

IFX1050GVIO

High Speed CAN-Transceiver

Data Sheet

Rev. 1.0, 2011-04-08

Standard Power

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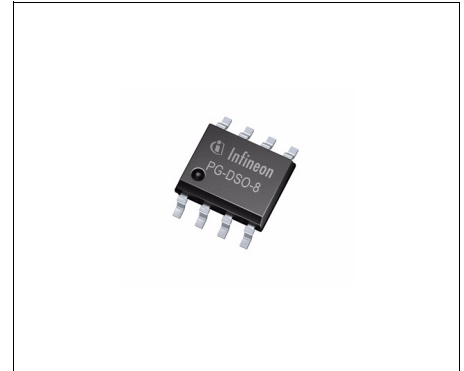
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1 Overview

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

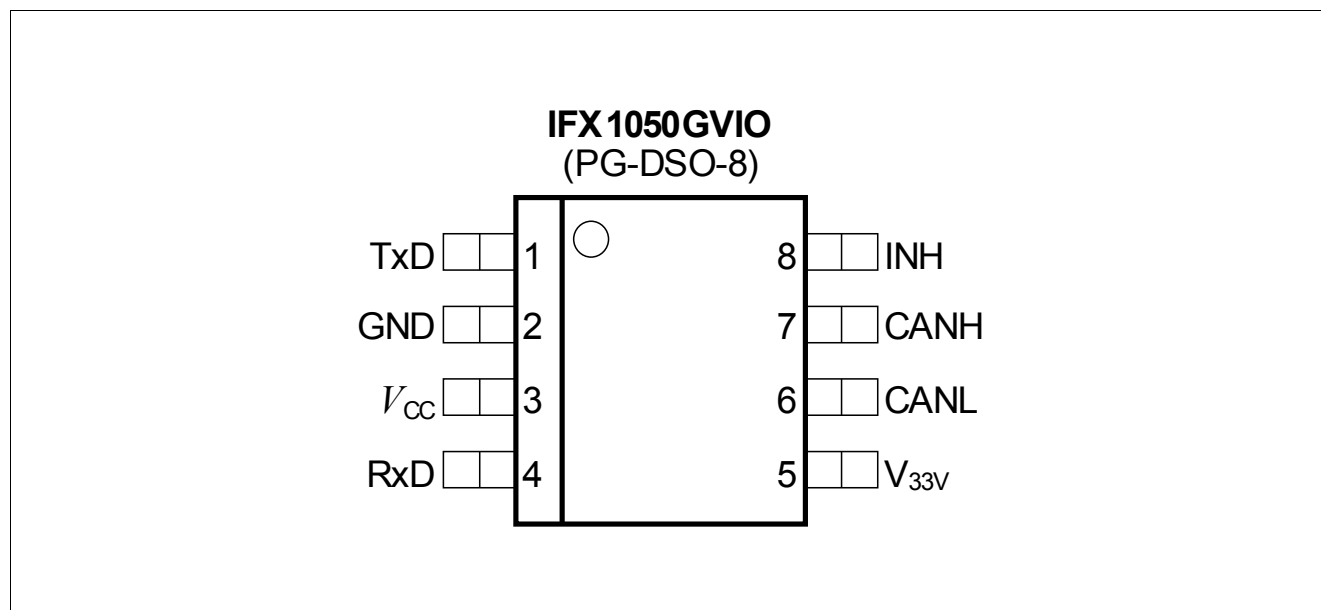


Figure 1 Pin Configuration IFX1050GVIO (top view)

