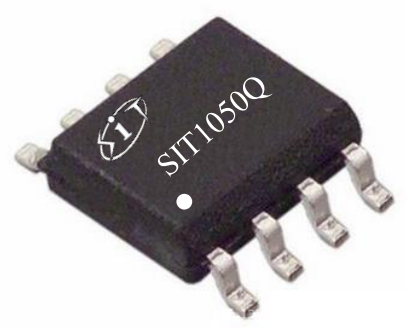
SIT1050Q

Corel 5V power supply, ±40V interface withstand voltage, 1 Mbps high-speed CAN bus transceiver

characteristic:

- Fully compatible with the "ISO 11898" standard;
- Comply with AEC-Q100 requirements;
- Built-in over temperature protection;
- Overcurrent protection function;
- Visible timeout function;
- Silent mode;
- The unpowered node does not interfere with the bus;
- At least 110 nodes are allowed to connect to the bus;
- High speed CAN, transmission rate can reach 1 Mbps;
- High electromagnetic interference resistance;
- Provide HVSON8 /DFN3*3-8, small form factor, pinless package.

Typical product appearance:



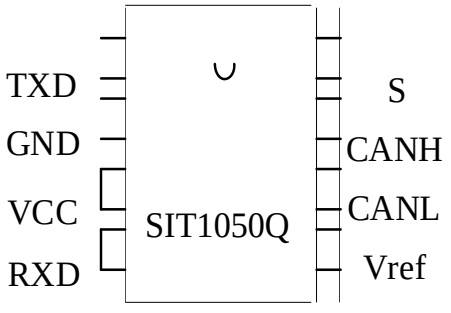
Provide green, lead-free packaging

description

SIT1050Q is an interface chip applied between CAN protocol controller and physical bus. It can be used in truck, bus, car, industrial control and other fields. The rate can reach 1Mbps, and it has the ability to transmit differential signals between bus and CAN protocol controller.

Parameter	Symbol	Test condition	Minimum	Maximum	Unit
Service voltage	V_{cc}		4.75	5.25	V
Peak transfer rate	$1/t_{bit}$	Non-zero code	1		Mbaud
CANH、CANL Input and output voltage	V_{can}		-40	+40	V
Total line differential voltage	V_{diff}		1.5	3.0	V
Ambient temperature	T_{amb}		-40	125	℃
ESD ability	V_{esd}	Human model (HBM)	±8		KV

