



CAN-Transceiver

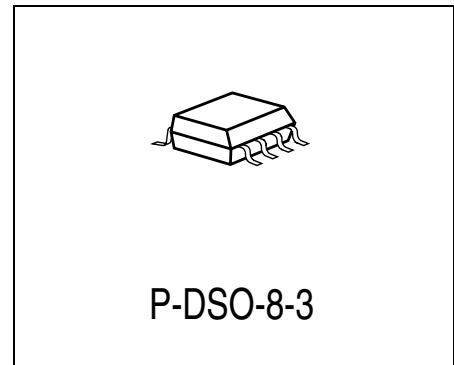
TLE 6250

TLE 6250 V33

Final Data Sheet

Features

- CAN data transmission rate up to 1 MBaud
- Suitable for 12 V and 24 V applications
- Excellent EMC performance (very high immunity and very low emission)
- Version for 5 V and 3.3 V micro controllers
- Bus pins are short circuit proof to ground and battery voltage
- Over-temperature protection
- Very wide temperature range (- 40°C up to 150°C)



| Type | Ordering Code | Package |
|----------------|---------------|-----------|
| TLE 6250 G | Q67006-A9427 | P-DSO-8-3 |
| TLE 6250 C | Q67000-A9594 | (chip) |
| TLE 6250 G V33 | Q67006-A9523 | P-DSO-8-3 |
| TLE 6250 C V33 | Q67000-A9538 | (chip) |

Description

The CAN-transceiver TLE 6250 is a monolithic integrated circuit that is available as bare die as well as in a P-DSO-8-3 package. The IC is optimized for high speed differential mode data transmission in automotive and industrial applications and is compatible to ISO/DIS 11898 (see page 12 and 20). It works as an interface between the CAN protocol controller and the physical differential bus in both, 12 V and 24 V systems.

Note:

There are two versions available: one for 5 V logic and the other one for 3.3 V logic requiring additional supply via the V_{33V} pin. The IC can be set to stand-by mode via an control input. In addition the 5 V-version offers a receive only mode feature to support diagnostic functions.

The IC is based on the **Smart Power Technology SPT®** which allows bipolar and CMOS control circuitry in accordance with DMOS power devices existing on the same monolithic circuit. The TLE 6250 is designed to withstand the severe conditions of automotive applications and provides excellent EMC performance.

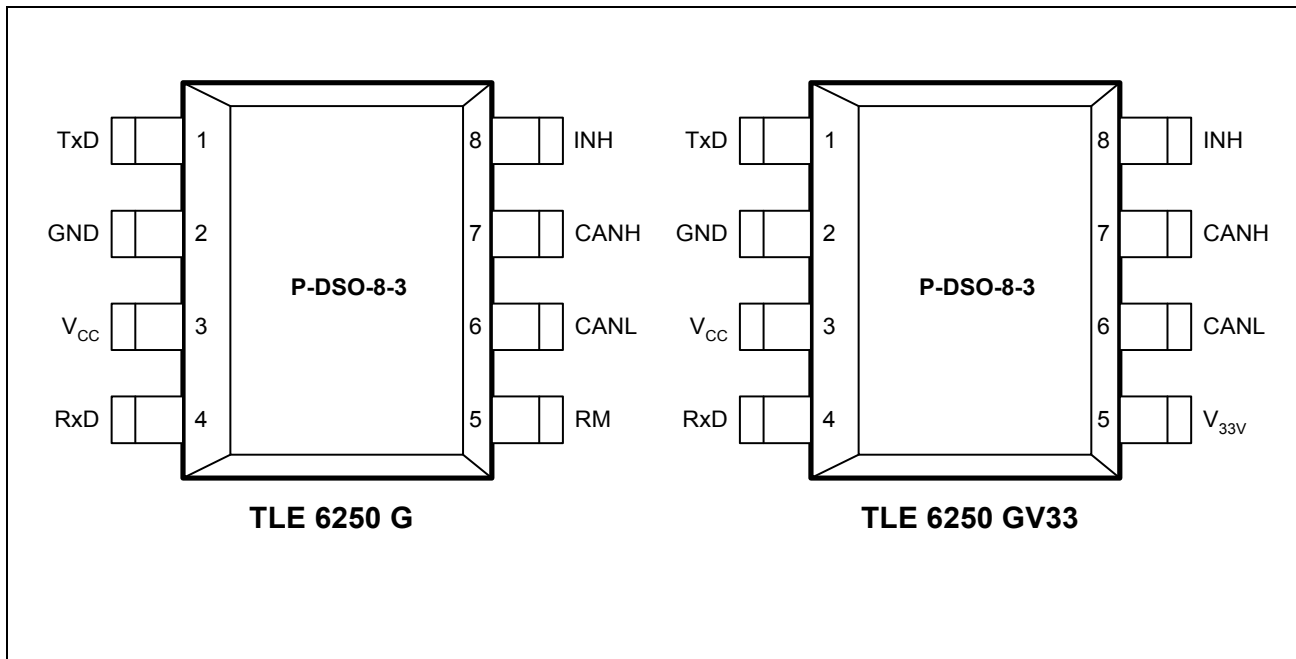


Figure 1 Pin Configuration (top view)

Pin Definitions and Functions

| Pin No. | Symbol | Function |
|---------|------------------|--|
| 1 | TxD | CAN transmit data input; 20 k Ω pull up, LOW in dominant state |
| 2 | GND | Ground; |
| 3 | V _{CC} | 5 V Supply; |
| 4 | RxD | CAN receive data output; LOW in dominant state, integrated pull up |
| 5 | RM | Receive-only input; (5 V-version), 20 k Ω pull up, set low to activate RxD-only mode |
| | V _{33V} | Logic supply; (3.3 V-version) <u>3.3 V OR 5V</u> microcontroller logic supply can be connected here! The digital I/Os of the TLE6250V33 adopt to the connected microcontroller logic supply at V _{33V} |
| 6 | CANL | Low line input; LOW in dominant state |
| 7 | CANH | High line output; HIGH in dominant state |
| 8 | INH | Control input; 20 k Ω pull, set LOW for normal mode |

