

IFX1050GVIO

High Speed CAN-Transceiver

Data Sheet

Rev. 1.0, 2011-04-08

Standard Power

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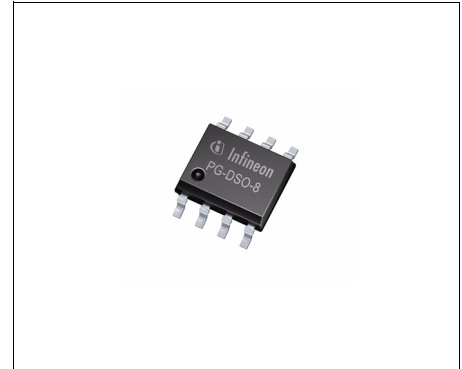
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1 Overview

Features

- CAN data transmission rate up to 1 MBaud
- Stand-by Mode
- Suitable for 12 V and 24 V applications
- Excellent EMC performance (very high immunity and very low emission)
- Bus pins are short circuit proof to ground and battery voltage
- Versions for 5V and 3.3V microcontrollers
- Overtemperature protection
- Green Product (RoHS compliant)



PG-DSO-8

Description

The HS CAN-transceiver IFX1050GVIO is optimized for high speed differential mode data transmission in industrial applications and is compatible to ISO/DIS 11898. It works as an interface between the CAN protocol controller and the physical differential bus in both, 12 V and 24 V systems.

The IFX1050GVIO is designed to withstand the conditions of industrial applications and provides excellent EMC performance.

IFX1050GVIO

3.3 V logic I/O version (logic I/O voltage adaptive to V_{33} pin within the range 3.3 V to 5 V):

RxD, TxD, INH. One control pin (INH) and two operation modes: Normal Mode and Standby Mode.

| Type | Package | Marking |
|-------------|----------|---------|
| IFX1050GVIO | PG-DSO-8 | 1050IO |

2 Pin Configuration

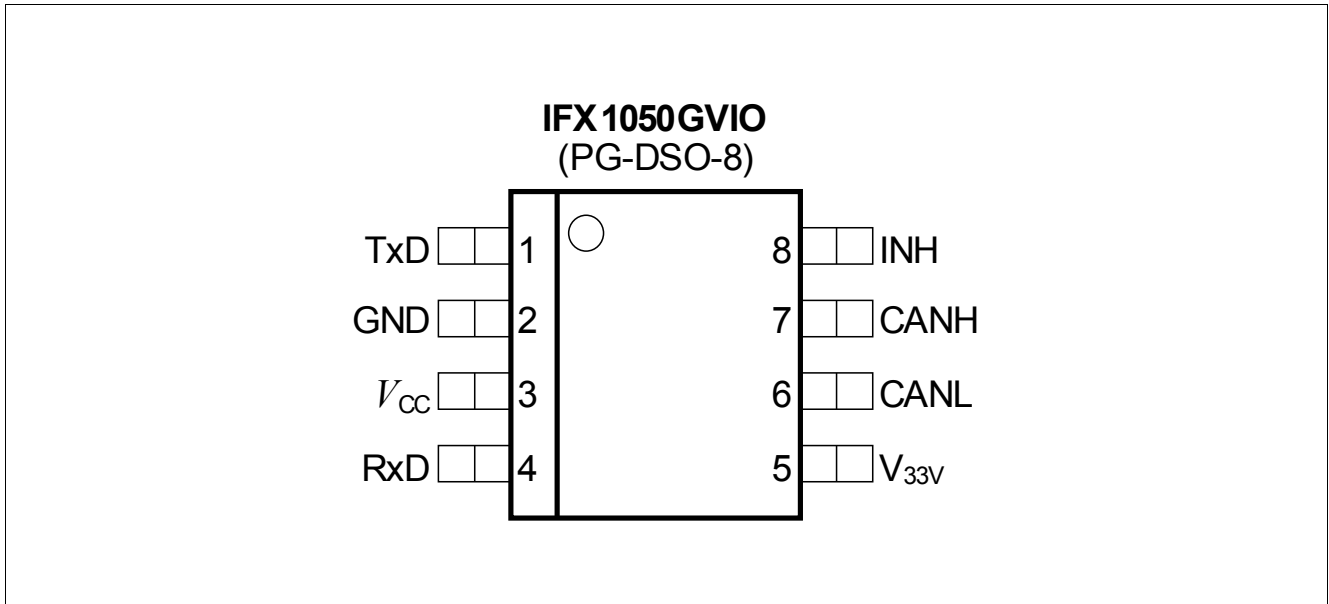


Figure 1 Pin Configuration IFX1050GVIO (top view)

