

TLE6250

High Speed CAN-Transceiver



1 Overview

Quality Requirement Category: Automotive

Features

- CAN data transmission rate up to 1 Mbit/s
- Receive-only mode and Stand-by mode
- Suitable for 12 V and 24 V applications
- Excellent EMC performance (very high immunity and very low emission)
- Versions for 5 V and 3.3 V microcontrollers
- Bus pins are short circuit proof to ground and battery voltage
- Overtemperature protection
- Very wide temperature range (-40°C up to 150°C)
- Green Product (RoHS compliant)
- AEC Qualified

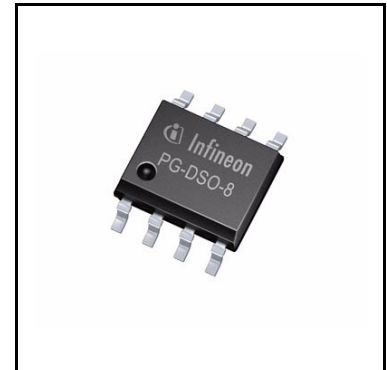
Applications

- Engine Control Unit (ECUs)
- Transmission Control Units (TCUs)
- Chassis Control Modules
- Electric Power Steering

Description

The HS CAN-transceivers of the TLE6250 family are monolithic integrated circuits that are available as bare die as well as in a PG-DSO-8 package with the same functionality. The transceivers are optimized for high speed differential mode data transmission in automotive applications and industrial applications and they are compatible to ISO 11898. The transceivers work as an interface between the CAN protocol controller and the physical differential bus in both 12 V systems and 24 V systems.

The transceivers are based on the Smart Power Technology (SPT), which allows bipolar and CMOS control circuitry in accordance with DMOS power devices to coexist in the monolithic circuit. The TLE6250 is designed to withstand the severe conditions of automotive applications and provides excellent EMC performance.



Overview

TLE6250G

5 V logic I/O version: RxD, TxD, INH, RM. Two control pins (RM, INH) and three operation modes: Normal mode, Stand-by mode and Receive-only mode.

The functions and parameters of the TLE6250G and TLE6250C are identical, except those related to the package. In this document the content for TLE6250G also applies to TLE6250C, unless otherwise stated.

TLE6250GV33

3.3 V logic I/O version (logic I/O voltage adaptive to V_{33V} pin in the range of 3.3 V to 5 V): RxD, TxD, INH. One control pin (INH) and two operation modes: Normal mode and Standby mode.

The functions and parameters of the TLE6250GV33 and TLE6250CV33 are identical, except those related to the package. In this document the content for TLE6250GV33 also applies to TLE6250CV33, unless otherwise stated.

| Type | Package | Marking |
|-------------|----------|------------|
| TLE6250G | PG-DSO-8 | TLE6250 |
| TLE6250C | (chip) | - |
| TLE6250GV33 | PG-DSO-8 | TLE6250V33 |
| TLE6250CV33 | (chip) | - |

Table of contents

| | | |
|----------|---|-----------|
| 1 | Overview | 1 |
| | Table of contents | 3 |
| 2 | Block diagram | 4 |
| 3 | Pin configuration | 5 |
| 4 | General product characteristics and electrical characteristics | 7 |
| 4.1 | General product characteristics TLE6250G (5 V version) | 7 |
| 4.2 | Electrical characteristics TLE6250G (5 V version) | 8 |
| 4.3 | General product characteristics TLE6250GV33 (3.3 V version) | 12 |
| 4.4 | Electrical characteristics TLE6250GV33 (3.3 V version) | 13 |
| 5 | Diagrams | 16 |
| 6 | Package outlines | 19 |
| 7 | Application information | 20 |
| 8 | Revision history | 23 |

