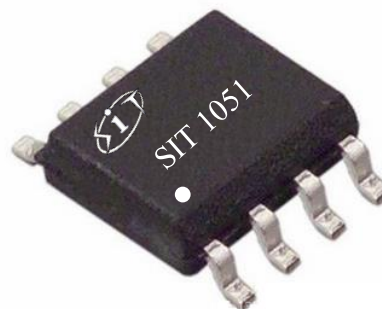


**FEATURES**

- Fully compatible with the ISO 11898 standard
- Thermally protected
- $\pm 70V$  BUS Protection
- Transmit Data (TXD) dominant time-out function
- Silent receiving mode
- SIT1051T/E has a low-power shutdown mode
- SIT1051T/3 can be interfaced directly to microcontrollers with supply voltages from 3V to 5V
- Under-voltage protection
- Timing guaranteed for data rates up to 5 Mbit/s in the (CAN FD) fast phase
- High anti-electromagnetic interference ability
- Unpowered nodes do not interfere with the bus

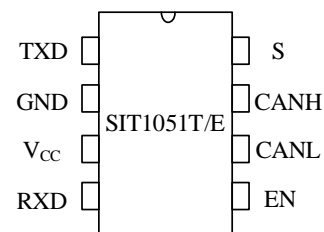
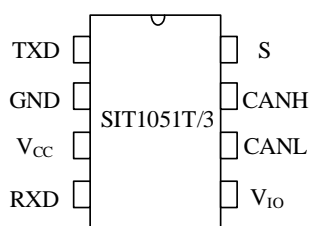
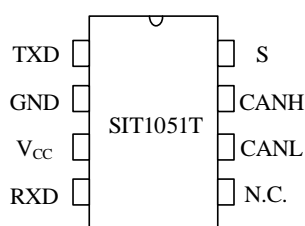
**OUTLINE**


Provide Green and Environmentally  
 Friendly Lead-free package

**DESCRIPTION**

SIT1051 is an interface chip used between the CAN protocol controller and the physical bus. It can be used in trucks, buses, cars, industrial control and other fields. It supports 5Mbps CAN With Flexible Data-Rate, and has a connection between the bus and the CAN protocol controller. The ability to perform differential signal transmission between.

PARAMETER	SYMBOL	CONDITION	MIN.	MAX.	UNIT
Supply voltage	$V_{CC}$		4.5	5.5	V
Maximum transmission rate	$1/t_{bit}$	Non-return to zero code	5		Mbaud
DC voltage on pin CANH and CANL	$V_{can}$		-70	+70	V
Bus differential voltage	$V_{diff}$		1.5	3.0	V
Virtual junction temperature	$T_j$		-40	150	$^{\circ}C$

**PIN CONFIGURATION**

**LIMITING VALUES**

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	$V_{CC}$	-0.3~+7	V
MCU side port	TXD, RXD, STB, $V_{IO}$	-0.3~+7	V
Bus side input voltage	CANL, CANH	-70~70	V
Bus differential breakdown voltage	$V_{CANH-CANL}$	-27~27	V
Transient voltage on pins CANH, CANL and SPLIT	$V_{tr}$	-200~+200	V
Storage temperature		-55~150	°C
Virtual junction temperature		-40~150	°C
Welding temperature range		300	°C

The maximum limit parameters means that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conducive to the normal operation of the device. The continuous operation of the device at the maximum allowable rating may affect the reliability of the device. The reference point for all voltages is ground.

**PINNING**

PIN	SYMBOL	DESCRIPTION
1	TXD	transmit data input
2	GND	ground supply
3	$V_{CC}$	supply voltage
4	RXD	receive data output; reads out data from the bus lines

5	V <sub>IO</sub>	Transceiver I/O level conversion power supply voltage (SIT1051T/3 model)
	EN	Low-power shutdown mode selection, low level is shutdown mode (SIT1051T/E version)
	N.C.	No need connect, floating
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	S	High speed and silent mode selection, low level is high speed

