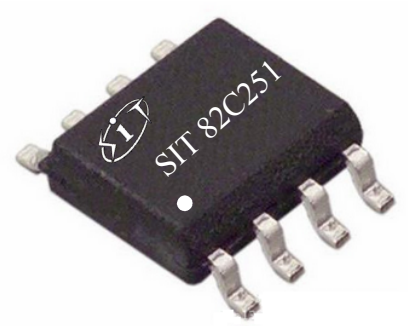
FEATURES

- Fully compatible with the "ISO 11898-24V" standard, can be used in 24V systems;
- Thermal protection;
- Overcurrent protection;
- Ultra-low current Standby mode (<5μA);
- An unpowered node does not disturb the bus lines;
- At least 110 nodes can be connected;
- High speed (up to 1 Mbps);
- High immunity against ElectroMagnetic Interference

OUTLINE



Provide green and environmentally friendly lead-free package

DESCRIPTION

The SIT82C251 is the interface between the Controller Area Network (CAN) protocol controller and the physical bus. It is primarily intended for high speed applications, up to 1 Mbps, in buses, trucks, industrial applications etc. The device provides differential transmit capability to the bus and differential receive capability to the CAN controller.

PARAMETER	SYMBOL	CONDITION	MIN.	MAX.	UNIT
Supply voltage	V_{cc}		4.5	5.5	V
Supply current	I_{cc}	Standby mode		10	uA
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

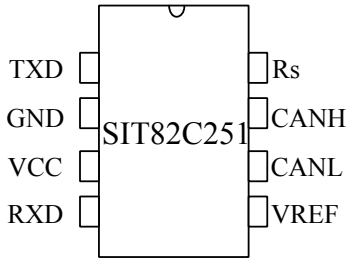


Fig. 1 SIT82C251 Pin configuration

LIMITING VALUES

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	V_{CC}	-0.3~+7	V
MCU side DC voltage	TXD, RXD, VREF, Rs	-0.3~VCC+0.3	V
Voltage range at any bus terminal	CANL, CANH	-40~40	V
Transient voltage on pins 6,7; see Fig.7	V_{tr}	-200~+200	V
Storage temperature		-55~150	℃
Ambient temperature		-40~125	℃
Welding temperature range		300	℃
Continuous power consumption	SOP8	400	mW
	DIP8	700	mW

The maximum limit parameters means that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conductive 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
3	VCC	supply voltage
4	RXD	receive data output
5	VREF	reference voltage output
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	Rs	high-speeed / standby mode selection, low level = high speed

BUS TRANSMITTER DC 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 output voltage (recessive)	$V_{O(R)}$	VI=3V, Rs=0V, RL=60Ω, Fig.1, Fig.2	2	2.5	3	V
Bus differential output voltage (dominant)	$V_{OD(D)}$	VI=0V, Rs=0V, RL=60Ω, Fig.1, Fig.2	1.5		3	V
Bus differential output voltage (recessive)	$V_{OD(R)}$	VI=3V, Rs=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
Peak-to-peak common-mode output voltage	ΔV_{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	
		CANL=-12V, CANH=open, Fig.10	-1	0.5		
		CANL=12V, CANH=open, Fig.10		71	105	
Recessive output current	$I_{O(R)}$	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA

(unless specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

BUS TRANSMITTER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time (low-to-high-level output)	tPLH	Rs=0V, Fig.4	25	65	120	ns
Propagation delay time (high-to-low-level output)	tPHL		25	45	90	ns
Differential output signal rise time	tr			25		ns
Differential output signal fall time	tf			50		ns
Enable time from silent mode to dominant	t_{EN}	Fig. 7			10	μs
Bus wake-up time	t_{BUS}		0.7		5	μs

(unless specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

BUS RECEIVER DC 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, CANL)	C_I			13		pF
Differential input capacitance	C_{ID}			5		pF
Input resistance (CANH, CANL)	R_{IN}	TXD=3V, Rs=0V	15	30	40	KΩ
Differential input resistance	R_{ID}		30		80	KΩ
RIN(CANH), RIN(CANL) resistance matching	RI_{match}	CANH=CANL	-3%		3%	
The range of common-mode voltage	V_{COM}		-12		12	V

