

# IFX1050GVIO

High Speed CAN-Transceiver

## Data Sheet

Rev. 1.0, 2011-04-08

Standard Power

## Table of Contents

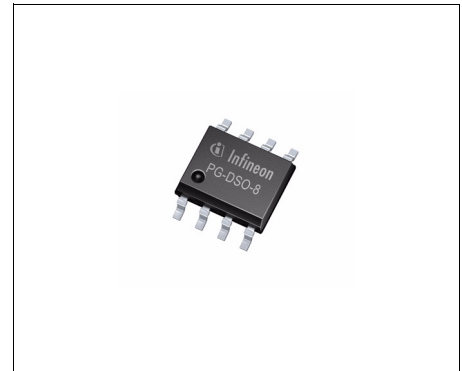
|     |   |    |
|-----|---|----|
| 1   | <b>Overview</b> .....                   | 3  |
| 2   | <b>Pin Configuration</b> .....          | 4  |
| 3   | <b>Block Diagram</b> .....              | 5  |
| 4   | <b>Electrical Characteristics</b> ..... | 6  |
| 4.1 | Operating Range .....                   | 6  |
| 5   | <b>Diagrams</b> .....                   | 11 |
| 6   | <b>Application Information</b> .....    | 13 |
| 7   | <b>Package Outlines</b> .....           | 17 |
| 8   | <b>Revision History</b> .....           | 18 |



## 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.

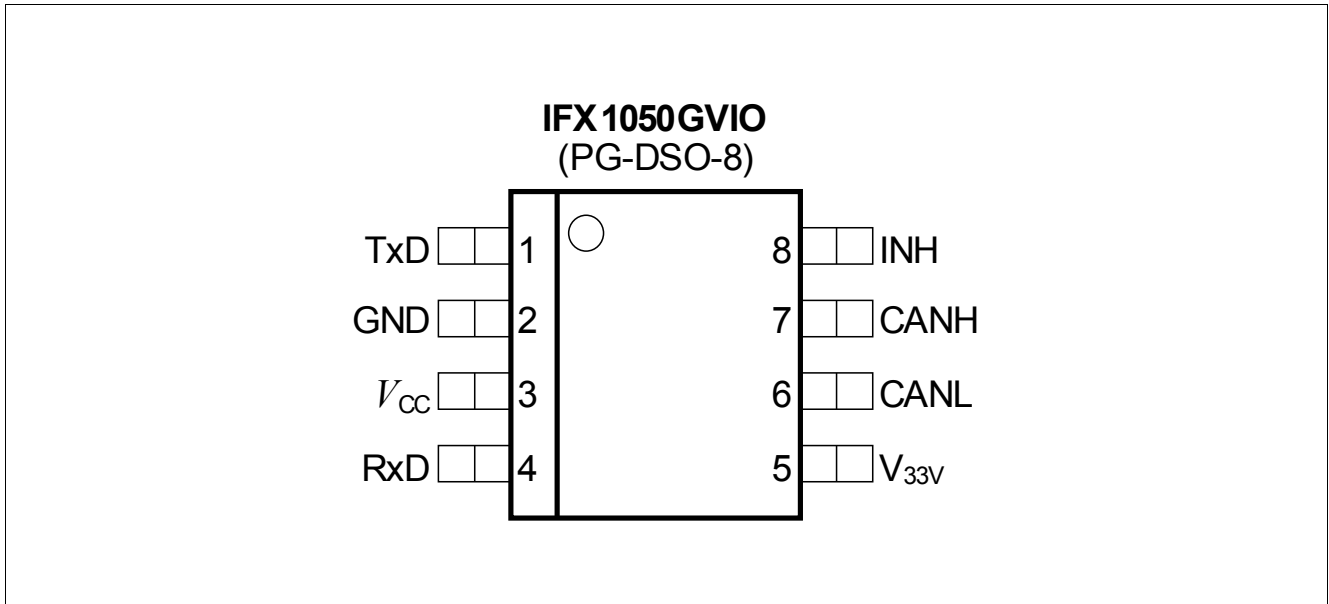
### IFX1050GVIO

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       | <b>CAN transmit data input</b> ; 20 k $\Omega$ pull-up, LOW in dominant state   |
| 2       | GND       | <b>Ground</b>   |
| 3       | $V_{CC}$  | <b>5 V Supply input</b>   |
| 4       | RxD       | <b>CAN receive data output</b> ; LOW in dominant state, integrated pull-up  |
| 5       | $V_{33V}$ | <b>Logic supply input</b> ; <b>3.3V or 5V</b> 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      | <b>Low line I/O</b> ; LOW in dominant state   |
| 7       | CANH      | <b>High line I/O</b> ; HIGH in dominant state   |
| 8       | INH       | <b>Inhibit Input</b> ; control input, 20 k $\Omega$ pull, set LOW for normal mode   |

