FEATURES

- Compliant with ISO 11898 standard
- Built-in over-temperature protection
- Over-current protection function
- Dominant timeout function
- Low current standby mode with bus wake-up (typically 5μA)
- Unpowered nodes do not interfere with the bus
- Allowing at least 110 nodes to be connected to bus line
- Support high-speed CAN bus rates up to 1Mbps
- Very low ElectroMagnetic Emission (EME)

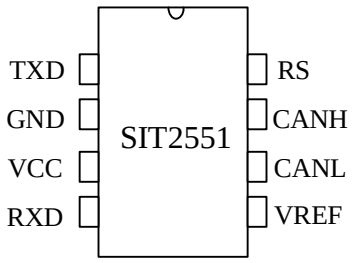
PRODUCT APPEARANCE

DESCRIPTION

SIT2551 is an interface chip used between the CAN protocol controller and the physical bus. It can be used in vehicle, industrial control and other fields. It supports 1Mbps, and has the ability to transmit differential signals between the bus and 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 code	1		Mbaud
CANH, CANL input or output voltage	V_{can}		-40	+40	V
Bus differential voltage	V_{diff}		1.5	3.0	V
Ambient temperature	T_{amb}		-40	125	℃

PIN CONFIGURATION



PIN DESCRIPTION

Pin	Symbol	Description
1	TXD	Transmit data input
2	GND	Ground
3	VCC	Supply voltage
4	RXD	Receiver data output
5	VREF	Reference voltage output
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	RS	Standby mode control input

LIMITING VALUE

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	-0.3~+6	V
MCU side ports	TXD, RXD, RS	-0.3~VCC+0.3	V
Bus side input voltage	CANL，CANH，VREF	-40~40	V
Transient voltage on pins 6, 7, see Fig 7	V_{tr}	-200~+200	V
Storage temperature	T_{stg}	-55~150	℃
Ambient temperature	T_{amb}	-40~125	℃
Welding temperature		300	℃
Continuous power dissipation	SOP8	400	mW
	DIP8	700	mW

The maximum limit parameters mean 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.

DRIVER ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
CANH dominant output voltage	$V_{OH(D)}$	VI=0V, RS=0V, RL=60Ω, Fig 1, Fig 2	2.9	3.4	4.5	
CANL dominant output voltage	$V_{OL(D)}$		0.8		1.5	
Bus recessive output voltage	$V_{O(R)}$	VI=3V, RS=0V, RL=60Ω, Fig 1, Fig 2	2	2.5	3	V
Bus dominant differential output voltage	$V_{OD(D)}$	VI=0V, RS=0V, RL=60Ω, Fig 1, Fig 2	1.5		3	V
Bus recessive differential output voltage	$V_{OD(R)}$	VI=3V, S=0V, Fig 1, Fig 2	-0.012		0.012	V
		VI=3V, RS=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}	RS=0V, Fig 8	2	2.5	3	V
Common-mode differential voltage	$\triangle V_{OC}$			30		mV
Short-circuit output current	I_{OS}	CANH=-12V, CANL=open, Fig 11	-105	-72		mA
		CANH=12V, CANL=open, Fig 11		0.36	1	
		CANL=-12V, CANH=open, Fig 11	-1	0.5		
		CANL=12V, CANH=open, Fig 11		71	105	
Recessive output current	$I_{O(R)}$	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

DRIVER SWITCHING CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit
Propagation delay time (low-to-high)	t_{PLH}	RS=0V, Fig 4	25	65	120	ns
Propagation delay time (high-to-low)	t_{PHL}		25	45	90	ns
Differential output signal rise time	t_r			25		ns
Differential output signal fall time	t_f			50		ns
Enable time from listen-only mode to dominant	t_{EN}	Fig 7			10	μs
dominant time-out time	t_{dom}	Fig 10	300	450	700	μs
Bus wake-up filter time	t_{BUS}		0.7		5	μs