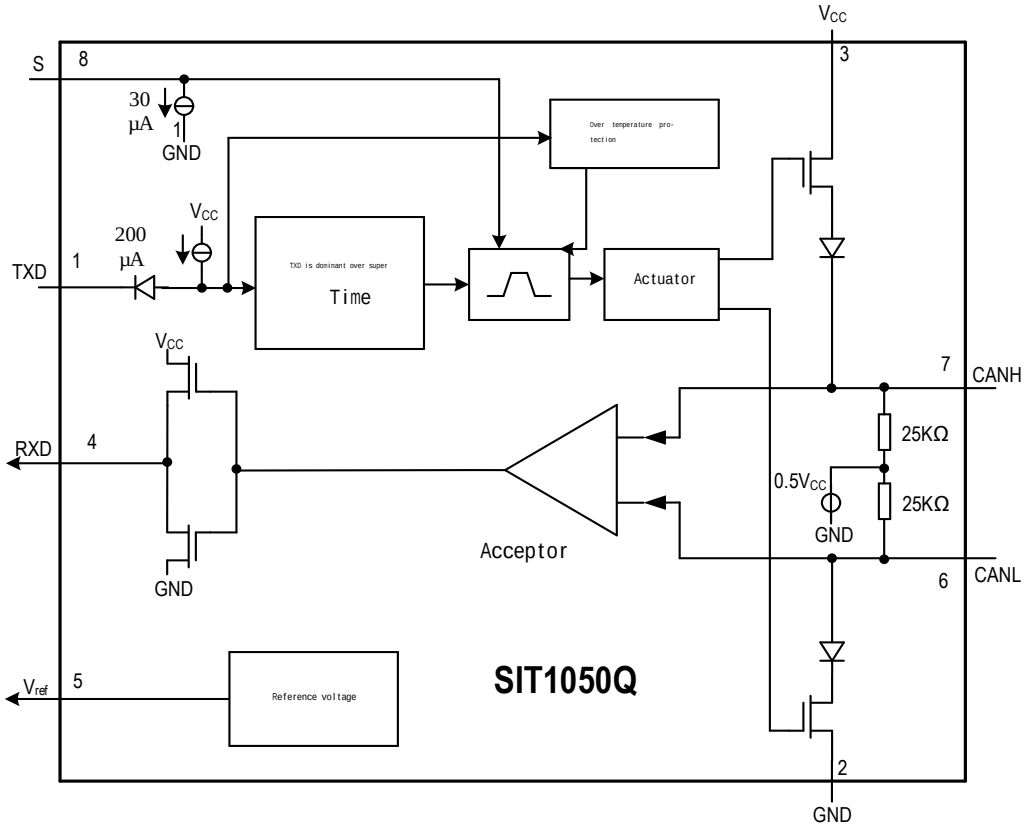
Pin distribution diagram



Pin definition

Pin number	Pin name	Pin function
1	TXD	Data input end of transmitter
2	GND	The earth
3	VCC	Power Supply Voltage
4	RXD	Receiver data output end
5	Vref	Reference voltage output
6	CANL	Low potential CAN voltage input/output terminals
7	CANH	High potential CAN voltage input/output terminal
8	S	High speed and silent mode selection, low level is high speed

Note: DFN3*3-8/HVSON8 package, the back pad is connected to the chip GDN pin. If better heat dissipation performance is required, the back pad can be connected to the appropriate "ground" of the PCB board.



SIT1050Q Internal block diagram

absolute rating

Parameter	Symbol	Big or small	Unit
Supply voltage	V_{CC}	-0.3~+6	V
MCU, side port	TXD,RXD,Vref,S	-0.3~VCC+0.3	V
Total input voltage on the bus	CANL, CANH	-40~40	V
6, The transient voltage of pin 7 is shown in Figure 7	V_{tr}	-200~+200	V
Storage operating temperature range		-55~150	℃
Ambient temperature		-40~125	℃
Welding temperature range		300	℃

The maximum limit parameter value is the value beyond which the device may suffer irrecoverable damage. Under these conditions, it is not conducive to the normal operation of the device. Continuous operation of the device at the maximum allowable rating may affect the reliability of the device. All voltage reference points are ground.

DC characteristics of the total signal transmitter

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
CANH output voltage (visible)	$V_{OH(D)}$	VI=0V, S=0V, RL=60Ω, Figure 1, Figure 2	2.9	3.4	4.5	V
CANL Output Voltage (Visible)	$V_{OL(D)}$		0.8		1.5	V
The total signal output is a differential voltage (covert gender)	$V_{O(R)}$	VI=3V, S=0V, RL=60Ω, Figure 1, Figure 2	2	2.5	3	V
The total signal output is a differential voltage (dominance)	$V_{OD(D)}$	VI=0V, S=0V, RL=60Ω, Figure 1, Figure 2	1.5		3	V
Total line differential output voltage (covert gender)	$V_{OD(R)}$	VI=3V, S=0V, Figure 1, Figure 2	-0.012		0.012	V
		VI=3V, S=0V, NO LOAD	-0.5		0.05	V
Output 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, graph 8	2	2.5	3	V

The difference between the dominant and recessive common mode output voltages	$\triangle V_{OC}$			30		mV

Short circuit output current	I_{OS}	CANH=-12V, CANL=open, graph 11	-105	-40		mA
		CANH=12V, CANL=open, graph 11		0.36	1	
		CANL=-12V, CANH=open, graph 11	-1	0.5		
		CANL=12V, CANH=open, graph 11		40	105	
Hidden output current	$I_{O(R)}$	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value in VCC=+5V, Temp = 25)