### 3 Block Diagram

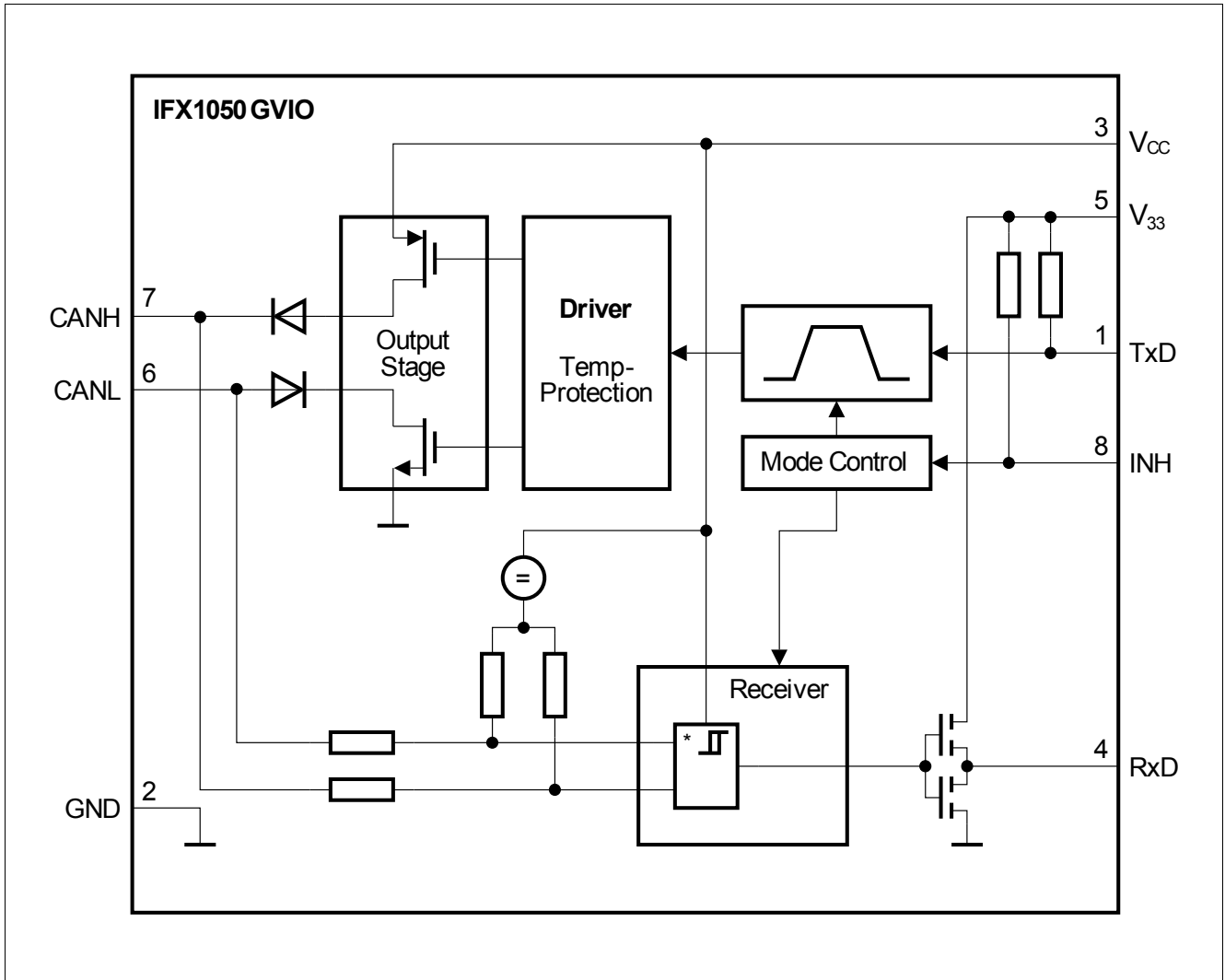


Figure 2 Block Diagram IFX1050GVIO

## 4 Electrical Characteristics

**Table 2 Absolute Maximum Ratings**

| Parameter                                     | Symbol       | Limit Values |          | Unit               | Remarks                                       |
|---|--------------|--------------|----------|--------------------|---|
|   |              | Min.         | Max.     |                    |   |
| <b>Voltages</b>                               |              |              |          |                    |   |
| 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 $\Omega$ ) |
| Electrostatic discharge voltage               | $V_{ESD}$    | -2           | 2        | kV                 | human body model (100 pF via 1.5 k $\Omega$ ) |
| <b>Temperatures</b>                           |              |              |          |                    |   |
| 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  | $^{\circ}\text{C}$ | –                                |
| <b>Thermal Resistances</b>                     |             |              |      |                    |                                  |
| Junction ambient                               | $R_{thj-a}$ | –            | 185  | K/W                | –                                |
| <b>Thermal Shutdown (junction temperature)</b> |             |              |      |                    |                                  |
| 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.                 |               |  |
| <b>Current Consumption</b>         |                   |                      |                       |                      |               |  |
| Current consumption                | $I_{CC+33V}$      | –                    | 6                     | 10                   | mA            | recessive state;<br>$V_{TxD} = V_{33V}$                          |
| Current consumption                | $I_{CC+33V}$      | –                    | 45                    | 70                   | mA            | dominant state;<br>$V_{TxD} = 0 \text{ V}$                       |
| Current consumption                | $I_{33V}$         | –                    | –                     | 2                    | mA            | –  |
| Current consumption                | $I_{CC+33V, stb}$ | –                    | 1                     | 10                   | $\mu\text{A}$ | stand-by mode;<br>TxD = high                                     |
| <b>Receiver Output RxD</b>         |                   |                      |                       |                      |               |  |
| HIGH level output current          | $I_{RD,H}$        | –                    | -2                    | -1                   | mA            | $V_{RD} = 0.8 \times V_{33V}$ ,<br>$V_{diff} < 0.4 \text{ V}^1)$ |
| LOW level output current           | $I_{RD,L}$        | 1                    | 2                     | –                    | mA            | $V_{RD} = 0.2 \times V_{33V}$ ,<br>$V_{diff} > 1 \text{ V}^1)$   |
| <b>Transmission Input TxD</b>      |                   |                      |                       |                      |               |  |
| 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 $\Omega$    | –  |
| <b>Inhibit Input (pin INH)</b>     |                   |                      |                       |                      |               |  |
| 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 $\Omega$    | –  |

