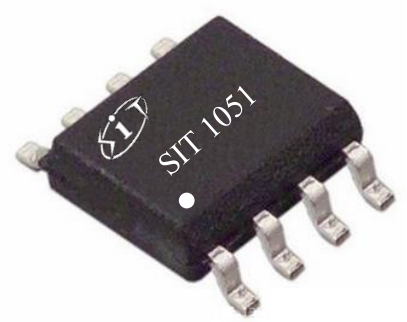
FEATURES

- Fully compatible with the ISO 11898 standard
- Thermally protected
- ±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



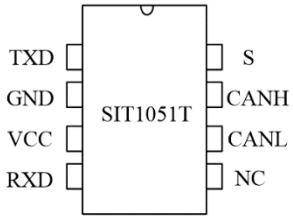
Provide Green and Environmentally Friendly Lead-free package

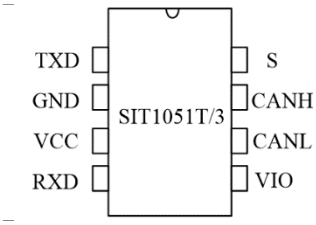
DESCRIPTION

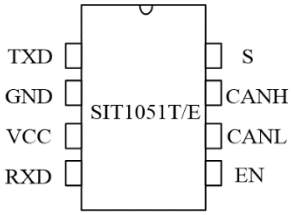
SIT1051 is an interface chip used between the CAN protocol controller and the physical bus. It can be used in trucks, buses, cars, industrial control and other fields. It supports 5Mbps CAN FD flexible data rate, and has a connection between the bus and the CAN protocol controller. The ability to perform 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_{amb}		-40	125	℃
Human Body Model	V_{HBM}		-8	+8	KV
Machine Model	V_{MM}		-300	+300	V
Charged Device Model	V_{CDM}		-750	+750	V

PIN CONFIGURATION







LIMITING VALUES

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	VCC	-0.3~+7	V
MCU side port	TXD,RXD, STB, VIO	-0.3~+7	V
Bus side input voltage	CANL,CANH	-70~70	V
Transient voltage on pins CANH, CANL and SPLIT see Fig.7	V_{tr}	-200~+200	V
Storage temperature		-55~150	℃
Virtual junction temperature		-40~150	℃
Welding temperature range		300	℃
Continuous power consumption	SOP8	400	mW

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	VCC	supply voltage

4	RXD	receive data output; reads out datafrom the bus lines
5	VIO	Transceiver I/O level conversion power supply voltage (SIT1051T/3 model)
	EN	Low-power shutdown mode selection, low level is shutdown mode (SIT1051T/E model)
	NC	No connection (SIT1051T model)
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，RL=60Ω，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=VIO，S=0V，RL=60Ω，Fig.1, Fig.2	2	2.5	3	V
Bus dominant differential output voltage	$V_{OD(D)}$	TXD=0V，S=0V，RL=60Ω，Fig.1, Fig.2	1.5		3	V
Bus recessive differential output voltage	$V_{OD(R)}$	TXD=VIO，S=0V，Fig.1, Fig.2	-0.012		0.012	V
		TXD=VIO，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	$\triangle V_{OC}$			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<VCC<5.25V	-2.0		2.5	mA

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time,low-to-high-level output	tPLH	S=0V，Fig.4		90		ns
Propagation delay time,low-to-high-level output	tPHL			65		ns
Differential output signal rise time	tr			45		ns
Differential output signal fall time	tf			45		ns
TXD dominant time-out	t_{dom_TXD}	Fig.9	0.8	2	5	ms

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

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 (VIT+ – VIT–)	V_{HYS}		50	120	200	
Power-off bus input current	$I_{(OFF)}$	CANH or CANL=5V，Other pin=0V	-5		5	uA
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=VIO，S=0V	9	15	28	KΩ
Differential input resistance	R_{ID}		19	30	52	KΩ
Input resistance	RI_{match}	CANH=CANL	-1%		1%	

matching						
The range of commen-mode voltage	V_{COM}		-30		30	V

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time,low-to-high-level output	tPLH	S=0V，Fig.6		65		ns
Propagation delay time,low-to-high-level output	tPHL			60		ns
RXD signal rise time	tr			10		ns
RXD signal fall time	tf			10		ns

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

DEVICE SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Loop delay1, driver input to receiver output, Recessive to Dominant	Td(LOOP1)	S=0V，Fig.8		90	220	ns
Loop delay 2, driver input to receiver output, Dominant to Recessive	Td(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±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

