   |                 | ± 18V  | 500A 0 Ω ~ 92 Ω<br>800A 0 Ω ~ 30 Ω                                              |                                     |
|                                   |                 | ± 24V  | 500A 5 Ω ~ 149 Ω<br>800A 5 Ω ~ 65 Ω                                             |                                     |
| Output Current                    | Io              | —      | 100mA (Conversion Ratio 1:5000)                                                 |                                     |
| Output Current Accuracy           | X <sub>G</sub>  | —      | Io ± 0.5% (without Iof)                                                         |                                     |
| Offset Current                    | Iof             | —      | ≤ ± 0.4mA (at If = 0A) *1                                                       |                                     |
| Output Linearity                  | ε <sub>L</sub>  | —      | ≤ ± 0.1% (at If)                                                                |                                     |
| Power Supply Voltage              | Vcc             | —      | ± 15 ~ ± 24V                                                                    |                                     |
| Consumption Current               | Icc             | —      | ≤ ± 30mA (without Io)                                                           |                                     |
| di/dt Response Time (@90% of If)  | tr              | —      | ≤ 1us (di/dt=100A/us)                                                           |                                     |
| Output Temperature Characteristic | TCIo            | —      | ≤ ± 0.01%/°C (Without TClof)                                                    |                                     |
| Offset Temperature Characteristic | TClof           | —      | ≤ ± 0.4mA max                                                                   |                                     |
| Hysteresis allowance              | I <sub>oH</sub> | —      | ≤ ± 0.2mA max (at If = 0A → 3*If → 0A)                                          |                                     |
| Insulation Withstanding           | Vd              | —      | AC4,000V, for 1minute (sensing current 0.5mA) inside of through hole ⇔ terminal |                                     |
| Insulation Withstanding           | R <sub>IS</sub> | —      | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                          |                                     |
| Operating Temperature             | T <sub>A</sub>  | —      | - 40°C ~ + 70°C                                                                 |                                     |
| Storage Temperature               | T <sub>S</sub>  | —      | - 40°C ~ + 85°C                                                                 |                                     |
| Secondary coil resistance         | Rs              | —      | 70 Ω (Ta=70°C)                                                                  |                                     |

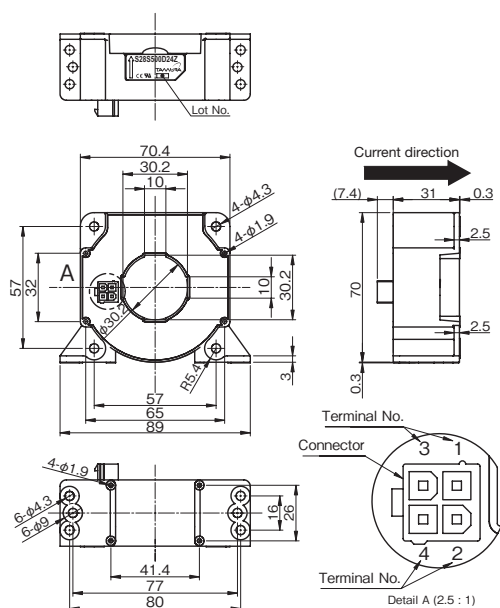
\* 1 Offset current value is after removal of core hysteresis.

\* Please refer to the another sheet about conditions of UL Recognition.



## DIMENSIONS (mm)

### S28S500D24Z



#### Terminal number

- 1 NC
- 2 - Vcc
- 3 OUT
- 4 + Vcc

#### Weight:

260g typ

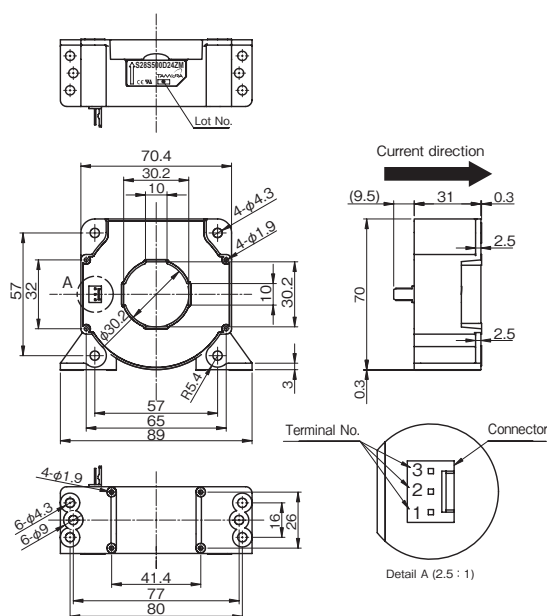
#### Connector

| Manufacturer | Part Number | Old Part Number |
|--------------|-------------|-----------------|
| Molex        | 39-28-8040  | 5566-04A-210    |

#### Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5\text{mm}$
- 2. Unit is [mm]

### S28S500D24ZM



#### Terminal number

- 1 + Vcc
- 2 OUT
- 3 - Vcc

#### Weight:

260g typ

#### Connector

| Manufacturer | Part Number | Old Part Number |
|--------------|-------------|-----------------|
| Molex        | 38-00-6293  | 6410-03C (102)  |

#### Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5\text{mm}$
- 2. Unit is [mm]

