

# IFX1050GVIO

High Speed CAN-Transceiver

## Data Sheet

Rev. 1.0, 2011-04-08

Standard Power

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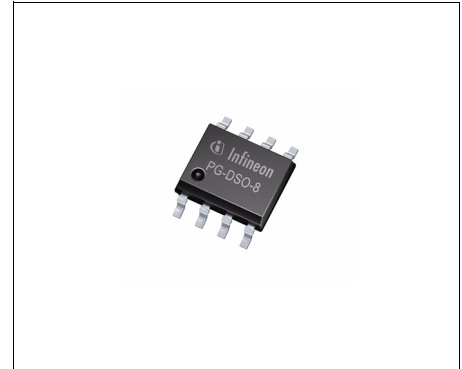
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## 1 Overview

### 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

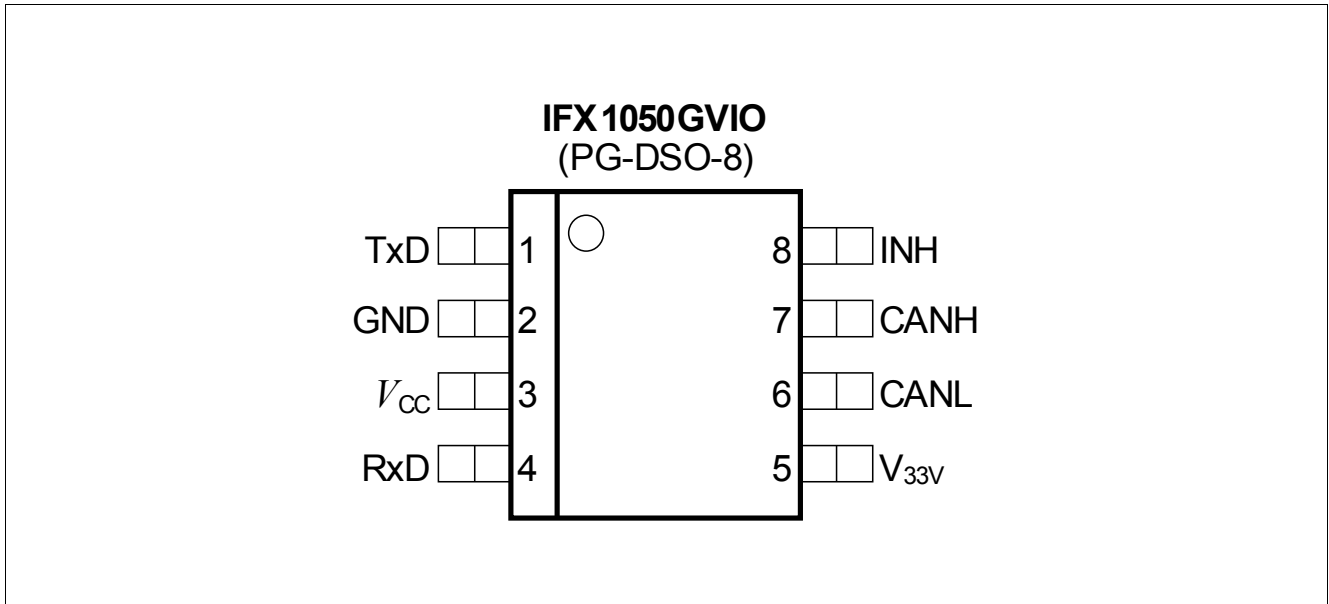


Figure 1 Pin Configuration IFX1050GVIO (top view)

Table 1 Pin Definitions and Functions IFX1050GVIO

Pin No.	Symbol	Function
1	TxD	<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