OVER TEMPERATURE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Shutdown junction temperature	Tj(sd)			190		℃

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

UNDER-VOLATAGE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VCC under-voltage protection	V_{uvd_VCC}		3.5		4.5	V
VIO under-voltage protection	V_{uvd_VIO}		1.5		2.5	V

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

TXD PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	I_{IH}(TXD)	TXD=VIO	-5		5	uA
LOW-level input current	I_{IL}(TXD)	TXD=0V	-260	-150	-30	uA
When VCC=0V，current on TXD pin	I_O(off)	VCC=VIO=0V，TXD=VIO	-1		1	uA
HIGH-level input voltage	V_{IH}		0.7V_{IO}		VCC+0.3	V
LOW-level input voltage	V_{IL}		-0.3		0.3V_{IO}	V
Open voltage on TXD pin	TXD_O		H			logic

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

STB PIN CHARACTERISTICS

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

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

RXD PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	I_{OH}(RXD)	VIO=VCC，RXD=VIO-0.4V	-8	-3	-1	mA
LOW-level input current	I_{OL}(RXD)	RXD=0.4V，bus dominant	2	5	12	mA
When VCC=0V，current on RXD pin	I_O(off)	VCC=VIO=0V，RXD=VIO	-1		1	uA

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

EN PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
EN HIGH-level input current	I_{IH}(EN)	EN=VCC	1	4	10	uA
EN LOW-level input current	I_{IL}(EN)	EN=0V	-1		1	uA
EN HIGH-level input voltage	V_{IH}		$0.7V_{CC}$		VCC+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±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

SUPPLY CURRENT

PARAMETER		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VCC 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=VIO		1	2.5	mA
	Shutdown	I_{CC_EN}	EN=0V or open（SIT1051T/E model）		0.5	5	uA
VIO supply current	Normal or Silent mode dominant	I_{IO_D}	RXD open TXD=0V		350	1000	uA
	Normal or Silent mode recessive	I_{IO_R}	RXD open，TXD=VIO		80	200	uA

（V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25℃）

FUNCTION TABLE

Table1.CAN TRANSCEIVER TRUTH TABLE

V_{CC}	TXD(1)	S(1)	CANH(1)	CANL(1)	BUS STATE	RXD(1)
4.5V~5.5V	L	L or Open	H	L	Dominate	L
4.5V~5.5V	H or Open	X	0.5V_{CC}	0.5V_{CC}	Recessive	H
4.5V~5.5V	X	H	0.5V_{CC}	0.5V_{CC}	Recessive	H
0<V_{CC}<4.5V	X	X	0V<V_{CANH}<V_{CC}	0V<V_{CANL}<V_{CC}	Recessive	X

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

Table 2. DRIVER FUNCTION TABLE

INPUTS		OUTPUTS		Bus State
TXD(1)	S(1)	CANH(1)	CANL(1)	
L	L or Open	H	L	Dominate
H or Open	X	Z	Z	Recessive
X	H	Z	Z	Recessive

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

Table 3. RECEIVER FUNCTION TABLE

V_{ID}=CANH-CANL	RXD(1)	Bus State
V_{ID}≥0.9V	L	Dominate
0.5< V_{ID}<0.9V	?	?
V_{ID}≤0.5V	H	Recessive
Open	H	Recessive