Functional Block Diagram

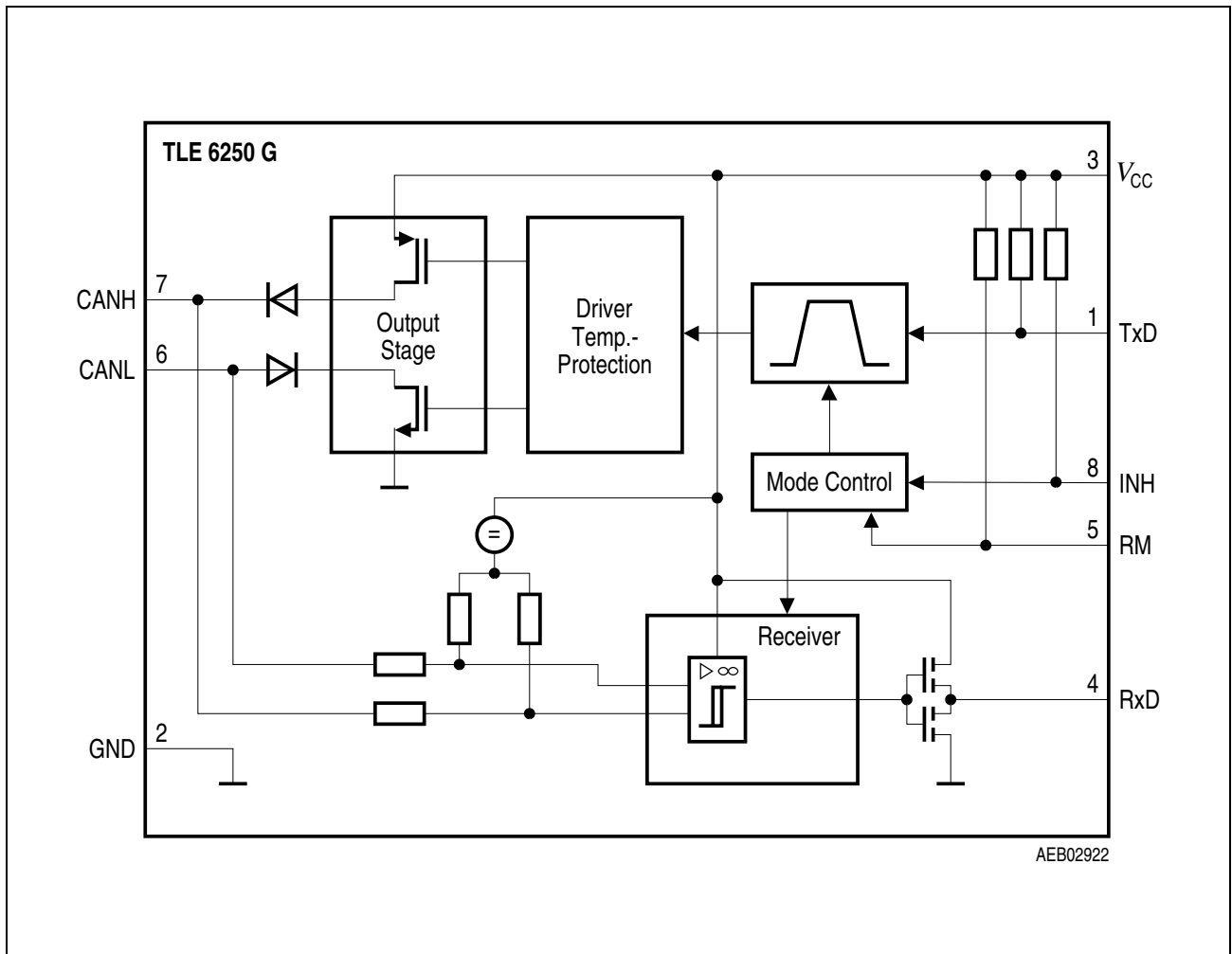


Figure 2 **Block Diagram TLE 6250 G**

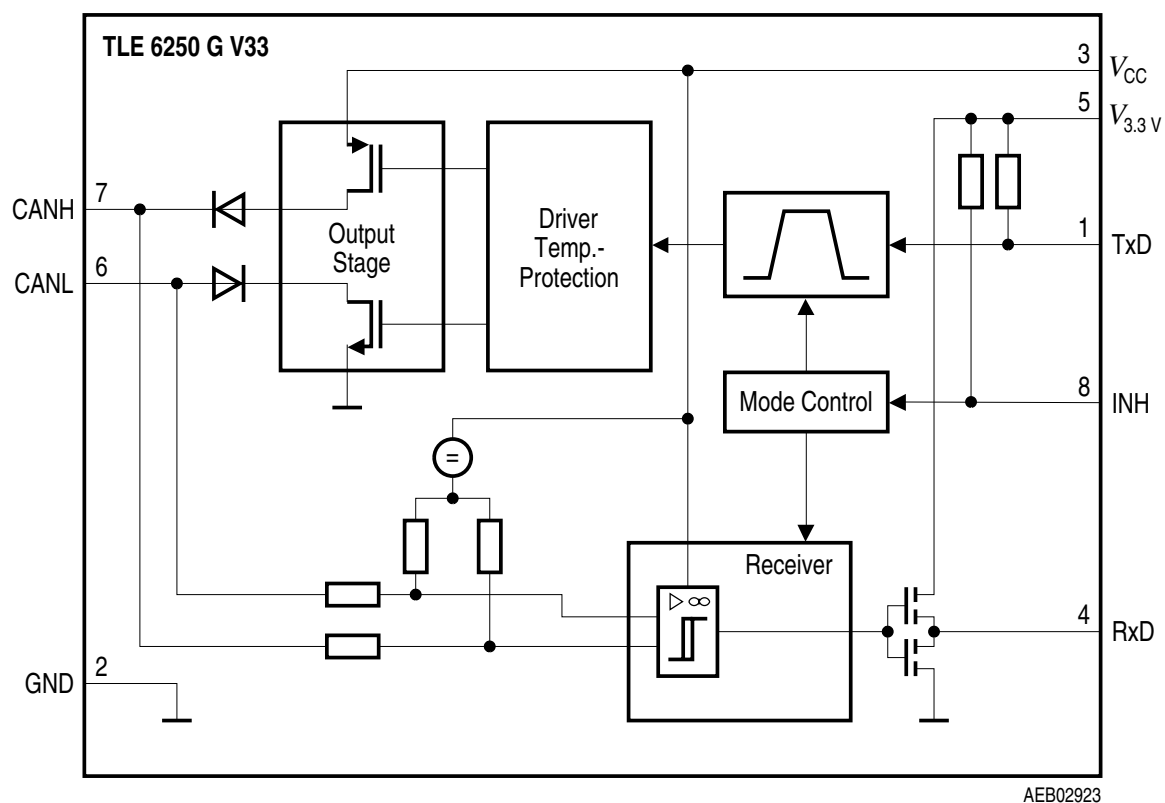


Figure 3 **Block Diagram TLE 6250 G V33**

Application Information

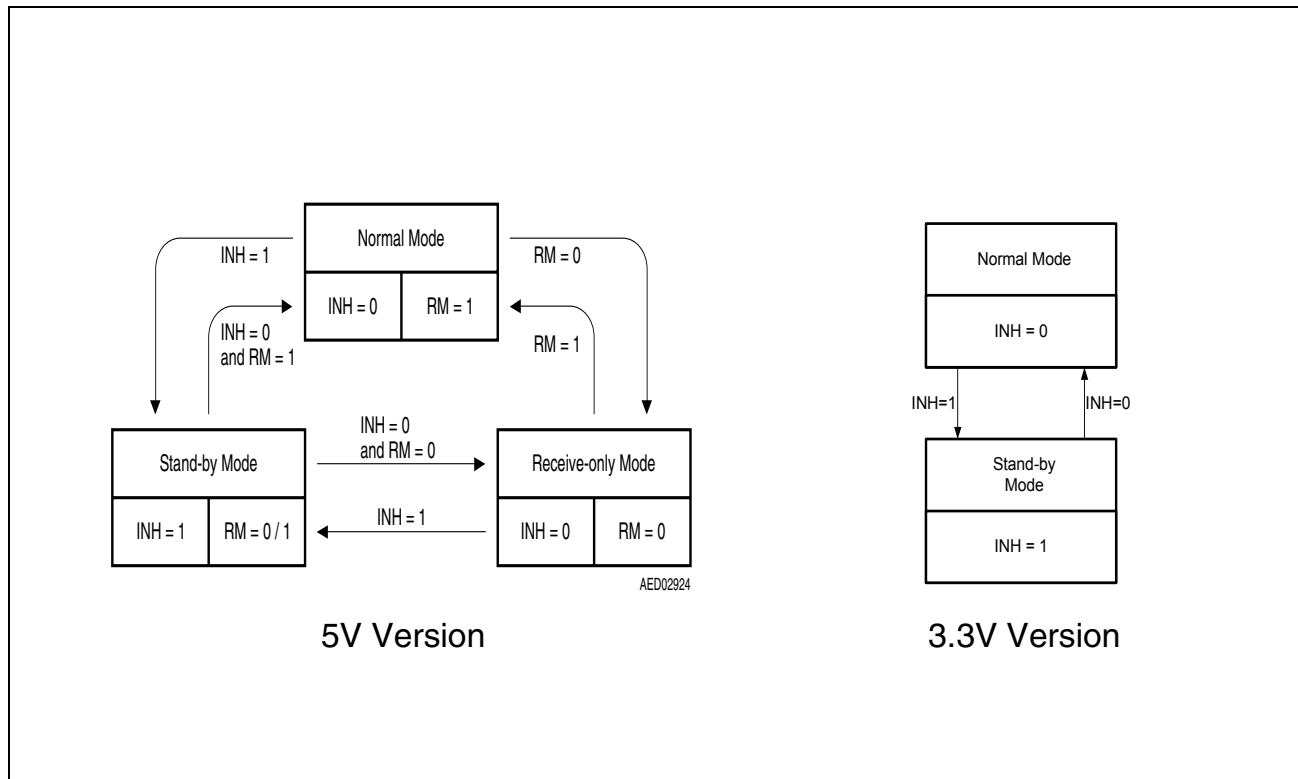
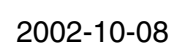


Figure 4 Mode State Diagram

Both, the TLE 6250 G as well as the TLE 6250 C offer three different operation modes (see **Figure 4**), controlled by the INH and RM pin for the TLE6250 and only by the INH pin for the 6250 V33. In the normal mode the device is able to receive and to transmit messages whereas in the receive-only mode signals at the TxD input are not transmitted to the CAN bus. The receive-only mode can be used for diagnostic purposes as well as to prevent the bus being blocked by a faulty permanent dominant TxD input signal. The stand-by mode is a low power mode that disables both, the receiver as well as the transmitter. For the TLE 6250 G V33 and TLE 6250 C V33 the receive only mode feature is not available. The inhibit feature for this versions works in the same way as for the 5V versions.