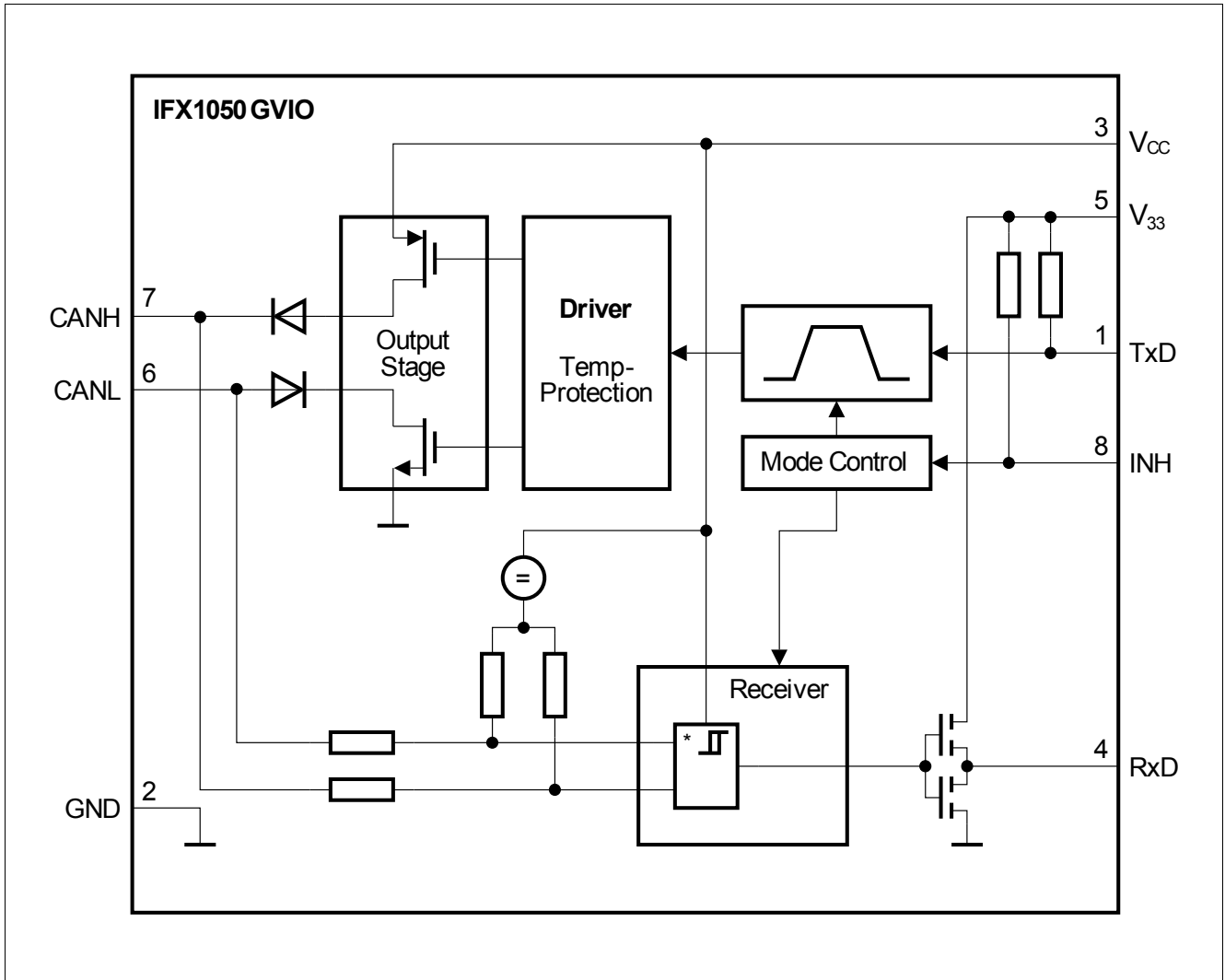


Figure 2 Block Diagram IFX1050GVIO

## 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; $V_{TxD} = V_{33V}$
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	$\mu\text{A}$	stand-by mode; TxD = high
<b>Receiver Output RxD</b>						
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	$V_{RD} = 0.2 \times V_{33V}$ , $V_{diff} > 1 \text{ V}^1)$
<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 $V_{diff} = V_{CANH} - V_{CANL}$
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 $\Omega$	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 $V_{diff} = V_{CANH} - V_{CANL}$ , no load <sup>2)</sup>	$V_{diff}$	-1	–	0.05	V	$V_{TxD} = V_{33V}$
CANL dominant output voltage	$V_{CANL}$	–	–	2.0	V	$V_{TxD} = 0 V$ ; $V_{CC} = 5 V$
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	$V_{CANLshort} = 18 V$
		–	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	$I_{CANH/L,ik}$	-50	-300	-400	$\mu A$	$V_{CC} = 0 V$ , $V_{CANH} = V_{CANL} = -7 V$
		-50	-100	-150	$\mu A$	$V_{CC} = 0 V$ , $V_{CANH} = V_{CANL} = -2 V$
Output current	$I_{CANH/L,ik}$	50	280	400	$\mu A$	$V_{CC} = 0 V$ , $V_{CANH} = V_{CANL} = 7 V$
		50	100	150	$\mu A$	$V_{CC} = 0 V$ , $V_{CANH} = V_{CANL} = 2 V$