**DRIVER ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
CANH dominant output voltage	$V_{OH(D)}$	TXD=0V, S=0V, $R_L=60\Omega$ , Fig.1, Fig.2	2.9	3.4	4.5	V
CANL dominant output voltage	$V_{OL(D)}$		0.8		1.5	V
Bus recessive output voltage	$V_{O(R)}$	TXD= $V_{IO}$ , S=0V, $R_L=60\Omega$ , Fig.1, Fig.2	2	2.5	3	V
Bus dominant differential output voltage	$V_{OD(D)}$	TXD=0V, S=0V, $R_L=60\Omega$ , Fig.1, Fig.2	1.5		3	V
Bus recessive differential output voltage	$V_{OD(R)}$	TXD= $V_{IO}$ , S=0V, Fig.1, Fig.2	-0.012		0.012	V
		TXD= $V_{IO}$ , S=0V, NO LOAD	-0.5		0.05	V
Transmitter dominant voltage symmetry	$V_{dom(TX)sym}$	$V_{dom(TX)sym}=V_{CC}-V_{CANH}-V_{CANL}$	-400		400	mV
Transmitter voltage symmetry	$V_{TXsym}$	$V_{TXsym}=V_{CANH}+V_{CANL}$	$0.9V_{CC}$		$1.1V_{CC}$	V
Common-mode output voltage	$V_{OC}$	S=0V, Fig.7	2	2.5	3	V
Peak-to-peak Common-mode output voltage	$\Delta V_{OC}$			30		mV
Short-circuit output current	$I_{OS}$	CANH=-12V, CANL=open, Fig.10	-105	-72		mA
		CANH=12V, CANL=open, Fig.10		0.36	1	mA
		CANL=-12V, CANH=open, Fig.10	-1	0.5		mA
		CANL=12V, CANH=open, Fig.10		71	105	mA
Recessive output current	$I_{O(R)}$	-27V<CANH<32V 0< $V_{CC}$ <5.25V	-2.0		2.5	mA

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^\circ C$ )

**DRIVER SWITCHING CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time, low-to-high-level output	$t_{PLH}$	S=0V, Fig.4		90		ns
Propagation delay time, low-to-high-level output	$t_{PHL}$			65		ns
Differential output signal rise time	$t_r$			45		ns
Differential output signal fall time	$t_f$			45		ns
TXD dominant time-out	$t_{dom\_TXD}$	Fig.9	0.8	2	5	ms

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**RECEIVER ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Positive-going input threshold voltage	$V_{IT+}$	S=0V, Fig.5		800	900	mV
Negative-going input threshold voltage	$V_{IT-}$		500	650		
Hysteresis voltage ( $V_{IT+} - V_{IT-}$ )	$V_{HYS}$		50	120	200	
Power-off bus input current	$I_{(OFF)}$	CANH or CANL=5V, Other pin=0V	-5		5	$\mu A$
Input capacitance to ground, (CANH or CANL)	$C_I$			24		pF
Differential input capacitance	$C_{ID}$			12		pF
Input resistance, (CANH or CANL)	$R_{IN}$	TXD= $V_{IO}$ , S=0V	9	15	28	k $\Omega$
Differential input resistance	$R_{ID}$		19	30	52	k $\Omega$

Input resistance matching	$R_{I_{match}}$	CANH=CANL	-2%		2%	
The range of common-mode voltage	$V_{COM}$		-30		30	V

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

## RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time, low-to-high-level output	$t_{PLH}$	S=0V, Fig.6		65		ns
Propagation delay time, low-to-high-level output	$t_{PHL}$			60		ns
RXD signal rise time	$t_r$			10		ns
RXD signal fall time	$t_f$			10		ns

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

## DEVICE SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Loop delay 1, driver input to receiver output, Recessive to Dominant	$T_d(LOOP1)$	S=0V, Fig.8		90	220	ns
Loop delay 2, driver input to receiver output, Dominant to Recessive	$T_d(LOOP2)$			100	220	ns
Bit time of BUS output pin	$t_{bit(BUS)}$	$t_{bit(TXD)}=500ns$	435		530	ns
		$t_{bit(TXD)}=200ns$	155		210	ns
Bit time of RXD output pin	$t_{bit(RXD)}$	$t_{bit(TXD)}=500ns$	400		550	ns
		$t_{bit(TXD)}=200ns$	120		220	ns

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**OVER TEMPERATURE PROTECTION**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Shutdown junction temperature	$T_{j(sd)}$			190		°C

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**UNDER-VOLATAGE PROTECTION**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
$V_{CC}$ under-voltage protection	$V_{uvd\_VCC}$		3.5		4.5	V
$V_{IO}$ under-voltage protection	$V_{uvd\_VIO}$		1.5		2.5	V