In case the receive-only feature is not used the RM pin has to be left open. When the stand-by mode is not used the INH pin has to be connected to ground level in order to switch the TLE 6250 in normal mode.

The TLE 6250V33 can be used for both; 3.3V and 5V microcontroller logic supply as shown below. Don't apply external resistors between the power supply and this pin. This may cause a voltage drop and so reduce the available voltage at this pin.



Electrical Characteristics TLE6250 G (5V Version)

Electrical Characteristics

Absolute Maximum Ratings

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|-----------|--------|--------------|------|------|---------|
| | | min. | max. | | |

Voltages

| | | | | | |
|--|--------------|-------|----------|----|---|
| Supply voltage | V_{CC} | - 0.3 | 6.5 | V | – |
| CAN input voltage (CANH, CANL) | $V_{CANH/L}$ | - 40 | 40 | V | – |
| Logic voltages at INH, RM, TxD, RxD | V_I | - 0.3 | V_{CC} | V | $0\text{ V} < V_{CC} < 5.5\text{ V}$ |
| Electrostatic discharge voltage at CANH,CANL | V_{ESD} | - 6 | 6 | kV | human body model (100 pF via 1.5 k Ω) |
| Electrostatic discharge voltage | V_{ESD} | - 2 | 2 | kV | human body model (100 pF via 1.5 k Ω) |

Temperatures

| | | | | | |
|----------------------|-------|------|-----|----|---|
| Junction temperature | T_j | - 40 | 160 | °C | – |
|----------------------|-------|------|-----|----|---|

Note: Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.

Operating Range

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|----------------------|----------|--------------|------|------|---------|
| | | min. | max. | | |
| Supply voltage | V_{CC} | 4.5 | 5.5 | V | – |
| Junction temperature | T_j | – 40 | 150 | °C | – |

Thermal Resistances

| | | | | | |
|------------------|-------------|---|-----|-----|---|
| Junction ambient | R_{thj-a} | – | 185 | K/W | – |
|------------------|-------------|---|-----|-----|---|

Thermal Shutdown (junction temperature)

| | | | | | |
|------------------------------|-----------|-----|-----|----|------------------|
| Thermal shutdown temperature | T_{jsD} | 160 | 200 | °C | 10 °C hysteresis |
|------------------------------|-----------|-----|-----|----|------------------|

Electrical Characteristics

$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; $R_L = 60\ \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Current Consumption

| | | | | | | |
|---------------------|--------------|---|----|----|---------------|---|
| Current consumption | I_{CC} | – | 6 | 10 | mA | recessive state; $V_{TxD} = V_{CC}$ |
| Current consumption | I_{CC} | – | 45 | 70 | mA | dominant state; $V_{TxD} = 0\text{ V}$ |
| Current consumption | I_{CC} | – | 6 | 10 | mA | receive-only mode; RM = low |
| Current consumption | $I_{CC,stb}$ | – | 1 | 10 | μA | stand-by mode; TxD = RM = high |

Receiver Output RxD

| | | | | | | |
|---------------------------|------------|---|----|----|----|--|
| HIGH level output current | $I_{RD,H}$ | – | -4 | -2 | mA | $V_{RD} = 0.8 \times V_{CC}$, $V_{diff} < 0.4\text{ V}^{(\text{note } 1)}$ |
| LOW level output current | $I_{RD,L}$ | 2 | 4 | – | mA | $V_{RD} = 0.2 \times V_{CC}$, $V_{diff} > 1\text{ V}^{(\text{note } 1)}$ |

Transmission Input TxD

| | | | | | | |
|------------------------------------|------------|---------------------|---------------------|---------------------|------------|------------------|
| HIGH level input voltage threshold | $V_{TD,H}$ | – | $0.5 \times V_{CC}$ | $0.7 \times V_{CC}$ | V | recessive state; |
| LOW level input voltage threshold | $V_{TD,L}$ | $0.3 \times V_{CC}$ | $0.4 \times V_{CC}$ | – | V | dominant state |
| TxD pull up resistance | R_{TD} | 10 | 25 | 50 | k Ω | – |

note1) $V_{diff} = V_{CANH} - V_{CANL}$

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Inhibit Input (pin INH)

| | | | | | | |
|------------------------------------|-------------|---------------------|---------------------|---------------------|------------|----------------|
| HIGH level input voltage threshold | $V_{INH,H}$ | – | $0.5 \times V_{CC}$ | $0.7 \times V_{CC}$ | V | stand-by mode; |
| LOW level input voltage threshold | $V_{INH,L}$ | $0.3 \times V_{CC}$ | $0.4 \times V_{CC}$ | – | V | normal mode |
| INH pull up resistance | R_{INH} | 10 | 25 | 50 | k Ω | – |

Receive only Input (RM) (5V version only)

| | | | | | | |
|------------------------------------|------------|---------------------|---------------------|---------------------|------------|-------------------|
| HIGH level input voltage threshold | $V_{RM,H}$ | – | $0.5 \times V_{CC}$ | $0.7 \times V_{CC}$ | V | normal mode; |
| LOW level input voltage threshold | $V_{RM,L}$ | $0.3 \times V_{CC}$ | $0.4 \times V_{CC}$ | – | V | receive-only mode |
| RM pull up resistance | R_{RM} | 10 | 25 | 50 | k Ω | – |