Block diagram

2 Block diagram

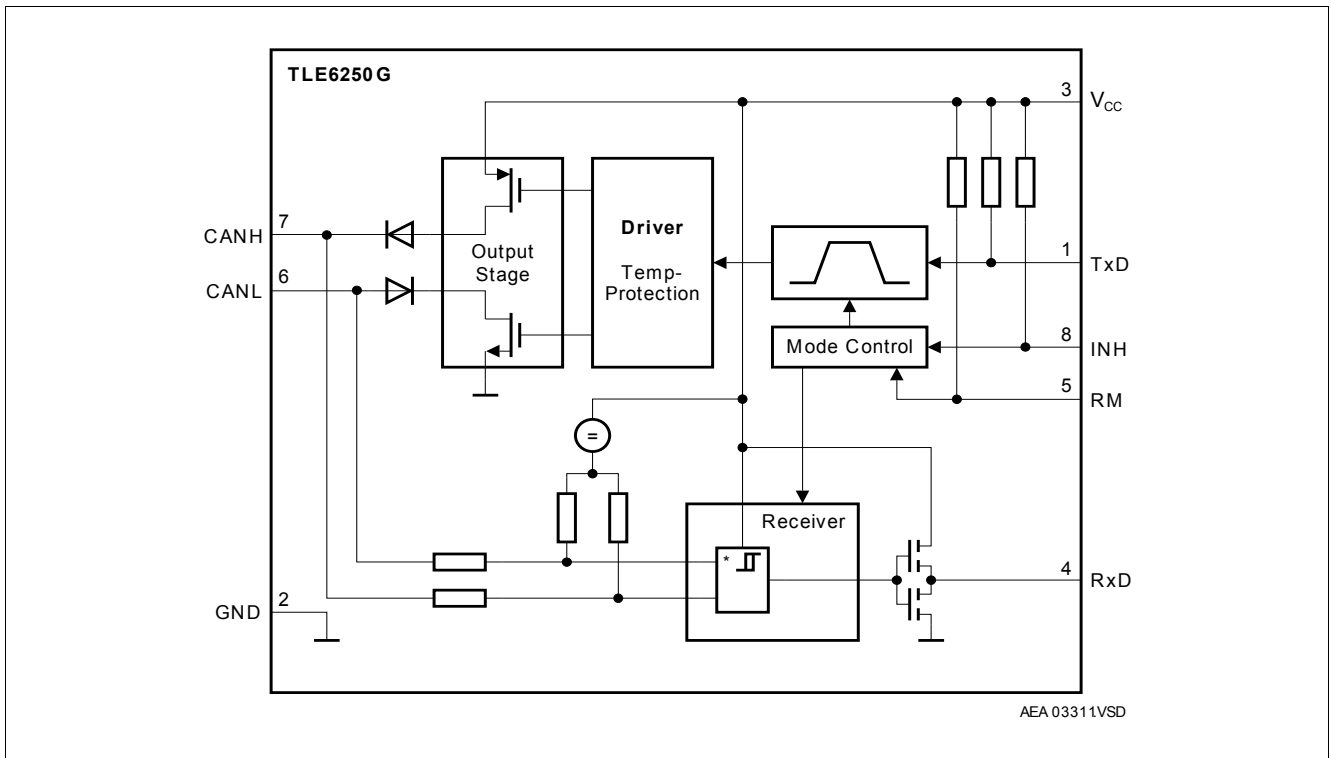


Figure 1 Block diagram TLE6250G

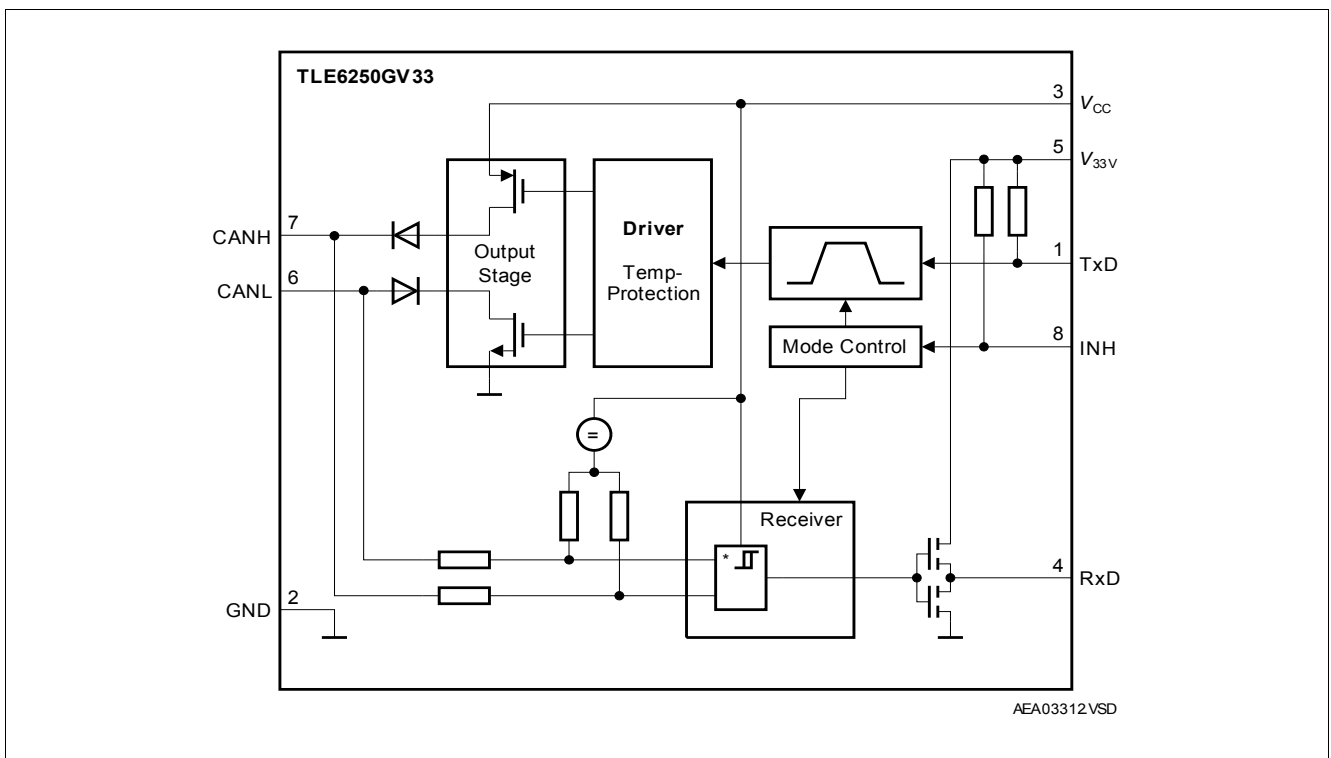


Figure 2 Block diagram TLE6250GV33

Pin configuration

3 Pin configuration

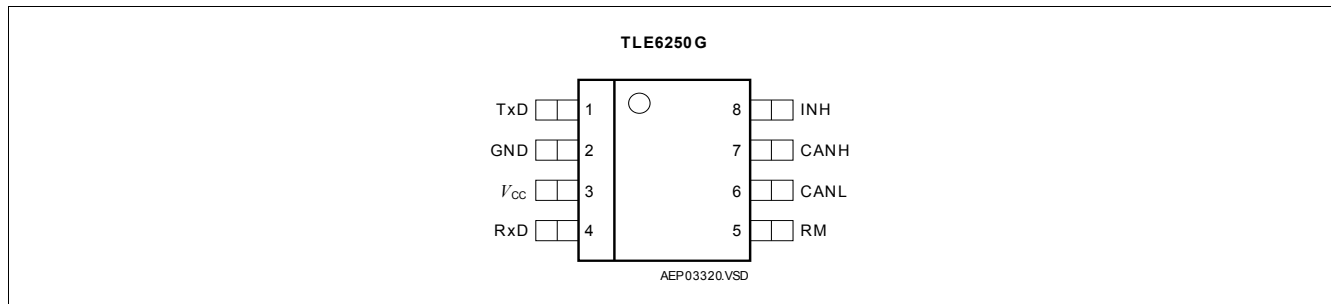


Figure 3 Pin configuration TLE6250G (top view)

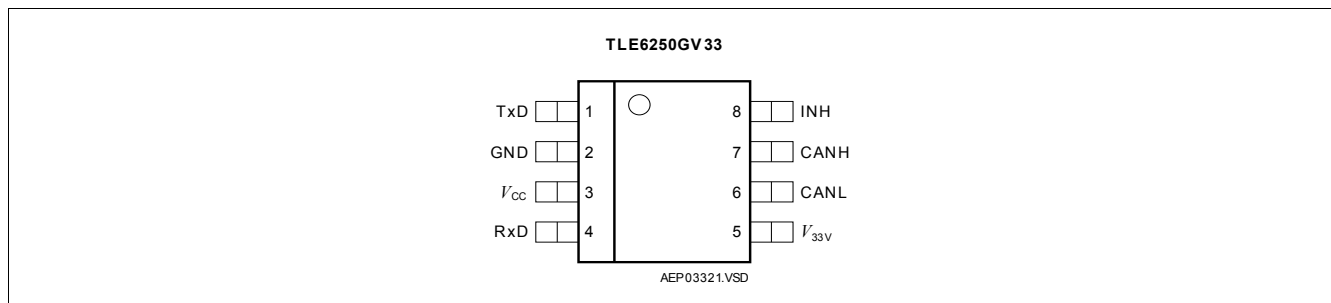


Figure 4 Pin configuration TLE6250GV33 (top view)

Table 1 Pin definitions and functions TLE6250G

| Pin No. | Symbol | Function |
|---------|-----------------|--|
| 1 | TxD | CAN transmit data input; 20 kΩ pull-up, “low” in dominant state |
| 2 | GND | Ground |
| 3 | V _{CC} | 5 V supply input |
| 4 | RxD | CAN receive data output; “low” in dominant state, integrated pull-up |
| 5 | RM | Receive-only input; control input, 20 kΩ pull-up, set to “low” for entering Receive-only mode |
| 6 | CANL | Low line I/O; “low” in dominant state |
| 7 | CANH | High line I/O; “high” in dominant state |
| 8 | INH | Inhibit input; control input, 20 kΩ pull-up, set to “low” for entering normal mode |

Table 2 Pin definitions and Functions TLE6250GV33

| Pin No. | Symbol | Function |
|---------|-----------------|---|
| 1 | TxD | CAN transmit data input; 20 kΩ pull-up, “low” in dominant state |
| 2 | GND | Ground |
| 3 | V _{CC} | 5V supply input |
| 4 | RxD | CAN receive data output; “low” in dominant state, integrated pull-up |

Pin configuration

Table 2 Pin definitions and Functions TLE6250GV33 (cont'd)

| Pin No. | Symbol | Function |
|----------------|---------------|--|
| 5 | V_{33V} | Logic supply input; 3.3 V or 5 V; the microcontroller logic supply can be connected to this pin. The TLE6250GV33 adapts the digital I/Os to the connected microcontroller logic supply at V_{33V} |
| 6 | CANL | Low line I/O; “low” in dominant state |
| 7 | CANH | High line I/O; “high” in dominant state |
| 8 | INH | Inhibit input; control input, 20 k Ω pull-up, set to “low” for entering normal mode |

General product characteristics and electrical characteristics

4 General product characteristics and electrical characteristics

4.1 General product characteristics TLE6250G (5 V version)

Table 3 Absolute maximum ratings TLE6250G (5 V version)

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|---|--------------|--------|------|----------|------|--------------------------------------|
| | | Min. | Typ. | 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 kΩ) |
| Electrostatic discharge voltage | V_{ESD} | -2 | - | 2 | kV | human body model (100 pF via 1.5 kΩ) |
| Temperatures | | | | | | |
| Junction temperature | T_j | -40 | - | 160 | °C | - |

Notes

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

Table 4 Operating range TLE6250G (5 V version)

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|--|-------------|--------|------|------|------|-------------------------------|
| | | Min. | Typ. | Max. | | |
| Voltages | | | | | | |
| Supply voltage | V_{CC} | 4.5 | - | 5.5 | V | - |
| Junction temperature | T_j | -40 | - | 150 | °C | - |
| Thermal resistance | | | | | | |
| Junction ambient | R_{thj-a} | - | - | 185 | K/W | in PG-DSO-8 package |
| Thermal shutdown (junction temperature) | | | | | | |
| Thermal shutdown temperature | T_{jsD} | 160 | - | 200 | °C | ¹⁾ 10°C hysteresis |

- 1) Not subject to production test, specified by design.