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

TEST CIRCUIT

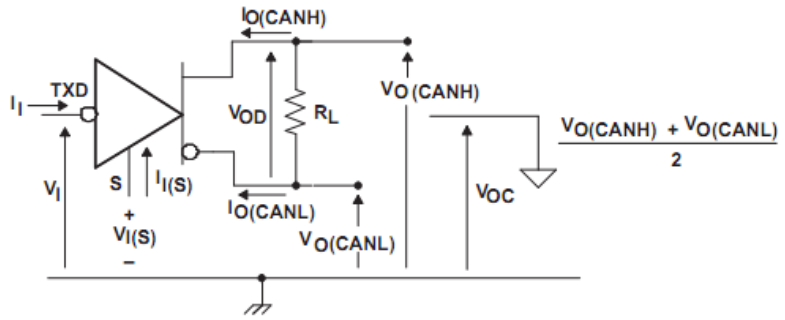


Fig.1 Driver Voltage, Current, and Test Definition

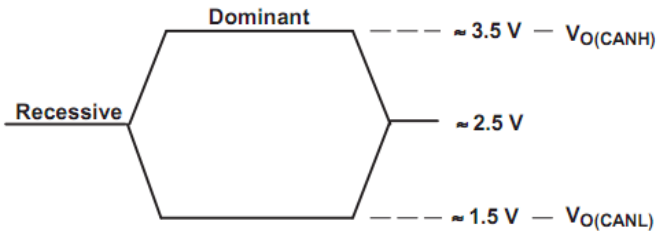


Fig.2 Bus Logic State Voltage Definition

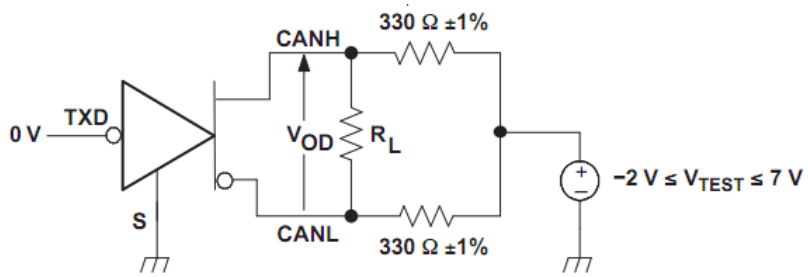


Fig.3 Driver V_{OD} Test Circuit

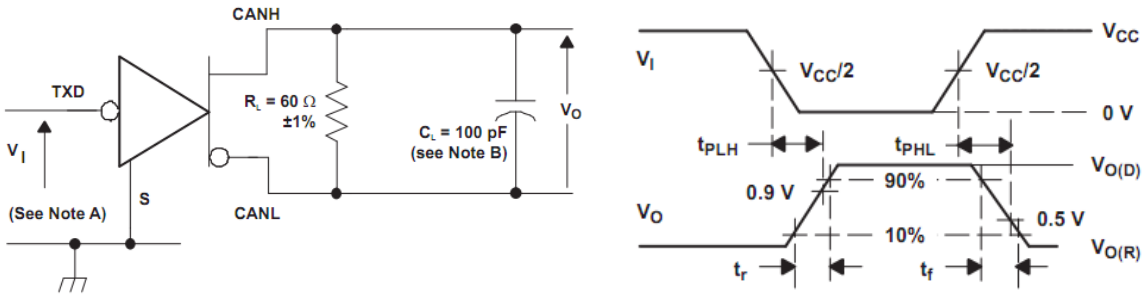


Fig.4 Driver Test Circuit and Waveform

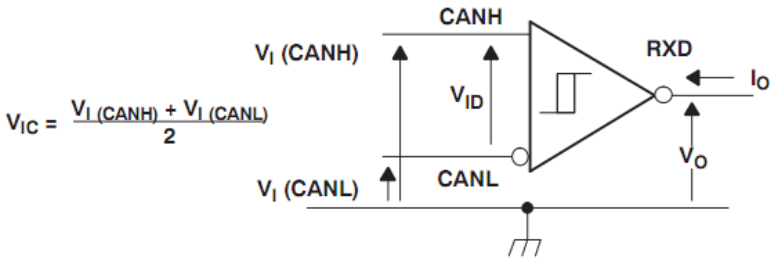
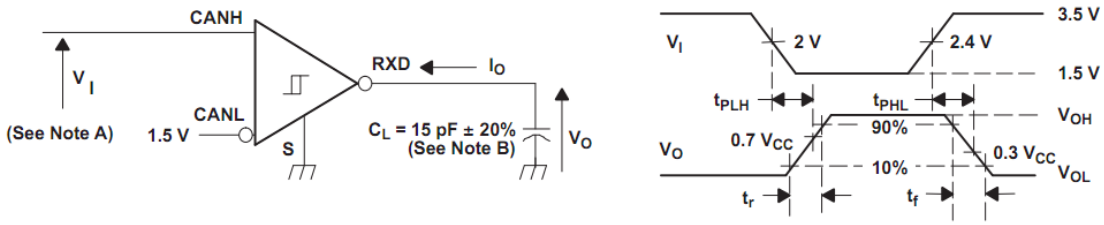


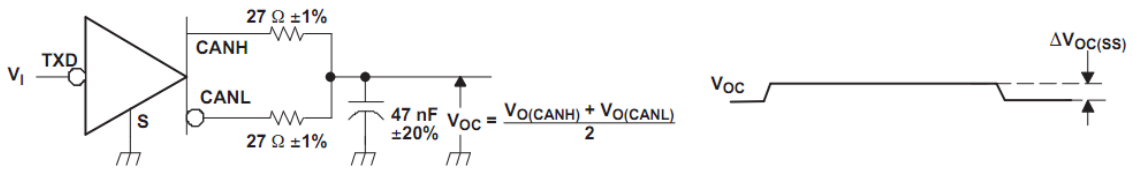
Fig.5 Receiver Voltage and Current Definition



A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 125 kHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6ns, Z_O = 50 Ω.

