

Preliminary



**BTA12-600B**

UL : E228720

## Bi-Directional Triode Thyristor

### Features

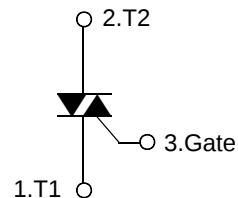
- ◆ Repetitive Peak Off-State Voltage : 600V
- ◆ R.M.S On-State Current (  $I_{T(RMS)} = 12\text{ A}$  )
- ◆ High Commutation  $dv/dt$
- ◆ Isolation Voltage (  $V_{ISO} = 1500\text{V AC}$  )

### General Description

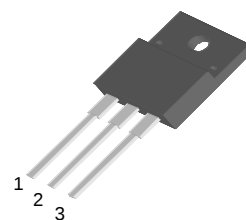
This device is fully isolated package suitable for AC switching application, phase control application such as fan speed and temperature modulation control, lighting control and static switching relay.

This device is approved to comply with applicable requirements by Underwriters Laboratories Inc.

Symbol



TO-220F



### Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$ unless otherwise specified )

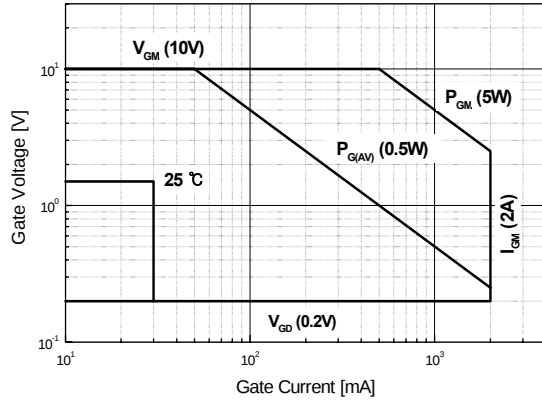
| Symbol       | Parameter                           | Condition                                  | Ratings    | Units                |
|--------------|-------------------------------------|--------------------------------------------|------------|----------------------|
| $V_{DRM}$    | Repetitive Peak Off-State Voltage   |                                            | 600        | V                    |
| $I_{T(RMS)}$ | R.M.S On-State Current              | $T_C = 79^\circ\text{C}$                   | 12         | A                    |
| $I_{TSM}$    | Surge On-State Current              | One Cycle, 50Hz/60Hz, Peak, Non-Repetitive | 119/130    | A                    |
| $I_t^2$      | $I_t^2$                             |                                            | 71         | $\text{A}^2\text{s}$ |
| $P_{GM}$     | Peak Gate Power Dissipation         |                                            | 5.0        | W                    |
| $P_{G(AV)}$  | Average Gate Power Dissipation      |                                            | 0.5        | W                    |
| $I_{GM}$     | Peak Gate Current                   |                                            | 2.0        | A                    |
| $V_{GM}$     | Peak Gate Voltage                   |                                            | 10         | V                    |
| $V_{ISO}$    | Isolation Breakdown Voltage(R.M.S.) | A.C. 1 minute                              | 1500       | V                    |
| $T_J$        | Operating Junction Temperature      |                                            | - 40 ~ 125 | $^\circ\text{C}$     |
| $T_{STG}$    | Storage Temperature                 |                                            | - 40 ~ 150 | $^\circ\text{C}$     |
|              | Mass                                |                                            | 2.0        | g                    |