General product characteristics and electrical characteristics

4.2 Electrical characteristics TLE6250G (5 V version)

Table 5 Electrical characteristics TLE6250G (5 V version)

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 | Values | | | Unit | Note or Test Condition |
|--------------------------------|--------------|---------------------|---------------------|---------------------|---------------|---|
| | | 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” output current | $I_{RD,H}$ | – | -4 | -2 | mA | $V_{RD} = 0.8 \times V_{CC}$; $V_{diff} < 0.4 \text{ V}^{1)}$ |
| “low” output current | $I_{RD,L}$ | 2 | 4 | – | mA | $V_{RD} = 0.2 \times V_{CC}$; $V_{diff} > 1 \text{ V}^{1)}$ |
| Transmission input TxD | | | | | | |
| “high” input voltage threshold | $V_{TD,H}$ | – | $0.5 \times V_{CC}$ | $0.7 \times V_{CC}$ | V | recessive state |
| “low” 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 | – |
| Inhibit input (INH pin) | | | | | | |
| “high” input voltage threshold | $V_{INH,H}$ | – | $0.5 \times V_{CC}$ | $0.7 \times V_{CC}$ | V | stand-by mode |
| “low” 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 | – |

General product characteristics and electrical characteristics

Table 5 Electrical characteristics TLE6250G (5 V version) (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 | Values | | | Unit | Note or Test Condition |
|---|----------------|---------------------|---------------------|---------------------|------------|--|
| | | Min. | Typ. | Max. | | |
| Receive only input (RM pin) (5 V version) | | | | | | |
| “high” input voltage threshold | $V_{RM,H}$ | – | $0.5 \times V_{CC}$ | $0.7 \times V_{CC}$ | V | normal mode; |
| “low” 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 | – |
| 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 |

General product characteristics and electrical characteristics

Table 5 Electrical characteristics TLE6250G (5 V version) (cont'd)

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

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|--|----------------------|-----------------------|------|-----------------------|------|--|
| | | Min. | Typ. | Max. | | |
| Bus transmitter | | | | | | |
| CANL/CANH recessive output voltage | V _{CANL/H} | 0.4 × V _{CC} | – | 0.6 × V _{CC} | V | V _{TxD} = V _{CC} |
| CANH, CANL recessive output voltage difference V _{diff} = V _{CANH} - V _{CANL} , no load ²⁾ | V _{diff} | -1 | – | 0.05 | V | V _{TxD} = V _{CC} |
| CANL dominant output voltage | V _{CANL} | – | – | 2.0 | V | V _{TxD} = 0 V; V _{CC} = 5 V |
| CANH dominant output voltage | V _{CANH} | 2.8 | – | – | V | V _{TxD} = 0 V; V _{CC} = 5 V |
| CANH, CANL dominant output voltage difference V _{diff} = V _{CANH} - V _{CANL} | V _{diff} | 1.5 | – | 3.0 | V | V _{TxD} = 0 V; V _{CC} = 5 V |
| CANL short circuit current | I _{CANLsc} | 50 | 120 | 200 | mA | V _{CANLshort} = 18 V |
| CANL short circuit current | I _{CANLsc} | – | 150 | – | mA | V _{CANLshort} = 36 V |
| CANH short circuit current | I _{CANHsc} | -200 | -120 | -50 | mA | V _{CANHshort} = 0 V |
| CANH short circuit current | I _{CANHsc} | – | -120 | – | mA | V _{CANHshort} = -5 V |
| Output current | I _{CANH,Ik} | -50 | -300 | -400 | μA | V _{CC} = 0 V; V _{CANH} = V _{CANL} = -7 V |
| Output current | I _{CANH,Ik} | -50 | -100 | -150 | μA | V _{CC} = 0 V; V _{CANH} = V _{CANL} = -2 V |
| Output current | I _{CANH,Ik} | 50 | 280 | 400 | μA | V _{CC} = 0 V; V _{CANH} = V _{CANL} = 7 V |
| Output current | I _{CANH,Ik} | 50 | 100 | 150 | μA | V _{CC} = 0 V; V _{CANH} = V _{CANL} = 2 V |

General product characteristics and electrical characteristics

Table 5 Electrical characteristics TLE6250G (5 V version) (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 | Values | | | Unit | Note or Test Condition |
|---|---------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Dynamic CAN-transceiver characteristics | | | | | | |
| Propagation delay TxD-to-RxD “low” (recessive to dominant) | $t_{d(L),TR}$ | – | 150 | 255 | ns | ³⁾ $C_L = 47 \text{ pF}$; $R_L = 60 \Omega$; $V_{CC} = 5 \text{ V}$; $C_{RxD} = 20 \text{ pF}$ |
| Propagation delay TxD-to-RxD “high” (dominant to recessive) | $t_{d(H),TR}$ | – | 150 | 255 | ns | ³⁾ $C_L = 47 \text{ pF}$; $R_L = 60 \Omega$; $V_{CC} = 5 \text{ V}$; $C_{RxD} = 20 \text{ pF}$ |
| 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) $V_{diff} = V_{CANH} - V_{CANL}$

2) Deviation from ISO 11898

3) TLE6250C: Not subject to production test, specified by design.

General product characteristics and electrical characteristics

4.3 General product characteristics TLE6250GV33 (3.3 V version)

Table 6 Absolute maximum ratings TLE6250GV33 (3.3 V version)

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|---|--------------|--------|------|----------|------|--|
| | | Min. | Typ. | Max. | | |
| Voltages | | | | | | |
| Supply voltage | V_{CC} | -0.3 | – | 6.5 | V | – |
| 3.3 V supply | V_{33V} | -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 | $0 V < V_{CC} < 5.5 V$ |
| 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.

Table 7 Operating range TLE6250GV33 (3.3 V version)

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|----------------------|-----------|--------|------|------|------|------------------------|
| | | Min. | Typ. | 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 resistance

| | | | | | | |
|------------------|-------------|---|---|-----|-----|---------------------|
| Junction ambient | R_{thj-a} | – | – | 185 | K/W | in PG-DSO-8 package |
|------------------|-------------|---|---|-----|-----|---------------------|

Thermal shutdown (junction temperature)

| | | | | | | |
|------------------------------|-----------|-----|---|-----|----|-------------------------------|
| Thermal shutdown temperature | T_{jSD} | 160 | – | 200 | °C | ¹⁾ 10°C hysteresis |
|------------------------------|-----------|-----|---|-----|----|-------------------------------|

1) Not subject to production test, specified by design.