(unless specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

BUS RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time (low-to-high-level output)	tPLH	Rs=0V or VCC, Fig.6	60	100	130	ns
Propagation delay time (high-to-low-level output)	tPHL		45	70	90	ns
RXD signal rise time	tr			8		ns
RXD signal fall time	tf			8		ns

(unless specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

DEVICE SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Loop delay1, driver input to receiver output, Recessive to Dominant	Td(LOOP1)	Rs=0V, Fig.9	90		190	ns
Loop delay 2, driver input to receiver output, Dominant to Recessive	Td(LOOP2)		90		190	ns

(unless specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

OVER TEMPERATURE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Shutdown junction temperature	Tj(sd)			160		℃

TXD-PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
TXD HIGH-level input current	I_{IH}(TXD)	VI=VCC	-2		2	μA
TXD 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 specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

REFERENCE VOLTAGE OUTPUT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Reference output voltage	V_O	-500uA<I_o<500uA	$0.3V_{CC}$		$0.7V_{CC}$	V
Standby current	$I_{O(Rs)}$	Rs=2V, -12V<V_O<12V	-5		5	μA

(unless specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

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 specified otherwise VCC=5V±10% and Temp=TMIN~TMAX; typical in VCC=+5V and Temp＝25°C)

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; X=irrelevant; Z=high impedance