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

RECEIVER ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Positive-going input threshold voltage	V_{IT+}	RS=0V, Fig 5		800	900	mV
Negative-going input threshold voltage	V_{IT-}		500	650		
Hysteresis voltage	V_{HYS}		100	125		
High-level output voltage	V_{OH}	IO=-2mA, Fig 6	4	4.6		V
Low-level output voltage	V_{OL}	IO=2mA, Fig 6		0.2	0.4	V
Power-off bus input current	$I_{(OFF)}$	CANH or CANL=5V, Other pin=0V			5	μA
Input capacitance to ground, (CANH or CANL)	C_I			13		pF
Differential input capacitance (CANH, CANL)	C_{ID}			5		pF
Input resistance, (CANH or CANL)	R_{IN}	TXD=3V, RS=0V	15	30	40	kΩ
Differential input resistance (CANH, CANL)	R_{ID}		30		80	kΩ
$R_{I(CANH)}$, $R_{IN(CANL)}$ mismatch	RI_{match}	CANH=CANL	-3%		3%	

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
The range of common-mode voltage	V_{COM}		-12		12	V

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

RECEIVER SWITCHING CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Propagation delay time (low-to-high)	t_{PLH}	RS=0V or VCC, 图 6	60	100	130	ns
Propagation delay time (high-to-low)	t_{PHL}		45	70	90	ns
RXD signal rise time	tr			8		ns
RXD signal fall time	tf			8		ns

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

DEVICE SWITCHING CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Loop delay1, driver input to receiver output, Recessive to Dominant	$t_{d(LOOP1)}$	RS=0V, Fig 9	90		190	ns
Loop delay 2, driver input to receiver output, Dominant to Recessive	$t_{d(LOOP2)}$		90		190	ns

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

OVER TEMPERATURE PROTECTION

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Shutdown junction temperature	$T_{j(sd)}$			160		℃

TXD PIN CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
HIGH-level input current	I_{IH}(TXD)	VI=VCC	-2		2	μA
LOW-level input current	I_{IL}(TXD)	VI=0	-50		-10	μA
When VCC=0V，current on TXD pin	I_O(off)	VCC=0V, TXD=5V			1	μA
HIGH-level input voltage	V_{IH}		2		VCC+0.3	V
LOW-level input voltage	V_{IL}		-0.3		0.8	V
Open voltage on TXD pin	TXD_O		H			logic

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

COMMON-MODE STABILIZATION OUTPUT

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Common-mode stabilization output voltage	V_O	-500μA<I_o<500μA	0.3V_{CC}		0.7V_{CC}	V
Leakage current	$I_{O(stb)}$	RS=2V, -12V<V_O<12V	-5		5	μA

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Standby	I_{CC}	RS=VCC, V_I=VCC		5	12	μA
Dominant		V_I=0V, RS=0V, Load=60Ω		50	70	mA
Recessive		V_I=VCC, RS=0V, no load		6	10	mA

(Unless otherwise stated, all typical values are measured at VCC=+5V, T_{amb}=25℃, supply voltage VCC=5V±10%, T_{amb}=-40℃~125℃.)

FUNCTION TABLE

Table 1 CAN transceiver truth table

V_{CC}	TXD (1)	RS (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 open)	X	$0.5V_{CC}$	$0.5V_{CC}$	Recessive	H
4.5V~5.5V	X	H (or open)	$0.5V_{CC}$	$0.5V_{CC}$	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)	RS (1)	CANH (1)	CANL (1)	
L	L	H	L	Dominant
H (or open)	X	Z	Z	Recessive
X	H (or open)	Z	Z	Recessive