General product characteristics and electrical characteristics

4.4 Electrical characteristics TLE6250GV33 (3.3 V version)

Table 8 Electrical characteristics TLE6250GV33 (3.3 V version)

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

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|---|--------------------------|------------------------|-------------------------|------------------------|------|---|
| | | Min. | Typ. | Max. | | |
| Current consumption (3.3 V 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 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” output current | I _{RD,H} | – | -2 | -1 | mA | V _{RD} = 0.8 × V _{33V} ; V _{diff} < 0.4 V ¹⁾ |
| “low” output current | I _{RD,L} | 1 | 2 | – | mA | V _{RD} = 0.2 × V _{33V} ; V _{diff} > 1 V ¹⁾ |
| Transmission input TxD | | | | | | |
| “high” input voltage threshold | V _{TD,H} | – | 0.55 × V _{33V} | 0.7 × V _{33V} | V | recessive state |
| “low” input voltage threshold | V _{TD,L} | 0.3 × V _{33V} | 0.45 × V _{33V} | – | V | dominant state |
| TxD pull-up resistance | R _{TD} | 10 | 25 | 50 | kΩ | – |
| Inhibit Input (pin INH) | | | | | | |
| “high” input voltage threshold | V _{INH,H} | – | 0.55 × V _{33V} | 0.7 × V _{33V} | V | stand-by mode |
| “low” input voltage threshold | V _{INH,L} | 0.3 × V _{33V} | 0.45 × V _{33V} | – | V | normal mode |
| INH pull-up resistance | R _{INH} | 10 | 25 | 50 | kΩ | – |
| Bus receiver | | | | | | |
| Differential receiver threshold voltage, recessive to dominant edge | V _{diff,d} | – | 0.75 | 0.90 | V | -20 V < (V _{CANH} , V _{CANL}) < 25 V; V _{diff} = V _{CANH} - V _{CANL} |
| Differential receiver threshold voltage, dominant to recessive edge | V _{diff,r} | 0.50 | 0.60 | – | V | -20 V < (V _{CANH} , V _{CANL}) < 25 V; V _{diff} = V _{CANH} - V _{CANL} |
| Common Mode Range | CMR | -20 | – | 25 | V | V _{CC} = 5 V |
| Differential receiver hysteresis | V _{diff,hys} | – | 150 | – | mV | – |
| CANH, CANL input resistance | R _i | 10 | 20 | 30 | kΩ | recessive state |
| Differential input resistance | R _{diff} | 20 | 40 | 60 | kΩ | recessive state |

General product characteristics and electrical characteristics

Table 8 Electrical characteristics TLE6250GV33 (3.3 V version) (cont'd)

4.5 V < V_{CC} < 5.5 V; (3.0 V < V_{33V} < 5.5V 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 | Values | | | Unit | Note or Test Condition |
|---|-----------------|---------------------|------|---------------------|---------------|---|
| | | 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 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 | $V_{TxD} = 0;$ $V_{CC} = 5 \text{ V}$ |
| 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 | $V_{CANLshort} = 18 \text{ V}$ |
| CANL short circuit current | I_{CANLsc} | – | 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 | $I_{CANH/L,Ik}$ | -50 | -300 | -400 | μA | $V_{CC} = 0 \text{ V};$ $V_{CANH} = V_{CANL} = -7 \text{ V}$ |
| Output current | $I_{CANH/L,Ik}$ | -50 | -100 | -150 | μA | $V_{CC} = 0 \text{ V};$ $V_{CANH} = V_{CANL} = -2 \text{ V}$ |
| Output current | $I_{CANH/L,Ik}$ | 50 | 280 | 400 | μA | $V_{CC} = 0 \text{ V};$ $V_{CANH} = V_{CANL} = 7 \text{ V}$ |
| Output current | $I_{CANH/L,Ik}$ | 50 | 100 | 150 | μA | $V_{CC} = 0 \text{ V};$ $V_{CANH} = V_{CANL} = 2 \text{ V}$ |

General product characteristics and electrical characteristics

Table 8 Electrical characteristics TLE6250GV33 (3.3 V version) (cont'd)

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

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|---|----------------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Dynamic CAN-transceiver characteristics | | | | | | |
| Propagation delay TxD-to-RxD “low” (recessive to dominant) | t _{d(L),TR} | – | 150 | 255 | ns | ³⁾ C _L = 47 pF; R _L = 60 Ω; V _{CC} = 5 V; C _{RxD} = 20 pF |
| Propagation delay TxD-to-RxD “high” (dominant to recessive) | t _{d(H),TR} | – | 150 | 255 | ns | ³⁾ C _L = 47 pF; R _L = 60 Ω; V _{CC} = 5 V; C _{RxD} = 20 pF |
| Propagation delay TxD “low” to bus dominant | t _{d(L),T} | – | 100 | 140 | ns | C _L = 47 pF; R _L = 60 Ω; V _{CC} = 5 V |
| Propagation delay TxD “high” to bus recessive | t _{d(H),T} | – | 100 | 140 | ns | C _L = 47 pF; R _L = 60 Ω; V _{CC} = 5 V |
| Propagation delay bus dominant to RxD “low” | t _{d(L),R} | – | 50 | 140 | ns | C _L = 47 ; R _L = 60 Ω; V _{CC} = 5 V; C _{RxD} = 20 pF |
| Propagation delay bus recessive to RxD “high” | t _{d(H),R} | – | 50 | 140 | ns | C _L = 47 pF; R _L = 60 Ω; V _{CC} = 5 V; C _{RxD} = 20 pF |

1) V_{diff} = V_{CANH} - V_{CANL}

2) Deviation from ISO 11898

3) TLE6250CV33: Not subject to production test, specified by design.

Diagrams

5 Diagrams

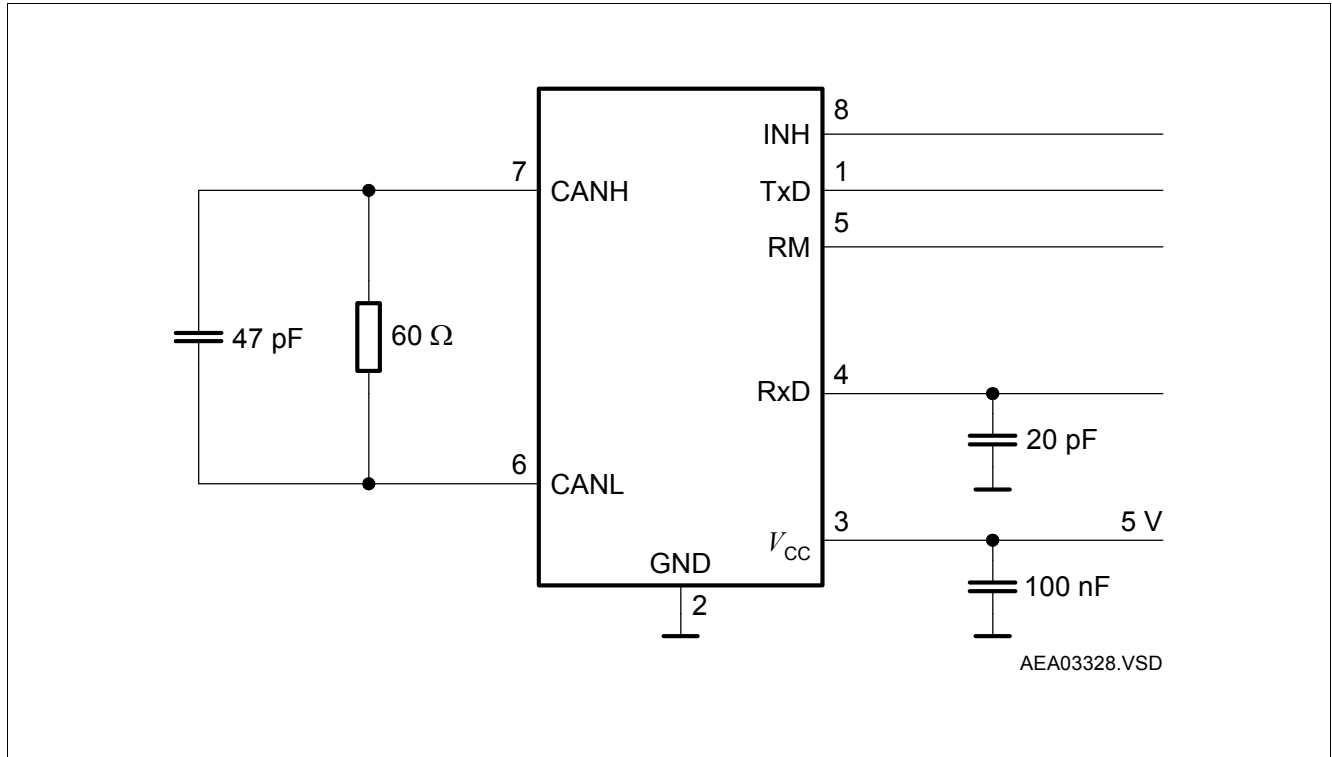


Figure 5 Test circuit for dynamic characteristics (5 V version)