## Servo system Current-output type

# S27S SERIES



RoHS

## SPECIFICATIONS

Ta=25°C, Vcc=±15V

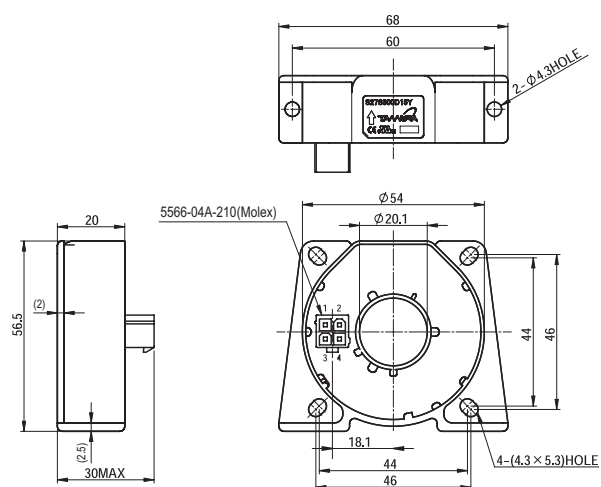
| Spec                                                | Types  | S27S300D15Y                                                                     | S27S300D15YM                         |
|-----------------------------------------------------|--------|---------------------------------------------------------------------------------|--------------------------------------|
| Connector                                           | —      | 39-28-8040 [5566-04A-210] (Molex)                                               | 38-00-6293 [6410-03C (102)] (Molex)  |
| Rated Current                                       | If     | 300A                                                                            |                                      |
| Maximum Current RL : 測定抵抗<br>Vcc = ± 15V, Ta = 85°C | If max | ± 500A                                                                          |                                      |
| Measuring resistance at Ta = 85°C<br>If = [± ADC]   | RL     | ± 12V                                                                           | 300A 0 Ω ~ 39 Ω<br>500A 0 Ω ~ 12 Ω   |
|                                                     |        | ± 15V                                                                           | 300A 0 Ω ~ 58 Ω<br>500A 0 Ω ~ 22 Ω   |
|                                                     |        | ± 20V                                                                           | 300A 15 Ω ~ 93 Ω<br>500A 15 Ω ~ 45 Ω |
| Output Current                                      | Io     | 150mA (Conversion Ratio 1:2000)                                                 |                                      |
| Output Current Accuracy                             | XG     | Io ± 0.4% (without Iof)                                                         |                                      |
| Offset Current                                      | Iof    | ≤ ± 0.2mA (at If = 0A) * 1                                                      |                                      |
| Output Linearity                                    | εL     | ≤ ± 0.1% (at If)                                                                |                                      |
| Power Supply Voltage                                | Vcc    | ± 12 ~ ± 20V                                                                    |                                      |
| Consumption Current                                 | Icc    | ≤ ± 20mA (without Io)                                                           |                                      |
| di/dt Response Time (@90% of If)                    | tr     | ≤ 1us (di/dt = 100A/us)                                                         |                                      |
| Thermal drift of gain                               | TCIo   | ≤ ± 0.01%/°C (without TClof)                                                    |                                      |
| Thermal drift of offset                             | TClof  | ≤ ± 0.5mA max                                                                   |                                      |
| Hysteresis error                                    | Ioh    | ≤ 0.1mA (at If = 0A → If → 0A)                                                  |                                      |
| Insulation voltage                                  | Vd     | AC4000V, for 1minute (sensing current 0.5mA), inside of through hole ⇔ terminal |                                      |
| Insulation resistance                               | Ris    | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                          |                                      |
| Ambient Operating temperature                       | TA     | - 40°C ~ + 85°C                                                                 |                                      |
| Ambient storage temperature                         | TS     | - 40°C ~ + 90°C                                                                 |                                      |
| Secondary coil resistance                           | Rs     | 25 Ω (Ta = 70°C)<br>28 Ω (Ta = 85°C)                                            |                                      |

\* 1 Offset current value is after removal of core hysteresis.

\* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)

### S27S300D15Y



#### Terminal number

- 1 + Vcc
- 2 Output
- 3 - Vcc
- 4 nc

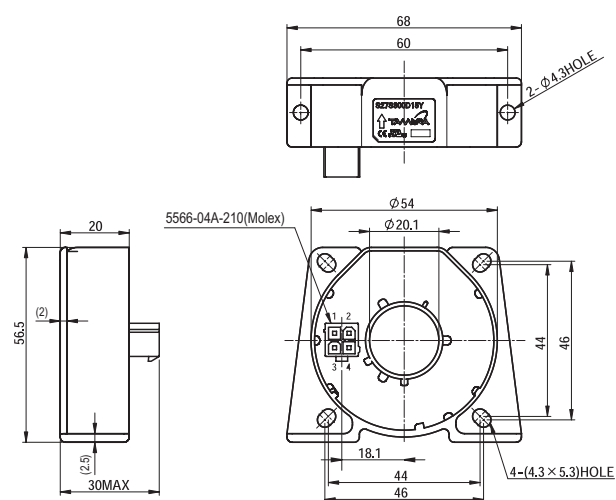
#### Weight:

90g typ

#### Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5$ mm
- 2. Unit is [mm]

### S27S300D15YM



#### Terminal number

- 1 + Vcc
- 2 Output
- 3 - Vcc

#### Weight:

90g typ

#### Note

- 1. Unless otherwise specified, tolerances shall be  $\pm 0.5$ mm
- 2. Unit is [mm]