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

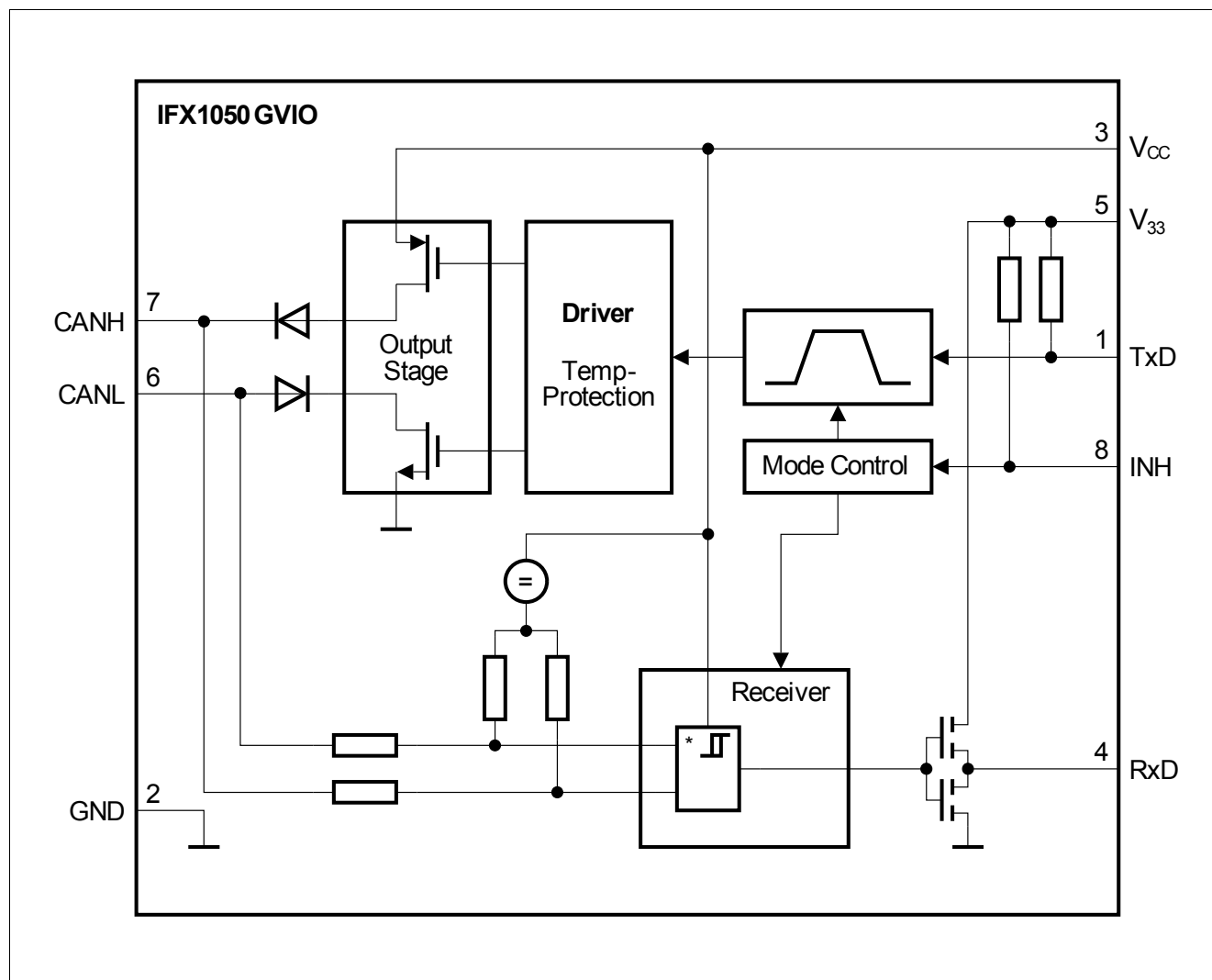


Figure 2 Block Diagram IFX1050GVIO

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 kΩ)
Electrostatic discharge voltage	V_{ESD}	-2	2	kV	human body model (100 pF via 1.5 kΩ)
Temperatures					
Junction temperature	T_j	-40	150	°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	°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

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 °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.		
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	kΩ	–
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	kΩ	–