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**TXD PIN CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	$I_{IH}(TXD)$	$TXD=V_{IO}$	-5		5	$\mu A$
LOW-level input current	$I_{IL}(TXD)$	$TXD=0V$	-260	-150	-30	$\mu A$
When $V_{IO}=0V$ , current on TXD pin	$I_{O(off)}$	$V_{CC}=V_{IO}=0V$ , $TXD=V_{IO}$	-1		1	$\mu A$
HIGH-level input voltage	$V_{IH}$		$0.7V_{IO}^{\textcircled{1}}$		$V_{IO}^{\textcircled{1}}+0.3$	V
LOW-level input voltage	$V_{IL}$		-0.3		$0.3V_{IO}^{\textcircled{1}}$	V
Open voltage on TXD pin	$TXD_O$		H			logic

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**STB PIN CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	$I_{IH}(S)$	$S=V_{IO}$	1	4	10	$\mu A$
LOW-level input current	$I_{IL}(S)$	$S=0V$	-1		1	$\mu A$
HIGH-level input voltage	$V_{IH}$		$0.7V_{IO}^{①}$		$V_{IO}^{①}+0.3$	V
LOW-level input voltage	$V_{IL}$		-0.3		$0.3V_{IO}^{①}$	V
Open voltage on STB pin	$S_O$		L			logic

① SIT1051T model  $V_{IO}=V_{CC}$

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**RXD PIN CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	$I_{OH}(RXD)$	$V_{IO}=V_{CC}$ , $RXD=V_{IO}-0.4V$	-8	-3	-1	mA
LOW-level input current	$I_{OL}(RXD)$	$RXD=0.4V$ , bus dominant	2	5	12	mA
When $V_{CC}=0V$ , current on RXD pin	$I_{O}(off)$	$V_{CC}=V_{IO}=0V$ , $RXD=V_{IO}$	-1		1	$\mu A$

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

**EN PIN CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
EN HIGH-level input current	$I_{IH}(EN)$	$EN=V_{CC}$	1	4	10	$\mu A$
EN LOW-level input current	$I_{IL}(EN)$	$EN=0V$	-1		1	$\mu A$
EN HIGH-level input voltage	$V_{IH}$		$0.7V_{CC}$		$V_{CC}+0.3$	V



EN LOW-level input voltage	$V_{IL}$		-0.3		$0.3V_{CC}$	V
EN open voltage	$EN_O$		L			logic

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

### SUPPLY CURRENT

PARAMETER		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
$V_{CC}$ supply current	Normal dominant	$I_{CC\_D}$	bus dominant		45	70	mA
	Normal recessive	$I_{CC\_R}$	bus recessive		5	10	mA
	Silent	$I_{CC\_S}$	$S=TXD=V_{IO}$		1	2.5	mA
	Shutdown	$I_{CC\_EN}$	EN=0V or open (SIT1051T/E model)		0.5	5	$\mu A$
$V_{IO}$ supply current	Normal or Silent mode dominant	$I_{IO\_D}$	RXD open TXD=0V		350	1000	$\mu A$
	Normal or Silent mode recessive	$I_{IO\_R}$	RXD open, TXD= $V_{IO}$		80	200	$\mu A$

( $V_{CC}=5V\pm 10\%$  and  $Temp=T_{MIN}\sim T_{MAX}$  unless specified otherwise; typical in  $V_{CC}=+5V$ ,  $V_{IO}=+5V$  and  $Temp=25^{\circ}C$ )

### ESD PERFORMANCE

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
CAN bus pin contact discharge model (IEC)	$V_{ESD\_IEC}$	IEC 61000-4-2: Contact discharge (CANH, CANL)	-4		+4	kV
CAN bus pin human body discharge model (HBM)	$V_{ESD\_HBM}$		-8		+8	kV
Component charging model (CDM)	$V_{CDM}$		-750		+750	V

**FUNCTION TABLE**
**Table1.CAN TRANSCEIVER TRUTH TABLE**

TXD <sup>(1)</sup>	S <sup>(1)</sup>	CANH <sup>(1)</sup>	CANL <sup>(1)</sup>	BUS STATE	RXD <sup>(1)</sup>
L	L or Open	H	L	Dominate	L
H or Open	L or Open	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	Recessive	H
X	H	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	Recessive	H