Table 1 Pin Definitions and Functions IFX1050GVIO

| 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 input |
| 4 | RxD | CAN receive data output ; LOW in dominant state, integrated pull-up |
| 5 | V_{33V} | Logic supply input ; 3.3V or 5V microcontroller logic supply can be connected here! The digital I/Os of the IFX1050GVIO adopt to the connected microcontroller logic supply a 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, set LOW for normal mode |

3 Block Diagram

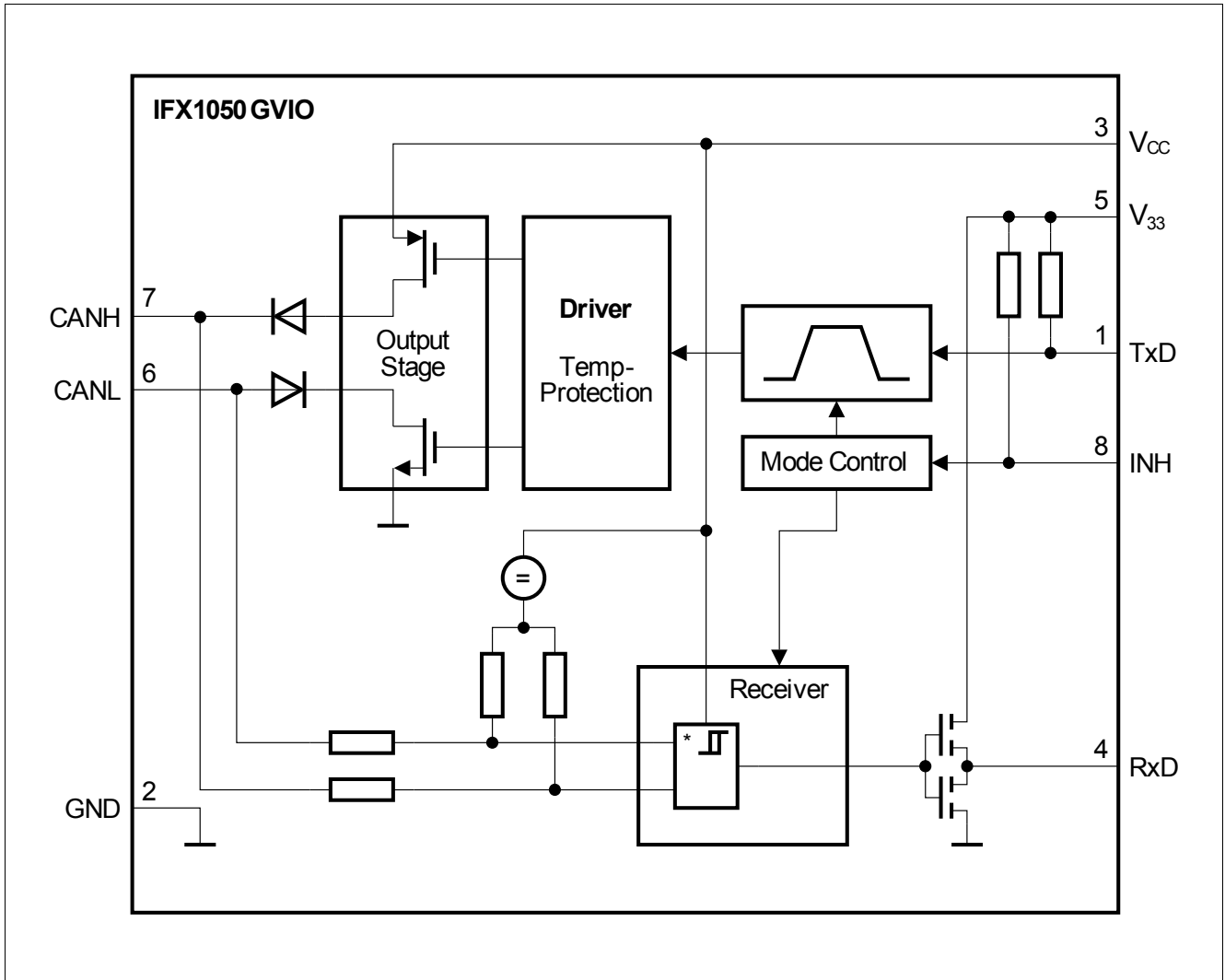


Figure 2 Block Diagram IFX1050GVIO

4 Electrical Characteristics

Table 2 Absolute Maximum Ratings

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|---|--------------|--------------|----------|--------------------|---|
| | | Min. | Max. | | |
| Voltages | | | | | |
| Supply voltage | V_{CC} | -0.3 | 6.5 | V | – |
| 3.3V 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 | $0\text{ V} < V_{CC} < 5.5\text{ V}$ |
| 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 | 150 | $^{\circ}\text{C}$ | – |