**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. |            |  |
| <b>Bus Receiver</b>   |                |              |      |      |            |  |
| Differential receiver threshold voltage, recessive to dominant edge | $V_{diff,d}$   | –            | 0.75 | 0.90 | V          | -20 V < ( $V_{CANH}$ , $V_{CANL}$ ) < 25 V<br>$V_{diff} = V_{CANH} - V_{CANL}$ |
| Differential receiver threshold voltage dominant to recessive edge  | $V_{diff,r}$   | 0.50         | 0.60 | –    | V          | -20 V < ( $V_{CANH}$ , $V_{CANL}$ ) < 25 V<br>$V_{diff} = V_{CANH} - V_{CANL}$ |
| 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 $\Omega$ | recessive state  |
| Differential input resistance                                       | $R_{diff}$     | 20           | 40   | 60   | k $\Omega$ | 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.                |               |  |
| <b>Bus Transmitter</b>   |                 |                     |      |                     |               |  |
| 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<br>$V_{diff} = V_{CANH} - V_{CANL}$ , no load <sup>2)</sup> | $V_{diff}$      | -1                  | –    | 0.05                | V             | $V_{TxD} = V_{33V}$  |
| CANL dominant output voltage   | $V_{CANL}$      | –                   | –    | 2.0                 | V             | $V_{TxD} = 0 \text{ V}$ ;<br>$V_{CC} = 5 \text{ V}$              |
| CANH dominant output voltage   | $V_{CANH}$      | 2.8                 | –    | –                   | V             | $V_{TxD} = 0 \text{ V}$ ;<br>$V_{CC} = 5 \text{ V}$              |
| CANH, CANL dominant output voltage difference<br>$V_{diff} = V_{CANH} - V_{CANL}$                          | $V_{diff}$      | 1.5                 | –    | 3.0                 | V             | $V_{TxD} = 0 \text{ V}$ ;<br>$V_{CC} = 5 \text{ V}$              |
| 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                | $\mu\text{A}$ | $V_{CC} = 0 \text{ V}$ ,<br>$V_{CANH} = V_{CANL} = -7 \text{ V}$ |
|  |                 | -50                 | -100 | -150                | $\mu\text{A}$ | $V_{CC} = 0 \text{ V}$ ,<br>$V_{CANH} = V_{CANL} = -2 \text{ V}$ |
| Output current   | $I_{CANH/L,ik}$ | 50                  | 280  | 400                 | $\mu\text{A}$ | $V_{CC} = 0 \text{ V}$ ,<br>$V_{CANH} = V_{CANL} = 7 \text{ V}$  |
|  |                 | 50                  | 100  | 150                 | $\mu\text{A}$ | $V_{CC} = 0 \text{ V}$ ,<br>$V_{CANH} = V_{CANL} = 2 \text{ V}$  |

## Electrical Characteristics

**Table 4 Electrical Characteristics (cont'd)**

4.5 V <  $V_{CC}$  < 5.5 V; 3.0 V <  $V_{33V}$  < 5.5 V  $R_L = 60 \Omega$ ;  $V_{INH} < V_{INH,ON}$ ;  $-40 \text{ }^\circ\text{C} < T_j < 125 \text{ }^\circ\text{C}$ ; all voltages with respect to ground; positive current flowing into pin; unless otherwise specified.