# BTA12-600B

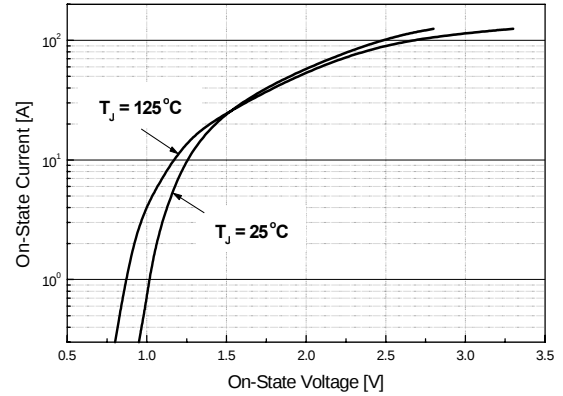
## Electrical Characteristics

| Symbol                        | Items                                                  |                      | Conditions                                                                                         | Ratings |      |      | Unit             |
|-------------------------------|--------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------|---------|------|------|------------------|
|                               |                                                        |                      |                                                                                                    | Min.    | Typ. | Max. |                  |
| I <sub>DRM</sub>              | Repetitive Peak Off-State Current                      |                      | V <sub>D</sub> = V <sub>DRM</sub> ; Single Phase, Half Wave<br>T <sub>J</sub> = 125 °C             | —       | —    | 2.0  | mA               |
| V <sub>TM</sub>               | Peak On-State Voltage                                  |                      | I <sub>T</sub> = 20 A, Inst. Measurement                                                           | —       | —    | 1.4  | V                |
| I <sup>+</sup> <sub>GT1</sub> | I                                                      | Gate Trigger Current | V <sub>D</sub> = 6 V, R <sub>L</sub> =10 Ω                                                         | —       | —    | 30   | mA               |
| I <sup>-</sup> <sub>GT1</sub> | II                                                     |                      |                                                                                                    | —       | —    | 30   |                  |
| I <sup>-</sup> <sub>GT3</sub> | III                                                    |                      |                                                                                                    | —       | —    | 30   |                  |
| V <sup>+</sup> <sub>GT1</sub> | I                                                      | Gate Trigger Voltage | V <sub>D</sub> = 6 V, R <sub>L</sub> =10 Ω                                                         | —       | —    | 1.5  | V                |
| V <sub>GT1</sub>              | II                                                     |                      |                                                                                                    | —       | —    | 1.5  |                  |
| V <sub>GT3</sub>              | III                                                    |                      |                                                                                                    | —       | —    | 1.5  |                  |
| V <sub>GD</sub>               | Non-Trigger Gate Voltage                               |                      | T <sub>J</sub> = 125 °C, V <sub>D</sub> = 1/2 V <sub>DRM</sub>                                     | 0.2     | —    | —    | V                |
| (dv/dt) <sub>c</sub>          | Critical Rate of Rise Off-State Voltage at Commutation |                      | T <sub>J</sub> = 125 °C, [di/dt] <sub>c</sub> = -6.0 A/ms,<br>V <sub>D</sub> =2/3 V <sub>DRM</sub> | 10      | —    | —    | V/ <sub>μs</sub> |
| I <sub>H</sub>                | Holding Current                                        |                      |                                                                                                    | —       | 20   | —    | mA               |
| R <sub>th(j-c)</sub>          | Thermal Impedance                                      |                      | Junction to case                                                                                   | —       | —    | 3.3  | °C/W             |

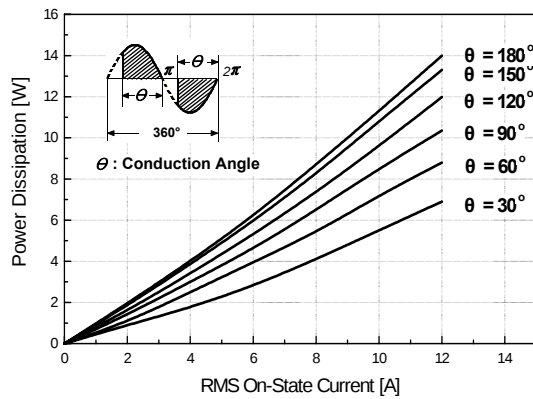
**Fig 1. Gate Characteristics**



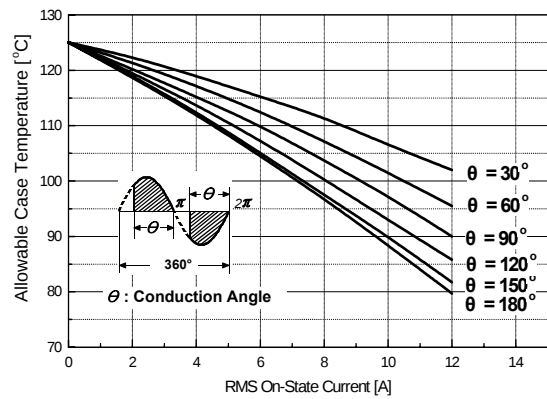
**Fig 2. On-State Voltage**



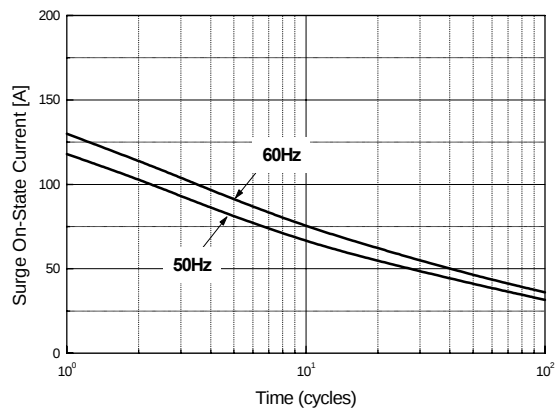
**Fig 3. On State Current vs. Maximum Power Dissipation**