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

Table 3 Receiver function table

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

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

TEST CIRCUIT

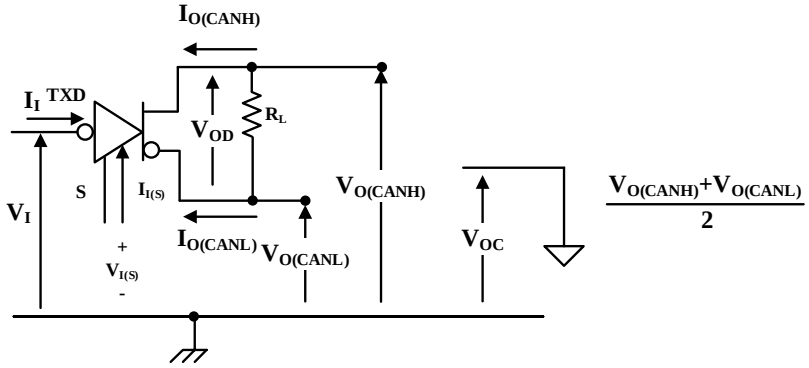


Fig 1 Driver Voltage, Current, and Test Definition

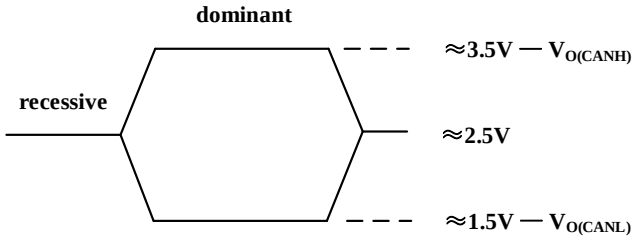


Fig 2 Bus Logic State Voltage Definition

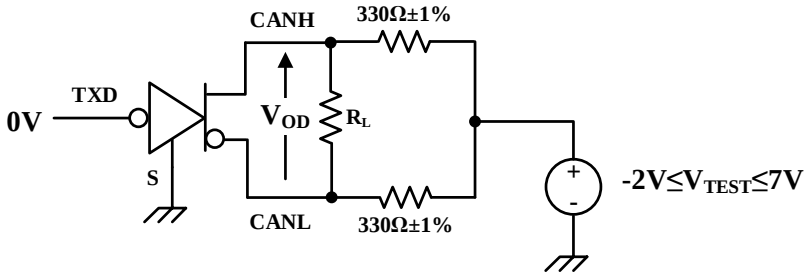


Fig 3 Driver V_{OD} Test Circuit

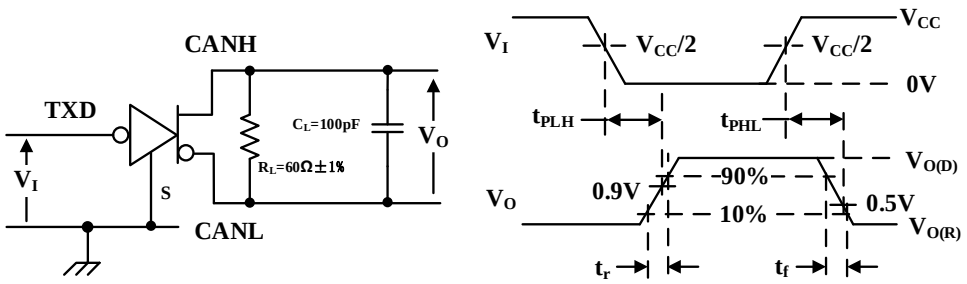


Fig 4 Driver Test Circuit and Waveform

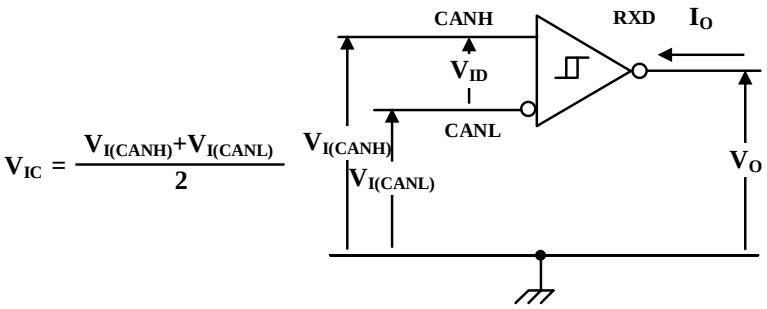
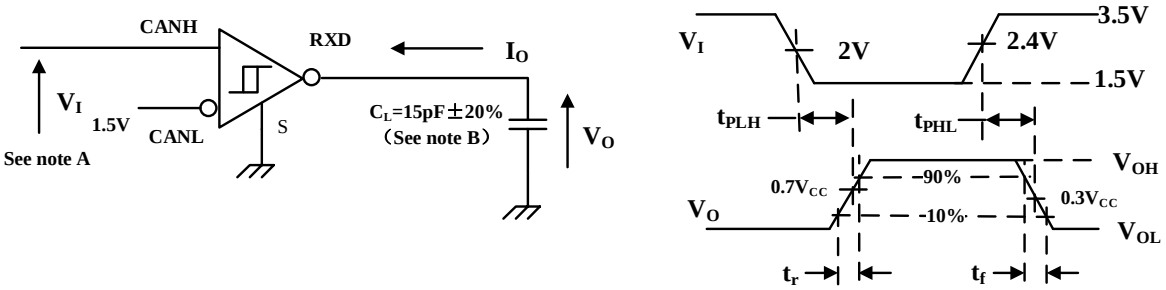