## Servo system Current-output type

# S26P SERIES



RoHS

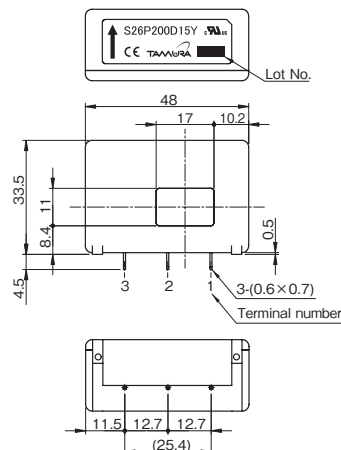
## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Spec                                   | Types  | S26P200D15Y                                                                    |                                                  |
|----------------------------------------|--------|--------------------------------------------------------------------------------|--------------------------------------------------|
| Primary nominal current                | If     | 200A                                                                           | 300A                                             |
| Measuring resistance @Ta=85°C          | RL     | Vcc= ± 12V 0 Ω ~ 26 Ω    Vcc= ± 15V 0 Ω ~ 56 Ω                                 | Vcc= ± 12V 0 Ω ~ 4 Ω * 1    Vcc= ± 15V 0 Ω ~ 8 Ω |
| Rated output current                   | Io     | 100mA (Turn Ratio: 1 : 2000)                                                   | 150mA (Turn Ratio: 1 : 2000)                     |
| Output current accuracy                | XG     | Io ± 0.4% (Without Iof)                                                        |                                                  |
| Offset current                         | Iof    | ≤ ± 0.2mA (at If=0A) * 2                                                       |                                                  |
| Maximum current<br>Vcc= ± 15V, Ta=85°C | If max | ± 350A (at RL ≤ 5 Ω)                                                           |                                                  |
| Output linearity                       | εL     | ≤ ± 0.15% (at If)                                                              |                                                  |
| Power supply voltage                   | Vcc    | ± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc)            |                                                  |
| Consumption current                    | Icc    | ≤ ± 16mA (Without Io)                                                          |                                                  |
| di/dt Response time (@90% of If)       | tr     | ≤ 1μs (at di/dt=If/μs)                                                         |                                                  |
| Frequency characteristics @- 1dB       | f      | DC...100kHz                                                                    |                                                  |
| Thermal drift of gain                  | TCIo   | ≤ ± 0.01%/°C (Without Tclof)                                                   |                                                  |
| Thermal drift of offset                | TCIof  | ≤ ± 0.5mA                                                                      |                                                  |
| Hysteresis error                       | Ioh    | ≤ 0.3mA (at If=0A → If → If=0A)                                                |                                                  |
| Insulation voltage                     | Vd     | AC3000V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |                                                  |
| Insulation resistance                  | RIS    | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                         |                                                  |
| Ambient Operating temperature          | TA     | - 40°C ~ + 85°C                                                                |                                                  |
| Ambient storage temperature            | TS     | - 40°C ~ + 90°C                                                                |                                                  |
| Secondary coil resistance              | RS     | at Ta=70°C 60 Ω    at Ta=85°C 65 Ω                                             |                                                  |

\* 1 : If=250A \* 2 Offset current value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



### Terminal number

- 1 + Vcc
- 2 Output
- 3 - Vcc

### Weight:

45g typ

### Note

- 1. Unless otherwise specified, tolerances shall be ±0.5mm
- 2. Unit is [mm]

## Servo system Current-output type

# S25P SERIES



RoHS

## SPECIFICATIONS

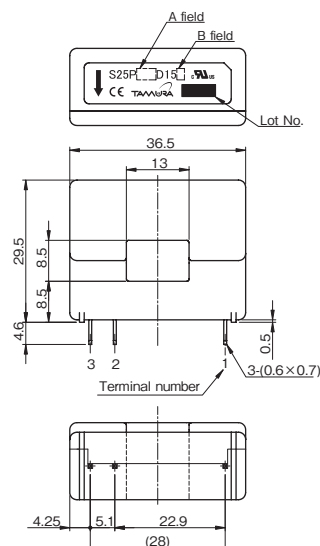
Ta=25°C, Vcc=±15V

| Spec                                         | Types  | S25P050D15X                                                                    | S25P100D15Y                                      | S25P100D15X                                      | S25P150D15Y                                    |
|----------------------------------------------|--------|--------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------|------------------------------------------------|
| Primary nominal current                      | If     | 50A                                                                            | 100A                                             | 100A                                             | 150A                                           |
| Measuring resistance<br>If= ± ADC at Ta=85°C | RL     | Vcc= ± 12V 60 Ω ~ 95 Ω<br>Vcc= ± 15V 135 Ω ~ 155 Ω                             | Vcc= ± 12V 0 Ω ~ 42 Ω<br>Vcc= ± 15V 20 Ω ~ 102 Ω | Vcc= ± 12V 10 Ω ~ 65 Ω<br>Vcc= ± 15V 40 Ω ~ 95 Ω | Vcc= ± 12V 0 Ω ~ 15 Ω<br>Vcc= ± 15V 0 Ω ~ 55 Ω |
| Rated output current                         | Io     | 50mA (Turn ratio 1 : 1000)                                                     | 50mA (Turn ratio 1 : 2000)                       | 100mA (Turn ratio 1 : 1000)                      | 75mA (Turn ratio 1 : 2000)                     |
| Output current accuracy                      | XG     | Io ± 0.5% (without Iof)                                                        |                                                  |                                                  |                                                |
| Offset current *1                            | Iof    | ≤ ± 0.2mA (at If=0A)                                                           | ≤ ± 0.1mA (at If=0A)                             | ≤ ± 0.2mA (at If=0A)                             | ≤ ± 0.2mA (at If=0A)                           |
| Maximum current<br>Vcc= ± 15V, Ta=85°C       | If max | ± 55A (at RL=135 Ω) *2                                                         | ± 150A (at 20 Ω ≤ RL ≤ 25 Ω)                     | ± 160A (at 40 Ω ≤ RL ≤ 50 Ω)                     | ± 200A (at 0 Ω ≤ RL ≤ 40 Ω)                    |
| Output linearity                             | εL     | ≤ ± 0.15% (at If)                                                              |                                                  |                                                  |                                                |
| Power supply voltage                         | Vcc    | ± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc)            |                                                  |                                                  |                                                |
| Consumption current                          | Icc    | ≤ ± 16mA (Without Io)                                                          |                                                  |                                                  |                                                |
| di/dt Response time (@90% of If)             | tr     | ≤ 1μs (at di/dt=If/μs)                                                         |                                                  |                                                  |                                                |
| Thermal drift of gain                        | TCIo   | ≤ ± 0.01%/°C (Without TClof)                                                   |                                                  |                                                  |                                                |
| Thermal drift of offset                      | TClof  | ≤ ± 0.5mA                                                                      |                                                  |                                                  |                                                |
| Hysteresis error                             | IoH    | ≤ 0.3mA (at If=0A → If → If=0A)                                                |                                                  |                                                  |                                                |
| Insulation voltage                           | Vd     | AC3000V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |                                                  |                                                  |                                                |
| Insulation resistance                        | RI     | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                         |                                                  |                                                  |                                                |
| Ambient Operating temperature                | TA     | - 40°C ~ + 85°C                                                                |                                                  |                                                  |                                                |
| Ambient storage temperature                  | TS     | - 40°C ~ + 90°C                                                                |                                                  |                                                  |                                                |
| Secondary coil resistance                    | Rs     | at Ta=70°C 80 Ω<br>at Ta=85°C 85 Ω                                             | at Ta=70°C 120 Ω<br>at Ta=85°C 128 Ω             | at Ta=70°C 25 Ω<br>at Ta=85°C 28 Ω               | at Ta=70°C 95 Ω<br>at Ta=85°C 105 Ω            |