| Parameter  | Symbol        | Limit Values |      |      | Unit | Remarks   |
|--|---------------|--------------|------|------|------|---|
|  |               | Min.         | Typ. | Max. |      |   |
| <b>Dynamic CAN-Transceiver Characteristics</b>               |               |              |      |      |      |   |
| Propagation delay TxD-to-RxD LOW<br>(recessive to dominant)  | $t_{d(L),TR}$ | –            | 150  | 280  | ns   | $C_L = 47 \text{ pF}$ ;<br>$R_L = 60 \Omega$ ;<br>$V_{CC} = 5 \text{ V}$ ;<br>$C_{RxD} = 20 \text{ pF}$ |
| Propagation delay TxD-to-RxD HIGH<br>(dominant to recessive) | $t_{d(H),TR}$ | –            | 150  | 280  | ns   | $C_L = 47 \text{ pF}$ ;<br>$R_L = 60 \Omega$ ;<br>$V_{CC} = 5 \text{ V}$ ;<br>$C_{RxD} = 20 \text{ pF}$ |
| Propagation delay<br>TxD LOW to bus dominant                 | $t_{d(L),T}$  | –            | 100  | 140  | ns   | $C_L = 47 \text{ pF}$ ;<br>$R_L = 60 \Omega$ ;<br>$V_{CC} = 5 \text{ V}$                                |
| Propagation delay<br>TxD HIGH to bus recessive               | $t_{d(H),T}$  | –            | 100  | 140  | ns   | $C_L = 47 \text{ pF}$ ;<br>$R_L = 60 \Omega$ ;<br>$V_{CC} = 5 \text{ V}$                                |
| Propagation delay bus dominant to RxD LOW                    | $t_{d(L),R}$  | –            | 50   | 140  | ns   | $C_L = 47 \text{ pF}$ ;<br>$R_L = 60 \Omega$ ;<br>$V_{CC} = 5 \text{ V}$ ;<br>$C_{RxD} = 20 \text{ pF}$ |
| Propagation delay bus recessive to RxD<br>HIGH               | $t_{d(H),R}$  | –            | 50   | 140  | ns   | $C_L = 47 \text{ pF}$ ;<br>$R_L = 60 \Omega$ ;<br>$V_{CC} = 5 \text{ V}$ ;<br>$C_{RxD} = 20 \text{ pF}$ |