Fig 5 Receiver Voltage and Current Definition



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

B. C_L includes probe and jig capacitance，the error is within 20%.

Fig 6 Receiver Test Circuit and Waveform

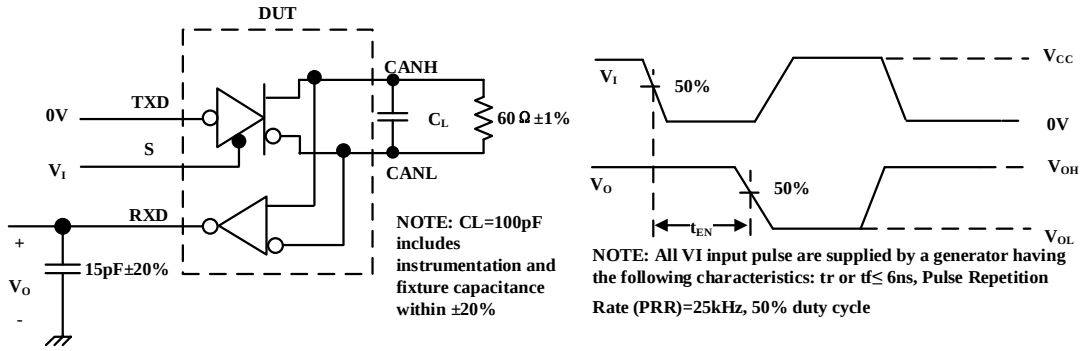
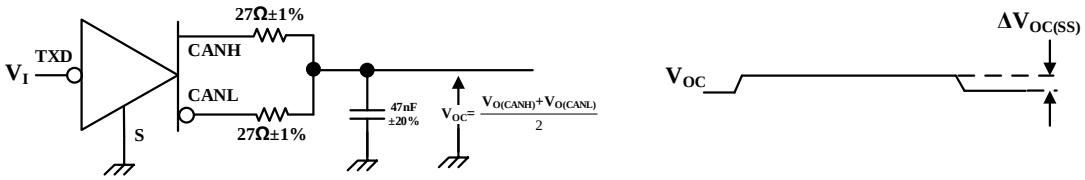
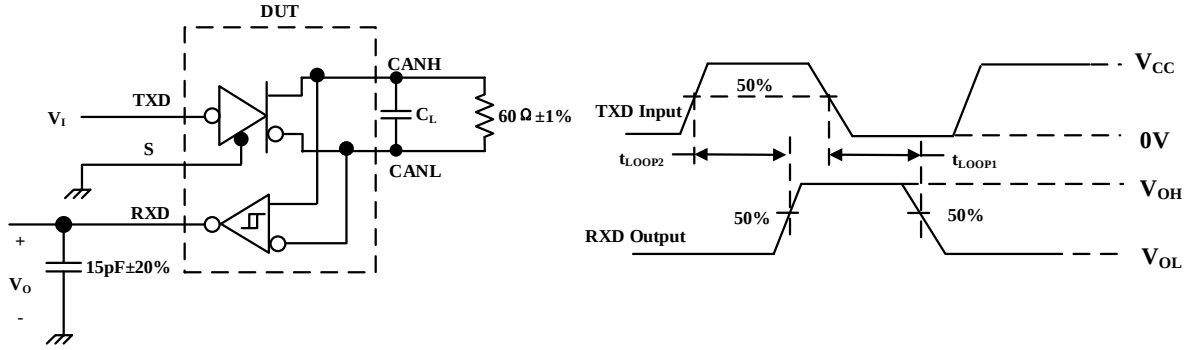


Fig 7 t_{EN} Test Circuit and Waveform



Note: VI is from 0V to VCC, the input pulse is supplied by a generator having the following characteristics: PRR≤125kHz, 50% duty cycle, t_r<6ns, t_f<6ns, Zo=50Ω.

Fig 8 Common Mode Output Voltage Test and Waveform



NOTE: C_L=100pF includes instrumentation and fixture capacitance within ±20%.