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	$V_{\text{diff,d}}$	–	0.75	0.90	V	-20 V < (V_{CANH} , V_{CANL}) < 25 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 V < (V_{CANH} , V_{CANL}) < 25 V $V_{\text{diff}} = V_{\text{CANH}} - V_{\text{CANL}}$
Common Mode Range	CMR	-20	–	25	V	$V_{\text{CC}} = 5 \text{ V}$
Differential receiver hysteresis	$V_{\text{diff,hys}}$	–	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

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

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

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

2) Deviation from ISO/DIS 11898

5 Diagrams

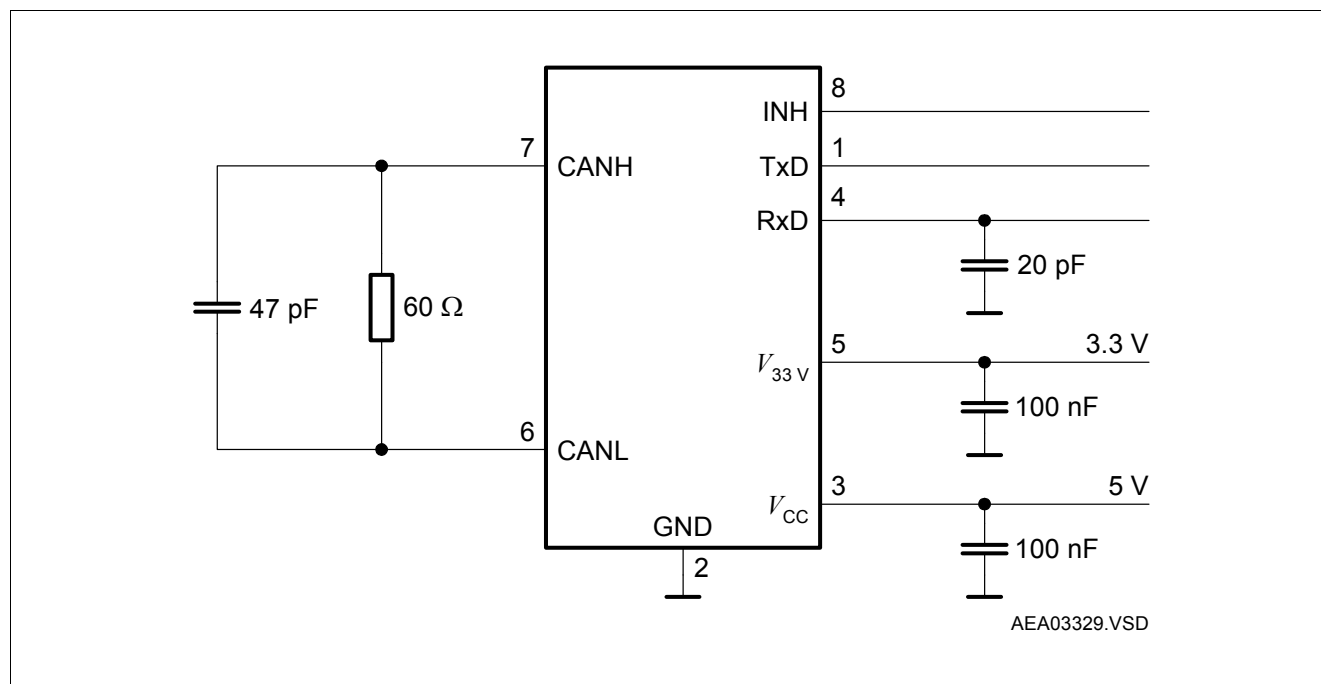


Figure 3 Test Circuit for Dynamic Characteristics

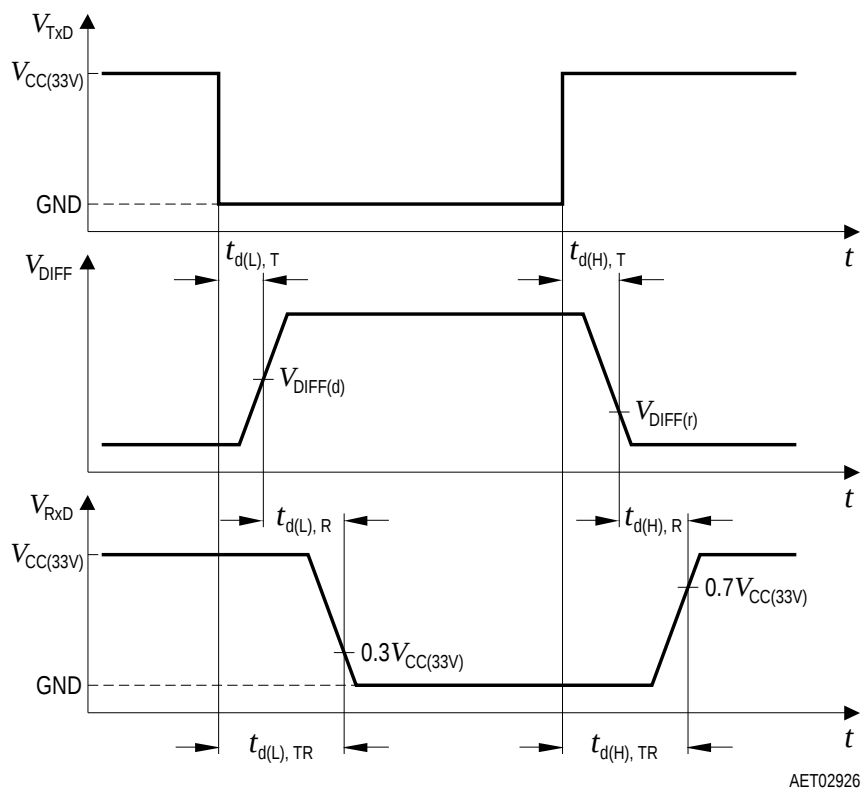


Figure 4 Timing Diagrams for Dynamic Characteristics

6 Application Information