\* 1 Offset current value is after removal of core hysteresis. \* 2 Ta=70°C, If max=70A (at 50 Ω ≤ RL ≤ 90 Ω)

\* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



A field display

| Current | A field |
|---------|---------|
| 50A     | 050     |
| 100A    | 100     |
| 150A    | 150     |

B field display

| Coil  | B field |
|-------|---------|
| 1000T | X       |
| 2000T | Y       |

※50A is 1000T only, 150A is 2000T only

### Terminal number

- 1 + Vcc
- 2 - Vcc
- 3 OUT

Weight:

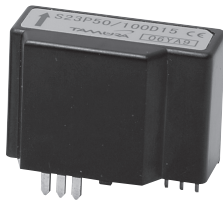
20g typ

### Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm

## Servo system Current-output type

# S23P M2



RoHS

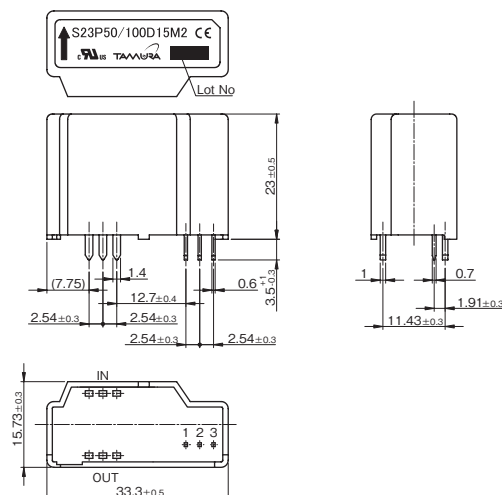
## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Types                                                   |        | S23P50/100D15M2                                                     |            |                            |             |
|---------------------------------------------------------|--------|---------------------------------------------------------------------|------------|----------------------------|-------------|
| Spec                                                    |        |                                                                     |            |                            |             |
| Primary nominal current                                 | If     | 50A                                                                 |            | 100A                       |             |
| Measuring resistance<br>(If= ± ADC, Ta=85℃)             | RL     | Vcc= ± 12V                                                          | 0 Ω~ 217 Ω | Vcc= ± 12V                 | 0 Ω~ 57 Ω   |
|                                                         |        | Vcc= ± 15V                                                          | 0 Ω~ 327 Ω | Vcc= ± 15V                 | 45 Ω~ 114 Ω |
| Output current                                          | Io     | 25mA (Turn ratio 1 : 2000)                                          |            | 50mA (Turn ratio 1 : 2000) |             |
| Output current accuracy                                 | XG     | Io ± 0.25% (without Iof)                                            |            |                            |             |
| Offset current                                          | Iof    | ≦ ± 0.15mA (at If=0A) *1                                            |            |                            |             |
| Maximum current Vcc= ± 15V<br>(Operating time: ≦ 10sec) | If max | ± 110A (at RL ≦ 71 Ω)                                               |            | ± 160A (at RL ≦ 25 Ω)      |             |
| Output linearity                                        | εL     | ≦ ± 0.15% (at If)                                                   |            |                            |             |
| Power supply voltage                                    | Vcc    | ± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc) |            |                            |             |
| Consumption current                                     | Icc    | ≦ ± 16mA (without Io)                                               |            |                            |             |
| di/dt Response time (@90% of If)                        | tr     | ≦ 0.5μs (at di/dt = 100A/μss)                                       |            |                            |             |
| Thermal drift of gain                                   | Tclo   | ≦ ± 0.01%/℃ (Without Tclof)                                         |            |                            |             |
| Thermal drift of offset                                 | Tclof  | ≦ ± 0.5mA (− 25℃~+ 85℃)                                             |            |                            |             |
| Hysteresis error                                        | Ioh    | ≦ 0.3mA (at If=0A → If → If=0A)                                     |            |                            |             |
| Insulation voltage                                      | Vd     | AC5000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary    |            |                            |             |
| Insulation resistance                                   | RIS    | ≧ 500M Ω (at DC500V) Primary ⇔ Secondary                            |            |                            |             |
| Ambient Operating temperature                           | TA     | − 40℃~+ 85℃                                                         |            |                            |             |
| Ambient storage temperature                             | TS     | − 40℃~+ 90℃                                                         |            |                            |             |
| Secondary coil resistance                               | Rs     | at Ta=70℃ 115 Ω at Ta=85℃ 121 Ω                                     |            |                            |             |

\* 1 Offset current value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



Terminal number

1 − Vcc  
2 + Vcc  
3 OUT

Weight:

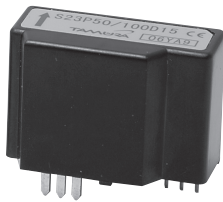
26g typ

Note

1. Unless otherwise specified,  
tolerances shall be ± 0.5mm  
2. Unit is [mm]

## Servo system Current-output type

# S23P M1



RoHS

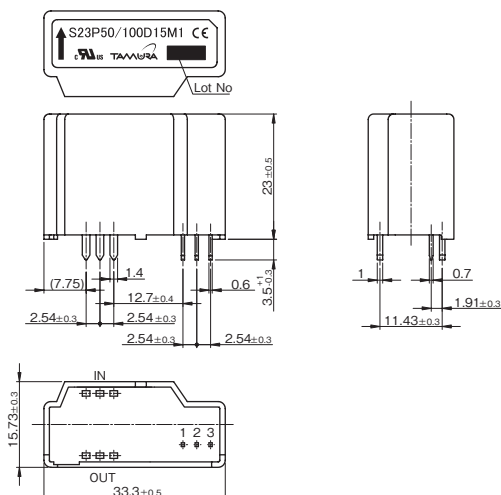
## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Types                                                  |                 | S23P50/100D15M1                                                    |             |                             |            |
|--------------------------------------------------------|-----------------|--------------------------------------------------------------------|-------------|-----------------------------|------------|
| Spec                                                   |                 |                                                                    |             |                             |            |
| Primary nominal current                                | If              | 50A                                                                |             | 100A                        |            |
| Measuring resistance<br>If= ± ADC at Ta=85℃            | RL              | Vcc= ± 12V                                                         | 20 Ω～ 145 Ω | Vcc= ± 12V                  | 20 Ω～ 57 Ω |
|                                                        |                 | Vcc= ± 15V                                                         | 48 Ω～ 205 Ω | Vcc= ± 15V                  | 48 Ω～ 85 Ω |
| Rated output current                                   | Io              | 50mA (Turn ratio 1 : 1000)                                         |             | 100mA (Turn ratio 1 : 1000) |            |
| Output current accuracy                                | XG              | Io ± 0.25% (without Iof)                                           |             |                             |            |
| Offset current                                         | Iof             | ≦± 0.3mA (at If=0A) *1                                             |             |                             |            |
| Maximum current Vcc= ± 12V<br>(Operating time: ≦ 3sec) | If max          | ± 226A (at RL=7.5 Ω)                                               |             |                             |            |
| Output linearity                                       | ε L             | ≦ ± 0.15% (at If)                                                  |             |                             |            |
| Power supply voltage                                   | Vcc             | ± 12V ± 5% ～± 15V ± 5% (Rated output current is restricted by Vcc) |             |                             |            |
| Consumption current                                    | Icc             | ≦ ± 16mA (without Io)                                              |             |                             |            |
| di/dt Response time (@90% of If)                       | tr              | ≦ 0.5μs (at di / dt = 100A/μs)                                     |             |                             |            |
| Thermal drift of gain                                  | Tclo            | ≦± 0.01%/℃ (Without Tclof)                                         |             |                             |            |
| Thermal drift of offset                                | Tclof           | ± 0.5mA type, ≦± 0.8mA max (－ 25℃～+ 85℃)                           |             |                             |            |
| Hysteresis error                                       | Ioh             | ≦ 0.3mA (at If=0A → If → 0A)                                       |             |                             |            |
| Insulation voltage                                     | Vd              | AC5000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Sacondary   |             |                             |            |
| Insulation resistance                                  | RI <sub>S</sub> | ≧ 500M Ω (at DC500V) Primary ⇔ Sacondary                           |             |                             |            |
| Ambient Operating temperature                          | T <sub>A</sub>  | － 40℃～+ 85℃                                                        |             |                             |            |
| Ambient storage temperature                            | T <sub>S</sub>  | － 40℃～+ 90℃                                                        |             |                             |            |
| Secondary coil resistance                              | Rs              | at Ta=70℃ 33 Ω                                                     |             | at Ta=85℃ 35 Ω              |            |

\* 1 Offset current value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



Terminal number

1 − Vcc  
2 + Vcc  
3 OUT

Weight:

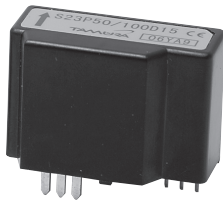
26g typ

Note

1. Unless otherwise specified, tolerances shall be ±0.5mm  
2. Unit is [mm]

## Servo system Current-output type

# S23P



RoHS

TAMURA recommends S23P50/100D15M2 as a succession model.

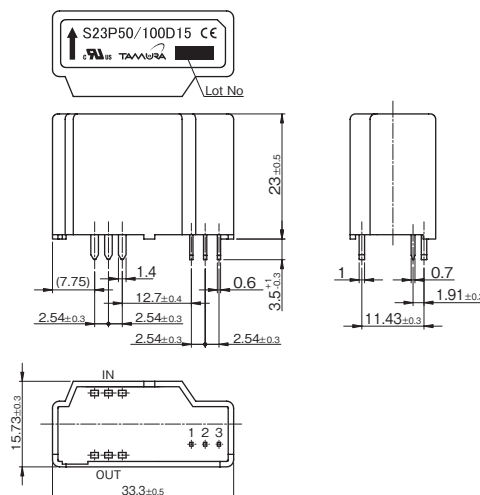
## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Types                                                   |                 | S23P50/100D15                                                       |            |                            |             |
|---------------------------------------------------------|-----------------|---------------------------------------------------------------------|------------|----------------------------|-------------|
| Spec                                                    |                 |                                                                     |            |                            |             |
| Primary nominal current                                 | If              | 50A                                                                 |            | 100A                       |             |
| Measuring resistance<br>If= ± ADC at Ta=85℃             | RL              | Vcc= ± 12V                                                          | 0 Ω~ 217 Ω | Vcc= ± 12V                 | 0 Ω~ 57 Ω   |
|                                                         |                 | Vcc= ± 15V                                                          | 0 Ω~ 327 Ω | Vcc= ± 15V                 | 45 Ω~ 114 Ω |
| Rated output current                                    | Io              | 25mA (Turn ratio 1 : 2000)                                          |            | 50mA (Turn ratio 1 : 2000) |             |
| Output current accuracy                                 | XG              | Io ± 0.25% (without Iof)                                            |            |                            |             |
| Offset current                                          | Iof             | ≒± 0.15mA (at If=0A) *1                                             |            |                            |             |
| Maximum current Vcc= ± 15V<br>(Operating time: ≦ 10sec) | If max          | ± 110A (at RL ≦ 71 Ω)                                               |            | ± 160A (at RL ≦ 25 Ω)      |             |
| Output linearity                                        | ε L             | ≒ ± 0.15% (at If)                                                   |            |                            |             |
| Power supply voltage                                    | Vcc             | ± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc) |            |                            |             |
| Consumption current                                     | Icc             | ≒ ± 16mA (without Io)                                               |            |                            |             |
| di/dt Response time (@90% of If)                        | tr              | ≒ 0.5μs (di / dt = 100A/μs)                                         |            |                            |             |
| Thermal drift of gain                                   | Tclo            | ≒± 0.01%/℃ (Without Tclof)                                          |            |                            |             |
| Thermal drift of offset                                 | Tclof           | ≒± 0.5mA max (− 25℃~+ 85℃)                                          |            |                            |             |
| Hysteresis error                                        | Ioh             | ≒ 0.3mA (at If=0A → If → 0A)                                        |            |                            |             |
| Insulation voltage                                      | Vd              | AC5000V for 1 minute (Sensing current 0.5mA) Primary ⇔ Secondary    |            |                            |             |
| Insulation resistance                                   | RI <sub>S</sub> | ≧ 500M Ω (at DC500V) Primary ⇔ Secondary                            |            |                            |             |
| Ambient Operating temperature                           | T <sub>A</sub>  | − 40℃~+ 85℃                                                         |            |                            |             |
| Ambient storage temperature                             | T <sub>S</sub>  | − 40℃~+ 90℃                                                         |            |                            |             |
| Secondary coil resistance                               | Rs              | at Ta=70℃ 115 Ω at Ta=85℃ 121 Ω                                     |            |                            |             |