Fig 9 $t_{(LOOP)}$ Test Circuit and Waveform

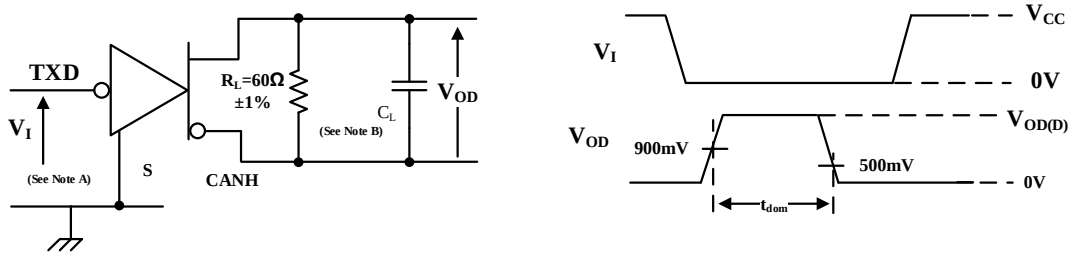


Fig 10 Dominant Time-Out Test Circuit and Waveform

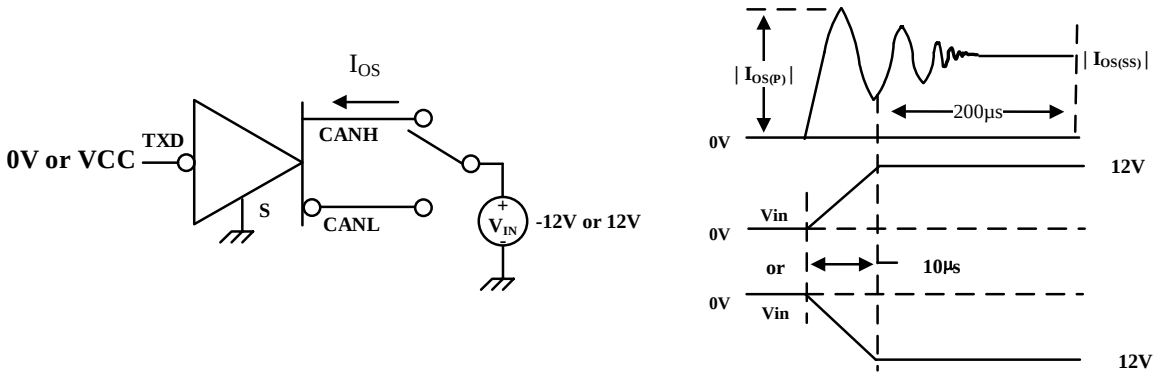


Fig 11 Driver Short-Circuit Current Test Circuit and Waveform

ADDITIONAL DESCRIPTION

1 Sketch

SIT2551 is the interface chip between the Controller Area Network (CAN) protocol controller and the physical bus, and can be applied to the fields of vehicle, industrial control etc. Support 1Mbps 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 Fail-safe

The TXD pin provides a pull-up path to VCC, ensuring that the bus is in a recessive state when the TXD is not powered.
The RS pin provides a pull-up path to VCC, ensuring that the transceiver is in a standby state when the RS is not powered.
When the VCC power supply is lost, the TXD, RS and RXD pins will become floating to prevent reverse power supply through these pins.

4 Overtemperature protection

SIT2551 has overtemperature protection function. After the overtemperature protection is triggered, the current of the driver stage will be reduced, because the drive 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 remain in normal operation.

5 Dominant time-out function

If the pin TXD is forced to be permanently low due to hardware and/or software application failure, the built-in TXD dominant timeout timer circuit prevents the bus line from being driven to a permanent dominant state (blocking all network traffic). The timer is triggered by a negative edge on pin TXD.
If the low-level duration on the pin TXD exceeds the internal timer value (t_{dom}), the transmitter will be disabled and the driver bus will enter a hidden state. Timer reset via positive edge on pin TXD.

6 Control modes

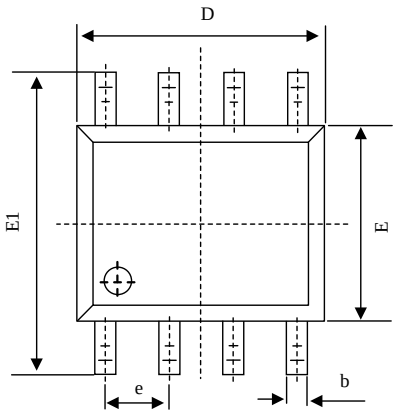
The control pin RS allows two modes of operation to be selected:
High-speed mode or Standby mode.
The High-speed mode is the normal operating mode and is selected by grounding the pin RS. The transceiver is capable of sending and receiving data over CANH and CANL. The differential receiver converts analog data on the bus into digital data and outputs it to pin RXD via a multiplexer (MUX).
If pin RS is high or not connected, it operates in Standby mode. In Standby mode, the transmitter and

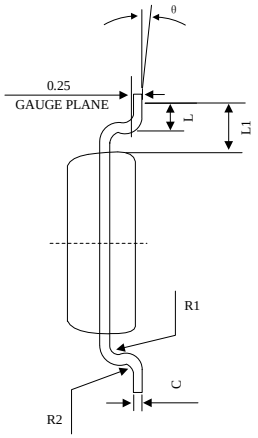
receiver are turned off and the bus line is monitored via a low-power differential comparator. A high level on pin RS activates this low-power receiver and wake filter, and pin RXD changes to low once the low-power differential comparator detects a dominant bus level that exceeds the t_{BUS}.