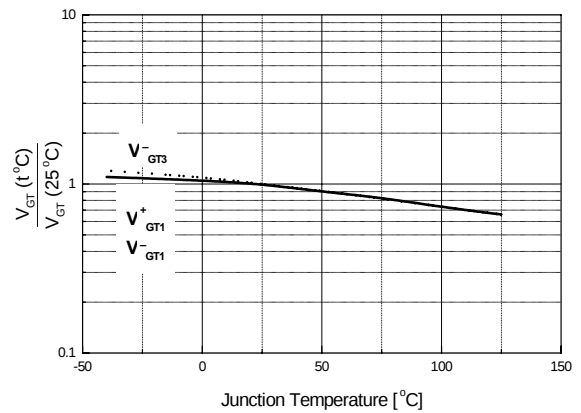
**Fig 4. On State Current vs. Allowable Case Temperature**



**Fig 5. Surge On-State Current Rating ( Non-Repetitive )**

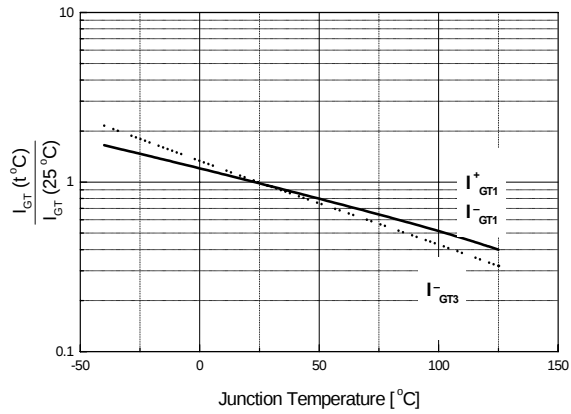


**Fig 6. Gate Trigger Voltage vs. Junction Temperature**

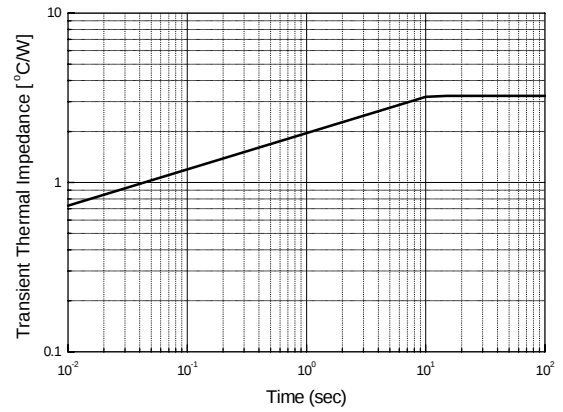


# BTA12-600B

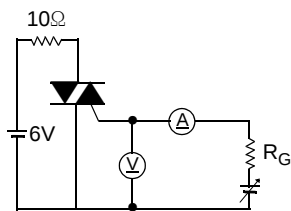
**Fig 7. Gate Trigger Current vs. Junction Temperature**



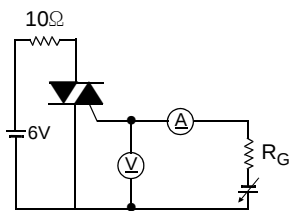
**Fig 8. Transient Thermal Impedance**



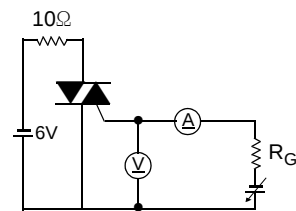
**Fig 9. Gate Trigger Characteristics Test Circuit**