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

2) Deviation from ISO/DIS 11898

5 Diagrams

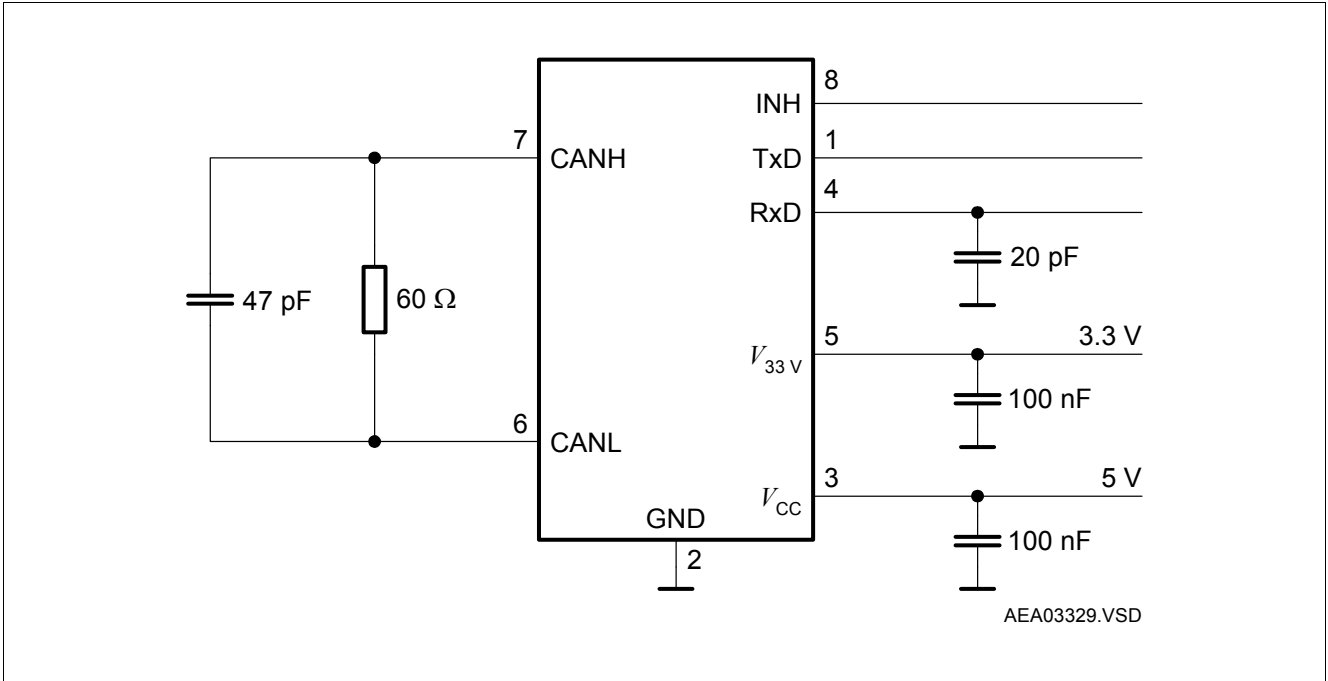


Figure 3 Test Circuit for Dynamic Characteristics

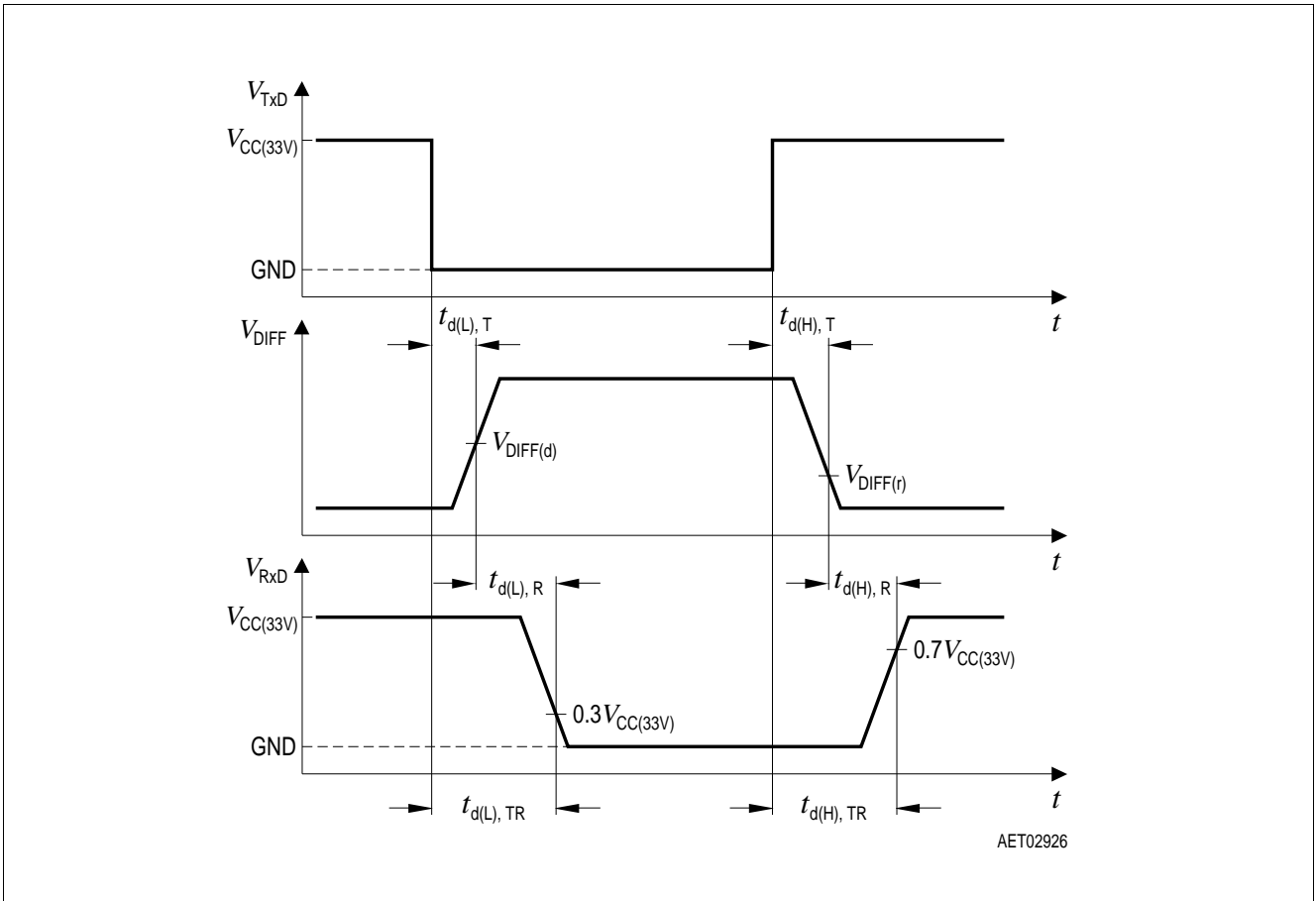
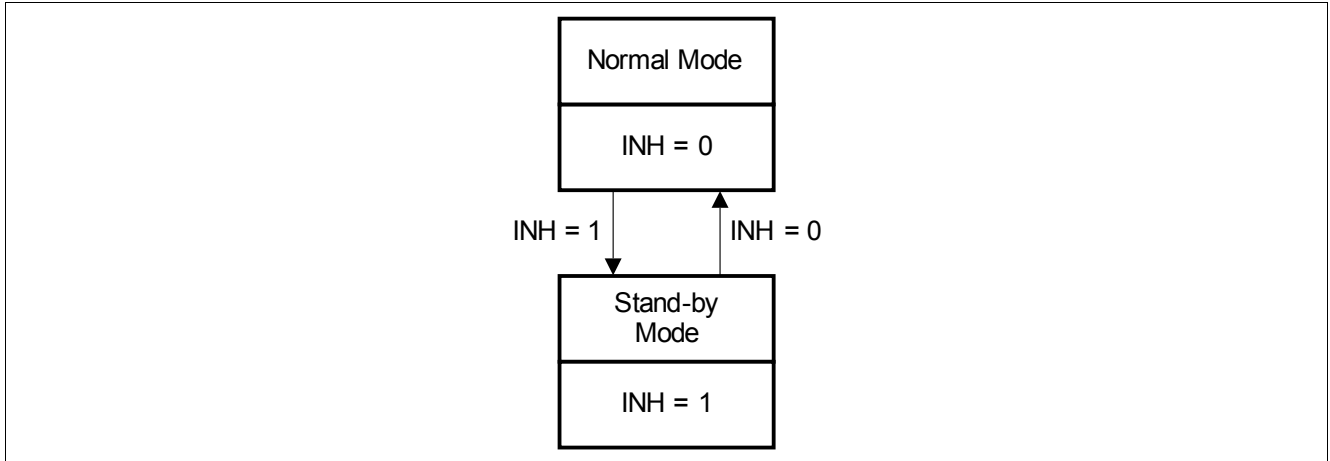