General transmitter switch characteristics

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Propagation delay (low to high)	tPLH	S=0V, graph 4	25	90	150	ns
Propagation delay (high to low)	tPHL		20	45	90	ns
Differential output rise time	tr			80		ns
Differential output delay time	tf			50		ns
From listening mode to explicit enable time	t_{EN}	Graph 7			1	us
Visible timeout time	t_{dom}	Graph 10	300	450	700	us

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value is VCC=+5V, Temp = 25)

DC characteristics of the total signal receiver

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Enter the threshold	V_{IT+}	S=0V, graph 5		750	900	mV
Negative input threshold	V_{IT-}		500	650		
Comparator threshold hysteresis interval	V_{HYS}		80	100		
High level output	V_{OH}	IO=-2mA, graph	4	4.6		V

voltage		6				
Low level output voltage	V_{OL}	IO=2mA, graph 6		0.2	0.4	V

Bus input current drops when power is lost	$I_{(OFF)}$	CANH or CANL=5V, Other pin=0V		3	20	uA
CANH and CANL are input capacitors to the ground	C_I			18		pF
CANH, CANL differential input capacitors	C_{ID}			10		pF
CANH, CANL, input resistance	R_{IN}	TXD=3V, S=0V	15	30	45	KΩ
CANH, CANL differential input resistance	R_{ID}		30		90	KΩ
RI (CANH) and RIN (CANL) mismatch	RI_{match}	CANH=CANL	-3%		3%	
Common-mode voltage range	V_{COM}		-12		12	V

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value is VCC=+5V, Temp = 25)

Total line receiver switch characteristics

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Propagation delay (low to high)	tPLH	S=0VorVCC, graph 6	60	100	140	ns
Propagation delay (high to low)	tPHL		45	70	100	ns
RXD signal rise time	tr			8		ns
RXD signal fall time	tf			8		ns

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value in VCC=+5V, Temp = 25)

Device switching characteristics

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Loop delay 1, driver input to receiver output, implicit to explicit	Td(LOOP1)	Graph 9,S=0V	90		230	ns
Loop delay 2, driver input to receiver output, explicit to impl-	Td(LOOP2)		90		230	ns

Over temperature protection

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Overtemperature shutdown	Tj(sd)			160		℃

TXD pin characteristics

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
TXD port high level input current	I_{IH}(TXD)	VI=VCC	-2		2	μA
TXD port low level input current	I_{IL}(TXD)	VI=0	-50		-10	μA
The current of TXD when VCC=0V	I_O(off)	VCC=0V，TXD=5V			1	μA
Enter the upper limit of high voltage	V_{IH}		2		VCC+0.3	V
Enter the upper limit of low level	V_{IL}		-0.3		0.8	V
TXD port is suspended voltage	TXD_O		H			logic

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value in VCC=+5V, Temp = 25)

Reference voltage output

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Refer to the output voltage	Vref	-50uA<I_o<50uA	$0.4V_{CC}$		$0.6V_{CC}$	V

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value in VCC=+5V, Temp = 25)

supply current

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Silent mode power consumption	I_{CC}	S=VCC, V_I=VCC		3.6	10	mA
Visible power consumption		V_I=0V, S=0V, LOAD=60Ω		38	70	mA
Hidden power con-		V_I=VCC, S=0V,		3.6	10	mA

sumption		NO LOAD				

(If no other description is given, VCC=5V±5%, Temp=TMIN~TMAX, typical value is VCC=+5V, Temp = 25)

Function table

Table 1 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 floating)	H	L	Dominance	L
4.5V~5.5V	H (or floating)	X	$0.5V_{CC}$	$0.5V_{CC}$	Covert gender	H
4.5V~5.5V	X	H	$0.5V_{CC}$	$0.5V_{CC}$	Covert gender	H
$0<V_{CC}<4.5V$	X	X	$0V<V_{CANH}<V_{CC}$	$0V<V_{CANL}<V_{CC}$	Covert gender	X

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

Table 2 Driver function table

INPUTS		OUTPUTS		Bus State
TXD(1)	S(1)	CANH(1)	CAL(1)	
L	L (or floating)	H	L	Dominate (dominant)
H (or floating)	X	Z	Z	Recessive (latent)
X	H	Z	Z	Recessive (latent)