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

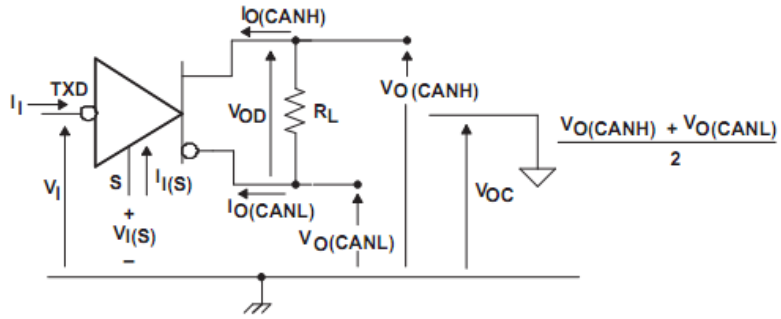


Fig.1 Driver Voltage And Current Definition

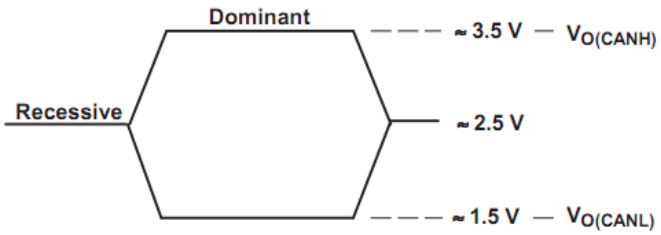


Fig.2 Bus Logic State Voltage Definition

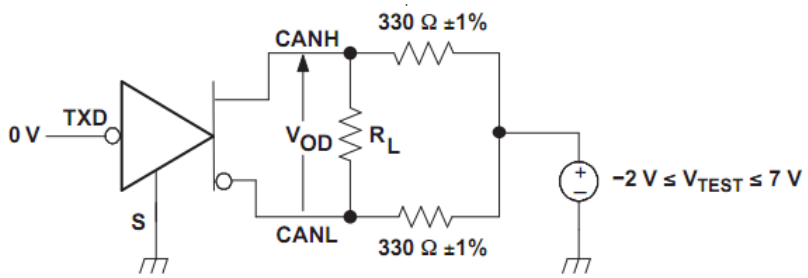


Fig.3 Driver V_{OD} Test Circuit

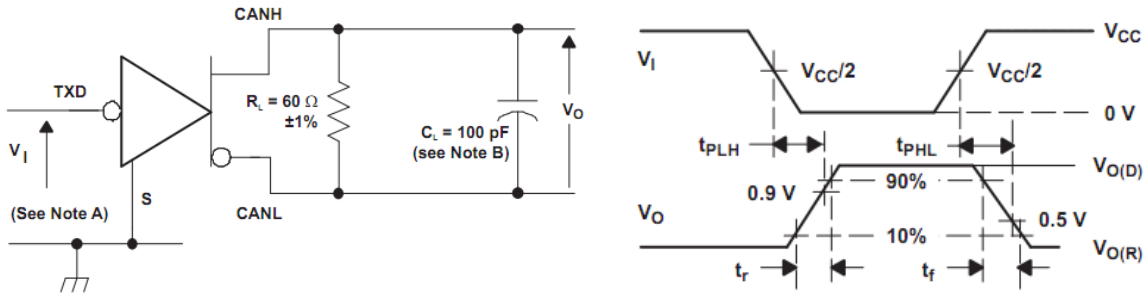


Fig.4 Driver Test Circuit and Waveform

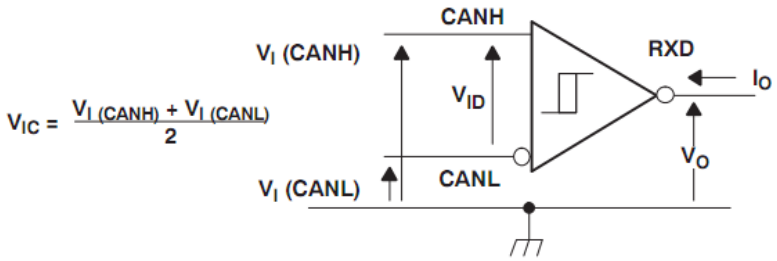
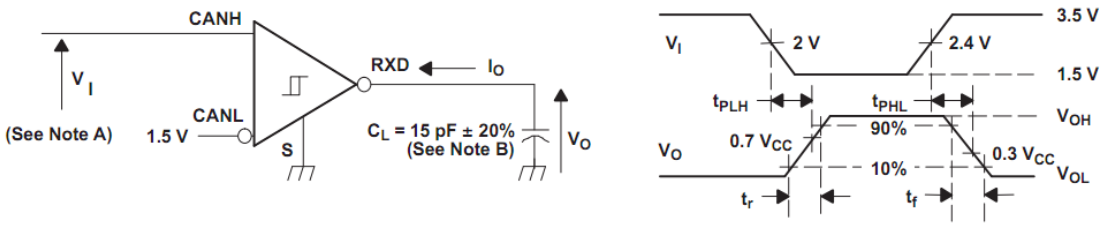


Fig.5 Receiver Voltage and Current Definition



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

B. CL includes instrumentation and fixture capacitance within ±20%.

Fig.6 Receiver Test Circuit and Waveform

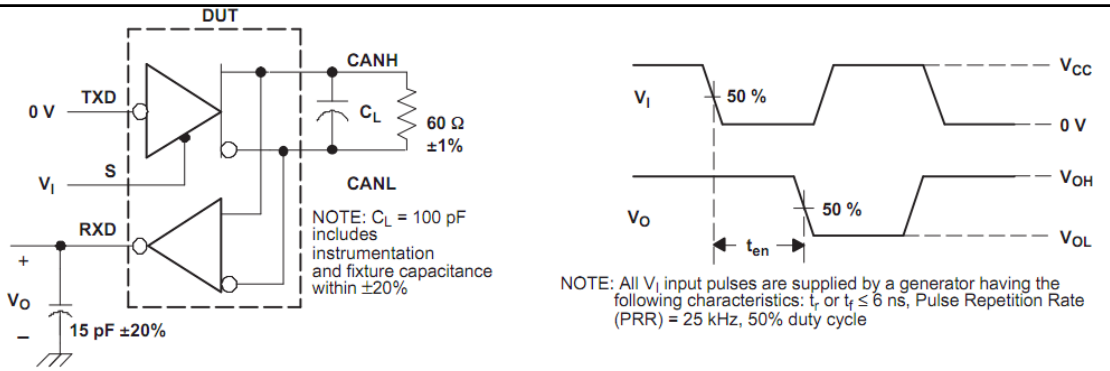
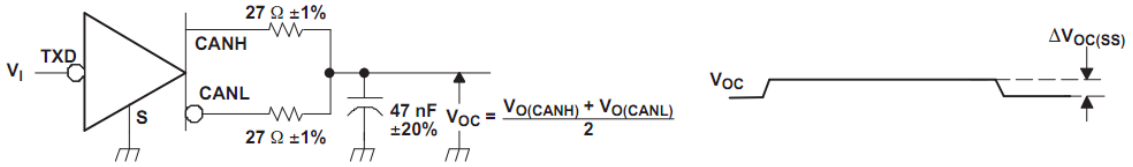


