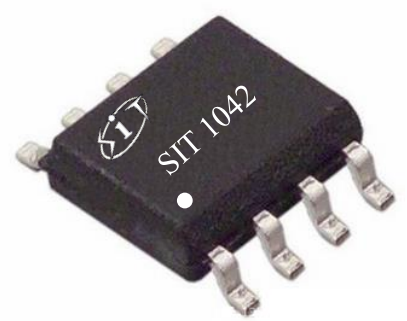
FEATURES

- Fully compatible with "ISO 11898" standard;
- Built-in over-temperature protection;
- Bus port ±70V withstand voltage;
- Drive (TXD) dominant timeout function;
- Standby bus (BUS) dominant overtime function;
- Low-power standby mode with wake-up function;
- SIT1042T/3 I/O voltage range supports 3.3V and 5V MCU;
- Undervoltage protection on VCC and VIO supply pins;
- High speed CAN, support 5Mbps CAN FD (flexible data rate) ;
- High resistance to electromagnetic interference;
- Unpowered nodes do not interfere with the bus

OUTLINE



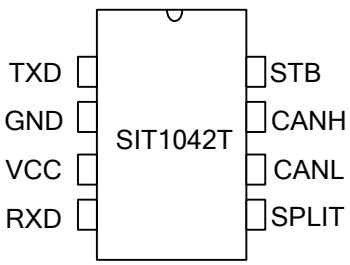
Provide green and environmentally friendly lead-free package

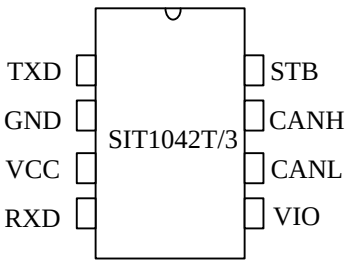
DESCRIPTION

SIT1042 is an interface chip used between the CAN protocol controller and the physical bus, can be used in trucks, buses, cars, industrial control and other fields, support 5Mbps CAN FD flexible data rate, with the ability to differential signal transmission between the bus and the CAN protocol controller.

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	5		Mbaud
CANH/CANL input or output voltage	V_{can}		-70	+70	V
Bus differential voltage	V_{diff}		1.5	3.0	V
Virtual junction temperature	T_{amb}		-40	150	℃

PIN CONFIGURATION





Limit parameters

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 voltages on pins 6 and 7 see Fig. 7	V_{tr}	-200~+200	V
Storage temperature		-55~150	℃
Ambient temperature		-40~150	℃
Welding temperature range		300	℃
Continuous power consumption	SOP8	400	mW

The maximum limit parameter value 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. Continuous operation of the device under the maximum allowable rating may affect the reliability of the device. The reference point of all voltages is ground.

PIN DEFINITION

PIN	SYMBOL	DESCRIPTION
1	TXD	Transmitter data input
2	GND	Ground
3	VCC	Power supply
4	RXD	Receiver data output
5	VIO	Transceiver I/O level conversion power supply voltage (SIT1042T/3)
5	SPLIT	Common-mode stable output port (SIT1042T)
6	CANL	Low potential CAN voltage input and output
7	CANH	High potential CAN voltage input and output
8	STB	High speed and standby mode selection, low for high speed