(1) H= high level; L= low level; Z= high resistance; X= not concerned

Table 3 Receiver function table

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

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

test circuit

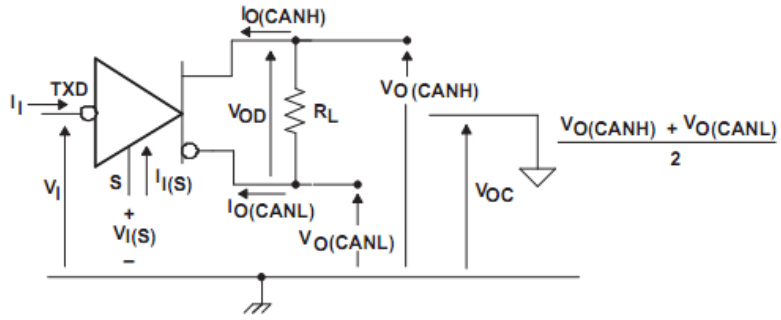


Figure 1 Definition of driver voltage and current test

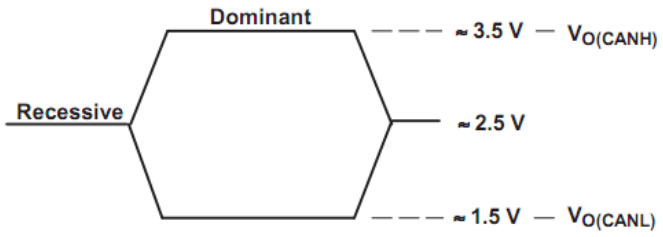


Figure 2 Bus logic voltage definition

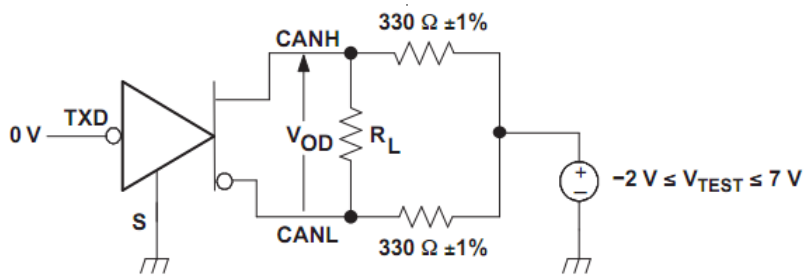


Figure 3 Driver VOD test circuit

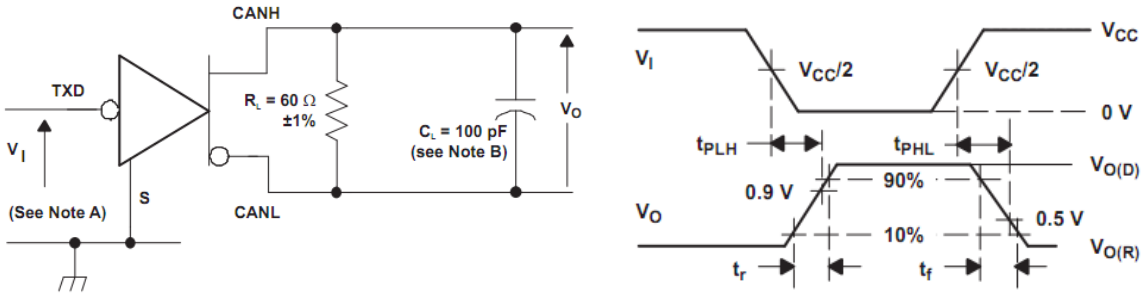


Figure 4 Driver test circuit and voltage waveform