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Bus Receiver

| | | | | | | |
|---|----------------|------|------|------|------------|---|
| Differential receiver threshold voltage, recessive to dominant edge | $V_{diff,d}$ | – | 0.75 | 0.90 | V | $-20\text{ V} < (V_{CANH}, V_{CANL}) < 25\text{ V}$ $V_{diff} = V_{CANH} - V_{CANL}$ |
| Differential receiver threshold voltage dominant to recessive edge | $V_{diff,r}$ | 0.50 | 0.60 | – | V | $-20\text{ V} < (V_{CANH}, V_{CANL}) < 25\text{ V}$ $V_{diff} = V_{CANH} - V_{CANL}$ |
| Common Mode Range | CMR | -20 | – | 25 | V | $V_{CC} = 5\text{ V}$ |
| Differential receiver hysteresis | $V_{diff,hys}$ | – | 150 | – | mV | – |
| CANH, CANL input resistance | R_i | 10 | 20 | 30 | k Ω | recessive state |
| Differential input resistance | R_{diff} | 20 | 40 | 60 | k Ω | recessive state |

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40^\circ\text{C} < T_j < 150^\circ\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Bus Transmitter

| | | | | | | |
|---|---------------|---------------------|------|---------------------|---------------|---|
| CANL/CANH recessive output voltage | $V_{CANL/H}$ | $0.4 \times V_{CC}$ | — | $0.6 \times V_{CC}$ | V | $V_{TxD} = V_{CC}$ |
| CANH, CANL recessive output voltage difference $V_{diff} = V_{CANH} - V_{CANL}$ no load; (see note 2) | V_{diff} | -1 | — | 0.05 | V | $V_{TxD} = V_{CC}$ |
| CANL dominant output voltage | V_{CANL} | — | — | 2.0 | V | $V_{TxD} = 0 \text{ V};$ $V_{CC} = 5 \text{ V}$ |
| CANH dominant output voltage | V_{CANH} | 2.8 | — | — | V | $V_{TxD} = 0 \text{ V};$ $V_{CC} = 5 \text{ V}$ |
| CANH, CANL dominant output voltage difference $V_{diff} = V_{CANH} - V_{CANL}$ | V_{diff} | 1.5 | — | 3.0 | V | $V_{TxD} = 0 \text{ V};$ $V_{CC} = 5 \text{ V}$ |
| CANL short circuit current | I_{CANLsc} | 50 | 120 | 200 | mA | $V_{CANLshort} = 18 \text{ V}$ |
| | | — | 150 | — | mA | $V_{CANLshort} = 36 \text{ V}$ |
| CANH short circuit current | I_{CANHsc} | -200 | -120 | -50 | mA | $V_{CANHshort} = 0 \text{ V}$ |
| CANH short circuit current | I_{CANHsc} | — | -120 | — | mA | $V_{CANHshort} = -5 \text{ V}$ |
| Output current | $I_{CANH,ik}$ | -50 | -300 | -400 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = -7 \text{ V}$ |
| | | -50 | -100 | -150 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = -2 \text{ V}$ |
| Output current | $I_{CANH,ik}$ | 50 | 280 | 400 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = 7 \text{ V}$ |
| | | 50 | 100 | 150 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = 2 \text{ V}$ |

note 2) deviation from ISO/DIS 11898

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; $R_L = 60\ \Omega$; $V_{INH} < V_{INH,ON}$; $-40\ ^\circ\text{C} < T_j < 150\ ^\circ\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Dynamic CAN-Transceiver Characteristics

| | | | | | | |
|---|---------------|---|-----|-----|----|---|
| Propagation delay TxD-to-RxD LOW (recessive to dominant) | $t_{d(L),TR}$ | — | 150 | 280 | ns | $C_L = 47\ \text{pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\ \text{V}$; $C_{RxD} = 20\ \text{pF}$ |
| Propagation delay TxD-to-RxD HIGH (dominant to recessive) | $t_{d(H),TR}$ | — | 150 | 280 | ns | $C_L = 47\ \text{pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\ \text{V}$; $C_{RxD} = 20\ \text{pF}$ |
| Propagation delay TxD LOW to bus dominant | $t_{d(L),T}$ | — | 100 | 140 | ns | $C_L = 47\ \text{pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\ \text{V}$ |
| Propagation delay TxD HIGH to bus recessive | $t_{d(H),T}$ | — | 100 | 140 | ns | $C_L = 47\ \text{pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\ \text{V}$ |
| Propagation delay bus dominant to RxD LOW | $t_{d(L),R}$ | — | 50 | 140 | ns | $C_L = 47\ \text{pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\ \text{V}$; $C_{RxD} = 20\ \text{pF}$ |
| Propagation delay bus recessive to RxD HIGH | $t_{d(H),R}$ | — | 50 | 140 | ns | $C_L = 47\ \text{pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\ \text{V}$; $C_{RxD} = 20\ \text{pF}$ |

1)

Electrical Characteristics TLE6250 GV33 (3.3V Version)

Electrical Characteristics

Absolute Maximum Ratings

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|-----------|--------|--------------|------|------|---------|
| | | min. | max. | | |

Voltages

| | | | | | |
|---|--------------|-------|----------|----|--|
| Supply voltage | V_{CC} | - 0.3 | 6.5 | V | – |
| 3.3 V supply | V_{33V} | - 0.3 | 5.5 | V | – |
| CAN input voltage (CANH, CANL) | $V_{CANH/L}$ | - 40 | 40 | V | – |
| Logic voltages at INH, RM, TxD, RxD | V_I | - 0.3 | V_{CC} | V | $0\text{ V} < V_{CC} < 5.5\text{ V}$ |
| Electrostatic discharge voltage at CANH,CANL | V_{ESD} | - 6 | 6 | kV | human body model (100 pF via 1.5 k Ω) |
| Electrostatic discharge voltage | V_{ESD} | - 2 | 2 | kV | human body model (100 pF via 1.5 k Ω) |

Temperatures

| | | | | | |
|----------------------|-------|------|-----|----|---|
| Junction temperature | T_j | - 40 | 160 | °C | – |
|----------------------|-------|------|-----|----|---|

Note: Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.