\* 1 Offset current value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



Terminal number

- 1 − Vcc
- 2 + Vcc
- 3 OUT

Weight:

26g typ

Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm
- 2. Unit is [mm]



Servo system / Voltage-output type External magnetic field improvement type

# S22P M2 SERIES



RoHS

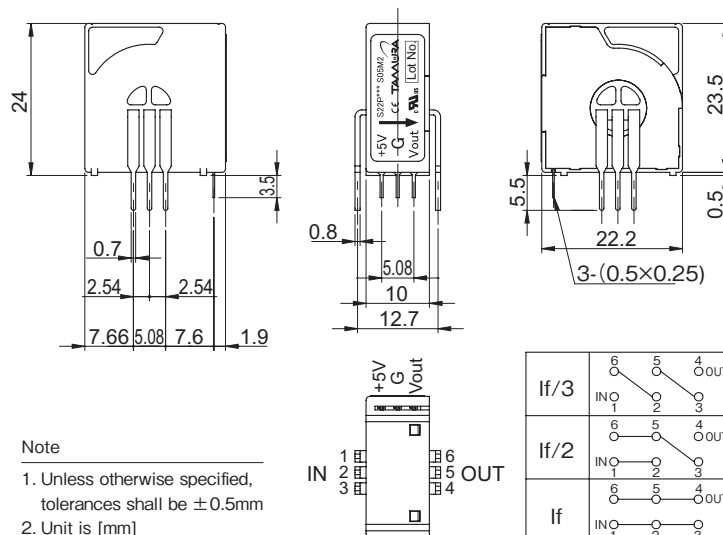
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

| Spec                             | Types  | S22P006S05M2                                                     | S22P015S05M2                                           | S22P025S05M2                                           |
|----------------------------------|--------|------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|
| Primary nominal current          | If     | 6A                                                               | 15A                                                    | 25A                                                    |
| Saturation current               | If max | ± 18A                                                            | ± 45A                                                  | ± 75A                                                  |
| Rated output voltage             | Vo     | Vof ± 0.625V (at If)                                             |                                                        |                                                        |
| Output voltage accuracy          | XG     | 0.625V ± 0.010V (at If)                                          |                                                        |                                                        |
| Offset voltage*1                 | Vof    | 2.5V ± 0.050V (at If = 0A)                                       | 2.5V ± 0.020V (at If = 0A)                             | 2.5V ± 0.015V (at If = 0A)                             |
| Output linearity                 | εL     | ± 0.2% (at If)                                                   |                                                        |                                                        |
| Power supply voltage             | Vcc    | + 5V ± 5%                                                        |                                                        |                                                        |
| Consumption current              | Icc    | Typ. 12.5mA (If=0A) + 37.5mA (If max)                            |                                                        |                                                        |
| di/dt Response time (@90% of If) | tr     | ≤ 1μs (at di / dt = If / μs)                                     |                                                        |                                                        |
| Thermal drift of gain            | TcVo   | ≤ ± 0.05mV / °C (Without TcVof)                                  |                                                        |                                                        |
| Thermal drift of offset          | TcVof  | − 10 ~ 25°C : ± 1.6mV / °C<br>25 ~ 85°C : ± 0.8mV / °C           | − 10 ~ 25°C : ± 0.6mV / °C<br>25 ~ 85°C : ± 0.3mV / °C | − 10 ~ 25°C : ± 0.4mV / °C<br>25 ~ 85°C : ± 0.2mV / °C |
| Hysteresis error                 | V0H    | ≤ 0.5mV (at If = 0A → If → 0A)                                   |                                                        |                                                        |
| Insulation voltage               | Vd     | AC3000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary |                                                        |                                                        |
| Insulation resistance            | RIS    | ≥ 500MΩ (at DC500V) Primary ↔ Secondary                          |                                                        |                                                        |
| Ambient Operating temperature    | TA     | − 10°C ~ + 85°C                                                  |                                                        |                                                        |
| Ambient storage temperature      | TS     | − 25°C ~ + 100°C                                                 |                                                        |                                                        |