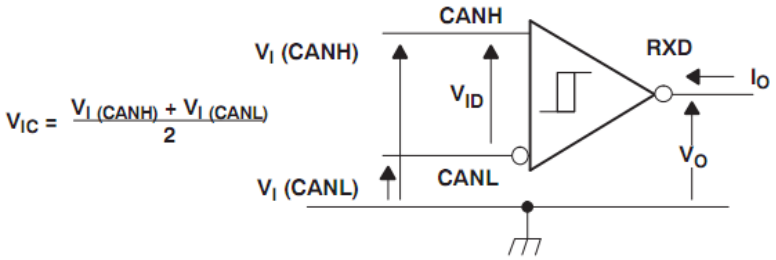
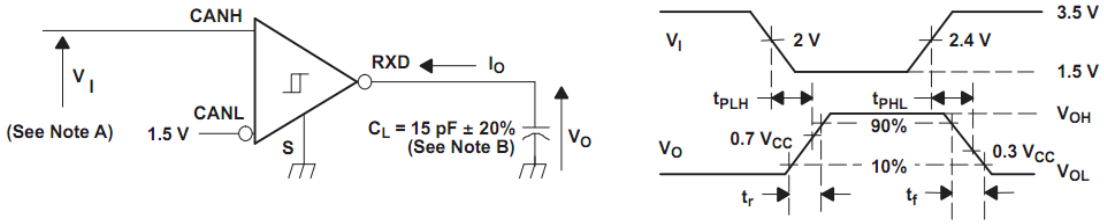
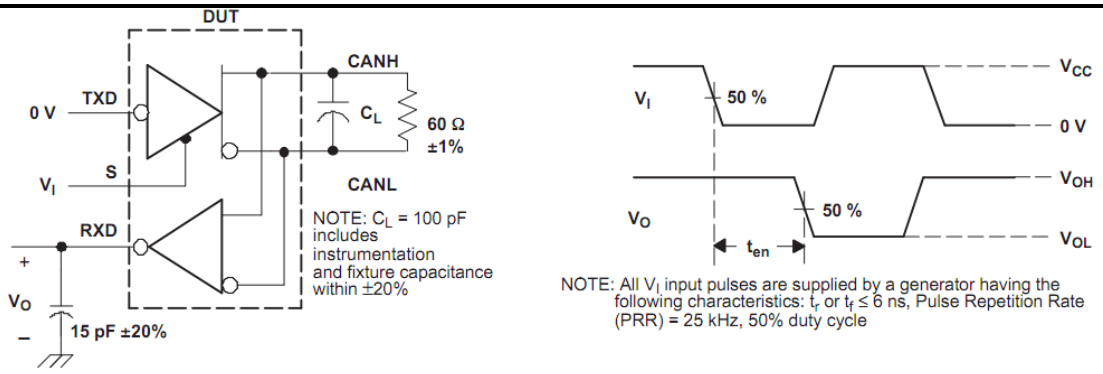


Figure 5 Receiver voltage and current definition



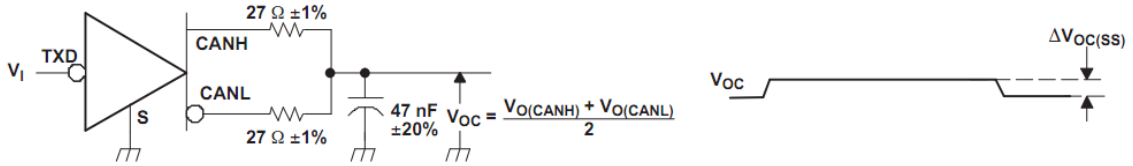
A. Characteristics of input pulse generator: PRR<=125KHz, 50% duty cycle, tr<6ns, tf<6ns, Zo=50Ω
B and CL include instruments and fixed capacitors with an error of less than 20%.

Figure 6 Receiver test circuit and voltage waveform



NOTE: All V_I input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq 6$ ns, Pulse Repetition Rate (PRR) = 25 kHz, 50% duty cycle