Operating Range

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|----------------------|-----------|--------------|------|------|---------|
| | | min. | max. | | |
| Supply voltage | V_{CC} | 4.5 | 5.5 | V | – |
| 3.3 V supply voltage | V_{33V} | 3.0 | 5.5 | V | – |
| Junction temperature | T_j | – 40 | 150 | °C | – |

Thermal Resistances

| | | | | | |
|------------------|-------------|---|-----|-----|---|
| Junction ambient | R_{thj-a} | – | 185 | K/W | – |
|------------------|-------------|---|-----|-----|---|

Thermal Shutdown (junction temperature)

| | | | | | |
|------------------------------|-----------|-----|-----|----|------------------|
| Thermal shutdown temperature | T_{jsD} | 160 | 200 | °C | 10 °C hysteresis |
|------------------------------|-----------|-----|-----|----|------------------|

Electrical Characteristics

$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; ($3.0\text{ V} < V_{33V} < 3.6\text{ V}$ for 3.3 V version); $R_L = 60\ \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Current Consumption (3.3V version)

| | | | | | | |
|---------------------|-------------------|---|----|----|---------------|---|
| Current consumption | I_{CC+33V} | – | 6 | 10 | mA | recessive state; $V_{TxD} = V_{33V}$ |
| Current consumption | I_{CC+33V} | – | 45 | 70 | mA | dominant state; $V_{TxD} = 0\text{ V}$ |
| Current consumption | I_{33V} | – | – | 2 | mA | |
| Current consumption | $I_{CC+33V, stb}$ | – | 1 | 10 | μA | stand-by mode TxD = high |

Receiver Output RxD

| | | | | | | |
|---------------------------|------------|---|----|----|----|---|
| HIGH level output current | $I_{RD,H}$ | – | -2 | -1 | mA | $V_{RD} = 0.8 \times V_{33V}$, $V_{diff} < 0.4\text{ V}^{(\text{note } 1)}$ |
| LOW level output current | $I_{RD,L}$ | 1 | 2 | – | mA | $V_{RD} = 0.2 \times V_{33V}$, $V_{diff} > 1\text{ V}^{(\text{note } 1)}$ |

Transmission Input TxD

| | | | | | | |
|------------------------------------|------------|----------------------|-----------------------|----------------------|------------|------------------|
| HIGH level input voltage threshold | $V_{TD,H}$ | – | $0.55 \times V_{33V}$ | $0.7 \times V_{33V}$ | V | recessive state; |
| LOW level input voltage threshold | $V_{TD,L}$ | $0.3 \times V_{33V}$ | $0.45 \times V_{33V}$ | – | V | dominant state; |
| TxD pull up resistance | R_{TD} | 10 | 25 | 50 | k Ω | – |

note1) $V_{diff} = V_{CANH} - V_{CANL}$

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; (3.0 V < V_{33V} < 3.6 V for 3.3 V version); $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Inhibit Input (pin INH)

| | | | | | | |
|------------------------------------|-------------|----------------------|-----------------------|----------------------|------------|----------------|
| HIGH level input voltage threshold | $V_{INH,H}$ | – | $0.55 \times V_{33V}$ | $0.7 \times V_{33V}$ | V | stand-by mode; |
| LOW level input voltage threshold | $V_{INH,L}$ | $0.3 \times V_{33V}$ | $0.45 \times V_{33V}$ | – | V | normal mode; |
| INH pull up resistance | R_{INH} | 10 | 25 | 50 | k Ω | – |

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; (3.0 V < V_{33V} < 3.6 V for 3.3 V version); $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40^\circ\text{C} < T_j < 150^\circ\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Bus Receiver

| | | | | | | |
|---|-----------------------|------|------|------|------------|--|
| Differential receiver threshold voltage, recessive to dominant edge | $V_{\text{diff,d}}$ | – | 0.75 | 0.90 | V | $-20\text{ V} < (V_{\text{CANH}}, V_{\text{CANL}}) < 25\text{ V}$ $V_{\text{diff}} = V_{\text{CANH}} - V_{\text{CANL}}$ |
| Differential receiver threshold voltage dominant to recessive edge | $V_{\text{diff,r}}$ | 0.50 | 0.60 | – | V | $-20\text{ V} < (V_{\text{CANH}}, V_{\text{CANL}}) < 25\text{ V}$ $V_{\text{diff}} = V_{\text{CANH}} - V_{\text{CANL}}$ |
| Common Mode Range | CMR | -20 | – | 25 | V | $V_{CC} = 5\text{V}$ |
| Differential receiver hysteresis | $V_{\text{diff,hys}}$ | – | 150 | – | mV | – |
| CANH, CANL input resistance | R_i | 10 | 20 | 30 | k Ω | recessive state |
| Differential input resistance | R_{diff} | 20 | 40 | 60 | k Ω | recessive state |

Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; (3.0 V < V_{33V} < 3.6 V for 3.3 V version); $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40^\circ\text{C} < T_j < 150^\circ\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Bus Transmitter