Fig.7 t_{EN} Test Circuit and Waveform



A. All VI input pulses are from 0 V to VCC and supplied by a generator having the following characteristics:

PRR ≤ 125 kHz, 50% duty cycle, tr < 6 ns, tf < 6 ns, Zo=50Ω

Fig.8 Peak-to-Peak Common Mode Output Voltage Test and Waveform

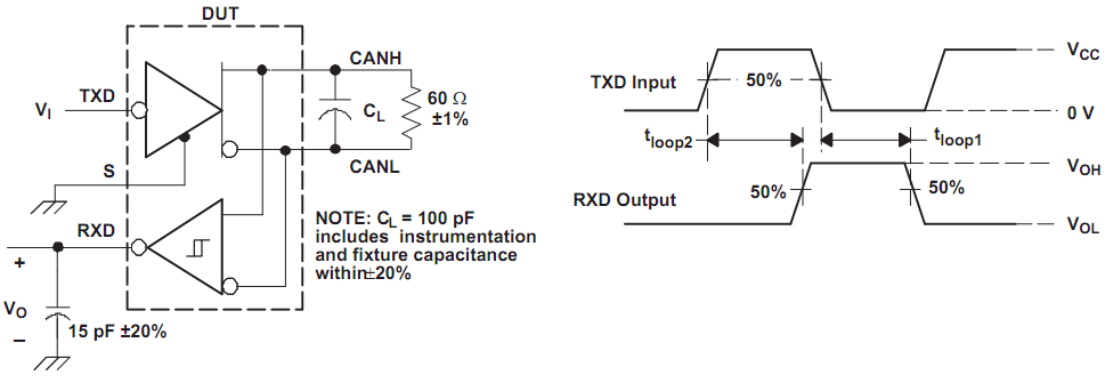


Fig.9 $t_{(LOOP)}$Test Circuit and Waveform

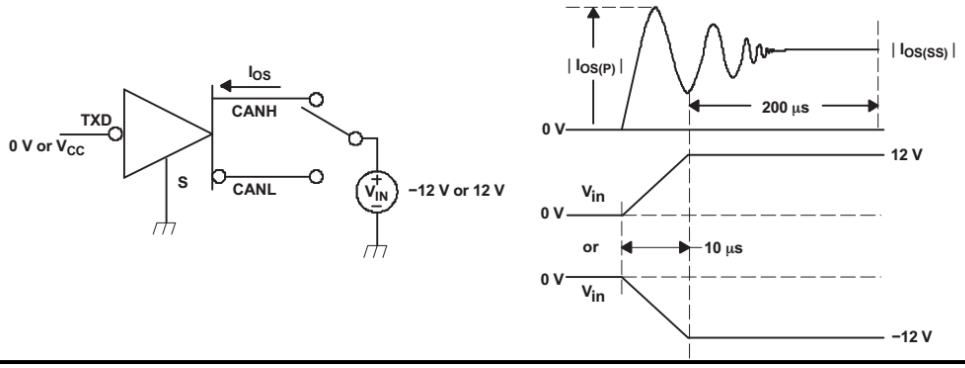


Fig.11 Driver Short-Circuit Current Test Circuit and Waveform

DESCRIPTION

1 Brief description

The SIT82C251 is the interface between a CAN protocol controller and the physical bus. It is primarily intended for high speed applications, up to 1 Mbps, in buses, trucks, industrial applications etc. The device provides differential transmit capability to the bus and differential receive capability to the CAN controller. It is fully compatible with the “ISO 11898-24V” standard.

2 Short-circuit protection

A current-limiting circuit protects the driver output stage of the SIT82C251 against short-circuits to positive and negative supply voltage. When short-circuit occurs the power dissipation increases but the short-circuit protection function will prevent destruction of the driver output stage.

3 Over-temperature protection

The SIT82C251 has an integrated over-temperature protection circuit. If the junction temperature exceeds approximately 160°C, the current in the driver stage will decrease. Because the driver stage dissipates most of the power, the power dissipation and temperature of the IC is reduced. All other parts of the chip remain operational.