DC CHARACTERISTICS OF BUS TRANSMITTER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
CANH output voltage (dominant)	$V_{OH(D)}$	TXD=0V，STB=0V，RL=60Ω，Figure 1, Figure 2	2.9	3.4	4.5	
CANL output voltage (dominant)	$V_{OL(D)}$		0.8		1.5	
Bus output differential voltage (recessive)	$V_{O(R)}$	TXD=VIO，STB=0V，RL=60Ω，Figure 1, Figure 2	2	2.5	3	V
Bus output differential voltage (dominant)	$V_{OD(D)}$	TXD=0V，STB=0V，RL=60Ω，Figure 1, Figure 2	1.5		3	V
Bus differential output voltage (recessive)	$V_{OD(R)}$	TXD=VIO，STB=0V，Figure 1, Figure 2	-0.012		0.012	V
		TXD=VIO，STB=0V，NO LOAD	-0.5		0.05	V
Dominant output voltage symmetry	$V_{dom(TX)sym}$	$V_{dom(TX)sym}=V_{CC}-V_{CANH}-V_{CANL}$	-400		400	mV
Output voltage symmetry	V_{TXsym}	$V_{TXsym}=V_{CANH}+V_{CANL}$	$0.9V_{CC}$		$1.1V_{CC}$	V
Common mode output voltage	V_{OC}	STB=0V，Fig. 8	2	2.5	3	V
Dominant recessive common mode output voltage difference	$\triangle V_{OC}$			30		mV
Short circuit output current	I_{OS}	CANH=-12V，CANL=open，Fig. 11	-105	-72		mA
		CANH=12V，CANL=open，		0.36	1	
		CANL=-12V，CANH=open，	-1	0.5		
		CANL=12V，CANH=open，		71	105	
Hidden output current	$I_{O(R)}$	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA

Unless otherwise specified, all typical values are measured at 25°C, power supply voltage VCC = 5V, VIO = 5V (if applicable), RL = 60Ω.

BUS TRANSMITTER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay (low to high)	tPLH	STB=0V，Fig. 4		90		ns
Propagation delay (high to low)	tPHL			65		ns
Differential output rise delay time	tr			45		ns
Differential output falling delay time	tf			45		ns
Enable time from listening mode to dominant	t_{EN}	Fig. 7		1	45	us
TXD dominant timeout	t_{dom_TXD}	Fig. 10	0.8	2	4	ms
BUS dominant timeout	t_{dom_BUS}		0.8	2	4	ms
Bus wake-up time	t_{WAKE}		0.5		5	us

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

BUS RECEIVER DC CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Positive input threshold	V_{IT+}	STB=0V，Fig. 5		800	900	mV
Negative input threshold	V_{IT-}		500	650		
Hysteresis voltage (VIT+ – VIT–)	V_{HYS}		50	120	200	
Bus input current on power-down	$I_{(OFF)}$	CANH or CANL=5V，Other pin=0V	-5		5	uA
CANH, CANL input capacitance to ground	C_I			24		pF
CANH, CANL differential input capacitance	C_{ID}			12		pF
CANH, CANL input resistance	R_{IN}	TXD=VIO，STB=0V	15	30	40	KΩ
CANH, CANL differential input resistance	R_{ID}		30		80	KΩ
RI (CANH), RIN (CANL) mismatch	RI_{match}	CANH=CANL	-2%		2%	
Common mode voltage range	V_{COM}		-30		30	V

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

BUS RECEIVER SWITCHING CHARACTERISTICS

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

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

DEVICE SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Loop delay 1, driver input to receiver output, recessive to dominant	Td(LOOP1)	STB=0V，图 9		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

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

OVER TEMPERATURE PROTECTION

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

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

UNDERVOLTAGE PROTECTION

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

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

TXD-PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
TXD Port high input current	I_{IH}(TXD)	TXD=VIO	-5		5	uA
TXD port low input current	I_{IL}(TXD)	TXD=0V	-260	-150	-30	uA
When VCC=0V, TXD current	I_O(off)	VCC=VIO=0V TXD=VIO	-1		1	uA
Input high level lower limit	V_{IH}		$0.7V_{IO}$		VCC+0.3	V
Input low level upper limit	V_{IL}		-0.3		$0.3V_{IO}$	V
TXD port floating voltage	TXD_O		H			logic