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

4.1 Operating Range

Table 3 Operating Range

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|--|-------------|--------------|------|--------------------|----------------------------------|
| | | Min. | Max. | | |
| Supply voltage | V_{CC} | 4.5 | 5.5 | V | – |
| 3.3V supply voltage | V_{33V} | 3.0 | 5.5 | V | – |
| Junction temperature | T_j | -40 | 125 | $^{\circ}\text{C}$ | – |
| Thermal Resistances | | | | | |
| Junction ambient | R_{thj-a} | – | 185 | K/W | – |
| Thermal Shutdown (junction temperature) | | | | | |
| Thermal shutdown temperature | T_{jsD} | 160 | 200 | $^{\circ}\text{C}$ | 10 $^{\circ}\text{C}$ hysteresis |

Electrical Characteristics
Table 4 Electrical Characteristics

4.5 V < V_{CC} < 5.5 V; 3.0 V < V_{33V} < 5.5 V $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; $-40 \text{ }^\circ\text{C} < T_j < 125 \text{ }^\circ\text{C}$; 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+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 | $V_{RD} = 0.8 \times V_{33V}$, $V_{diff} < 0.4 \text{ V}^1)$ |
| LOW level output current | $I_{RD,L}$ | 1 | 2 | – | mA | $V_{RD} = 0.2 \times V_{33V}$, $V_{diff} > 1 \text{ V}^1)$ |
| 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 | – |
| 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
Table 4 Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; 3.0 V < V_{33V} < 5.5 V $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; -40 °C < T_j < 125 °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 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 | k Ω | recessive state |
| Differential input resistance | R_{diff} | 20 | 40 | 60 | k Ω | recessive state |

Electrical Characteristics
Table 4 Electrical Characteristics (cont'd)

4.5 V < V_{CC} < 5.5 V; 3.0 V < V_{33V} < 5.5 V $R_L = 60 \Omega$; $V_{INH} < V_{INH,ON}$; -40 °C < T_j < 125 °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 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 | $I_{CANH/L,ik}$ | -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 | $I_{CANH/L,ik}$ | 50 | 280 | 400 | μA | $V_{CC} = 0 \text{ V}$, $V_{CANH} = V_{CANL} = 7 \text{ V}$ |
| | | 50 | 100 | 150 | μA | $V_{CC} = 0 \text{ V}$, $V_{CANH} = V_{CANL} = 2 \text{ V}$ |

Electrical Characteristics

Table 4 Electrical Characteristics (cont'd)

$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; $3.0\text{ V} < V_{33V} < 5.5\text{ V}$ $R_L = 60\ \Omega$; $V_{INH} < V_{INH,ON}$; $-40\text{ }^\circ\text{C} < T_j < 125\text{ }^\circ\text{C}$; 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 | $C_L = 47\text{ pF}$; $R_L = 60\ \Omega$; $V_{CC} = 5\text{ V}$; $C_{RxD} = 20\text{ pF}$ |