B. C_L includes instrumentation and fixture capacitance within ±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: tr or tf ≤ 6 ns. Pulse Repetition Rate (PRR) = 125 kHz, 50% duty cycle.

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

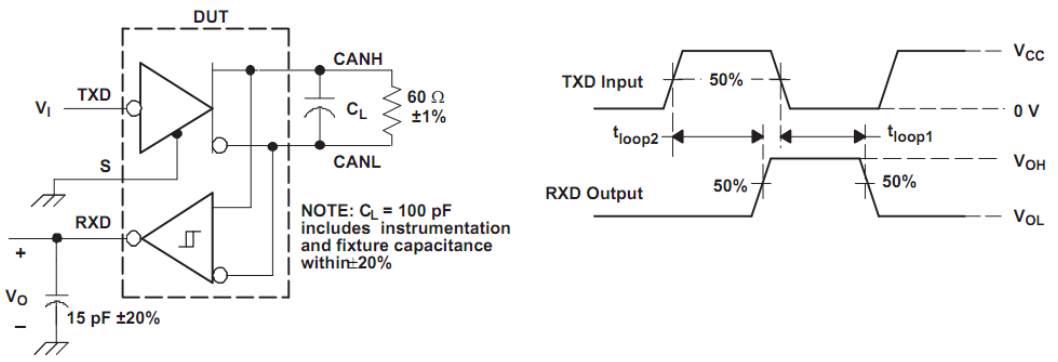


Fig.8 $t_{(LOOP)}$ Test Circuit and Waveform

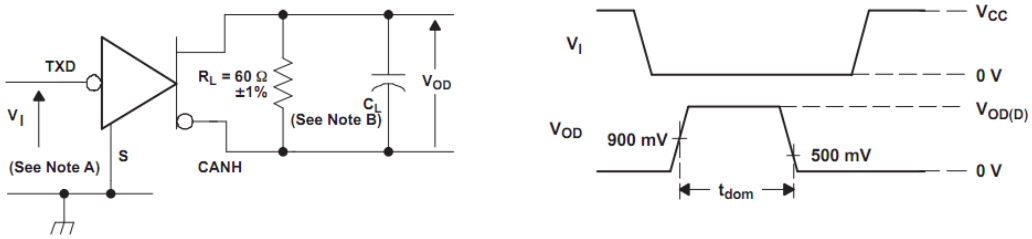


Fig.9 Dominant Time-Out Test Circuit and Waveform

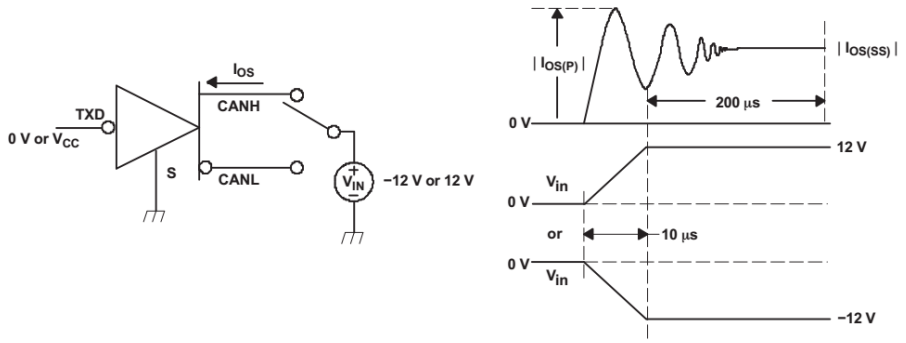


Fig.10 Driver Short-Circuit Current Test Circuit and Waveform

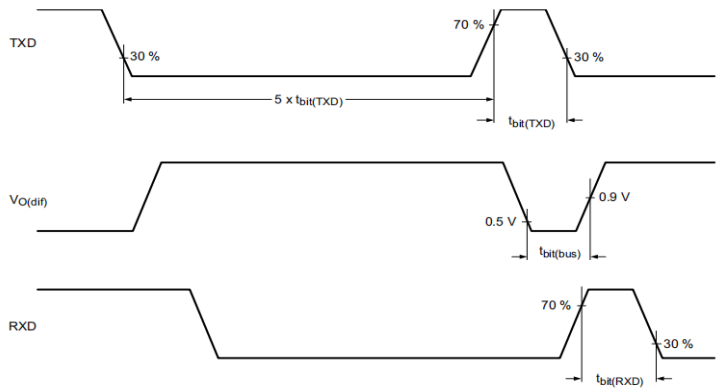


Fig.11 $t_{bit(RXD)}$ test circuit and waveform

ADDIYIONAL 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 FD 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 VCC is lower than V_{uvd_VCC} or VIO is lower than V_{uvd_VIO}.

5 Operating modes

The SIT1050 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.

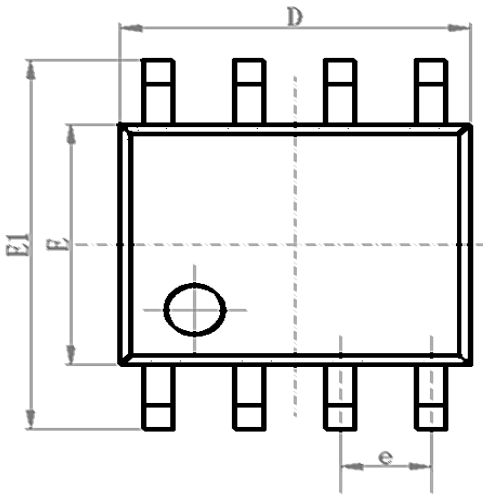
6 TXD dominant time-out function

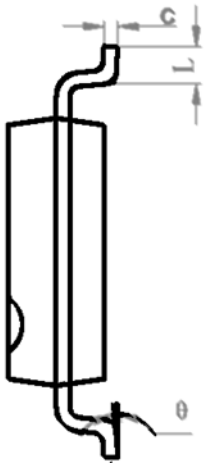