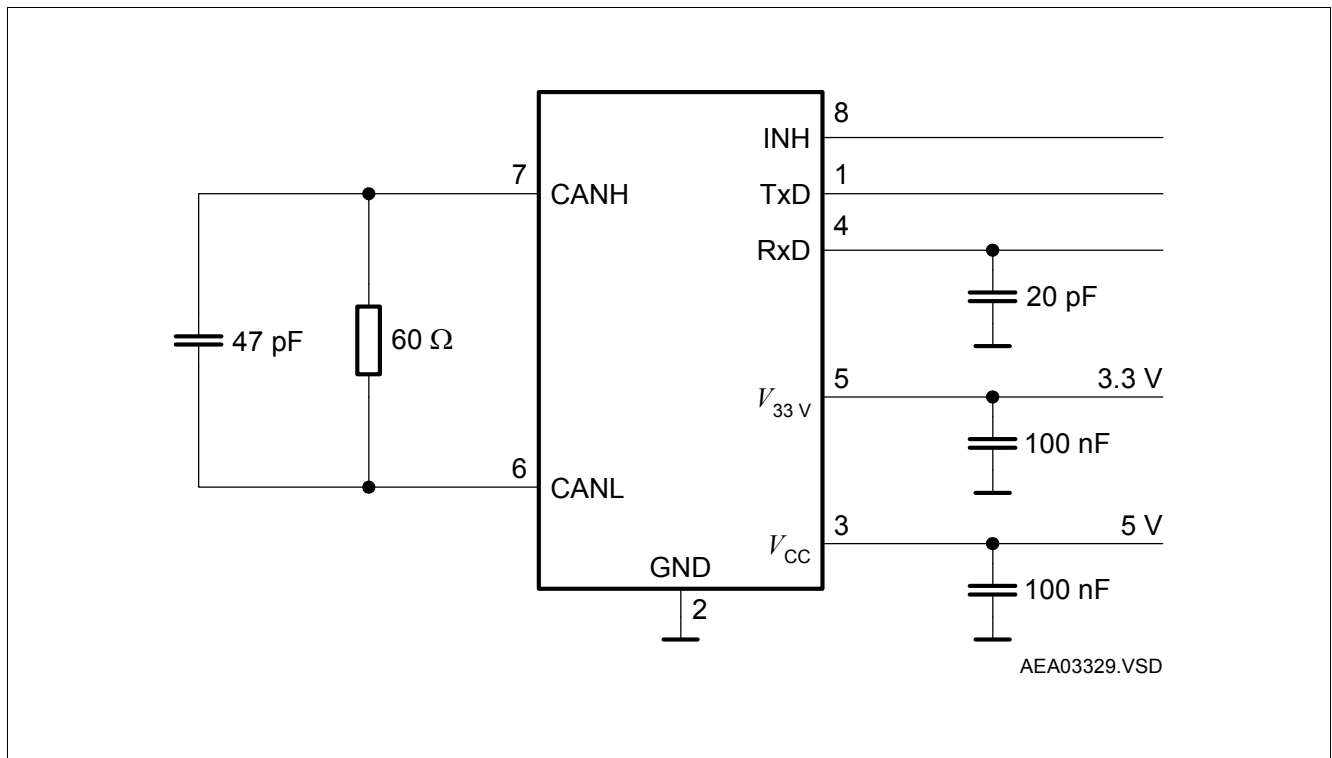


Figure 6 Test circuit for dynamic characteristics (3.3 V version)