(1) H=high level; L=low level; X=irrelevant

**Table 2. RECEIVER FUNCTION TABLE**

V <sub>ID</sub> =CANH-CANL	RXD <sup>(1)</sup>	BUS
V <sub>ID</sub> ≥0.9V	L	Dominate
0.5 < V <sub>ID</sub> < 0.9V	?	?
V <sub>ID</sub> ≤0.5V	H	Recessive
Open	H	Recessive

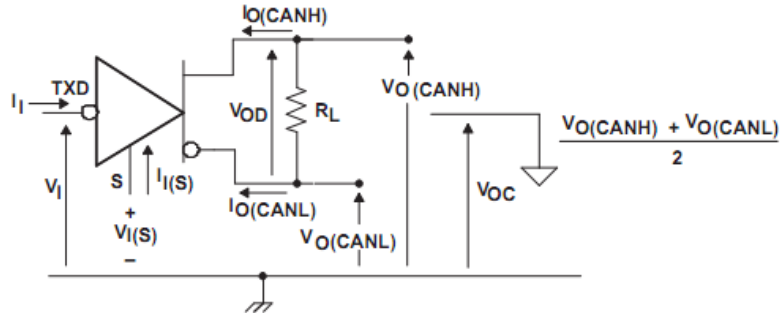
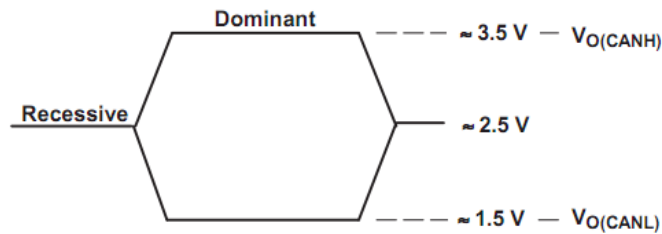
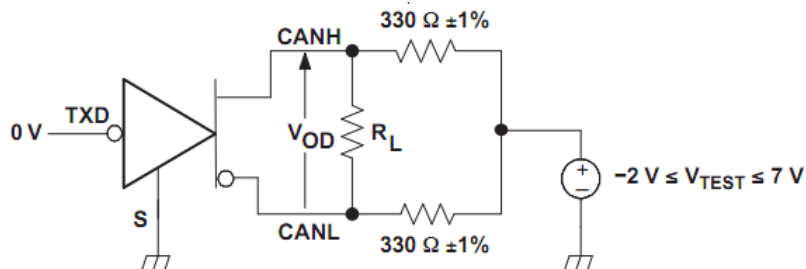
(1) H=high level; L=low level; ? =uncertain

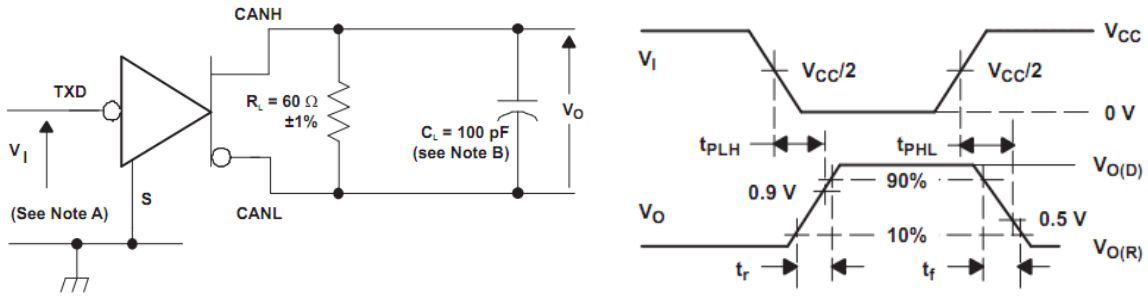
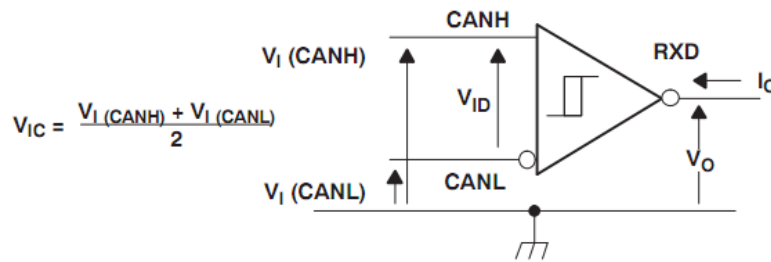
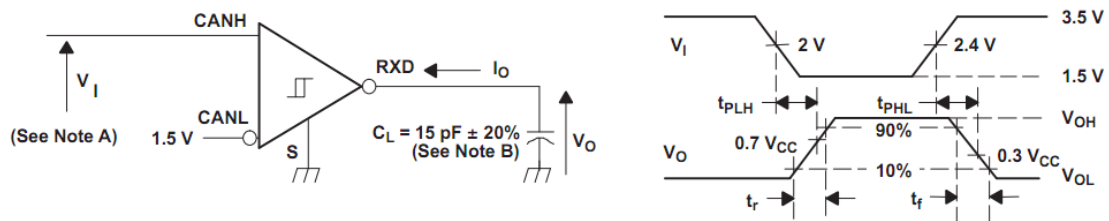
**Table 3. UNDERVOLTAGE PROTECTION STATUS TABLE**