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

STB PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
STB port high level input current	I_{IH}(STB)	STB=VIO	-2		2	uA
STB port low-level input current	I_{IL}(STB)	STB=0V	-20		-2	uA
When VCC=0V, STB current	I_O(off)	VCC=VIO=0V, STB=VIO	-1		1	uA
Input high lower limit	V_{IH}		$0.7V_{IO}$		VCC+0.3	V
Input low upper limit	V_{IL}		-0.3		$0.3V_{IO}$	V
STB port floating voltage	STB_O		H			logic

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

RXD PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
RXD Port high output current	I_{OH}(RXD)	VIO=VCC，RXD=VIO-0.4V	-8	-3	-1	mA
RXD port low output current	I_{OL}(RXD)	RXD=0.4V，Bus dominance	2	5	12	mA
When VCC=0V, the current of RXD	I_O(off)	VCC=VIO=0V，RXD=VIO	-1		1	uA

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

COMMON MODE STABLE OUTPUT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
SPLIT port output voltage	V_{SPLIT}	-500uA<I_{SPLIT}<500uA	0.3V_{CC}	0.5 V_{CC}	0.7V_{CC}	V

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Standby mode power consumption	I_{CC}	STB=VCC, TXD=VIO，SIT1042T/3 mod.			5	uA
		STB=VCC, TXD=VCC，SIT1042T mod.		10	15	uA
Dominant power consumption		TXD=VIO, STB=0V, LOAD=60Ω		45	70	mA
Hidden power consumption		TXD=VIO, STB=0V, NO LOAD		5	10	mA

Unless otherwise stated, all typical values are measured at 25 ° C, supply voltage VCC =5V, VIO=5V (if applicable), RL=60Ω.

FUNCTION TABLE

Table 1. CAN transceiver truth table

V_{CC}	TXD(1)	STB(1)	CANH(1)	CANL(1)	BUS STATE	RXD(1)
4.5V~5.5V	L	L	H	L	Dominant	L
4.5V~5.5V	H (or floating)	X	$0.5V_{CC}$	$0.5V_{CC}$	Dominant	H
4.5V~5.5V	X	H (or floating)	$0.5V_{CC}$	$0.5V_{CC}$	Dominant	H
0<V_{CC}<4.5V	X	X	$0V<V_{CANH}<V_{CC}$	$0V<V_{CANL}<V_{CC}$	Dominant	X