Test Procedure I



Test Procedure II

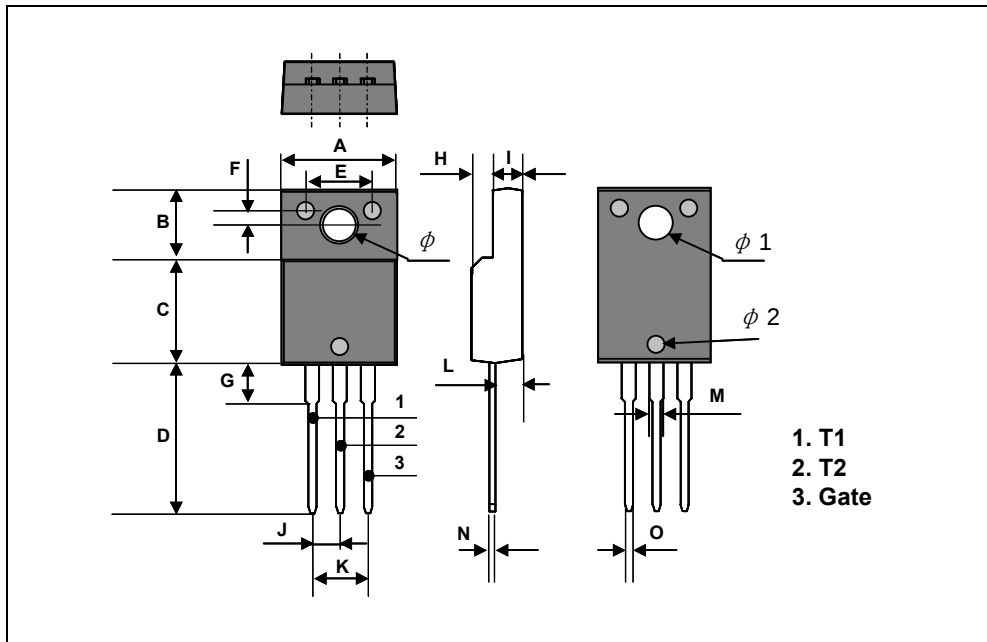


Test Procedure III

# BTA12-600B

## TO-220F Package Dimension

| Dim.     | mm    |      |       | Inch  |       |       |
|----------|-------|------|-------|-------|-------|-------|
|          | Min.  | Typ. | Max.  | Min.  | Typ.  | Max.  |
| A        | 10.4  |      | 10.6  | 0.409 |       | 0.417 |
| B        | 6.18  |      | 6.44  | 0.243 |       | 0.254 |
| C        | 9.55  |      | 9.81  | 0.376 |       | 0.386 |
| D        | 13.47 |      | 13.73 | 0.530 |       | 0.540 |
| E        | 6.05  |      | 6.15  | 0.238 |       | 0.242 |
| F        | 1.26  |      | 1.36  | 0.050 |       | 0.054 |
| G        | 3.17  |      | 3.43  | 0.125 |       | 0.135 |
| H        | 1.87  |      | 2.13  | 0.074 |       | 0.084 |
| I        | 2.57  |      | 2.83  | 0.101 |       | 0.111 |
| J        |       | 2.54 |       |       | 0.100 |       |
| K        |       | 5.08 |       |       | 0.200 |       |
| L        | 2.51  |      | 2.62  | 0.099 |       | 0.103 |
| M        | 1.25  |      | 1.55  | 0.049 |       | 0.061 |
| N        | 0.45  |      | 0.63  | 0.018 |       | 0.025 |
| O        | 0.6   |      | 1.0   | 0.024 |       | 0.039 |
| $\phi$   |       | 3.7  |       |       | 0.146 |       |
| $\phi 1$ |       | 3.2  |       |       | 0.126 |       |
| $\phi 2$ |       | 1.5  |       |       | 0.059 |       |



# BTA12-600B

## TO-220F Package Dimension, Forming

| Dim.     | mm   |      |      | Inch  |       |       |
|----------|------|------|------|-------|-------|-------|
|          | Min. | Typ. | Max. | Min.  | Typ.  | Max.  |
| A        | 10.4 |      | 10.6 | 0.409 |       | 0.417 |
| B        | 6.18 |      | 6.44 | 0.243 |       | 0.254 |
| C        | 9.55 |      | 9.81 | 0.376 |       | 0.386 |
| D        | 8.4  |      | 8.66 | 0.331 |       | 0.341 |
| E        | 6.05 |      | 6.15 | 0.238 |       | 0.242 |
| F        | 1.26 |      | 1.36 | 0.050 |       | 0.054 |
| G        | 3.17 |      | 3.43 | 0.125 |       | 0.135 |
| H        | 1.87 |      | 2.13 | 0.074 |       | 0.084 |
| I        | 2.57 |      | 2.83 | 0.101 |       | 0.111 |
| J        |      | 2.54 |      |       | 0.100 |       |
| K        |      | 5.08 |      |       | 0.200 |       |
| L        | 2.51 |      | 2.62 | 0.099 |       | 0.103 |
| M        | 1.25 |      | 1.55 | 0.049 |       | 0.061 |
| N        | 0.45 |      | 0.63 | 0.018 |       | 0.025 |
| O        | 0.6  |      | 1.0  | 0.024 |       | 0.039 |
| P        |      | 5.0  |      |       | 0.197 |       |
| $\phi$   |      | 3.7  |      |       | 0.146 |       |
| $\phi 1$ |      | 3.2  |      |       | 0.126 |       |
| $\phi 2$ |      | 1.5  |      |       | 0.059 |       |