\* 1 Offset voltage value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



Servo system / Voltage-output type / Short lead model

# S22P P SERIES



RoHS

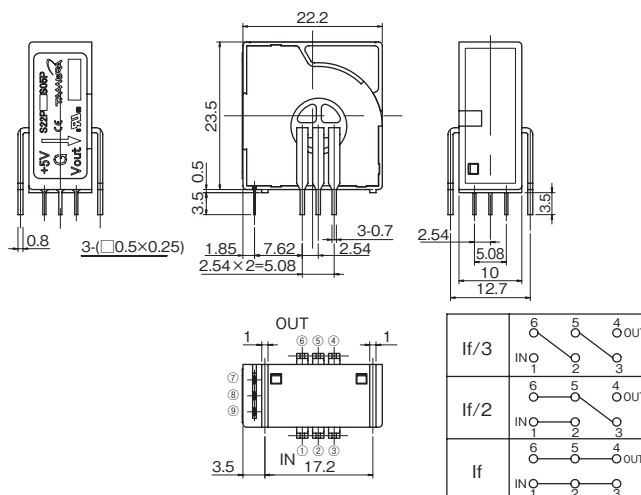
## SPECIFICATIONS

Ta=25°C, RL=10kΩ, Vcc=+5V

| Spec                               | Types  | S22P006S05P                                                      | S22P015S05P                                            | S22P025S05P                                            |
|------------------------------------|--------|------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|
| Primary nominal current            | If     | 6A                                                               | 15A                                                    | 25A                                                    |
| Saturation current                 | If max | ± 18A                                                            | ± 45A                                                  | ± 75A                                                  |
| Rated output voltage               | Vo     | Vof ± 0.625V (at If)                                             |                                                        |                                                        |
| Output voltage accuracy            | XG     | 0.625V ± 0.010V (at If)                                          |                                                        |                                                        |
| Offset voltage * 1                 | Vof    | 2.5V ± 0.050V (at If = 0 A)                                      | 2.5V ± 0.020V (at If = 0 A)                            | 2.5V ± 0.015V (at If = 0 A)                            |
| Output linearity                   | εL     | ≤ ± 0.2% (at If)                                                 |                                                        |                                                        |
| Power supply voltage               | Vcc    | + 5V ± 5%                                                        |                                                        |                                                        |
| Consumption current                | Icc    | Typ.12.5mA (If=0A) + 37.5mA (If max)                             |                                                        |                                                        |
| di / dt Response time (@90% of If) | tr     | ≤ 1μs (di/dt = If / μs)                                          |                                                        |                                                        |
| Thermal drift of gain              | TcVo   | ≤ ± 0.05mV / °C (Without TcVof)                                  |                                                        |                                                        |
| Thermal drift of offset            | TcVof  | - 10 ~ 25°C : ± 1.6mV / °C<br>25 ~ 85°C : ± 0.8mV / °C           | - 10 ~ 25°C : ± 0.6mV / °C<br>25 ~ 85°C : ± 0.3mV / °C | - 10 ~ 25°C : ± 0.4mV / °C<br>25 ~ 85°C : ± 0.2mV / °C |
| Hysteresis error                   | Voh    | ≤ 0.5mV (at If = 0A → If → 0A)                                   |                                                        |                                                        |
| Insulation voltage                 | Vd     | AC3000V for 1 minute (Sensing current 0.5mA) Primary ↔ Secondary |                                                        |                                                        |
| Insulation resistance              | Ris    | ≥ 500M Ω (at DC500V) Primary ↔ Secondary                         |                                                        |                                                        |
| Ambient Operating temperature      | TA     | - 10°C ~ + 85°C                                                  |                                                        |                                                        |
| Ambient storage temperature        | TS     | - 25°C ~ + 100°C                                                 |                                                        |                                                        |

\* 1 Offset voltage value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



### Terminal number

- ① IN-1
- ② IN-2
- ③ IN-3
- ④ OUT-3
- ⑤ OUT-2
- ⑥ OUT-1
- ⑦ Vout
- ⑧ GND
- ⑨ + Vcc ( + 5V)

### Weight:

8g typ

### Note

- 1. Unless otherwise specified, tolerances shall be ± 0.5mm
- 2. Unit is [mm]

## Servo system / Current-output type

# S21S SERIES



RoHS

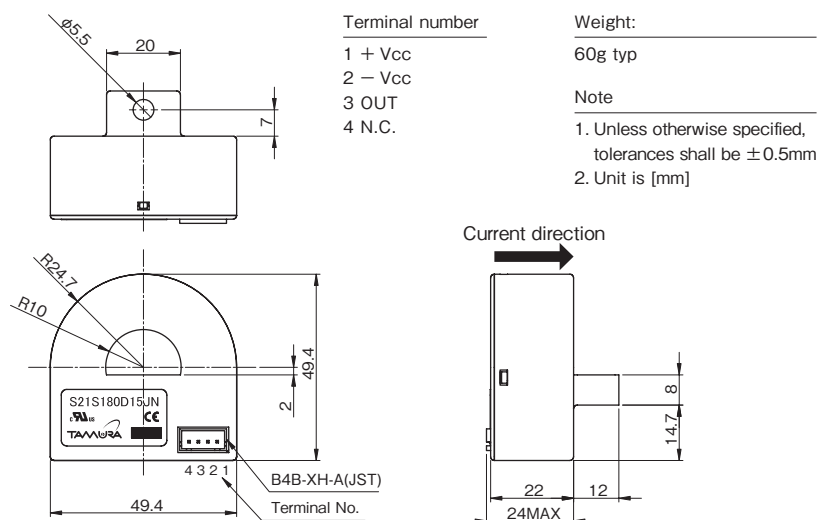
## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Spec                                          | Types              | S21S180D15JN                                                                          |
|-----------------------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Primary nominal current                       | If                 | 180A                                                                                  |
| Measuring Resistance (at 80°C)                | R <sub>L</sub>     | 0 ~ 68 Ω (at Vcc= ± 12V) 0 ~ 100 Ω (at Vcc= ± 15V)                                    |
| Rated output Current                          | I <sub>o</sub>     | 45mA (Turn Ratio: 1:4000)                                                             |
| Output Current Accuracy                       | X <sub>G</sub>     | I <sub>o</sub> ± 1% (at I <sub>f</sub> without I <sub>of</sub> )                      |
| Offset Current                                | I <sub>of</sub>    | ≤ ± 0.2mA (at I <sub>f</sub> =0A) *1                                                  |
| Maximum Current                               | I <sub>f</sub> max | ± 540A (TA=25°C, at 5 ≤ R <sub>M</sub> ≤ 30 Ω; at TA=80°C, 5 ≤ R <sub>M</sub> ≤ 20 Ω) |
| Output Linearity                              | ε <sub>L</sub>     | ≤ ± 0.3% (at I <sub>f</sub> )                                                         |
| Power supply voltage                          | Vcc                | ± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc)                   |
| Consumption Current                           | I <sub>cc</sub>    | ≤ ± 16mA (without I <sub>o</sub> )                                                    |
| di/dt Response Time (@90% of I <sub>f</sub> ) | tr                 | ≤ 1μs (at di/dt=100A/μs)                                                              |
| Thermal drift of gain                         | TC <sub>Lo</sub>   | ≤ ± 0.02%/°C (without TC <sub>LoF</sub> )                                             |
| Thermal drift of offset                       | TC <sub>LoF</sub>  | ≤ ± 0.01mA/°C                                                                         |
| Hysteresis error                              | I <sub>oH</sub>    | ≤ 0.2mA (at I <sub>f</sub> = 0A → I <sub>f</sub> → 0A)                                |
| Insulation voltage                            | V <sub>d</sub>     | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal        |
| Insulation resistance                         | R <sub>IS</sub>    | ≥ 500M Ω (at DC500V) inside of through hole ⇔ terminal                                |
| Ambient Operating temperature                 | T <sub>A</sub>     | - 30°C ~ + 80°C                                                                       |
| Ambient storage temperature                   | T <sub>S</sub>     | - 40°C ~ + 85°C                                                                       |
| Secondary coil resistance                     | R <sub>s</sub>     | 48 Ω (at TA=25°C), 60 Ω (at TA=80°C)                                                  |