(1) H=high level; L=low level; X=don't care

Table 2. Drive function table

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

(1) H=high level; L=low level; Z=high impedance; X=don't care

Table 3. Receiver function table

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

(1) H=high level; L=low level;? = Not sure

TEST CIRCUIT

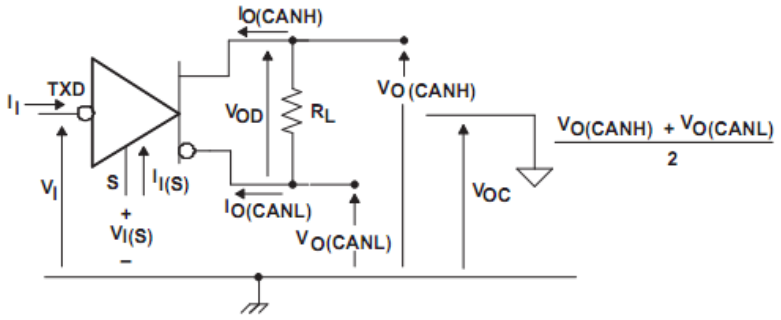


Figure 1 Test definition of drive voltage and current

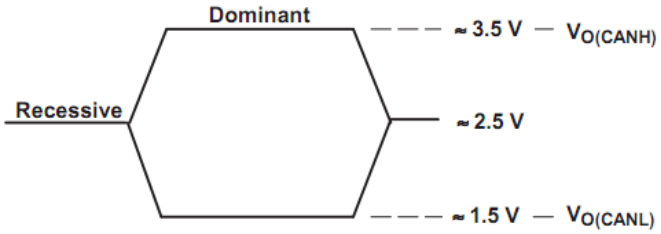


Figure 2 Definition of bus logic voltage

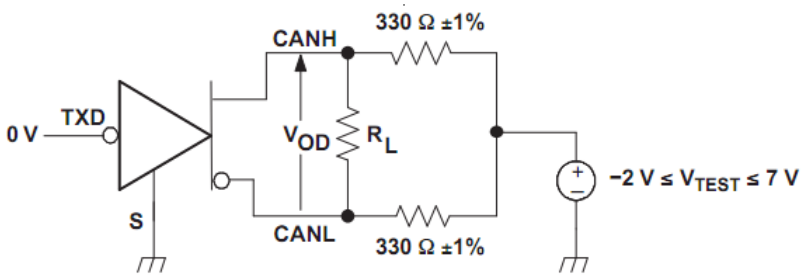


Figure 3 Drive VOD test circuit

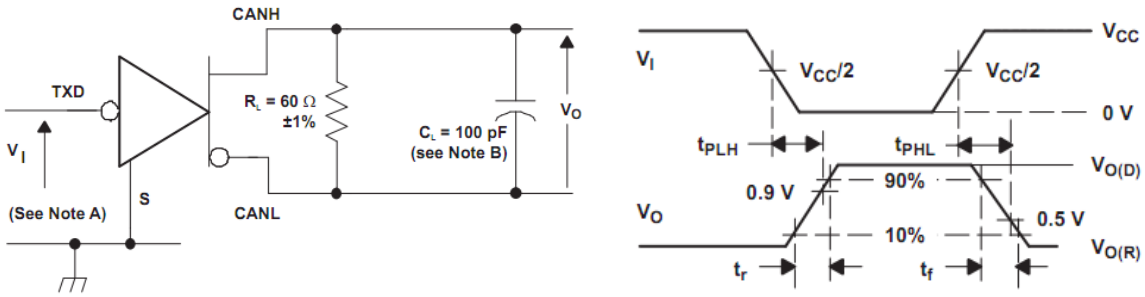


Figure 4 Drive test circuit and voltage waveform

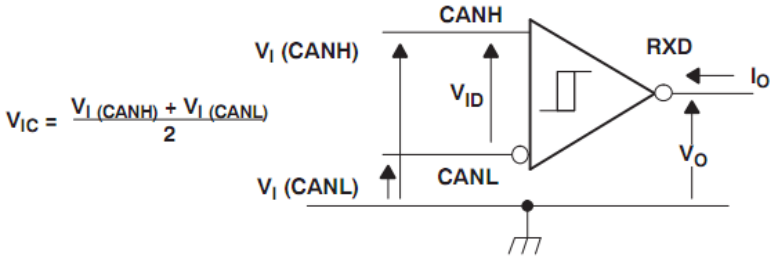
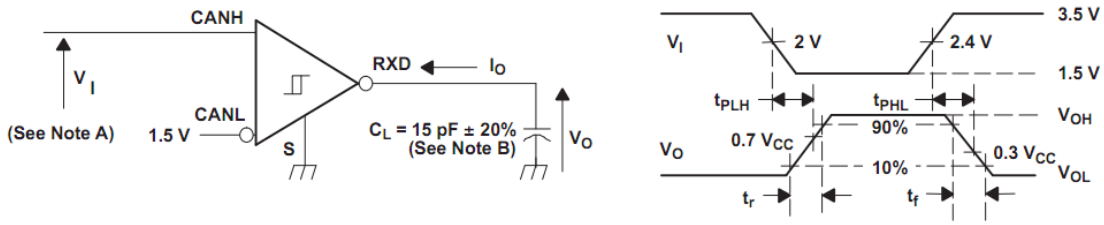