4 Electrical transient protection

Electrical transients often occur in automotive applications. The CANH and CANL of the SIT82C251 are also protected against electrical transients.

5 Control mode

The SIT82C251 provides two modes of operation which are selectable via pin Rs: high speed and low power standby.

High speed mode is a normal operating mode of the device and it is selected by setting Rs low.

In this mode the transceiver is able to transmit and receive data via the bus lines CANH and CANL.

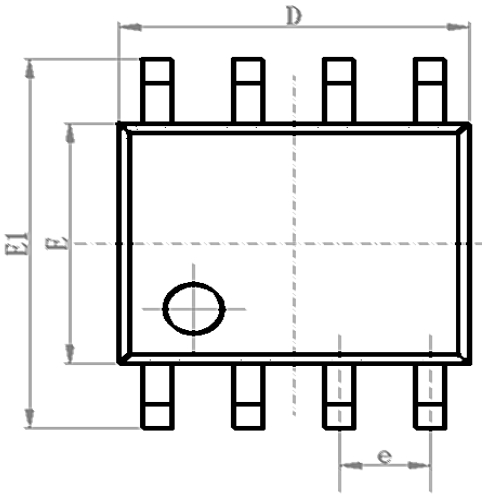
The differential receiver converts the analog data on the bus lines into digital data which is output to pin RXD via the multiplexer (MUX).

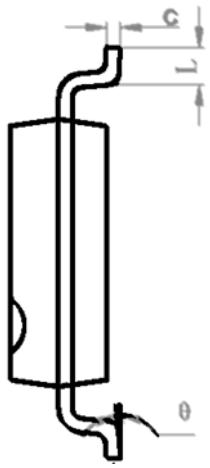
The device enters a low-current standby mode during which the driver is switched off and the receiver is switched to a low current if a high logic level is applied to pin Rs. When a dominant state (bus differential voltage > 900 mV typical) occurs on the bus, RXD will be switched to a LOW level. The attached microcontroller should reverse this low-current standby mode and place the transceiver into normal operation via pin Rs. Because the receiver is slower in this mode, the first CAN message may be lost at higher bit rates.

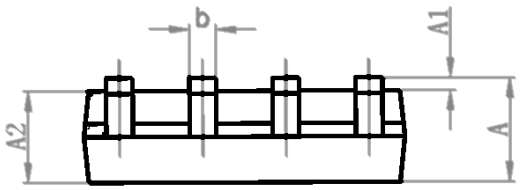
SOP8 DIMENSIONS

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°



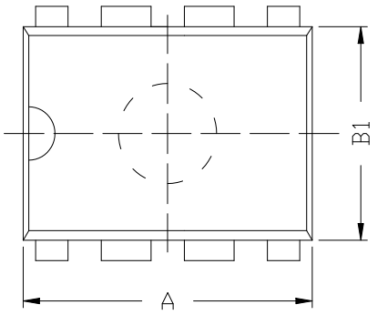


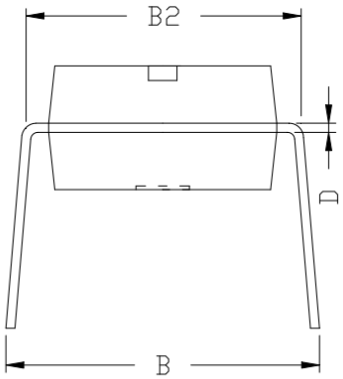


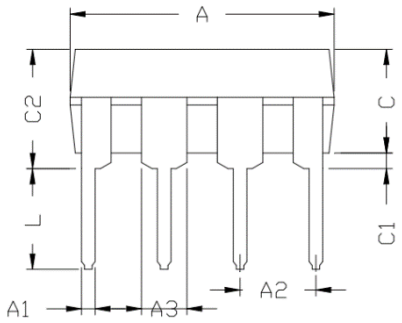
DIP8 DIMENSIONS

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







ORDERING INFORMATION

TYPE NUMBER	TEMPERATURE	PACKAGE
SIT82C251T	-40℃~125℃	SOP8
SIT82C251	-40℃~125℃	DIP8

Tape/reel package is 2500 pieces