| | | | | | | |
|---|----------------|---------------------|------|---------------------|---------------|---|
| CANL/CANH recessive output voltage | $V_{CANL/H}$ | $0.4 \times V_{CC}$ | — | $0.6 \times V_{CC}$ | V | $V_{TxD} = V_{33V}$ |
| CANH, CANL recessive output voltage difference $V_{diff} = V_{CANH} - V_{CANL}$ no load; (see note 2) | V_{diff} | - 1 | — | 0.05 | V | $V_{TxD} = V_{33V}$ |
| CANL dominant output voltage | V_{CANL} | — | — | 2.0 | V | $V_{TxD} = 0 \text{ V};$ $V_{CC} = 5 \text{ V}$ |
| CANH dominant output voltage | V_{CANH} | 2.8 | — | — | V | $V_{TxD} = 0 \text{ V};$ $V_{CC} = 5 \text{ V}$ |
| CANH, CANL dominant output voltage difference $V_{diff} = V_{CANH} - V_{CANL}$ | V_{diff} | 1.5 | — | 3.0 | V | $V_{TxD} = 0 \text{ V};$ $V_{CC} = 5 \text{ V}$ |
| CANL short circuit current | I_{CANLsc} | 50 | 120 | 200 | mA | $V_{CANLshort} = 18 \text{ V}$ |
| | | — | 150 | — | mA | $V_{CANLshort} = 36 \text{ V}$ |
| CANH short circuit current | I_{CANHsc} | -200 | -120 | -50 | mA | $V_{CANHshort} = 0 \text{ V}$ |
| CANH short circuit current | I_{CANHsc} | — | -120 | — | mA | $V_{CANHshort} = -5 \text{ V}$ |
| Output current | $I_{CANH, Ik}$ | -50 | -300 | -400 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = -7 \text{ V}$ |
| | | -50 | -100 | -150 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = -2 \text{ V}$ |
| Output current | $I_{CANH, Ik}$ | 50 | 280 | 300 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = 7 \text{ V}$ |
| | | 50 | 100 | 150 | μA | $V_{CC} = 0 \text{ V}, V_{CANH} =$ $V_{CANL} = 2 \text{ V}$ |

note 2) deviation from ISO/DIS 11898

Electrical Characteristics (cont'd)

$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; ($3.0\text{ V} < V_{33V} < 3.6\text{ V}$ for 3.3 V version); $R_L = 60\ \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^{\circ}\text{C} < T_j < 150\text{ }^{\circ}\text{C}$; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter | Symbol | Limit Values | | | Unit | Remarks |
|-----------|--------|--------------|------|------|------|---------|
| | | min. | typ. | max. | | |

Dynamic CAN-Transceiver Characteristics

| | | | | | | |
|---|---------------|---|-----|-----|----|--|
| Propagation delay TxD-to-RxD LOW (recessive to dominant) | $t_{d(L),TR}$ | — | 150 | 280 | ns | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$; $C_{RxD} = 20\text{ pF}$ |
| Propagation delay TxD-to-RxD HIGH (dominant to recessive) | $t_{d(H),TR}$ | — | 150 | 280 | ns | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$; $C_{RxD} = 20\text{ pF}$ |
| Propagation delay TxD LOW to bus dominant | $t_{d(L),T}$ | — | 100 | 140 | ns | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$ |
| Propagation delay TxD HIGH to bus recessive | $t_{d(H),T}$ | — | 100 | 140 | ns | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$ |
| Propagation delay bus dominant to RxD LOW | $t_{d(L),R}$ | — | 50 | 140 | ns | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$; $C_{RxD} = 20\text{ pF}$ |
| Propagation delay bus recessive to RxD HIGH | $t_{d(H),R}$ | — | 50 | 140 | ns | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$; $C_{RxD} = 20\text{ pF}$ |