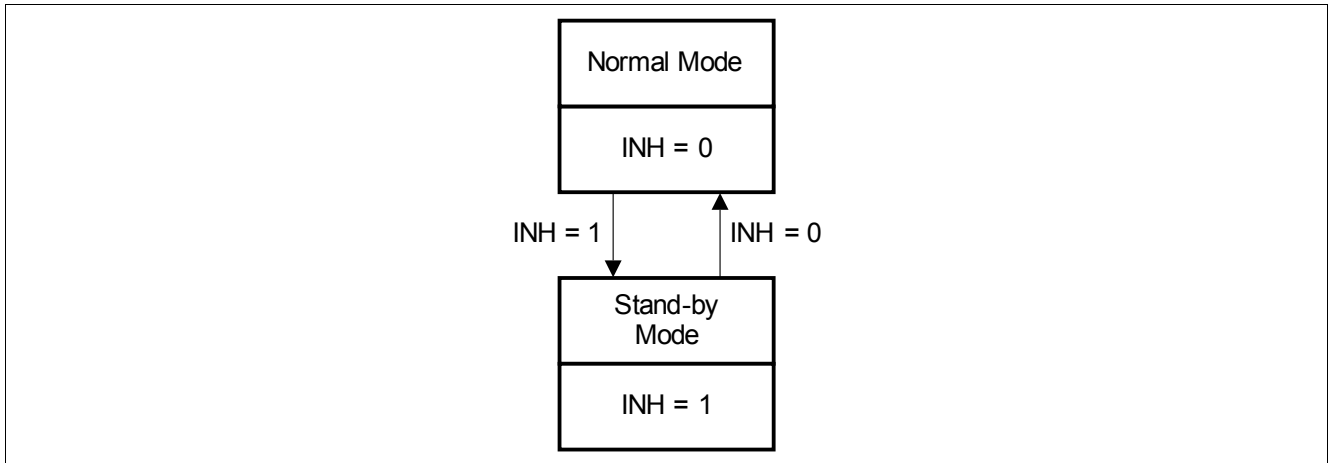


Figure 5 Mode State Diagram

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

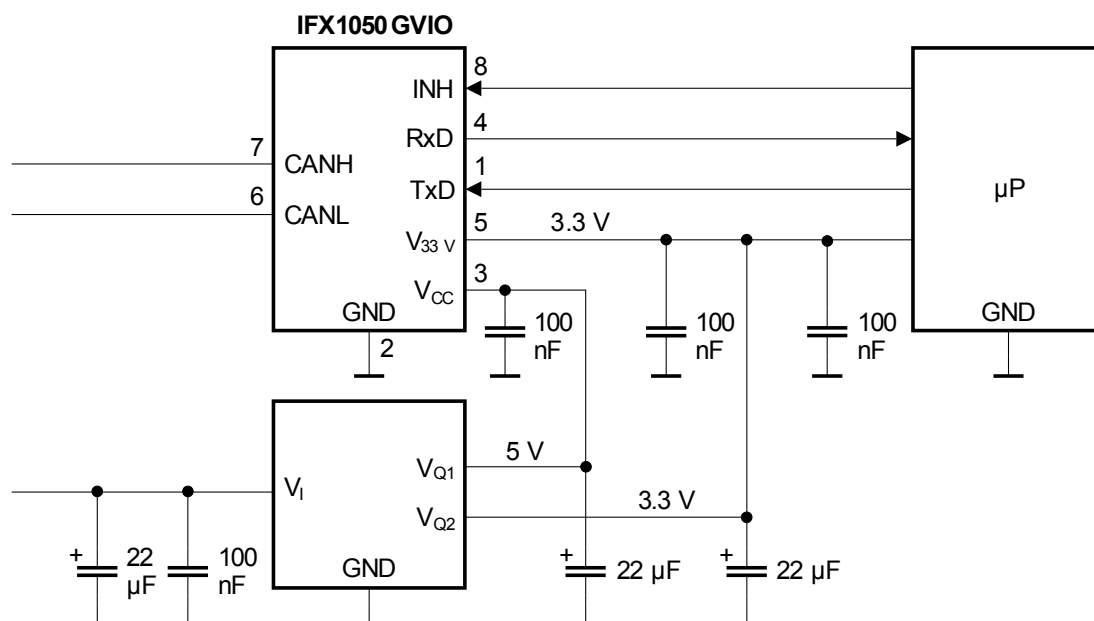
In the normal mode the device is able to receive and to transmit data from the TxD pin to the CAN bus. The stand-by mode is a low power mode that disables both, the receiver as well as the transmitter.

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.