In high-speed mode, if the low-level duration on pin TXD exceeds the internal timer value (tdom_BUS), the transmitter will be disabled and drive the bus into a recessive state. It can prevent the pin TXD from being forced to a permanent low level due to a hardware or software application failure, causing 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.

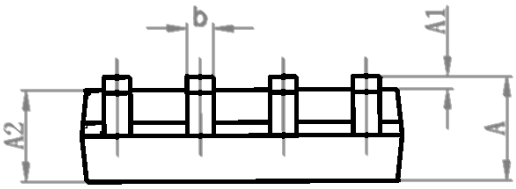
SOP8 DIMENSIONS

PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.50	1.60	1.70
A1	0.1	0.15	0.2
A2	1.35	1.45	1.55
b	0.355	0.400	0.455
D	4.800	4.900	5.00
E	3.780	3.880	3.980
E1	5.800	6.000	6.200
e		1.270BSC	
L	0.40	0.60	0.80
c	0.153	0.203	0.253
θ	-2°	-4°	-6°



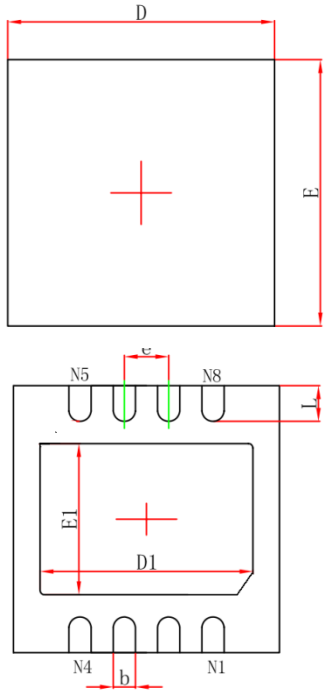


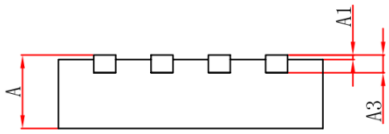


DFN3*3-8 /HVSON8 DIMENSIONS

PACKAGE SIZE

SYMBOL	MIN/mm	TYP /mm	MAX/mm
A	0.700		0.900
A1	0.000	0.02	0.050
A3	0.203 REF		
D	2.900	3.000	3.100
E	2.900	3.000	3.100
D1	2.200	2.3	2.400
E1	1.400	1.5	1.600
b	0.2	0.25	0.33
e	0.650 TYP		
L	0.250		0.575





ORDERING INFORMATION

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

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