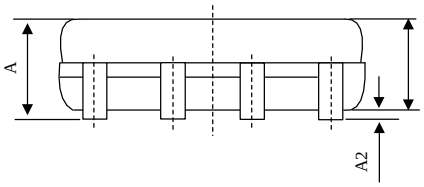
SOP8 DIMENSIONS

Package size

Symbol	Min/mm	Typ/mm	Max/mm
A	1.40	1.60	1.80
A1	0.05	0.15	0.25
A2	1.35	1.45	1.55
b	0.30	0.40	0.50
c	0.153	0.203	0.253
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
L	0.45	0.70	1.00
θ	2°	4°	6°
L1	1.04 REF		
e	1.27 BSC		
R1	0.07 TYP		
R2	0.07 TYP		



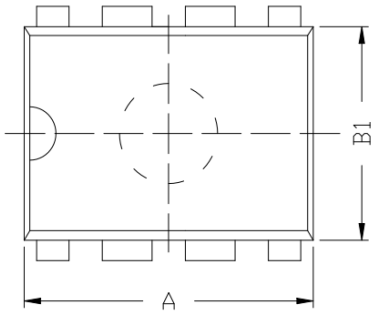


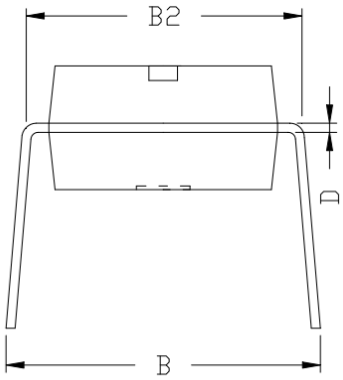


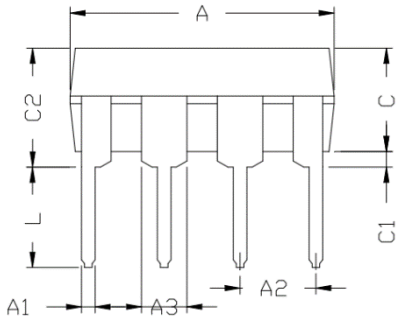
DIP8 DIMENSIONS

Package size

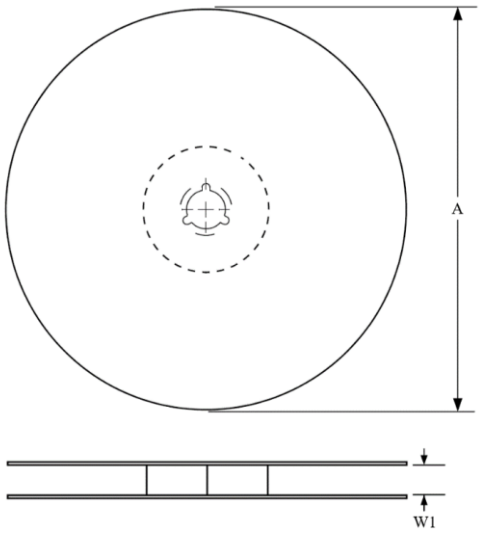
Symbol	Min/mm	Typ/mm	Max/mm
A	9.00	9.20	9.40
A1	0.38	0.47	0.57
A2	2.54TYP		
A3	1.524TYP		
B	8.40	8.70	9.10
B1	6.20	6.40	6.60
B2	7.32	7.62	7.92
C	3.20	3.40	3.60
C1	0.50	0.60	0.80
C2	3.71	4.00	4.31
D	0.20	0.28	0.36
L	3.00	3.30	3.60