Diagrams

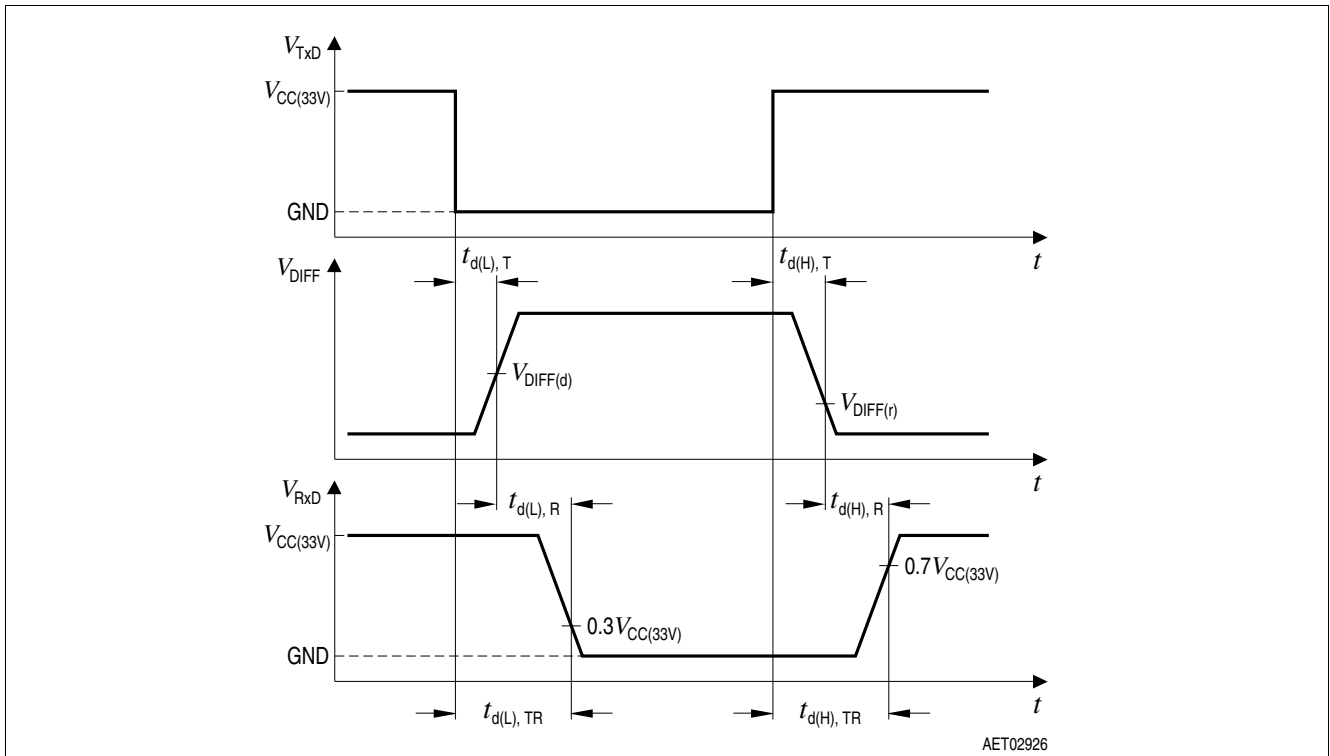


Figure 7 Timing diagram for dynamic characteristics

Diagrams

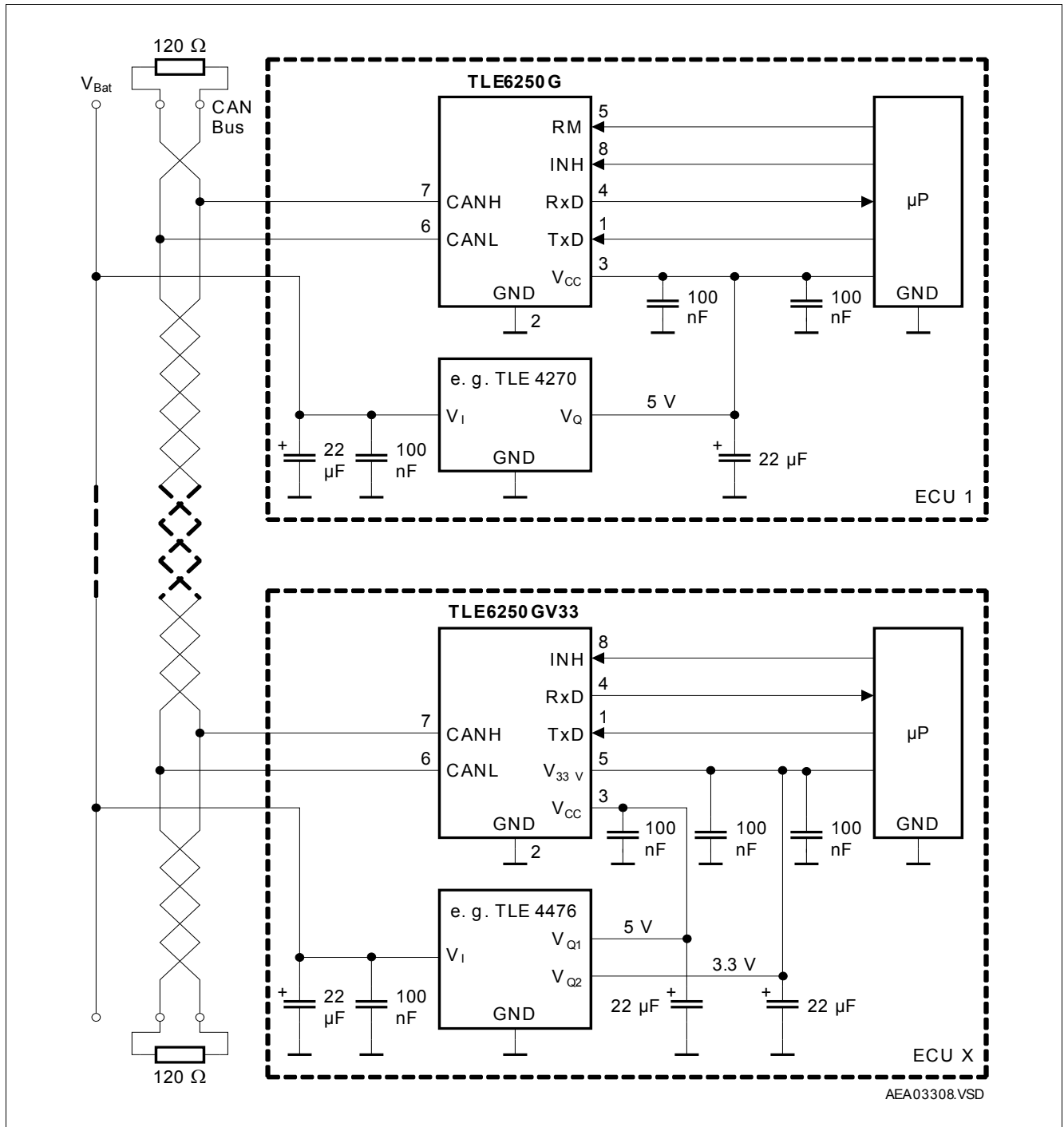


Figure 8 Application circuit TLE6250G with TLE6250GV33

6 Package outlines

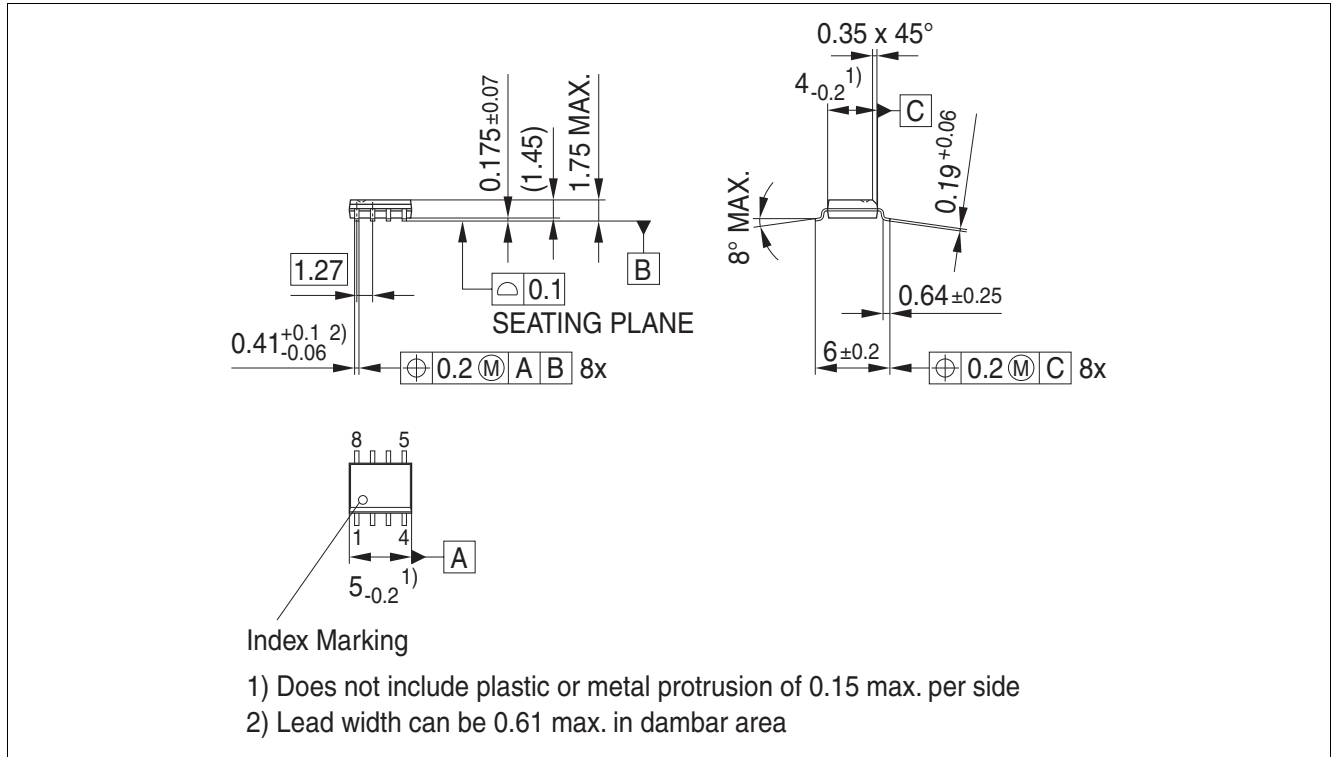


Figure 9 PG-DSO-8 (PG-DSO-8 Plastic Dual Small Outline)

Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-Compliant (i.e. Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