Figure 5 Definition of receiver voltage and current



A. Features of input pulse generator: PRR≤125KHz, 50% duty cycle, tr<6ns, tf<6ns, Zo=50Ω

B. CL includes instrument and fixed capacitor, and the error is within 20%.

Figure 6 Receiver test circuit and voltage waveform

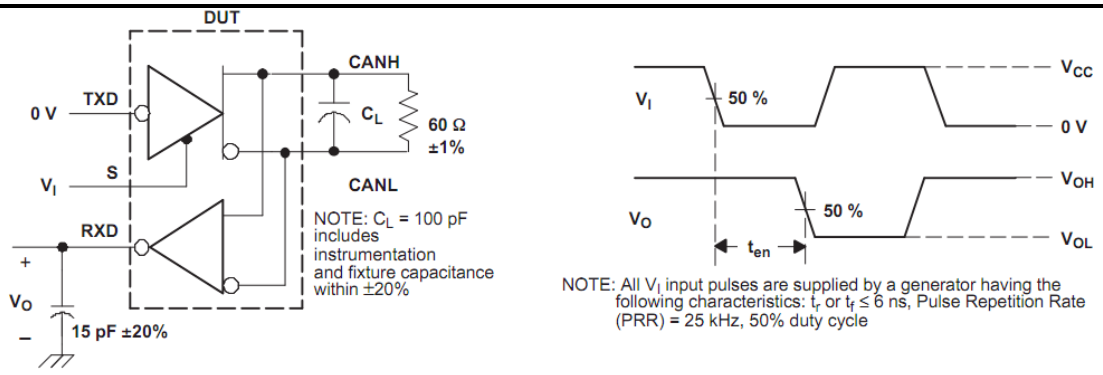
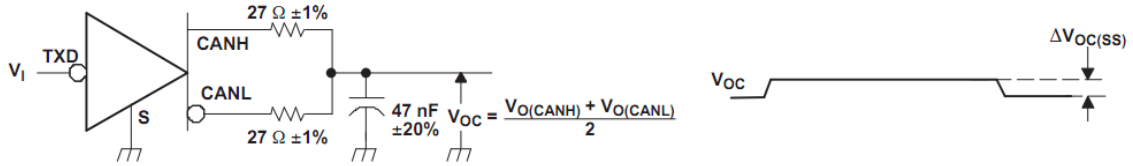


Figure 7 tEN test circuit and voltage waveform



Note: VI from 0~VCC, input pulse generator characteristics: PRR≤125KHz, 50% duty cycle, tr<6ns, tf<6ns, Zo=50Ω