V <sub>CC</sub>	V <sub>IO</sub> <sup>(1)</sup>	BUS	BUS OUTPUT <sup>(2)</sup>	RXD <sup>(2)</sup>
V <sub>CC</sub> >V <sub>uvd_VCC</sub>	V <sub>IO</sub> >V <sub>uvd_VIO</sub>	normal	According to S and TXD	Follow the bus
V <sub>CC</sub> <V <sub>uvd_VCC</sub>	V <sub>IO</sub> >V <sub>uvd_VIO</sub>	Protected status	Z	H
V <sub>CC</sub> >V <sub>uvd_VCC</sub>	V <sub>IO</sub> <V <sub>uvd_VIO</sub>	Protected status	Z	H
V <sub>CC</sub> <V <sub>uvd_VCC</sub>	V <sub>IO</sub> <V <sub>uvd_VIO</sub>	Protected status	Z	H

(1) SIT1051T/3 version only;

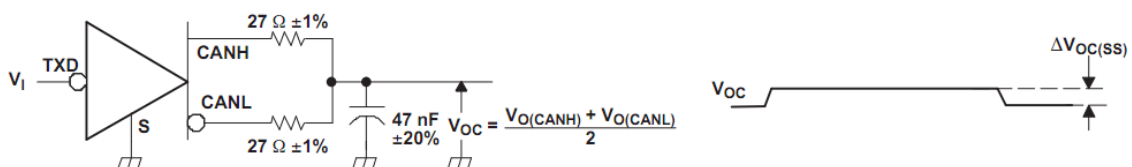
(2) H=high level; Z=high impedance;