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

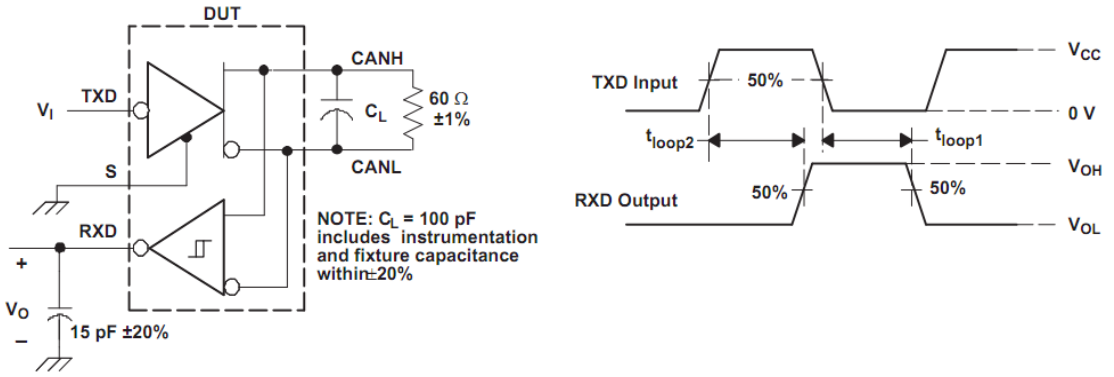


Figure 9 t (LOOP) test circuit and waveform

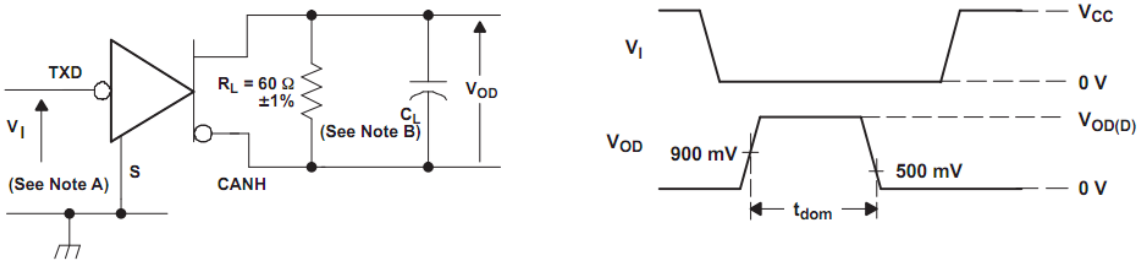


Figure 10 Explicit timeout test circuit and waveform

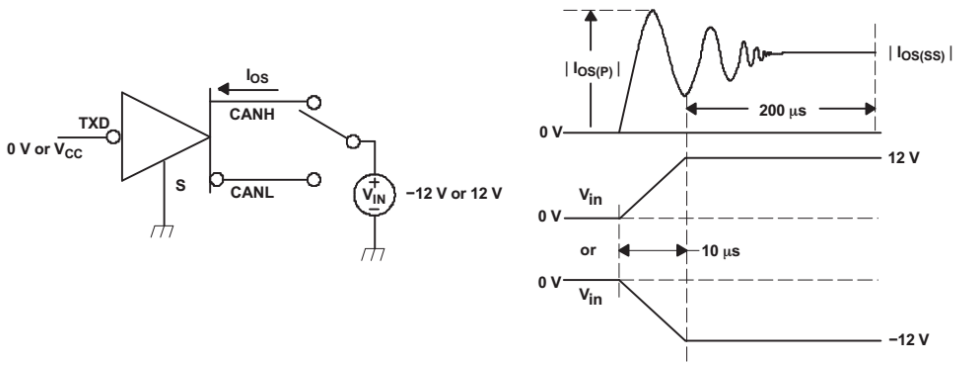


Figure 11 Circuit and waveform of short circuit current test for the driver

explain

1 resume

SIT1050Q is an interface chip applied between CAN protocol controller and physical bus. It can be used in truck, bus, car, industrial control and other fields. The rate can reach 1Mbps. It has the ability to transmit differential signal between bus and CAN protocol controller, and is fully compatible with "ISO 11898" standard.

2 short-circuit protection

The drive level of SIT1050Q has a current limiting protection function to prevent the drive circuit from short-circuiting to the positive and negative power supply voltage. When a short circuit occurs, the power consumption will increase, and the short circuit protection function can protect the drive level from damage.

3 Over temperature protection

SIT1050Q It has the overtemperature protection function. After the overtemperature protection is triggered, the current of the driver level will be reduced, because the driver tube is the main energy consuming component, and the current reduction can reduce the power consumption and thus reduce the chip temperature. At the same time, other parts of the chip still maintain normal operation.