\* 1 Offset current value is after removal of core hysteresis. \* Please refer to the another sheet about conditions of UL Recognition.

## DIMENSIONS (mm)



## Servo system Current-output type

# S20S M1 SERIES



RoHS

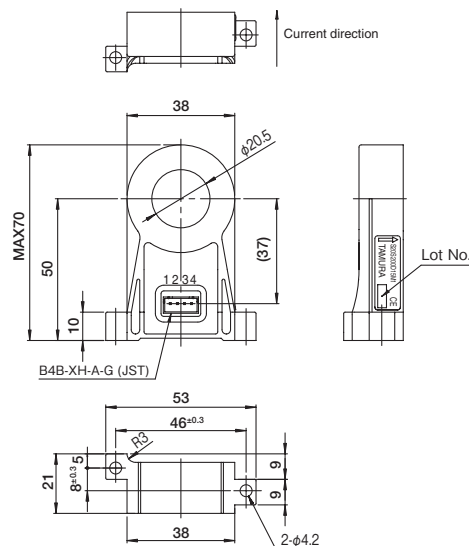
## SPECIFICATIONS

Ta=25°C, Vcc=±15V

| Spec                                 |        | Types                                                                          | S20S200D15M1 |                              |            |  |
|--------------------------------------|--------|--------------------------------------------------------------------------------|--------------|------------------------------|------------|--|
| Primary nominal current              | If     | 200AT                                                                          |              | 300AT                        |            |  |
| Measuring resistance                 | RL     | Vcc= ± 12V                                                                     | 5 Ω~ 35 Ω    | Vcc= ± 12V                   | 9 Ω~ 13 Ω  |  |
|                                      |        | Vcc= ± 15V                                                                     | 25 Ω~ 65 Ω   | Vcc= ± 15V                   | 29 Ω~ 33 Ω |  |
| Rated output current                 | Io     | 100mA (Turn Ratio: 1 : 2000)                                                   |              | 150mA (Turn Ratio: 1 : 2000) |            |  |
| Output current accuracy              | XG     | Io ± 1% (without Iof)                                                          |              |                              |            |  |
| Offset current * 1                   | Iof    | ≦ ± 0.5mA (at If=0A)                                                           |              |                              |            |  |
| Maximum current @ Vcc ± 15VDC&Ta=70℃ | If max | ± 300AT (at RL=30 Ω)                                                           |              |                              |            |  |
| Output linearity                     | εL     | ≦ ± 0.25% (at If)                                                              |              |                              |            |  |
| Power supply voltage                 | Vcc    | ± 12V ± 5% ~ ± 15V ± 5% (Rated output current is restricted by Vcc)            |              |                              |            |  |
| Consumption current                  | Icc    | ≦ ± 16mA (without Io)                                                          |              |                              |            |  |
| di/dt Response time                  | tr     | ≦ 1μs (di / dt = If/μs)                                                        |              |                              |            |  |
| Frequency characteristics @- 1dB     | f      | DC…150kHz                                                                      |              |                              |            |  |
| Thermal drift of gain                | Tclo   | ≦ ± 0.02%/℃ (Without Tc Iof) ( - 5℃~+ 70℃)                                     |              |                              |            |  |
| Thermal drift of offset              | Tclof  | ≦ ± 0.012mA/℃ ( - 5℃~+ 70℃)                                                    |              |                              |            |  |
| Hysteresis error                     | Ioh    | ≦ 0.3mA (at If = 0A → If → 0A)                                                 |              |                              |            |  |
| Insulation voltage                   | Vd     | AC2500V for 1 minute (Sensing current 0.5mA) inside of through hole ⇔ terminal |              |                              |            |  |
| Insulation resistance                | RIS    | ≧ 500M Ω (at DC500V) inside of through hole ⇔ terminal                         |              |                              |            |  |
| Ambient Operating temperature        | TA     | - 20℃~+ 70℃                                                                    |              |                              |            |  |
| Ambient storage temperature          | TS     | - 20℃~+ 85℃                                                                    |              |                              |            |  |
| Secondary coil resistance            | Rs     | 33 Ω @ Ta=70℃                                                                  |              |                              |            |  |

\* 1 Offset current value is after removal of core hysteresis.

## DIMENSIONS (mm)



Terminal number

- 1 + Vcc
- 2 - Vcc
- 3 OUT
- 4 NC

Weight:

46g typ

Note

- 1. Unless otherwise specified, tolerances shall be ±0.5mm



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