Figure 8 Common mode output voltage test and waveform

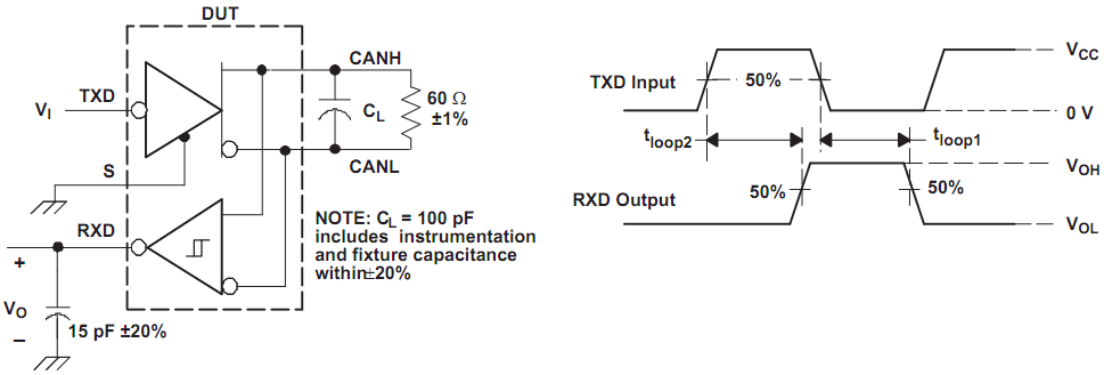


Figure 9 t(LOOP) test circuit and waveform

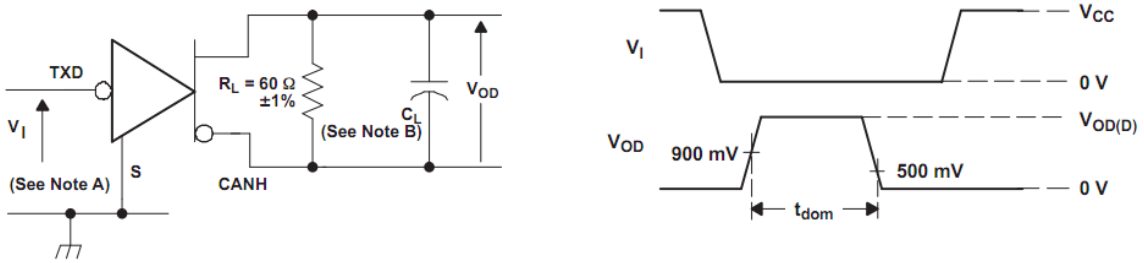


Figure 10 Dominant overtime test circuit and waveform

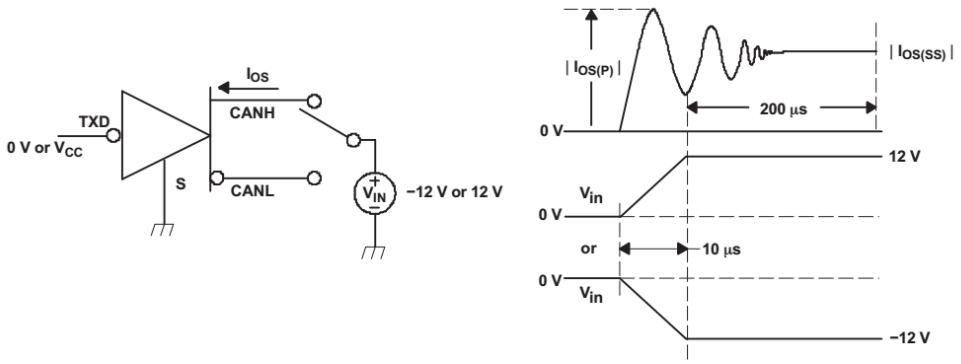


Figure 11 Drive short circuit current test circuit and waveform

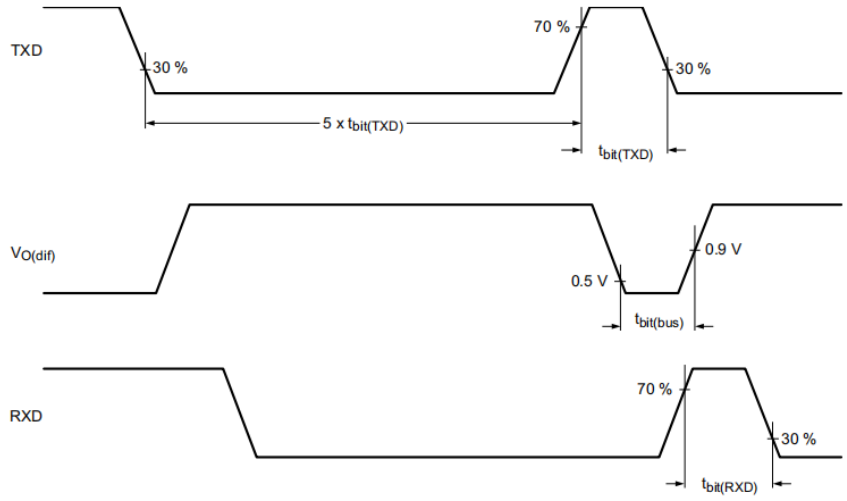


Figure 12 tbit (RXD) test circuit and waveform

DESCRIPTION

1 Brief description

SIT1042 is an interface chip used in CAN protocol controller and physical bus, can be used in trucks, buses, small cars, industrial control and other fields, support 5Mbps CAN FD flexible data rate, with the ability to differential signal transmission between the bus and the CAN protocol controller, fully compatible with the"ISO 11898"standard.