## 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.		
<b>Dynamic CAN-Transceiver Characteristics</b>						
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

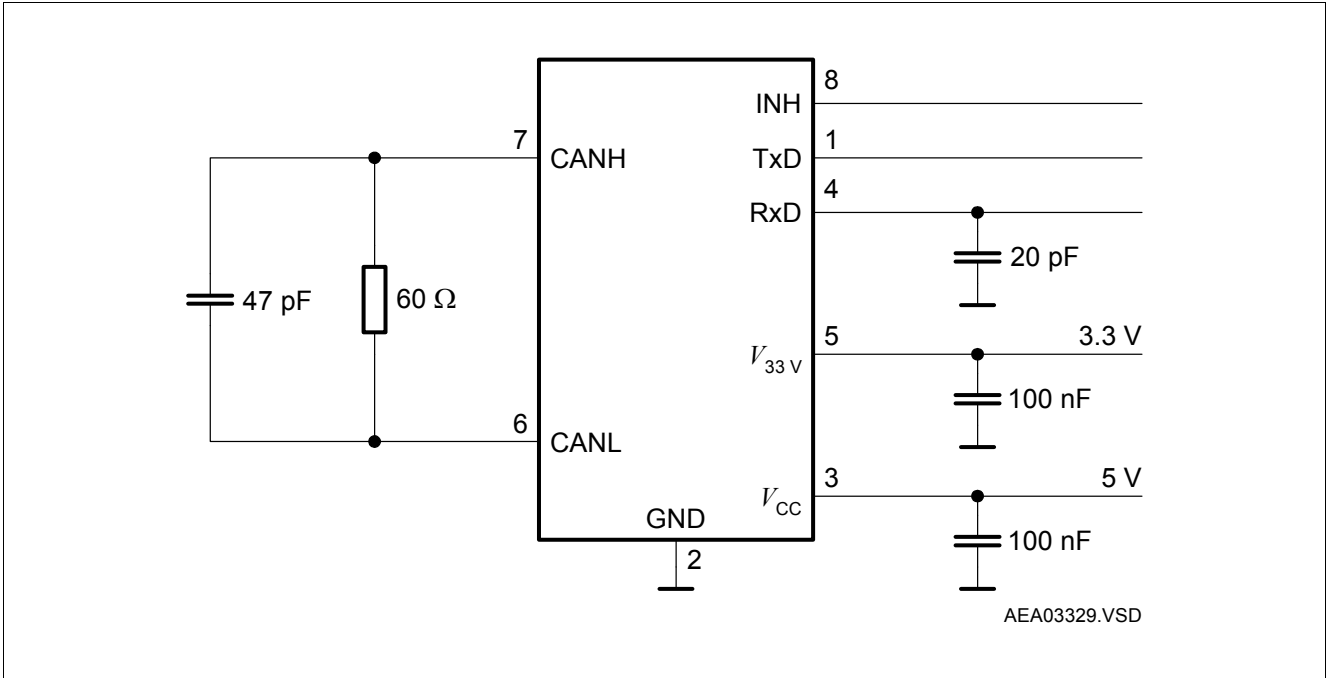


Figure 3 Test Circuit for Dynamic Characteristics

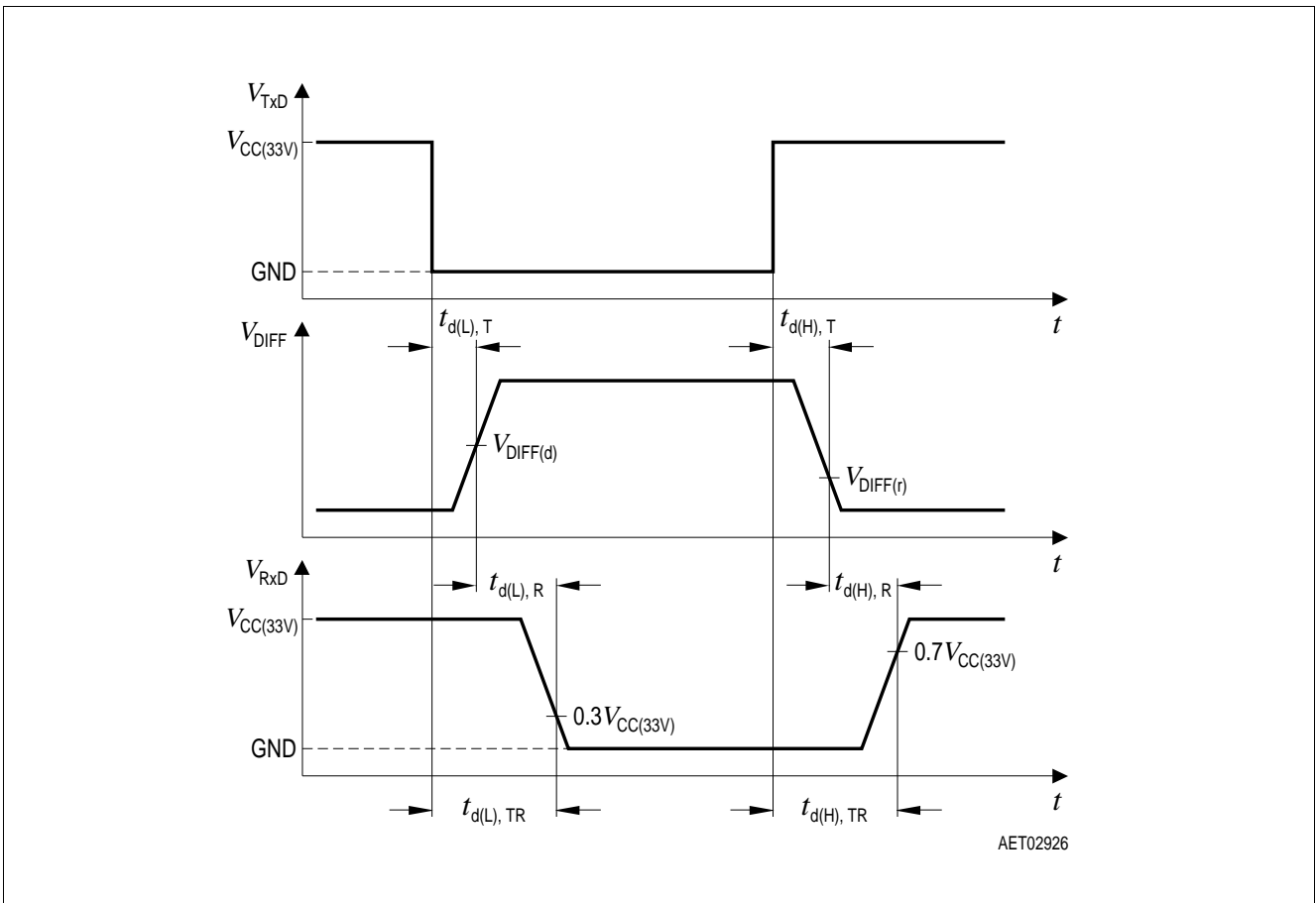
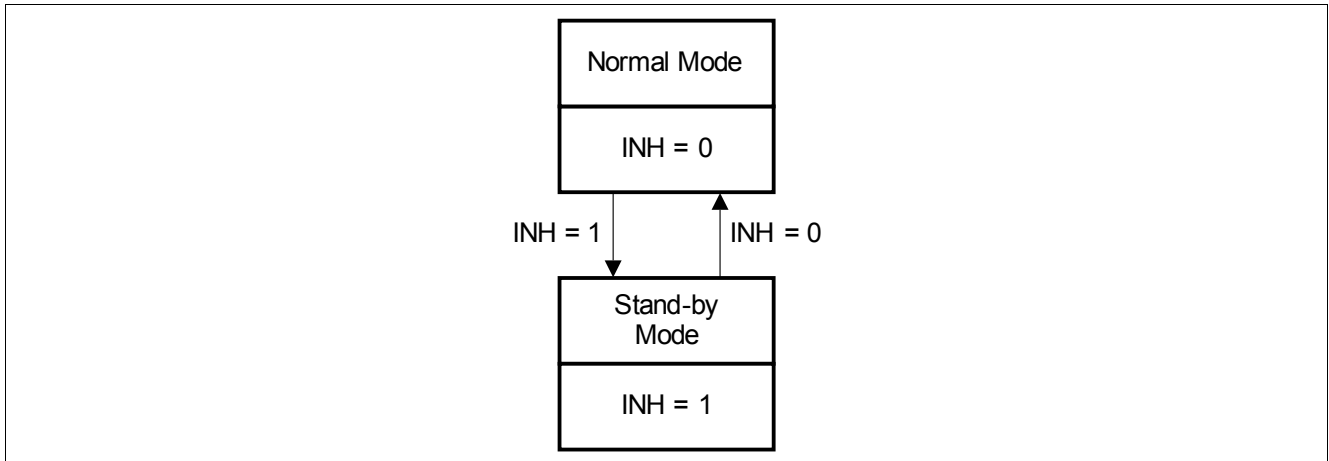