4 Visible timeout function

If the TXD pin is forced to a permanent low level due to hardware and/or software application failure, the built-in TXD explicit timeout timer circuit prevents the bus line from being driven into a permanent explicit state (blocking all network communications). The timer is triggered by a falling edge on the TXD pin.

If the low level on pin TXD persists for longer than the internal timer value (tdom), the transmitter is disabled and the drive bus enters a silent state. The timer is reset by a rising edge on pin TXD.

5 control model

The control pin S allows for two operating modes:

High speed mode or silent mode.

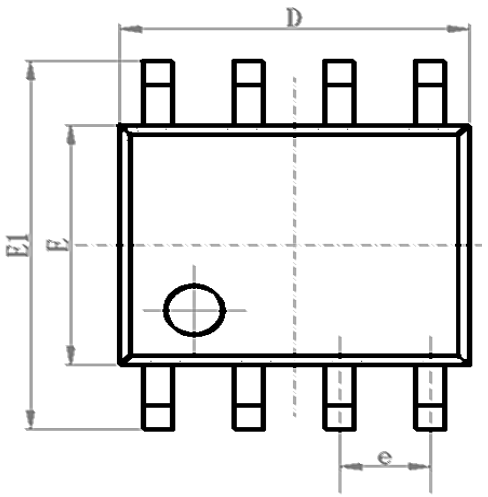
The high-speed mode is the normal operating mode and is selected by grounding pin S. If pin S is not connected, it is the default mode. However, to ensure EMI performance in applications that use only high-speed mode, it is recommended to ground pin S.

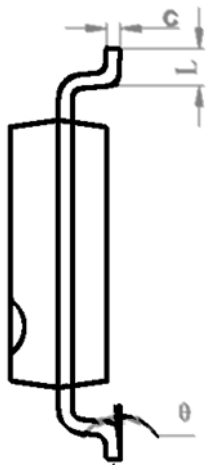
In silent mode, the transmitter is disabled. All other IC functions continue to operate. Silent mode is selected by connecting pin S to VCC and can be used to prevent network communication blockage due to CAN controller loss of control.

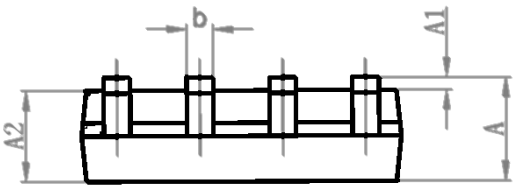
SOP8, external dimensions

Package size

Symbol	Least value /mm	Representative value /mm	Crest value /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°



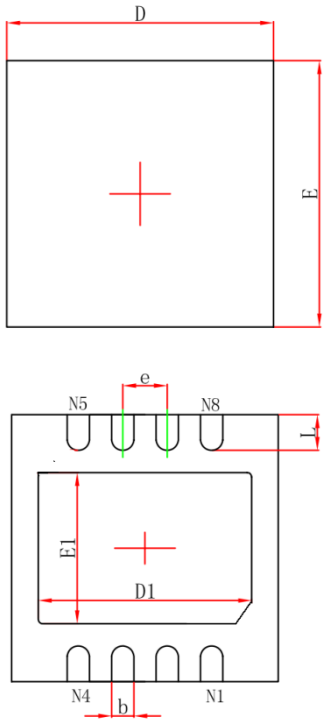


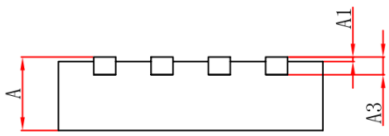


HVSON8 / DFN3*3-8 shape

Package size

Symbol	Least value /mm	Representative value / mm	Crest value /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





Order information

Order code	Temperature	Package
SIT1050QT	-40℃~125℃	SOP8
SIT1050QTK	-40℃~125℃	HVSON8 / DFN3*3-8, small shape, no pins

SOP8 tape packaging is 2500 per disc, HVSON8 / DFN3*3-8, small form factor, and pinless packaging is 5000 per disc.