Figure 4 Timing Diagrams for Dynamic Characteristics

## 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.

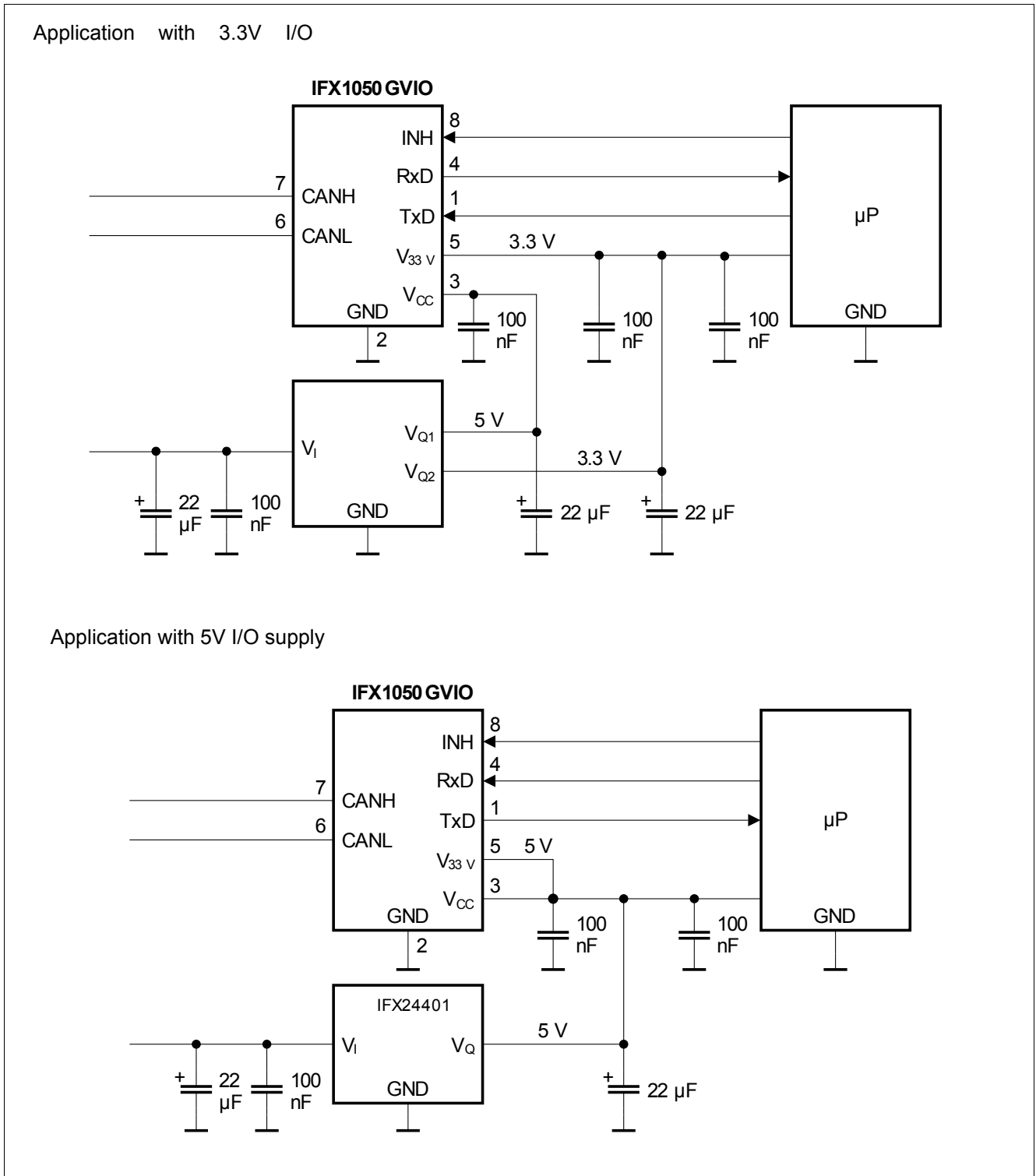


Figure 6 Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

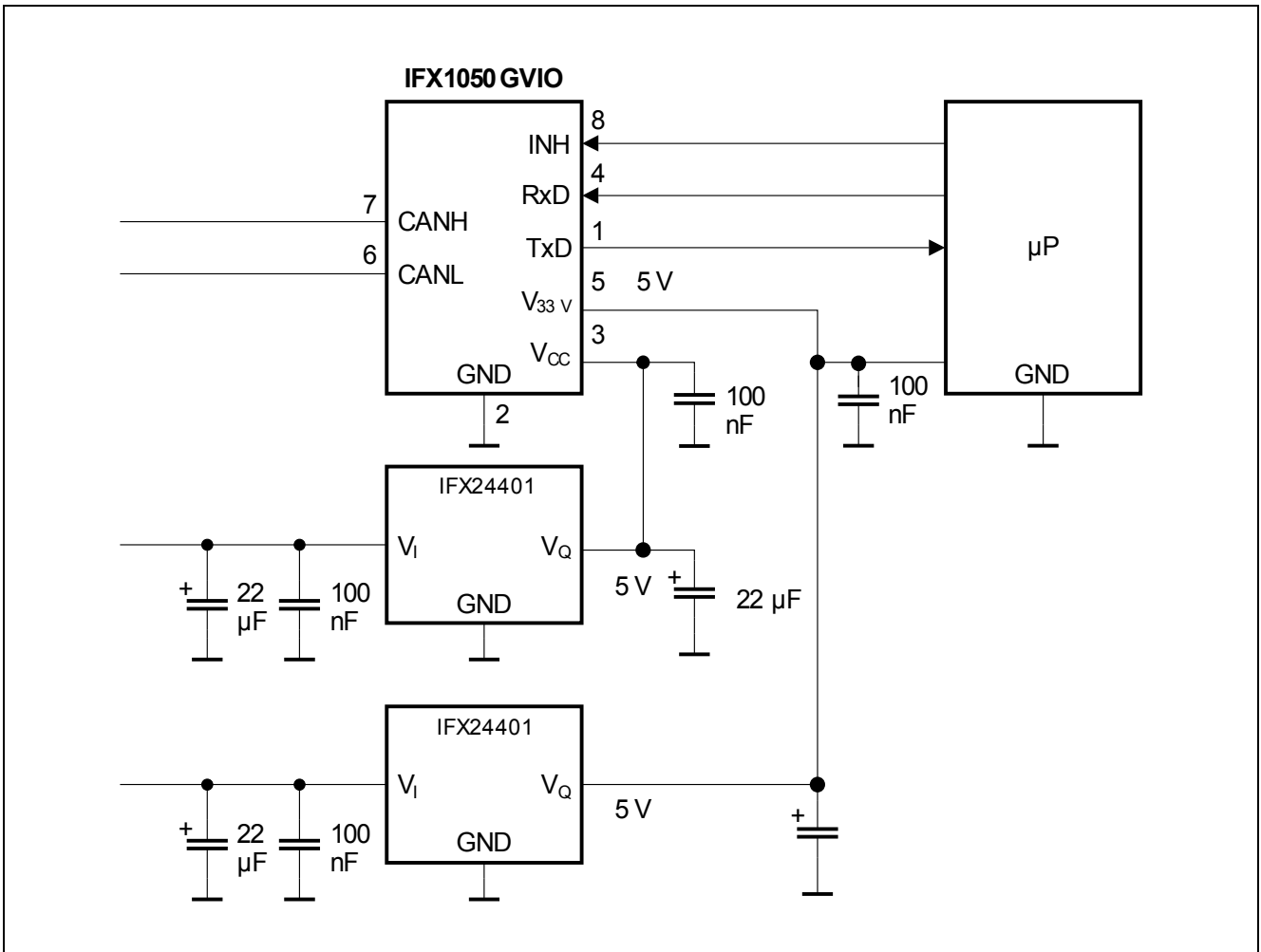