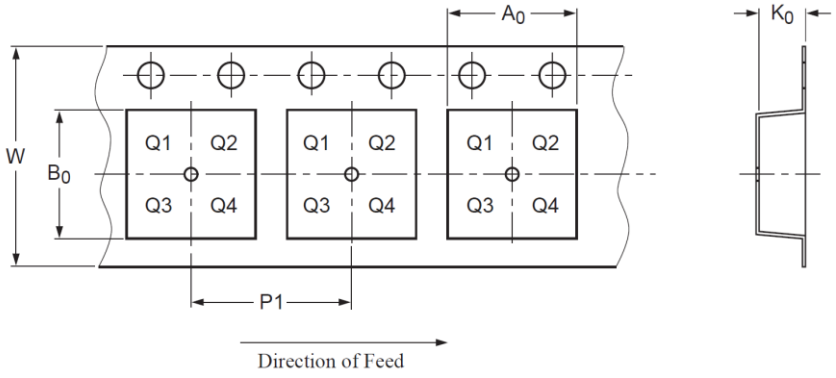




TAPE AND REEL INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers



PIN1 is in quadrant 1

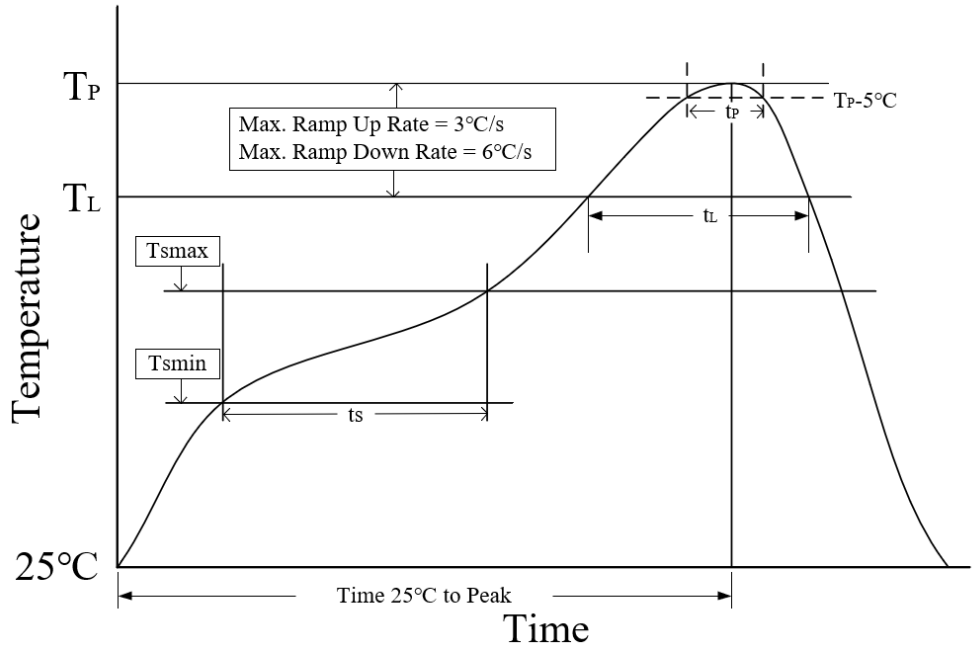
Package type	Reel diameter A (mm)	Tape width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
SOP8	330±2	12.4	6.50±0.1	5.30±0.10	2.05±0.1	8.00±0.1	12.00±0.1

ORDERING INFORMATION

Type number	Package	Packing
SIT2551T	SOP8	Tape and reel
SIT2551P	DIP8	Tube

SOP8 is packed with 2500 pieces/disc in braided packing. DIP8 is packed with 50 pieces/tube.

REFLOW SOLDERING



Parameter	Lead-free soldering conditions
Ave ramp up rate (T_L to T_P)	3 °C/second max
Preheat time ts (T_{smin}=150 °C to T_{smax}=200 °C)	60-120 seconds
Melting time t_L (T_L=217 °C)	60-150 seconds
Peak temp T_P	260-265 °C
5°C below peak temperature t_P	30 seconds
Ave cooling rate (T_P to T_L)	6 °C/second max
Normal temperature 25°C to peak temperature T_P time	8 minutes max

Important statement

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

REVISION HISTORY

Version number	Data sheet status	Revision date
V1.0~V1.3	Product datasheet.	December 2020
V1.4	Updated SOP8 dimensions; Added important statement.	January 2022
V1.5	Updated test circuit; Updated SOP8 dimensions; Added tape and reel information; Updated ordering information; Added reflow soldering; Added revision history.	December 2024