**TEST CIRCUIT**

**Fig.1 Driver Voltage, Current, and Test Definition**

**Fig.2 Bus Logic State Voltage Definition**

**Fig.3 Driver Vod Test Circuit**


**Fig.4 Driver Test Circuit and Waveform**

**Fig.5 Receiver Voltage and Current Definition**


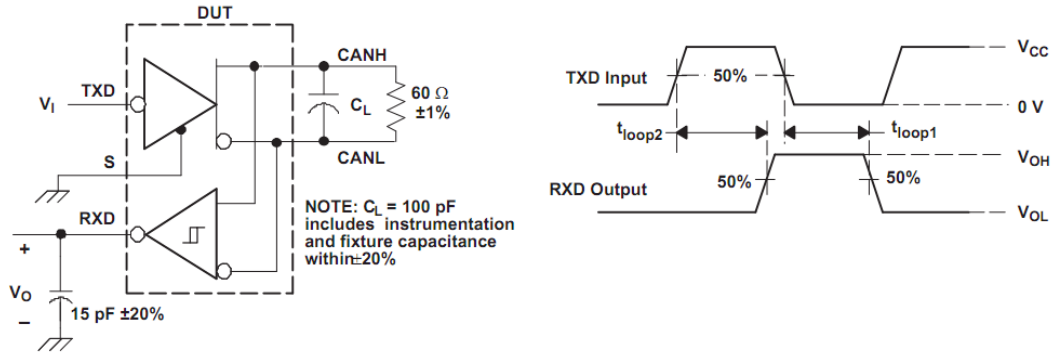
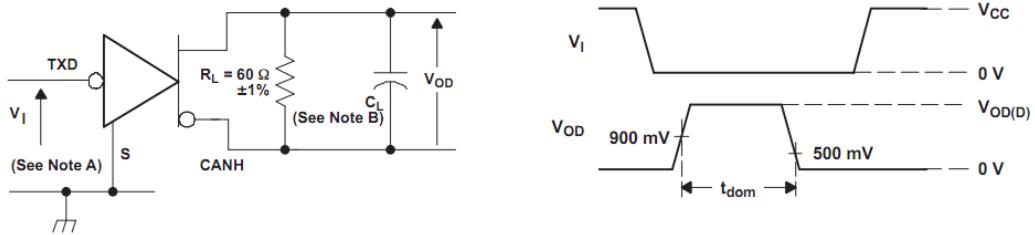
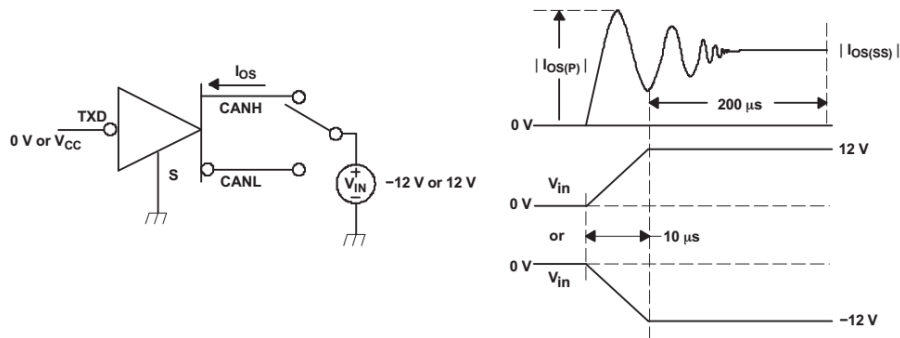
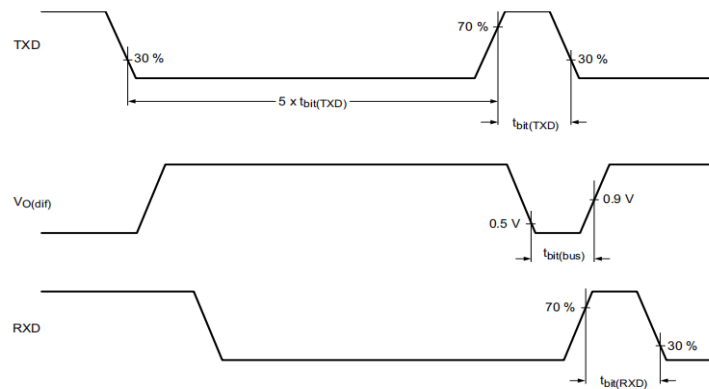
A. The input pulse is supplied by a generator having the following characteristics: PRR  $\leq$  125 kHz, 50% duty cycle,  $t_r \leq$  6 ns,  $t_f \leq$  6 ns,  $Z_0 = 50 \Omega$ .