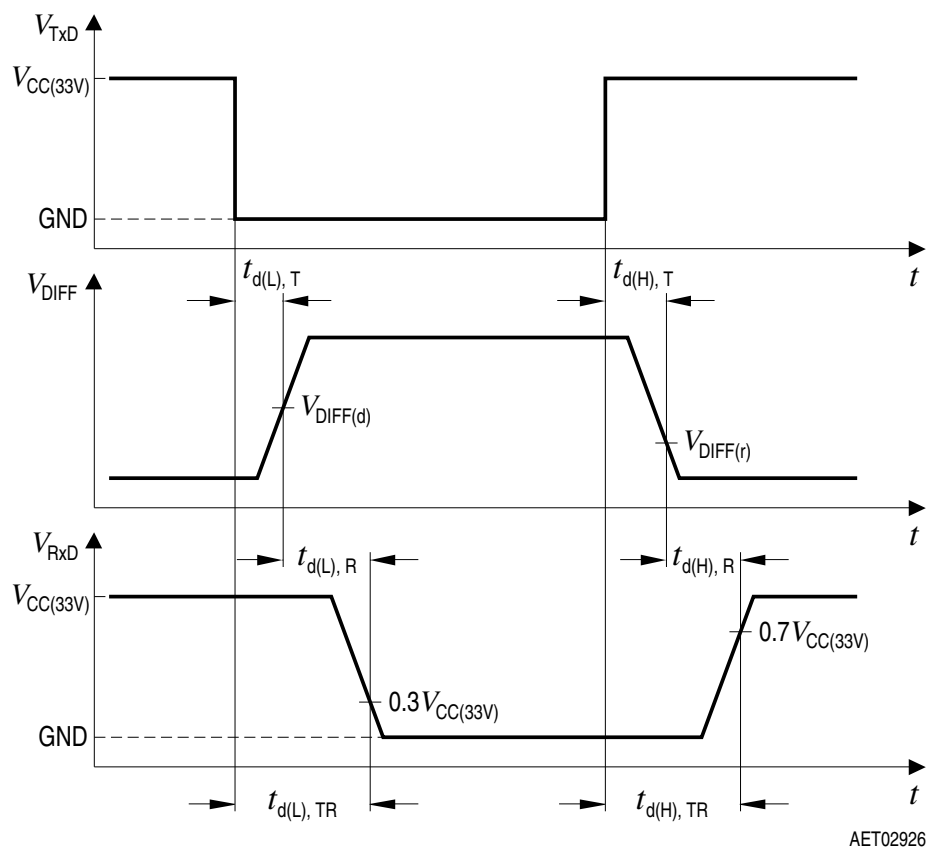


Figure 6 **Timing Diagrams for Dynamic Characteristics**

Application

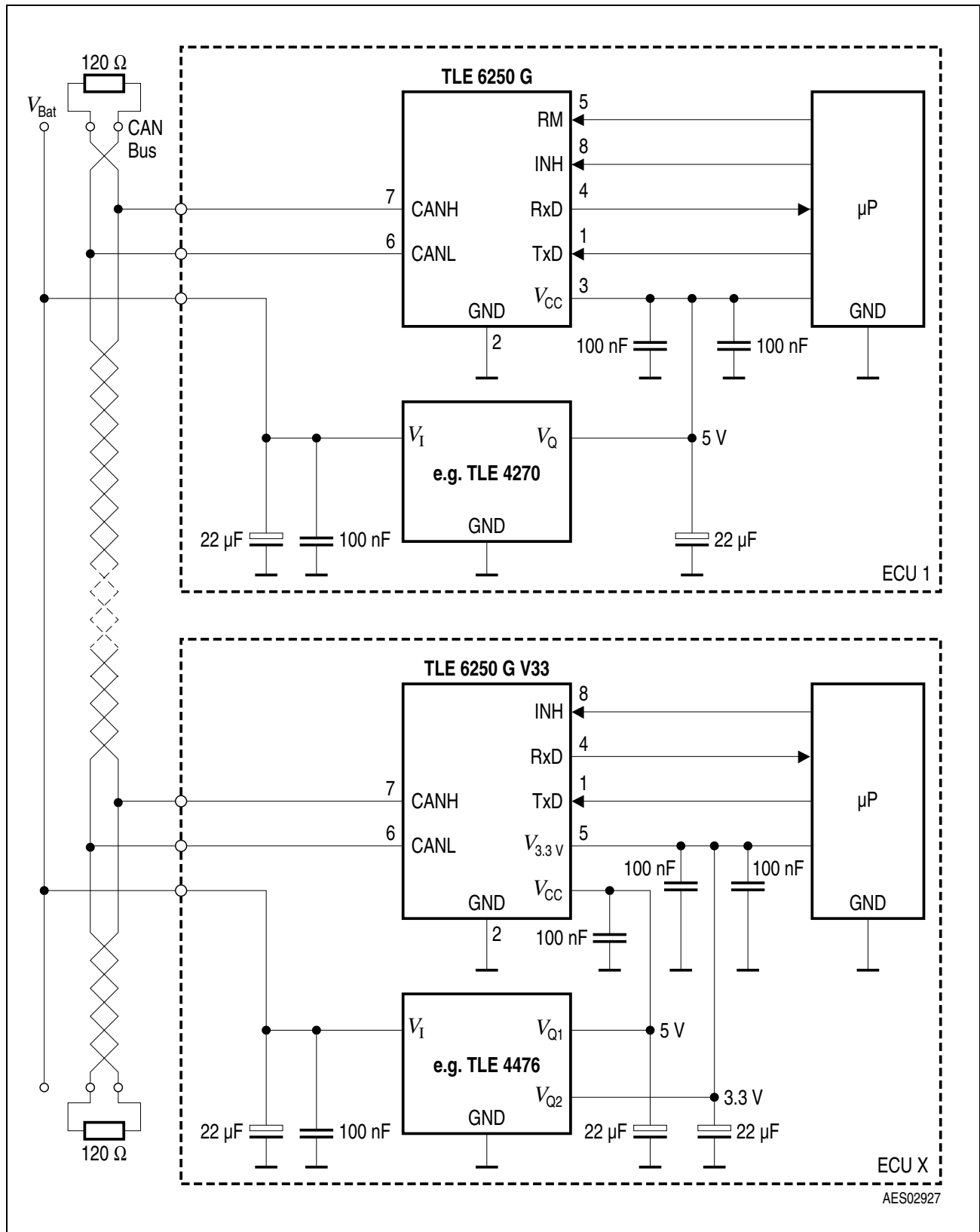
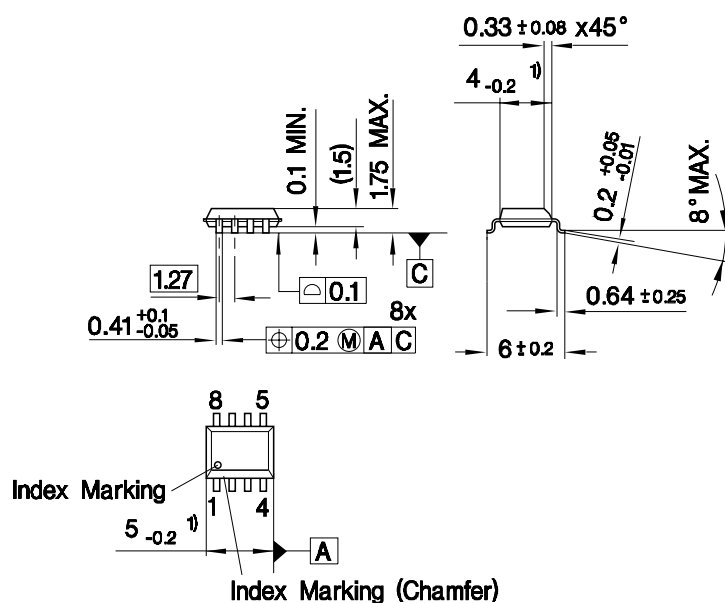


Figure 7 Application Circuit

Package Outlines

P-DSO-8-3

(Plastic Dual Small Outline Package)



1) Does not include plastic or metal protrusion of 0.15 max. per side

GPS09032

Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information"

SMD = Surface Mounted Device

Dimensions in mm

Edition 2002-10-08

**Published by Infineon Technologies AG,
St.-Martin-Strasse 53,
D-81541 München, Germany**

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