Application with 3.3V I/O



Application with 5V I/O supply

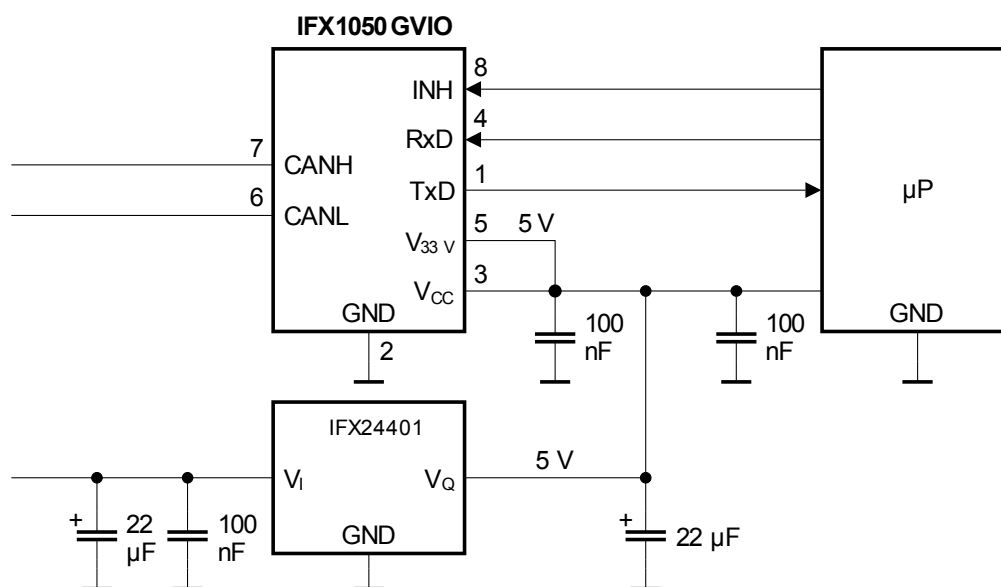


Figure 6 Application Circuit IFX1050GVIO used for 3.3 and 5V Logic

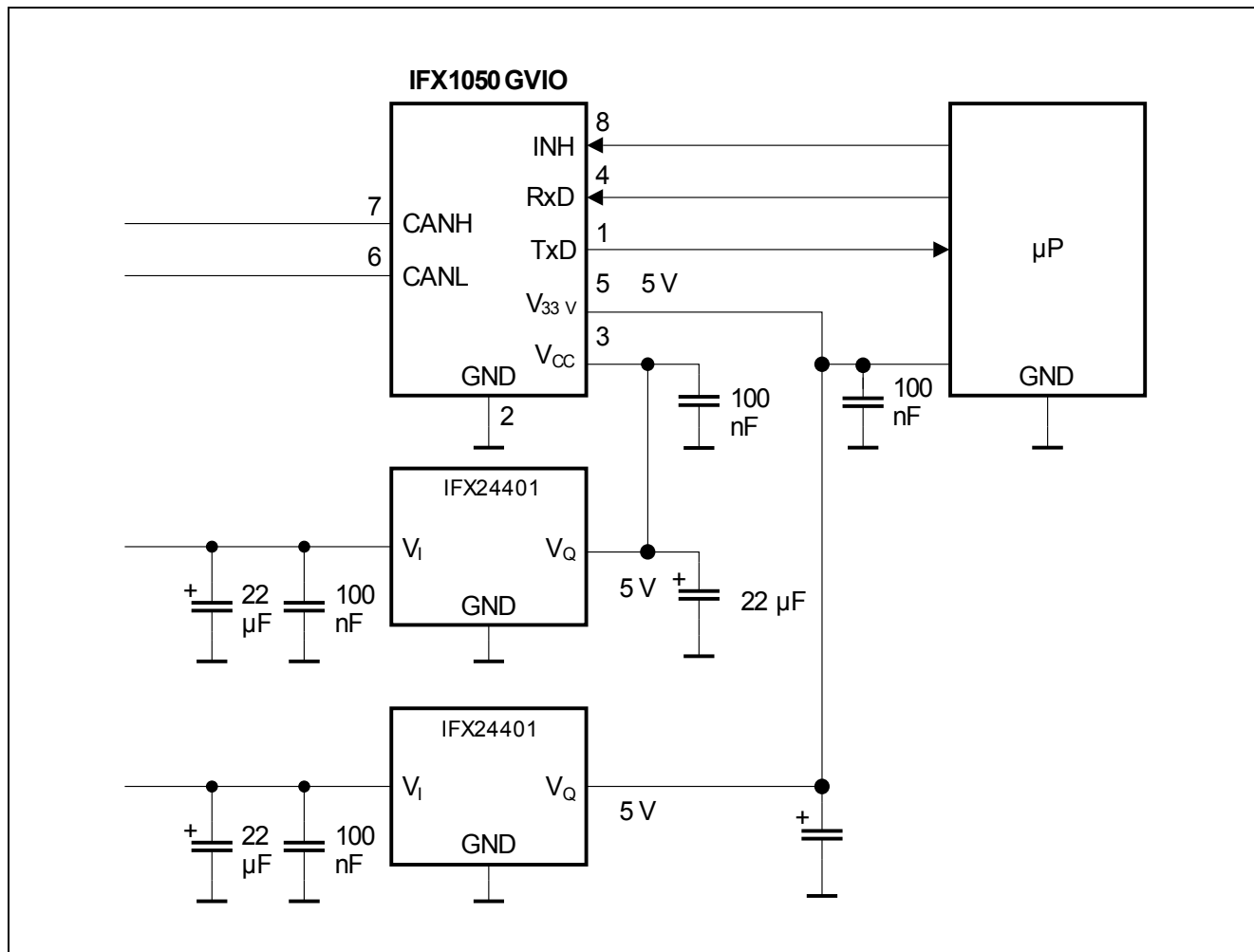


Figure 7 Figure 4 (cont.) **Application Circuit IFX1050GVIO used for 3.3 and 5V Logic**