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

2) Deviation from ISO/DIS 11898

5 Diagrams

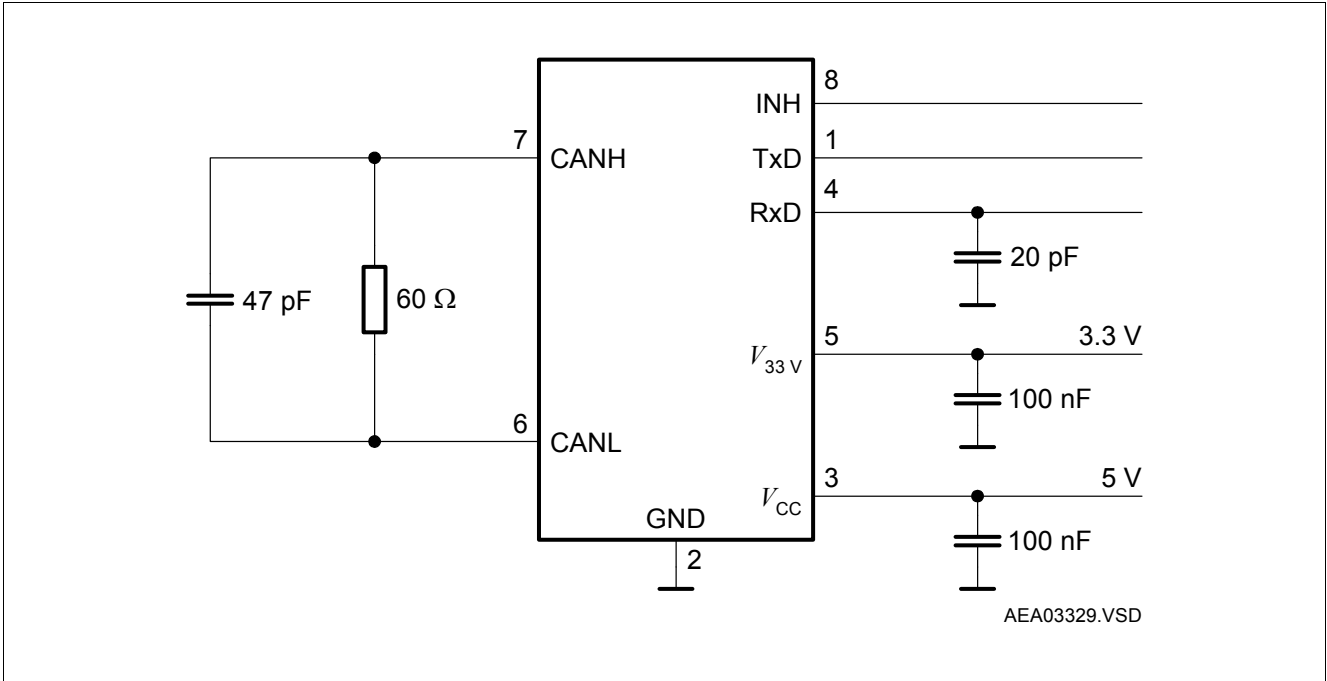


Figure 3 Test Circuit for Dynamic Characteristics

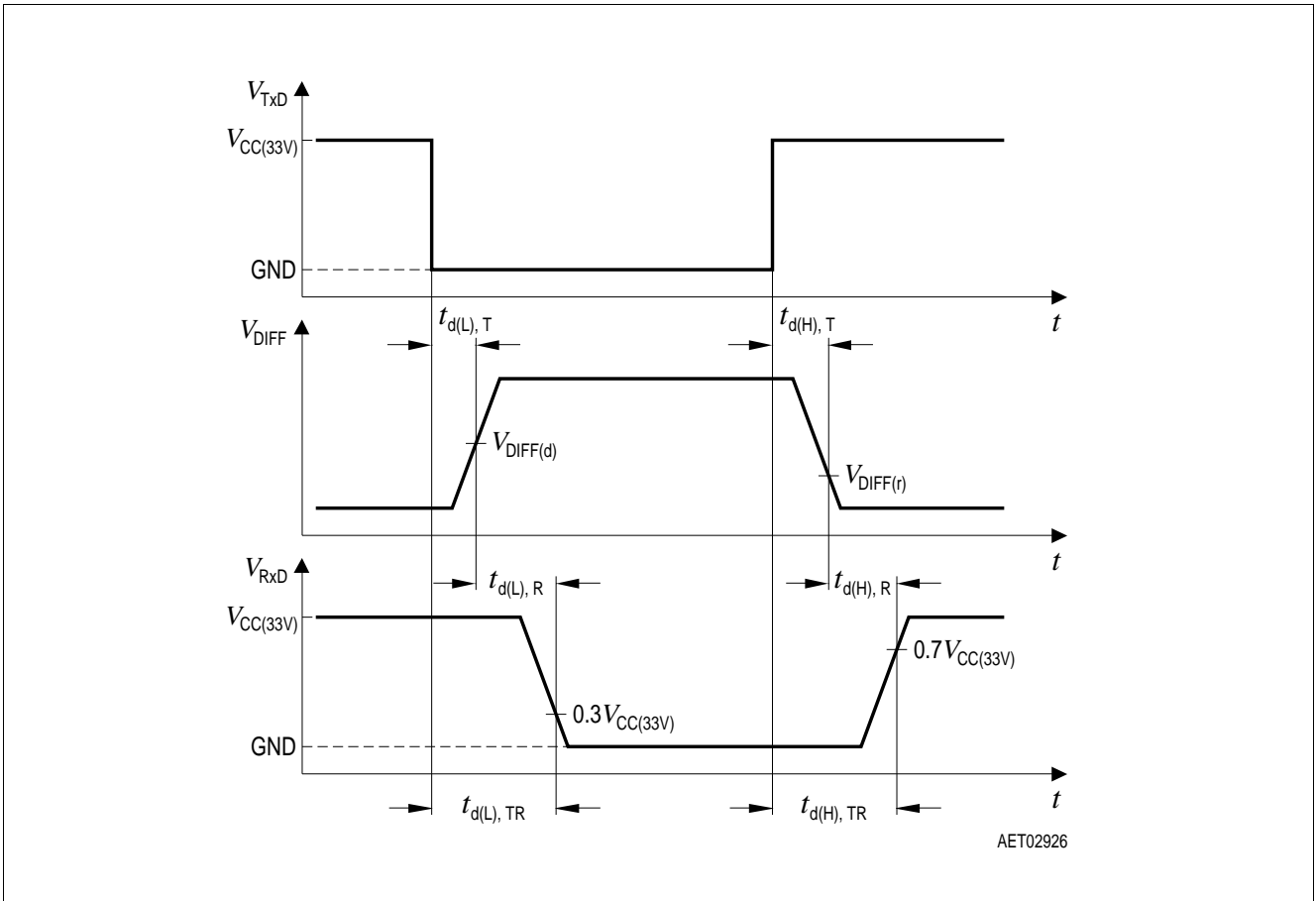


Figure 4 Timing Diagrams for Dynamic Characteristics

6 Application Information

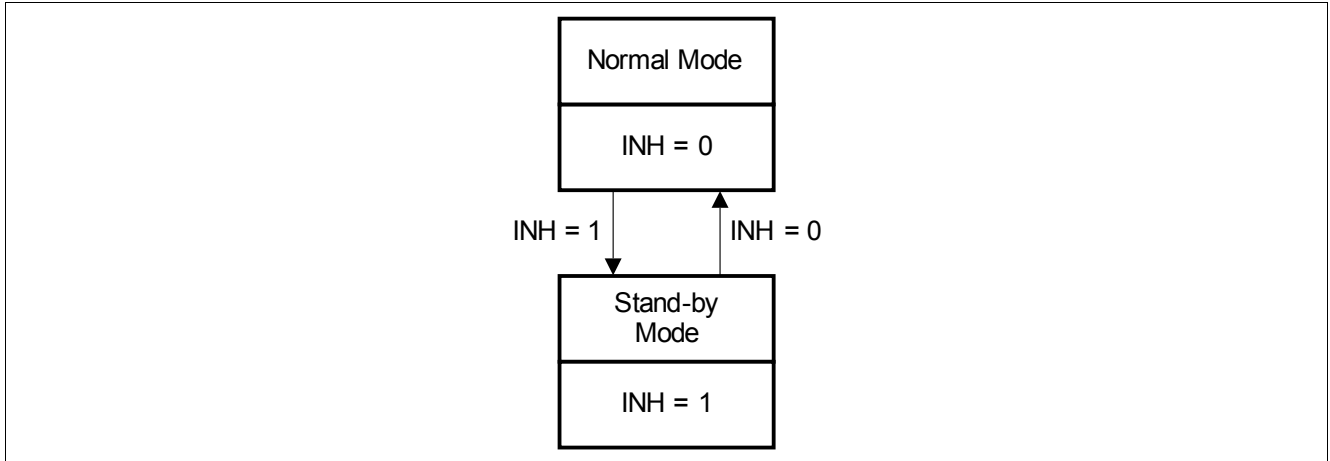


Figure 5 Mode State Diagram

The IFX1050GVIO offers two different operation modes (see [Figure 5](#)), controlled by the INH pin.

In the normal mode the device is able to receive and to transmit data from the TxD pin to the CAN bus. The stand-by mode is a low power mode that disables both, the receiver as well as the transmitter.

When the stand-by mode is not used the INH pin has to be connected to ground level in order to switch the IFX1050GVIO into normal mode.

Application Information for the 3.3 V Version

The IFX1050GVIO can be used for both; 3.3 V and 5 V microcontroller logic supply, as shown in [Figure 6](#). Don't apply any external resistors between the power supply and this pin. This may cause a voltage drop and reduce the available voltage at this pin.