Figure 4 Timing Diagrams for Dynamic Characteristics

## 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.

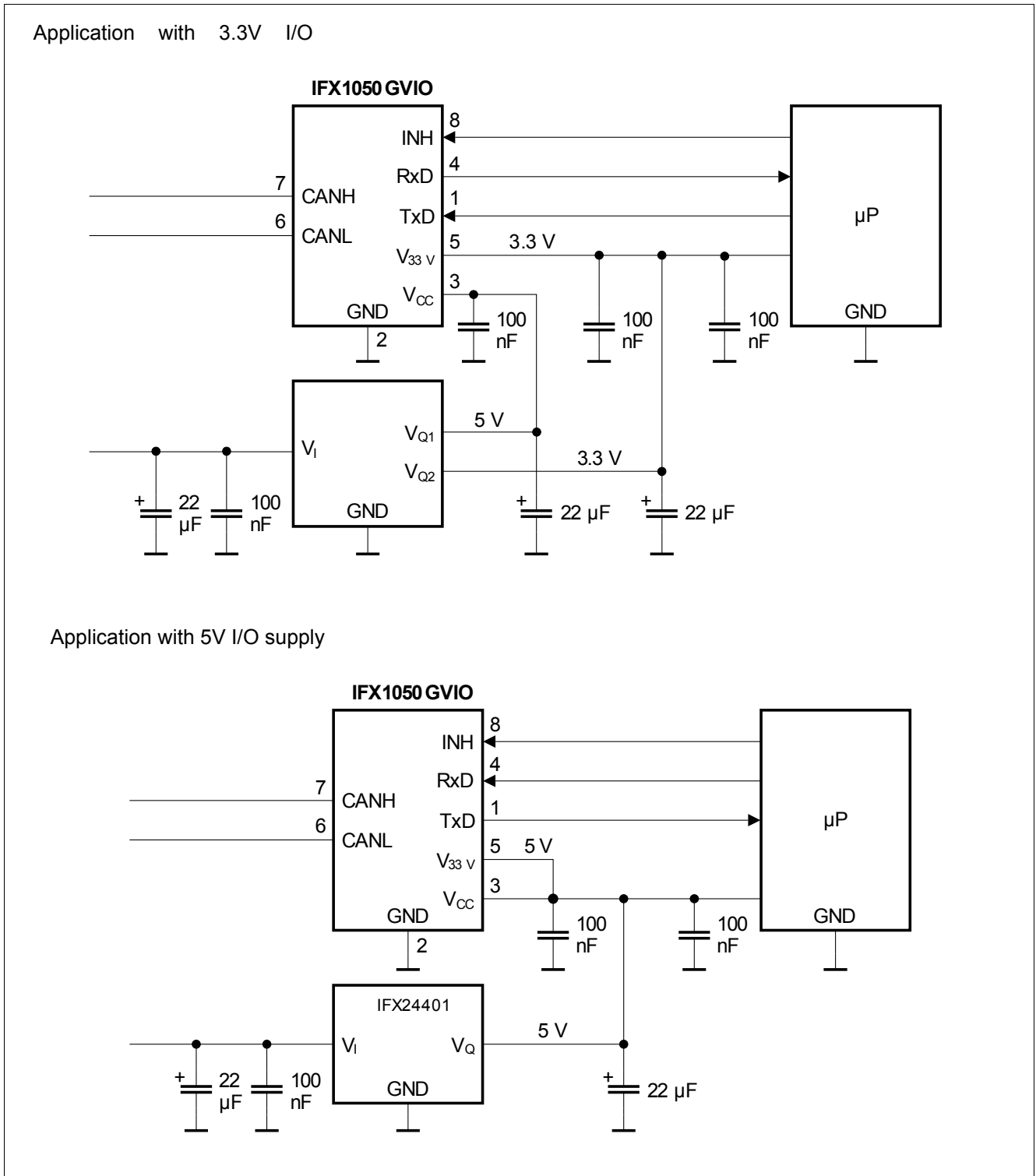