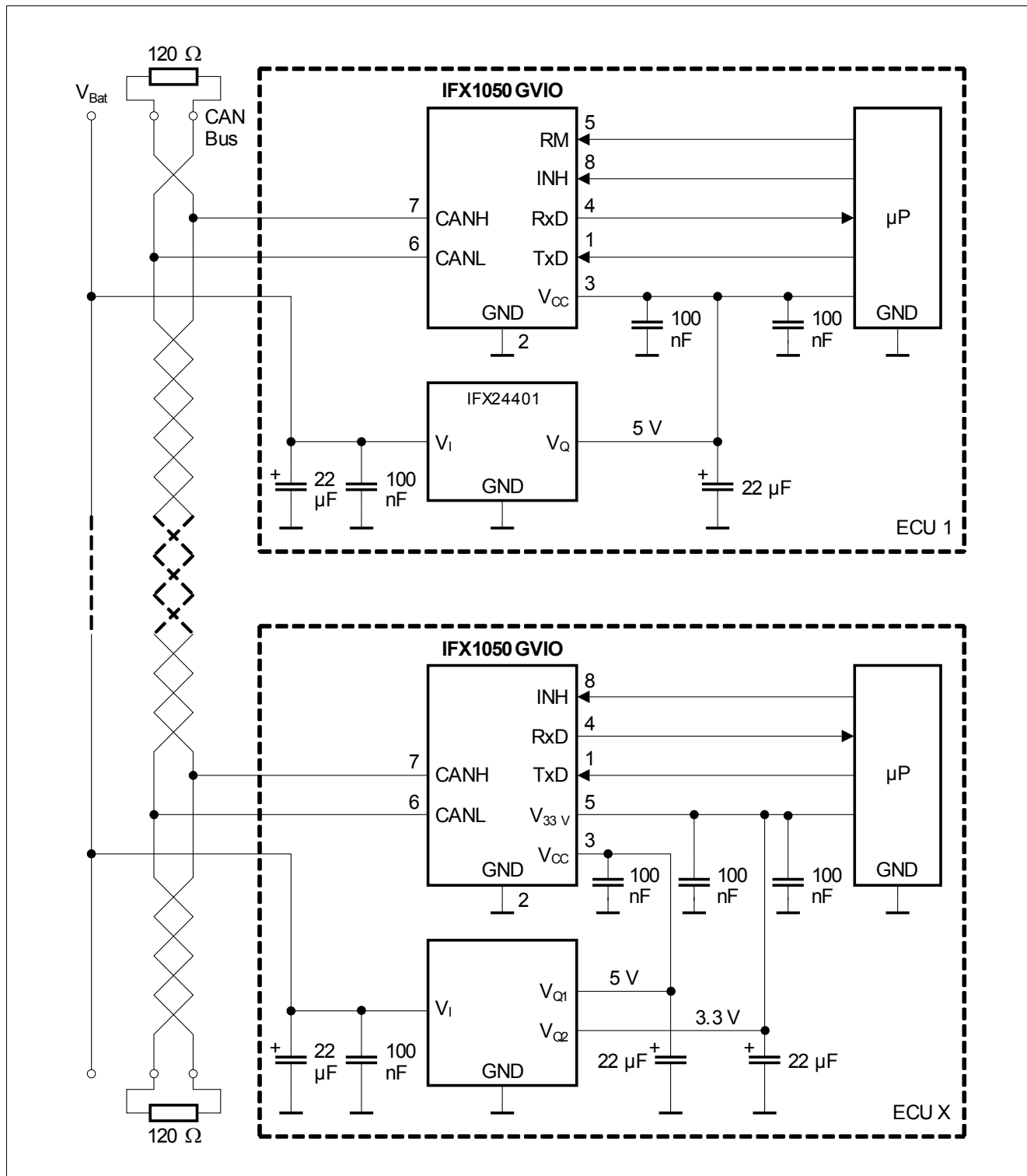


Figure 8 Application Circuit IFX1050GVIO

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

7 Package Outlines

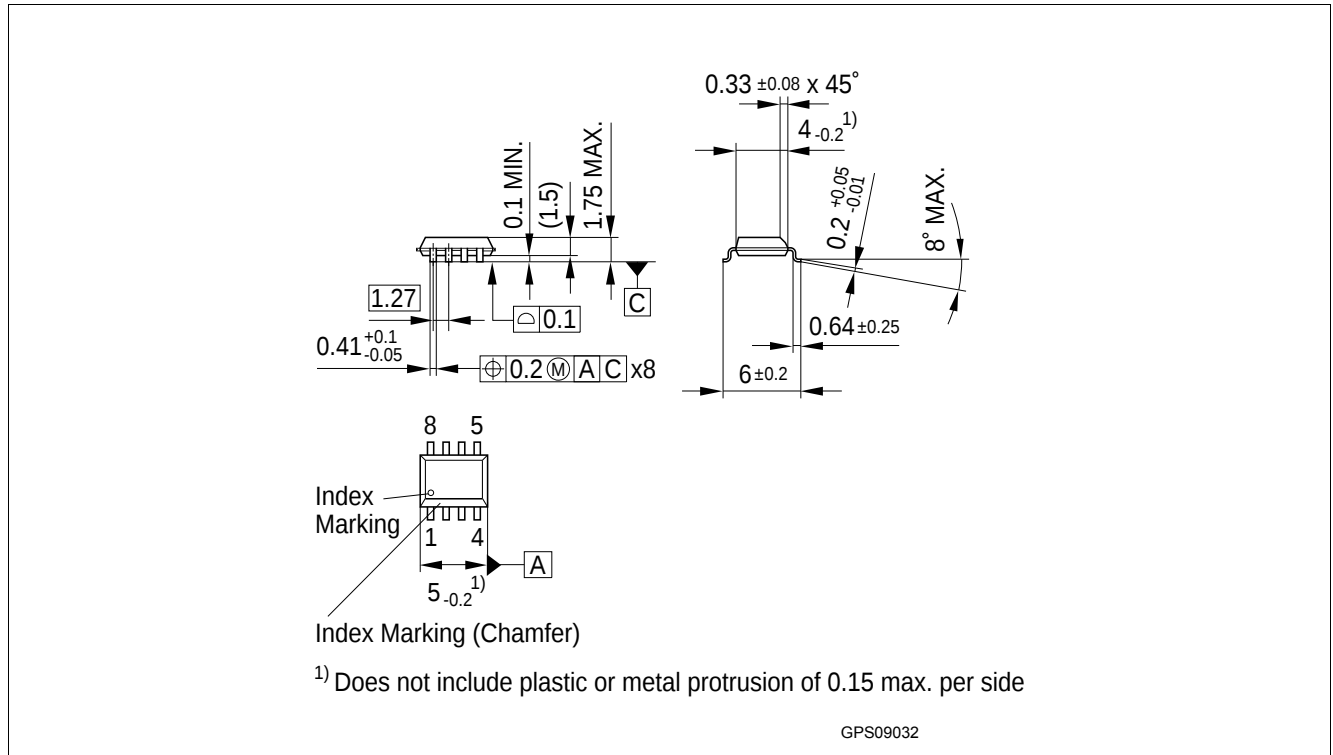


Figure 9 PG-DSO-8 (Plastic Dual Small Outline), lead free version

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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