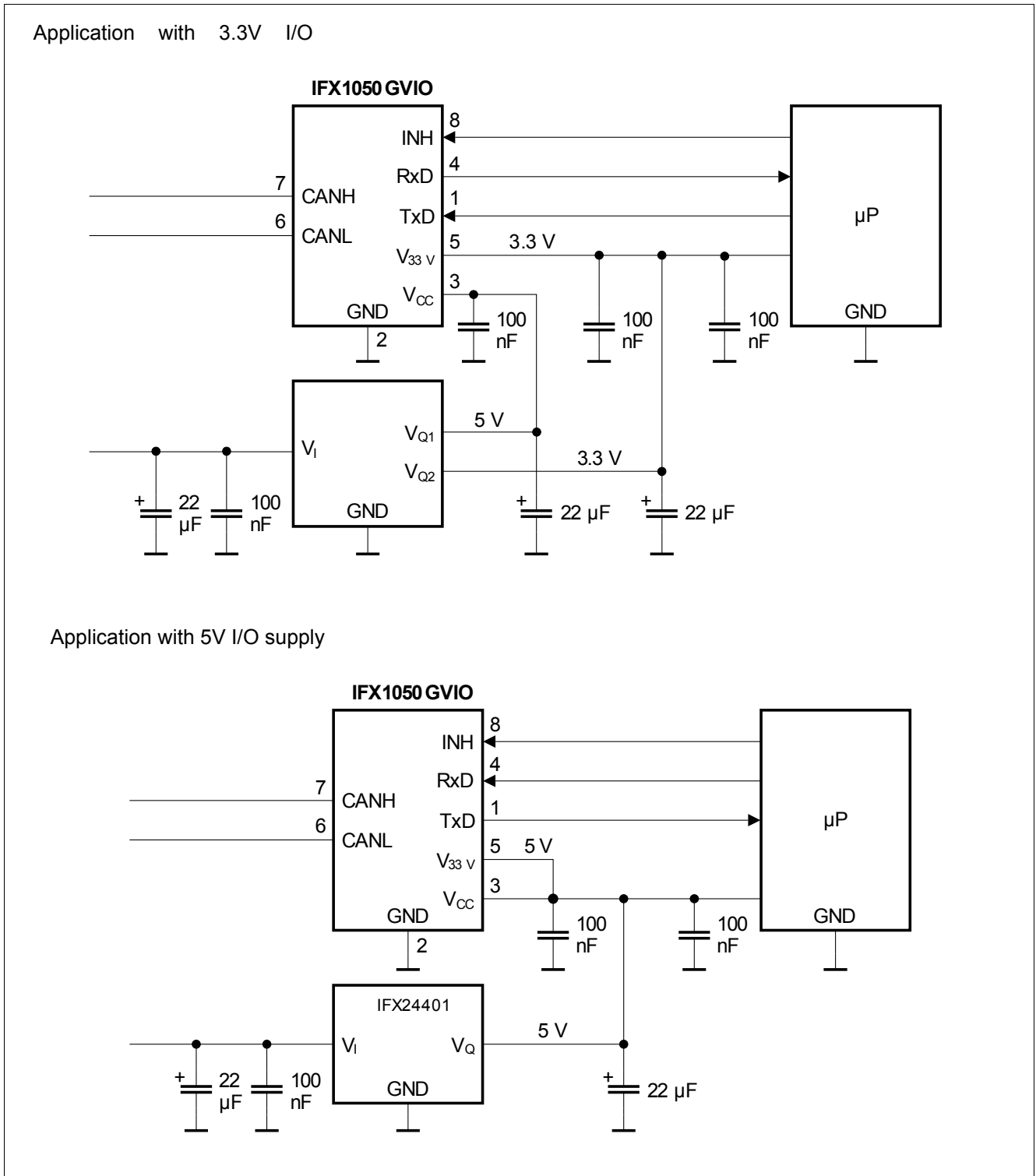


Figure 6 Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

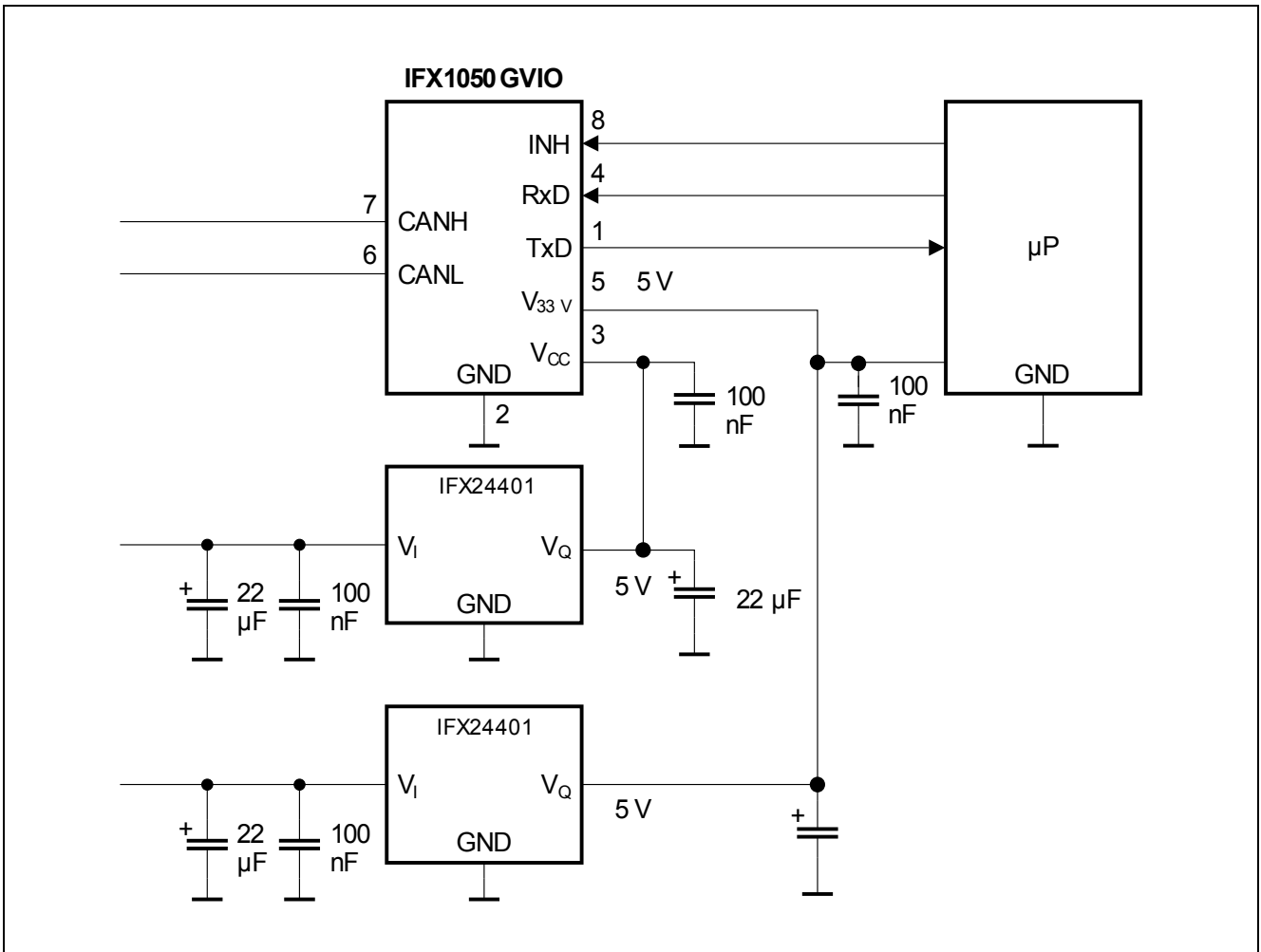


Figure 7 Figure 4 (cont.) Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

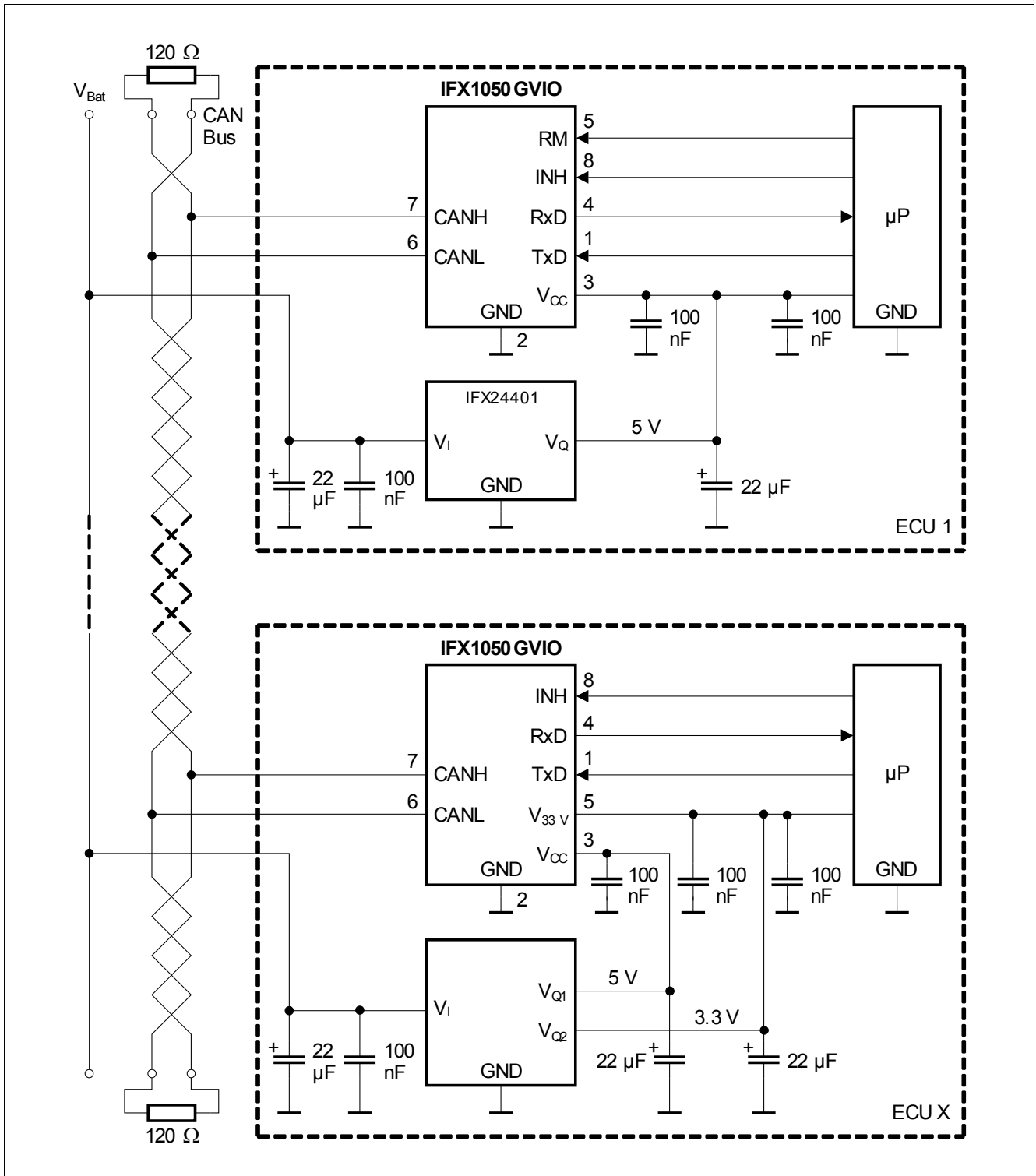