7 Application information

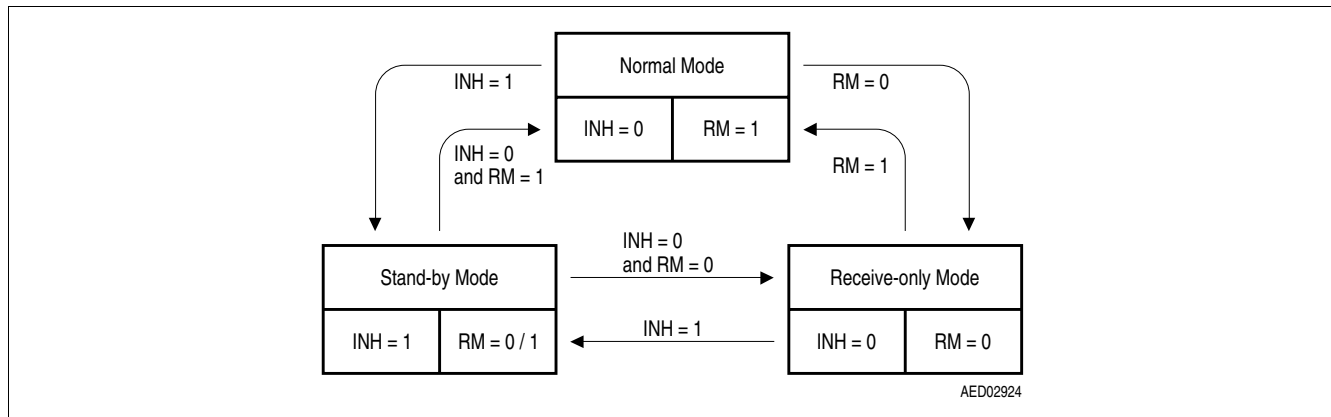


Figure 10 Mode state diagram TLE6250G

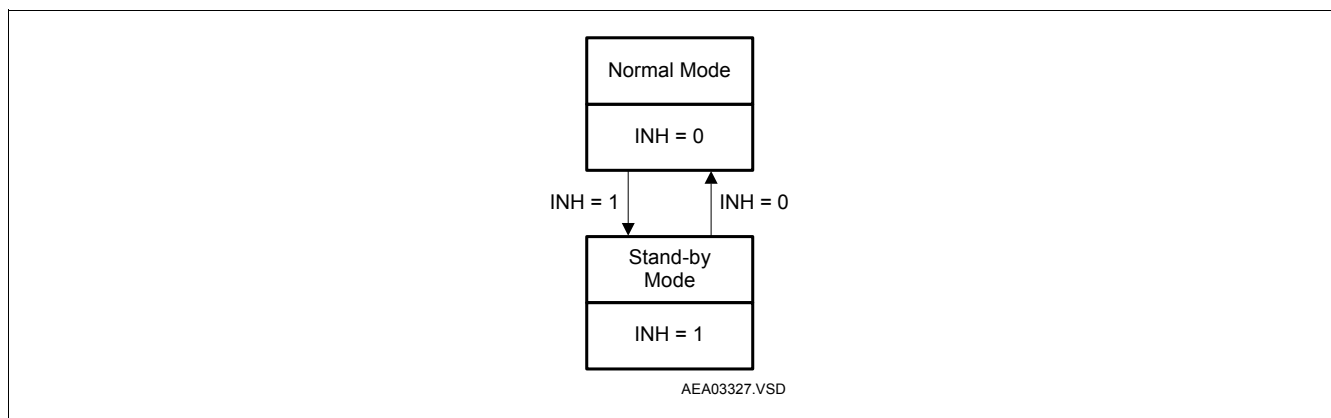


Figure 11 Mode state diagram TLE6250GV33

The TLE6250G offers three modes of operation (see [Figure 10](#)), controlled by the INH and RM pin. The TLE6250GV33 offers two modes of operation (see [Figure 11](#)), controlled by the INH pin respectively.

In normal mode the transceiver can receive and transmit messages. In receive-only mode the transceiver does not transmit signals at the TxD input to the CAN bus. Receive-only mode can be used for diagnostic purposes (to check the bus connections between the nodes) as well as to prevent the bus being blocked by a faulty permanent dominant TxD input signal. Stand-by mode is a low power mode that disables both the receiver and the transmitter.

If the receive-only feature is not used, then the RM pin must be left open. If stand-by mode is not used, then the INH pin must be connected to ground level in order to switch the TLE6250G to normal mode.

Application information for the 3.3 V versions

The TLE6250GV33 can be used for both 3.3 V and 5 V microcontroller logic supply, see [Figure 12](#), [Figure 13](#) and [Figure 14](#). Do not connect external resistors between the power supply and the V_{33V} pin, because that may lead to a voltage drop at this pin.