Figure 6 Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

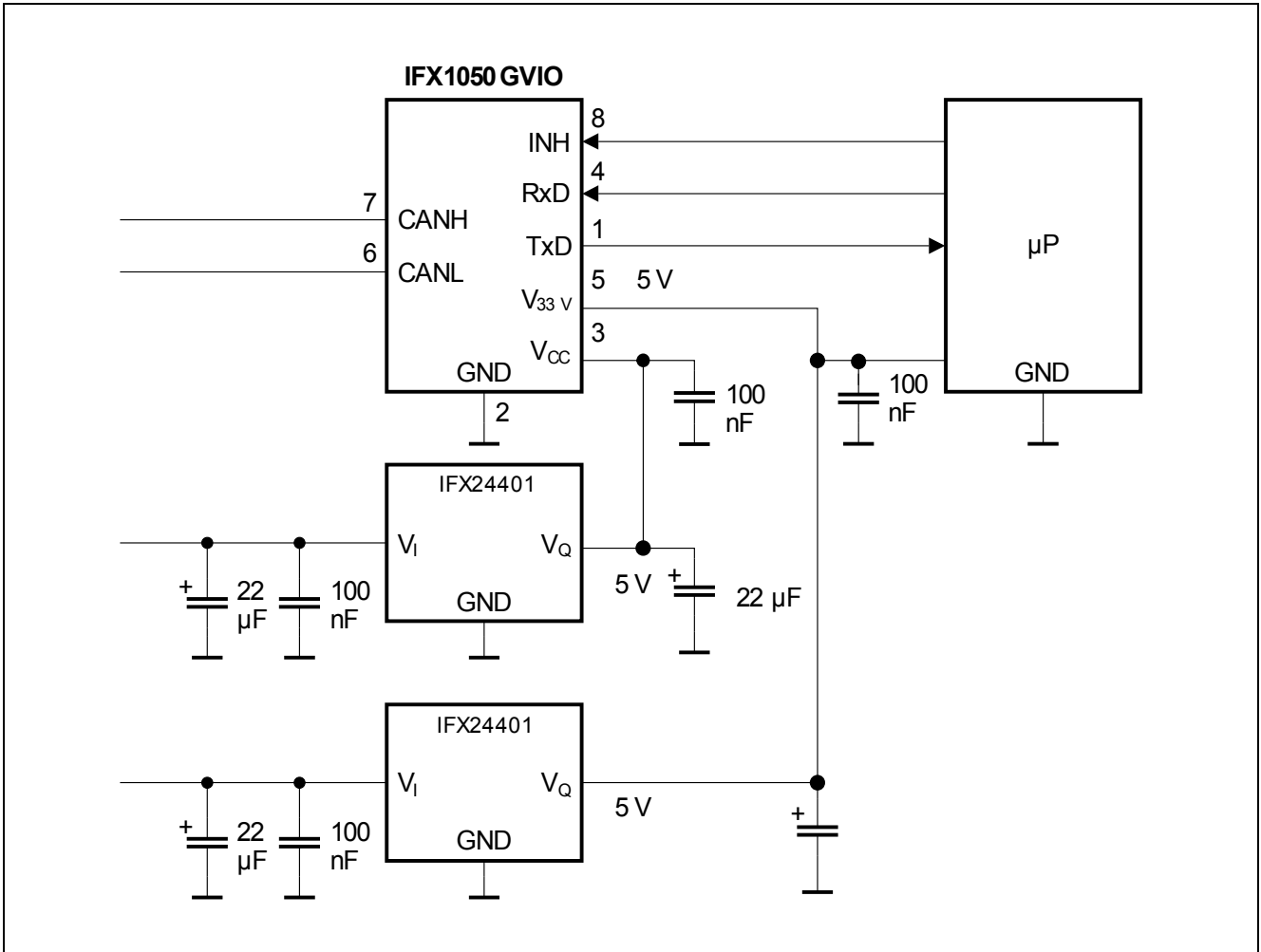


Figure 7 Figure 4 (cont.) Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