Figure 8 Application Circuit IFX1050GVIO

Applications with separate 5V power supplies,
for applications with switchable transceiver

7 Package Outlines

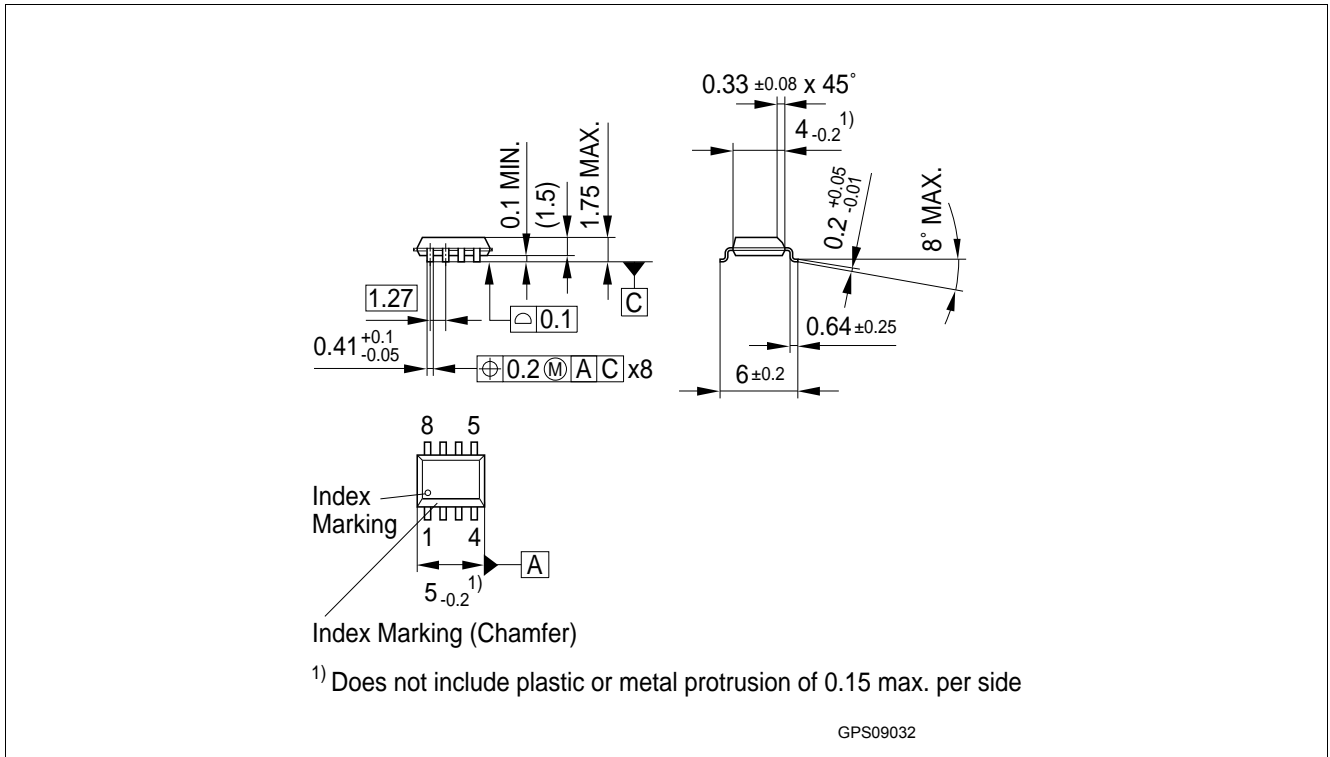


Figure 9 PG-DSO-8 (Plastic Dual Small Outline), lead free version

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).

8 Revision History

| Revision | Date | Changes |
|----------|------------|-------------------|
| 1.0 | 2011-04-08 | Release Datasheet |

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