Application information

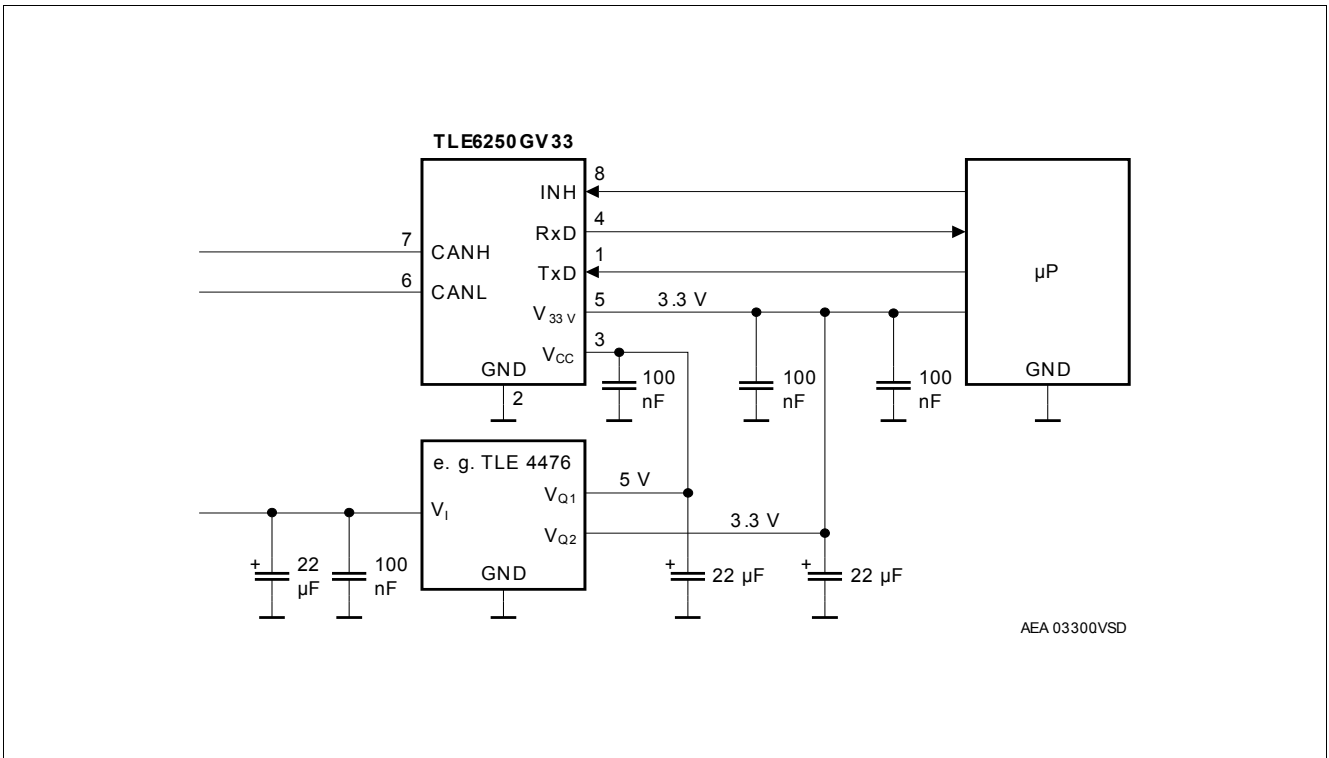


Figure 12 Application circuit TLE6250GV33 used for 3.3 V logic

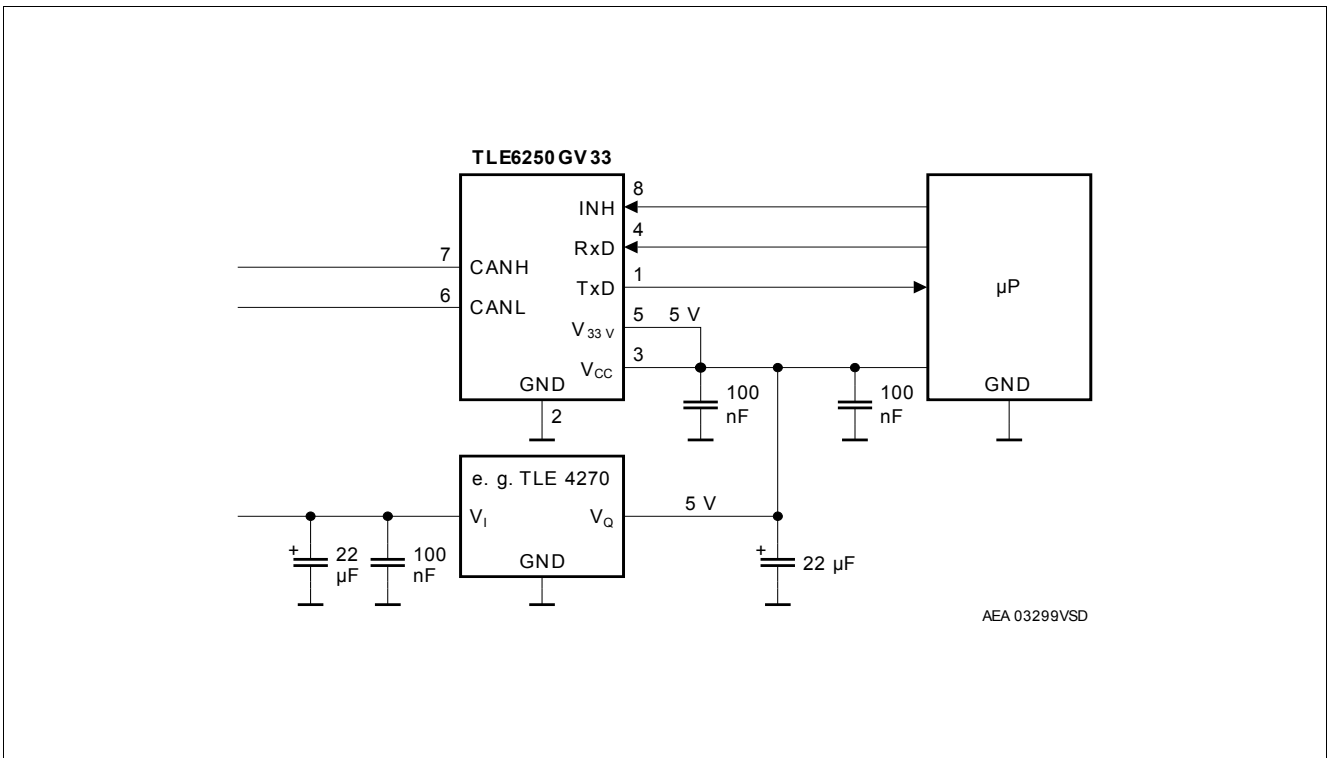


Figure 13 Application circuit TLE6250GV33 used for 5 V logic

Application information

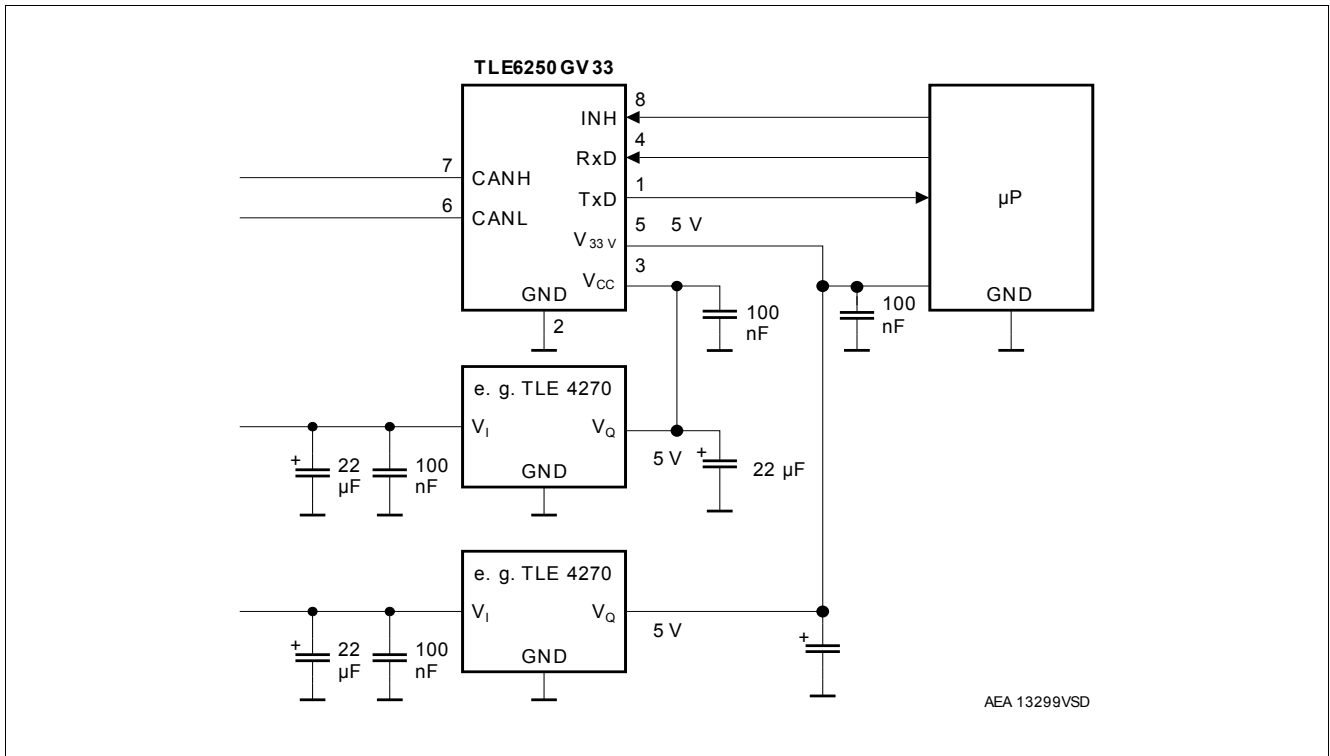


Figure 14 Application circuit TLE6250GV33 used for 5 V logic

Revision history

8 Revision history

| Revision | Date | Changes |
|-----------------|-------------|---|
| 4.1 | 2017-03-15 | <p>New style template. Editorial changes. Chapter „Overview“:</p> <ul style="list-style-type: none"> • Table of device types and packages: Marking added <p>Chapter „General product characteristics and electrical characteristics“:</p> <ul style="list-style-type: none"> • Table 5: Propagation delay TxD-to-RxD “low” (recessive to dominant) Max. value updated, footnote added • Table 5: Propagation delay TxD-to-RxD “high” (dominant to recessive) Max. value updated, footnote added • Table 8: Propagation delay TxD-to-RxD “low” (recessive to dominant) Max. value updated, footnote added • Table 8: Propagation delay TxD-to-RxD “high” (dominant to recessive) Max. value updated, footnote added |
| 4.0 | 2008-04-28 | <p>Changed symbol for the leakage current CANH/L: From $I_{CANH,IK}$ to $I_{CANH/L,IK}$ max. value for the parameter changed: Output current, $I_{CANH/L,IK}$, $V_{CC} = 0\text{ V}$, $V_{CANH} = V_{CANL} = 7\text{ V}$: From 300 μA to 400 μA</p> |

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