2 Short circuit protection

The driver stage of SIT1042 has a current-limiting protection function to prevent the driver circuit from being short-circuited to the positive and negative power supply voltages. Power consumption will increase when a short-circuit occurs. The short-circuit protection function can protect the driver stage from damage.

3 Over temperature protection

SIT1042 has an over-temperature protection function. After the over-temperature protection is triggered, the current of the driver stage will be reduced, because the driver tube is the main energy-consuming part, and the current reduction can reduce the power consumption and thus reduce the chip temperature. At the same time, other parts of the chip are still working normally.

4 Undervoltage protection

SIT1042 power supply pin has an under-voltage detection function, which can put the device in protected mode. This protects the bus (bus output high impedance) when VCC is lower than Vuvd_VCC or VIO is lower than Vuvd_VIO (if applicable).

5 Control mode

The control pin STB allows two operating modes to be selected: high-speed mode and standby mode. The high-speed mode is the normal operating mode, which is selected by grounding pin STB. Both the CAN driver and the receiver can operate normally and CAN communication is carried out in both directions.

Set pin STB to high level to activate low-power standby mode. Both the CAN driver and receiver are turned off to save system power consumption. The high level on pin STB activates the low-power receiver and wake-up filter. Once the low-power differential comparator detects the dominant bus level exceeding twake, the pin RXD will become low.

6 Explicit timeout function

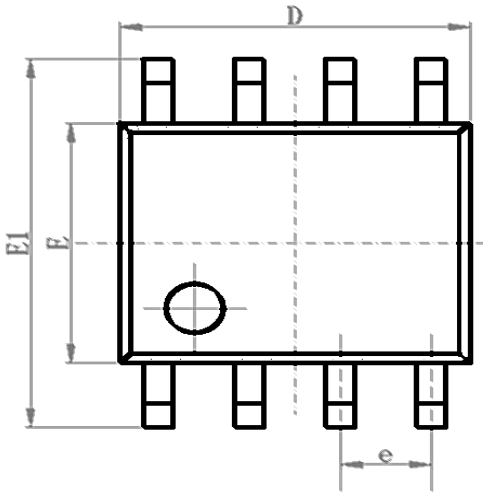
In high-speed mode, if the low-level duration on pin TXD exceeds the internal timer value (tdom_BUS), the transmitter will be disabled and drive the bus into a recessive state. It can prevent the TXD pin from being forced to a permanent low level due to a hardware or software application failure, causing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

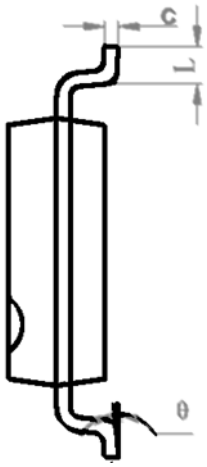
In the standby mode, if the bus has a dominant state and lasts longer than (tdom_BUS), the pin RXD will be forced to a high level. It can prevent permanent wake-up due to bus short circuit or failure of another node on the network. It can be reset when the bus changes from dominant to recessive.

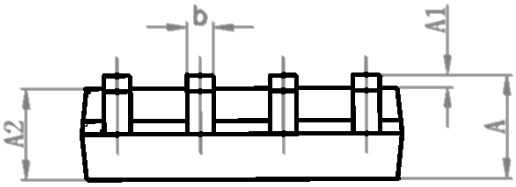
SOP8 DIMENSIONS

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 °







ORDERING INFORMATION

TYPE NUMBER	TEMPERATURE	PACKAGE
SIT1042T	-40℃~150℃	SOP8
SIT1042T/3	-40℃~150℃	SOP8

Tapered package is 2500 pieces/disc.