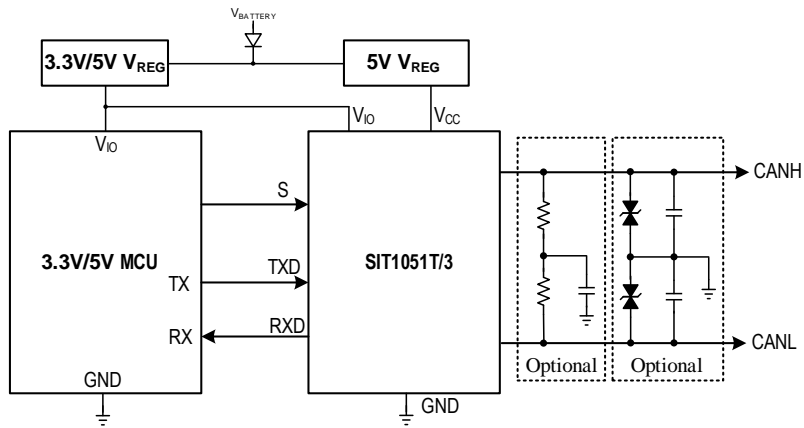
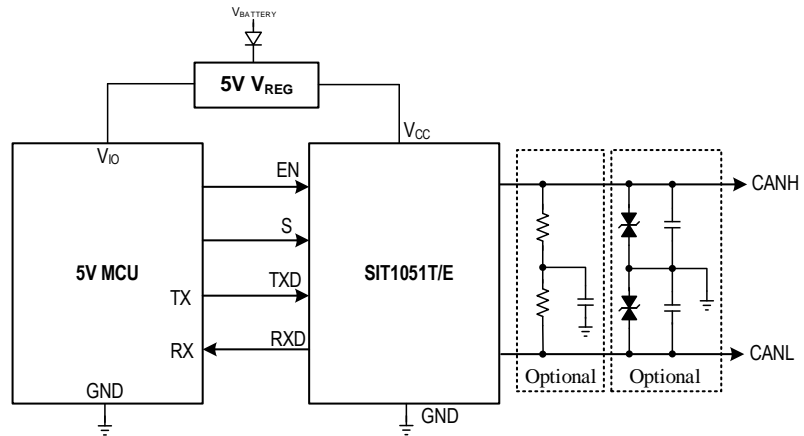
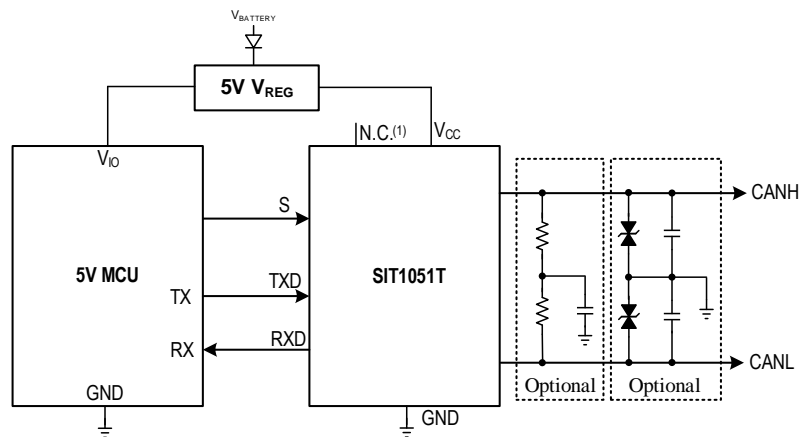
B.  $C_L$  includes instrumentation and fixture capacitance within  $\pm 20\%$ .

**Fig.6 Receiver Test Circuit and Waveform**


All VI input pulses are from 0 V to VCC and supplied by a generator having the following characteristics:  $t_r$  or  $t_f \leq$  6 ns. Pulse Repetition Rate (PRR) = 125 kHz, 50% duty cycle.

**Fig.7 Peak-to-Peak Common Mode Output Voltage Test and Waveform**


**Fig.8  $t_{(LOOP)}$  Test Circuit and Waveform**

**Fig.9 Dominant Time-Out Test Circuit and Waveform**

**Fig.10 Driver Short-Circuit Current Test Circuit and Waveform**

**Fig.11  $t_{bit(RXD)}$  test circuit and waveform**

**APPLICATION DIAGRAMS**

**Fig.12 Typical application of the SIT1051T/3**

**Fig.13 Typical application of the SIT1051T/E**

**Fig.14 Typical application of the SIT1051T**

(1) It is recommended to float the N.C. pin.

**ADDITIONAL DESCRIPTION****1 Sketch**

The SIT1051 is the interface between the Controller Area Network (CAN) protocol controller and the physical bus, and can be applied to the fields of trucks, buses, cars, industrial control etc. Support 5Mbps CAN With Flexible Data-Rate. The device provides differential transmit capability to the bus and differential receive capability to the CAN controller, and fully compatible with the ISO 11898 standard.

**2 Current protection**

A current-limiting circuit protects the transmitter output stage from damage caused by accidental short-circuit to either positive or negative supply voltage, although power dissipation increases during this fault condition.

**3 Over temperature protection**

SIT1051 has the function of over temperature protection. After the over temperature protection is triggered, the current of the driving stage will be reduced, because the driving tube is the main energy consuming part. The current reduction can reduce the power consumption and thus reduce the chip temperature. At the same time, other parts of the chip still work normally.

**4 Under-voltage protection**

The SIT1051 power supply pin has an under-voltage detection function, which can put the device in a protected mode. This protects the bus when  $V_{CC}$  is lower than  $V_{uvd\_VCC}$  or  $V_{IO}$  is lower than  $V_{uvd\_VIO}$ .

**5 Operating modes**

The SIT1051 provides two modes of operation which are selectable via pin S: High-speed mode and silent mode.