Figure 7 Figure 4 (cont.) Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

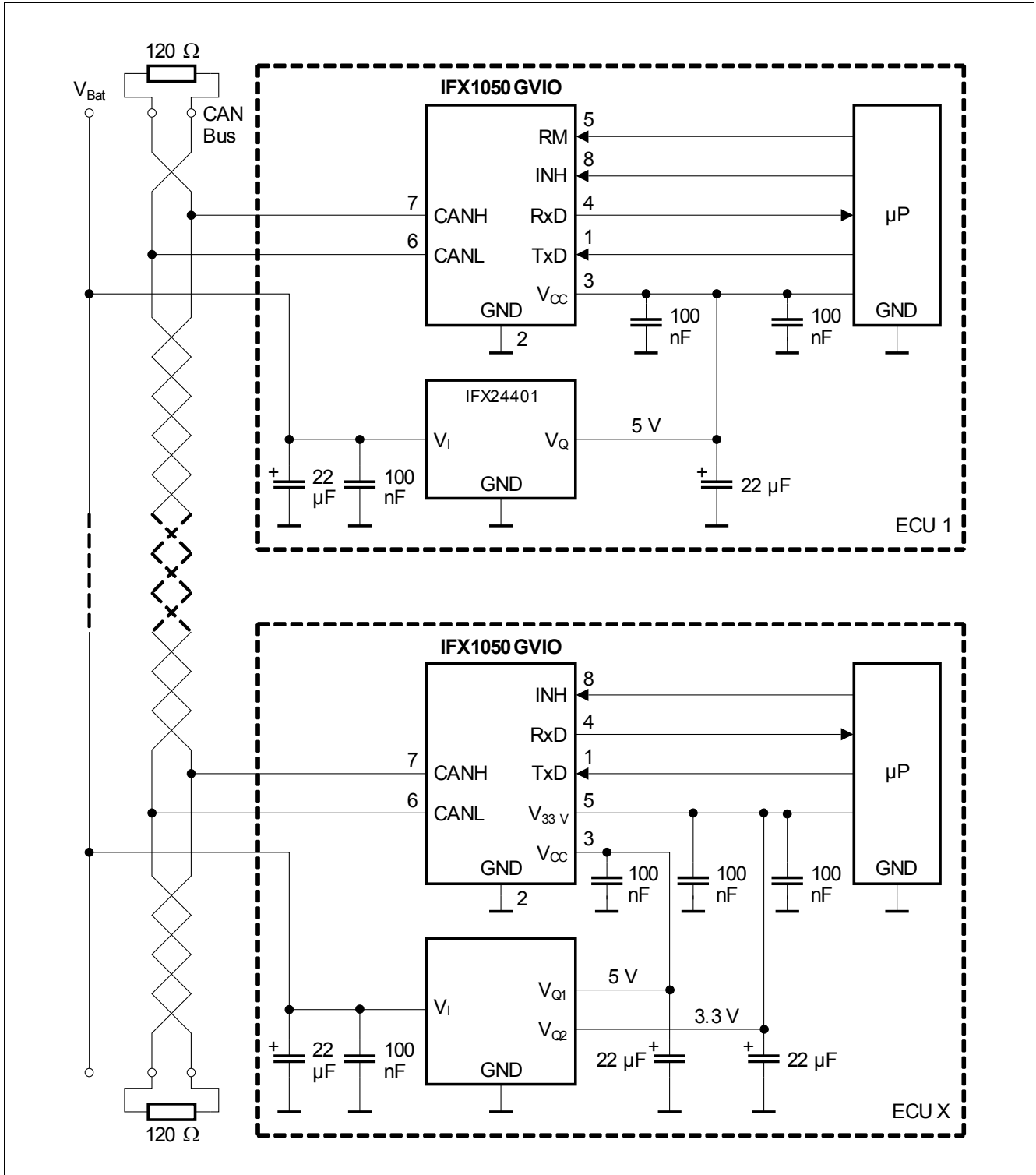
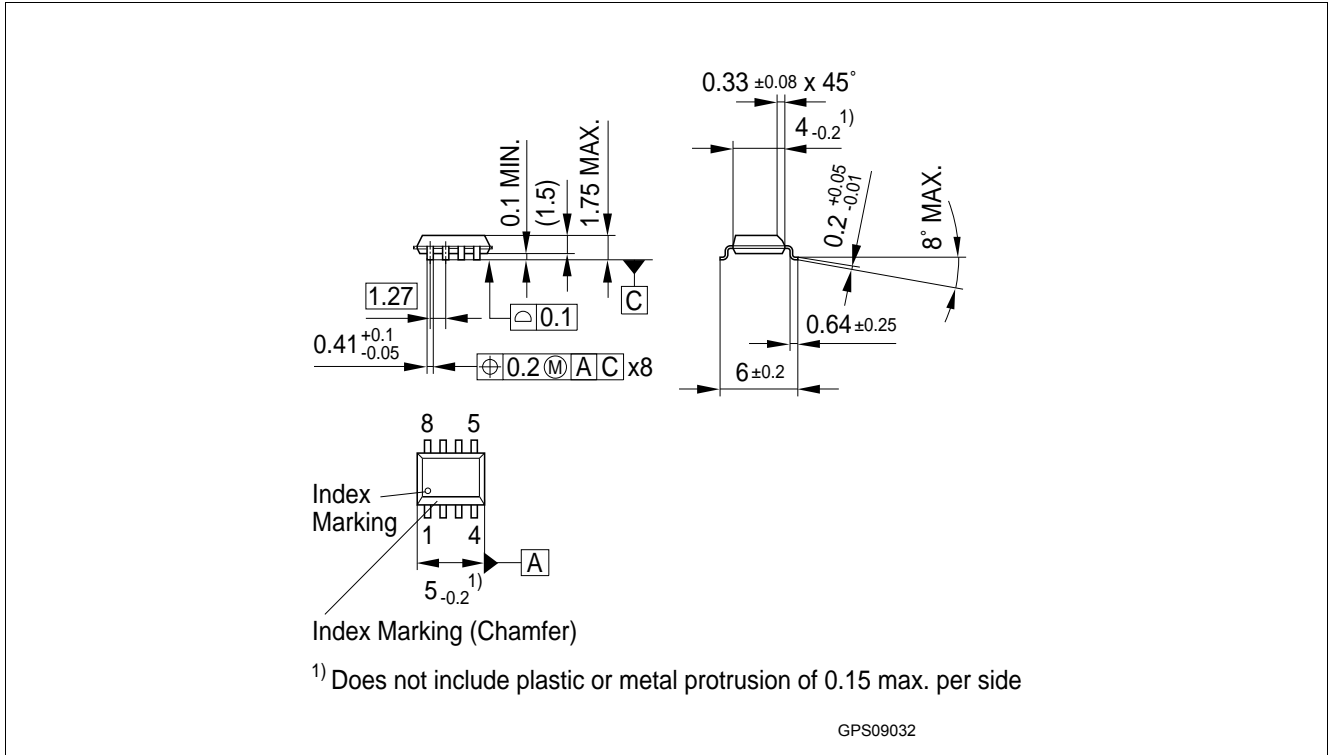


Figure 8 Application Circuit IFX1050GVIO

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 |

**Edition 2011-04-08**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

**© 2011 Infineon Technologies AG  
All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

### **Information**

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

### **Warnings**

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.