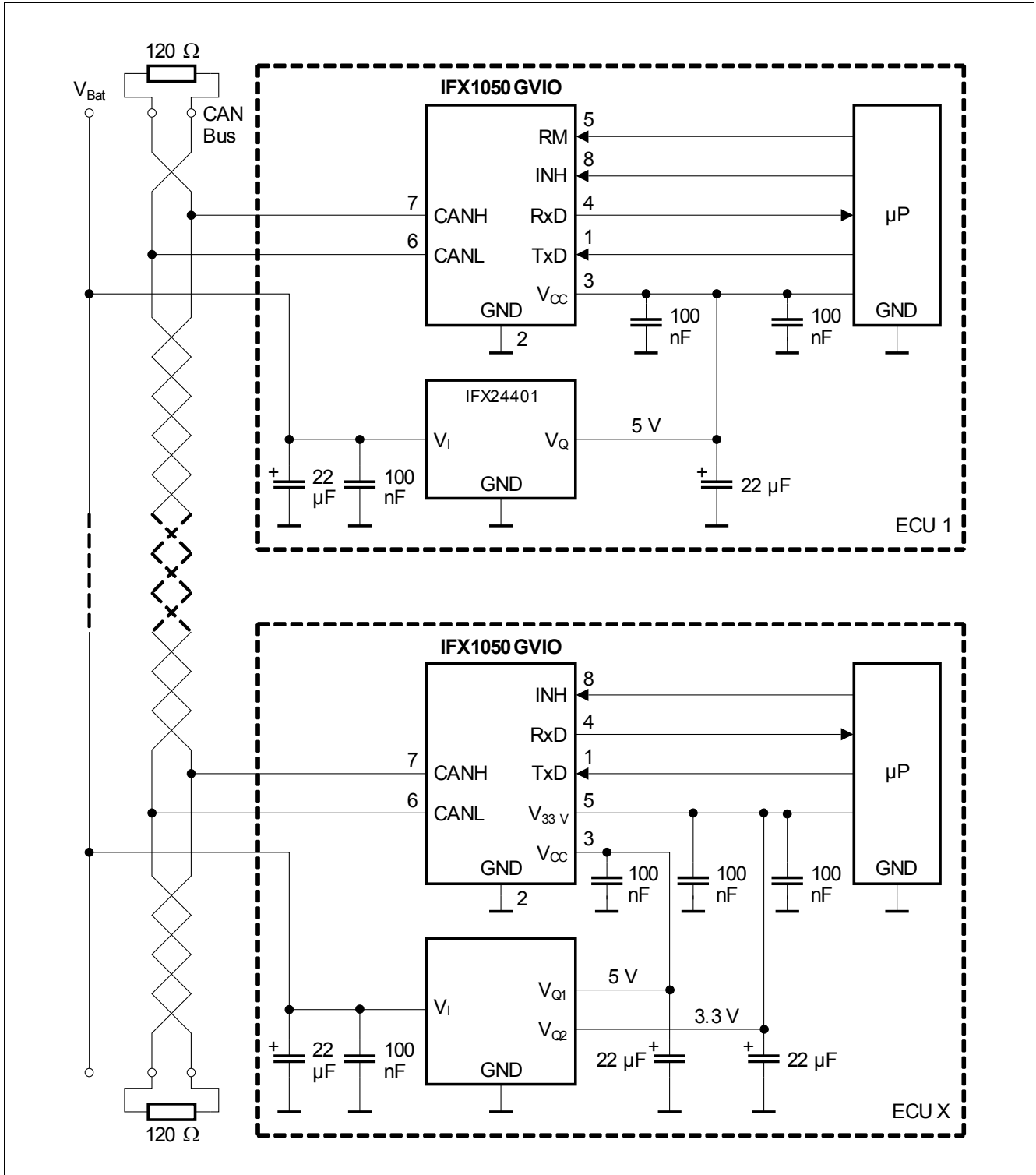
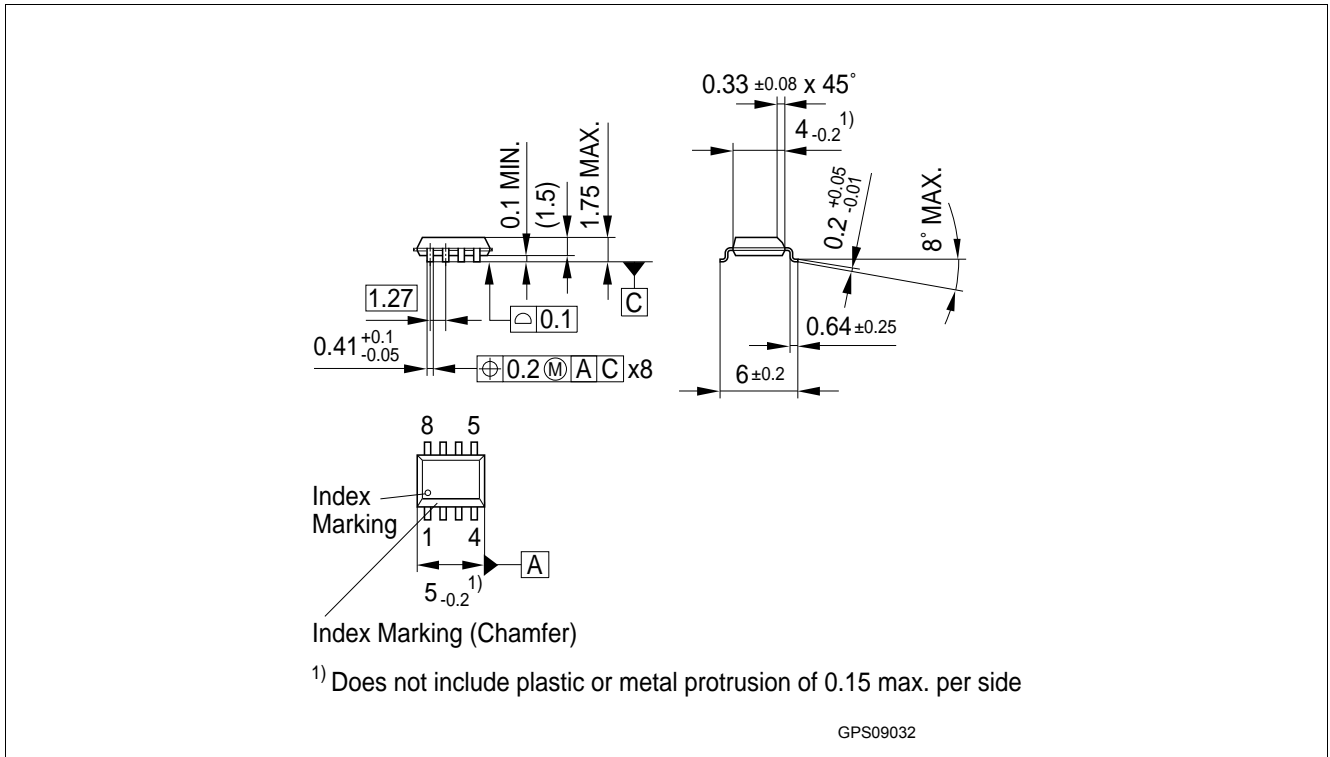


Figure 8 Application Circuit IFX1050GVIO

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

**Edition 2011-04-08**

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

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