The high-speed mode is the normal operating mode and is selected by connecting pin S to ground or open. Both the CAN driver and the receiver can operate normally and CAN communication is carried out in both directions.

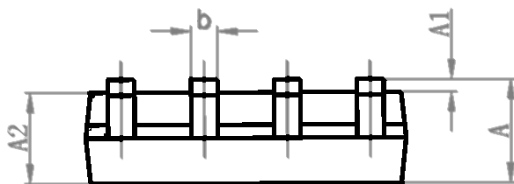
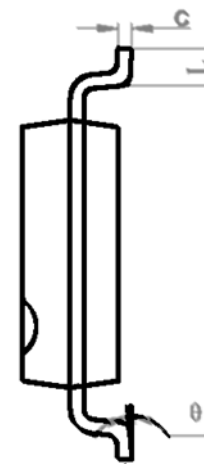
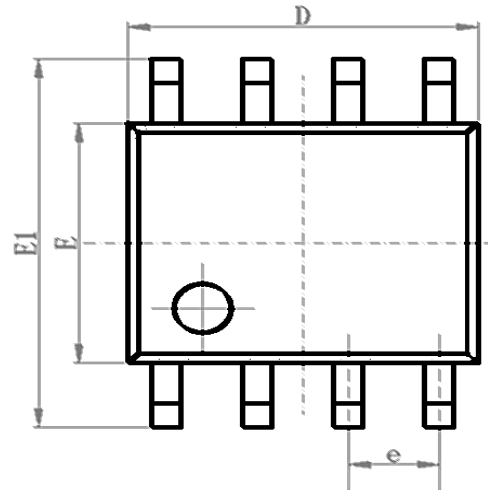
Set pin S to a high level to activate the mute mode. The CAN driver will shut down and the receiver will continue to work.

**6 TXD dominant time-out function**

In high-speed mode, if the low-level duration on pin TXD exceeds the internal timer value ( $t_{dom\_BUS}$ ), the transmitter will be disabled and drive the bus into a recessive state. It can prevent the pin TXD from being forced to a permanent low level due to a hardware or software application failure, causing the bus line to be driven to a permanent dominant state (blocking all network communications). A rising edge signal on pin TXD can be reset.

**SOP8 DIMENSIONS**
**PACKAGE SIZE**

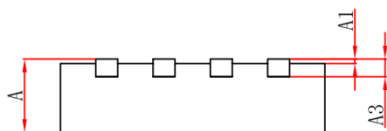
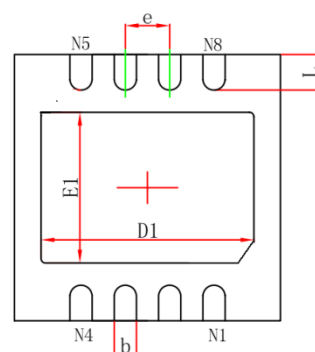
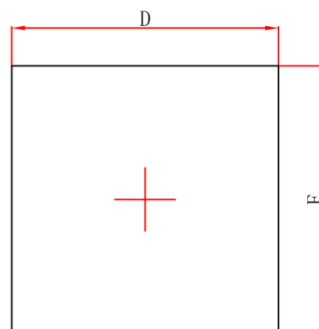
SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
b	0.38	-	0.51
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e		1.27BSC	
L	0.40	0.60	0.80
c	0.20	-	0.25
$\theta$	0°	-	8°





**DFN3\*3-8 /HVSON8 DIMENSIONS**
**PACKAGE SIZE**

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	0.70		0.80
A1	0.00	0.02	0.05
A3	0.203 REF		
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D1	2.35	2.3	2.55
E1	1.55	1.65	1.75
b	0.2	0.25	0.33
e	0.65 TYP		
L	0.35		0.45


**ORDERING INFORMATION**

TYPE NUMBER	TEMPERATURE	PACKAGE
SIT1051T	-40°C~150°C	SOP8
SIT1051T/E	-40°C~150°C	SOP8
SIT1051T/3	-40°C~150°C	SOP8
SIT1051TK/3	-40°C~150°C	HVSON8 / DFN3*3-8, Small Outline, Leadless

SOP8 package is 2500 pieces/disc. HVSON8 / DFN3\*3-8 package is 5000 pieces/disc.

**Important statement**

SIT reserves the right to change the above-mentioned information without prior notice.