钍地半导体
Tudi Semiconductor

Product Specification

TUDI-MCP2551

High-Speed CAN Transceiver

网址 www.sztdbdt.com

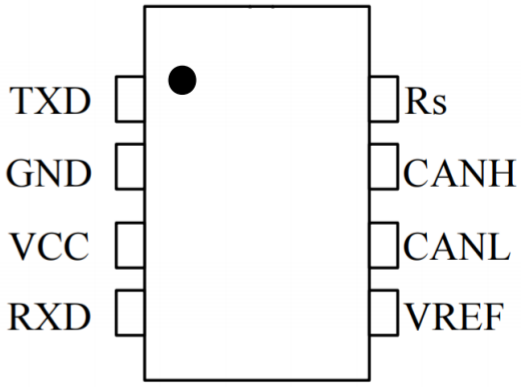
用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features

- ●Fully compatible with the ISO 11898 standards
- ●Built-in overtemperature protection
- ●Overflow protection function
- ●Ultra-low current standby mode (<5 μ A)
- ●The failed power-up node does not interfere with the bus
- ●At least 110 nodes are allowed to connect to the bus
- ●High-speed CAN, the transmission rate can reach 1Mbps
- ●High resistance to electromagnetic interfere nce capability



Pin Diagram

Explanation

MCP2551 are designed for applications the Controller Area Network (CAN) serial communication physical layer, complying with ISO 11898 standard. As a CAN transceiver, each device provides and receive functions between the differential CAN bus and the CAN controller with signaling speeds up to 1Mbps. It can be applied to in-vehicle, industrial control other fields.

Pin description

The pin number	Feet name	Feet function
1	TXD	Transmitter data input side.
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 and output terminal
7	CANH	High-potential CAN voltage input and output terminal
8	Rs	High speed and standby mode selection,low level for high speed

Parameter limit

Parameter	Symbol	Big or small	Unit		
Supply voltage	Vcc	-0.3~+7	V		
The MCU,the side port	TXD,RXD,VREF ,Rs	-0.3~VCC+0.3	V		
Bus-side port voltage	CANL ,CANH	-8~18	V		
6,Step 7 transient voltage is shown in Figure 7	Vtr	-200~+200	V		
Storage operating temperature range	Tstg	-55~150	℃		
Ambient temperature	Tamb	-40~125	℃		
Junction temperature	Tj	-40~150	℃		
Welding temperature range		300	℃		
Continuous power consumption	SOP8	400	mW		
	DIP8	700	mW		
Parameter	Symbol	Test condition	Minimum	Maximum	Unit
Service voltage	Vcc		4.5	5.5	V
CANH and CANL voltage resistance	Vcan		-8	+18	V
Ambient temperature	Tamb		-40	125	℃
Supply current	Icc	Standby mode		10	μA
Peak transfer rate	1/tbit	Non-zero code	1		Mbaud
Bus differential voltage	Vdiff		1.5	3.0	V

Note:The maximum limit parameter value means that exceeding these values may cause unrecoverable damage to the device. Under these conditions is not conducive to the normal operation of the device, the continuous operation of the device may affect the maximum allowable rating of the reliability of the device, the reference point of all the voltage is ground.

Bus transmitter switch characteristics						
Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Propagation delay (high to low)	tpHL		25	45	90	ns
Propagation delay (low to high)	tPLH	Rs=0V,Figure 4	25	65	120	ns
Bus wake up time	tBUS		0.7		5	μS
Differential output drop delay time	tf			50		ns
From listeningmode to explicit enabling time	tEN	Figure 7			10	μS
Differential output rise and delay time	tr			25		ns
The DC characteristics of the bus receiver						
Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Bus input current during power loss	I(OFF)	CANH or CANL =5 V,and other			5	μA
Input capacitance of CANH and CANL to the ground	CI			13		pF
CANH,CANL differential input capacitance	CD			5		pF
High level output voltage	VoH	IO=-2mA,Figure 6	4	4.6		V
CANH,CANL,and the input resistance	RIN	TXD=3V,Rs=0V	15	30	40	kΩ
CANH,CANL diffe-rential input resistance	RD		30		80	kS
RI(CANH),RIN (CANL)mismatch degree	RImatch	CANH=CANL	-3%		3%	
The threshold is entered	VIT+	Rs=0V,Figure 5		800	900	mV
Negative input threshold	VIT-		500	650		
Comparator threshold retardation interval	VHYs		100	125		
Low-level output voltage	VoL	IO=2mA,Figure 6		0.2	0.4	V
Common-mode volt-age range	VCOM		-12		12	V

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Short circuit output current	Ios	CANH=-12V, CANL =dangling, Figure 10	-105	-72		mA
		CANH=12V, CANL =dangling, Figure 10		0.36	1	
		CANL=-12V, CANH =dangling, Figure 10	-1	0.5		
		CANL=12V, CANH =dangling, Figure 10		71	105	
Bus differential output voltage (covert gender)	VoD(R)	VI=3V,Rs =0 V,Figures 1,	-0.012		0.012	V
		VI=3V,Rs =0 V,and no load	-0.5		0.05	V
Dominant output voltage symmetry	Vdom(TX)sym	Vdom(TX)sym=Vcc-VCANH-VCANL	-400		400	mV
Hidden output current	Io(R)	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA
Bus output voltage (hidden)	Vo(R)	VI=3V,Rs =0 V,RL=60 Ω,	2	2.5	3	**V**
Bus output differential voltage (dominance)	VoD(D)	VI=0V,Rs =0 V,RL =60 Ω,	1.5		3	V
CANH,and the output voltage (dominance)	VoHD)	VI=0V,Rs =0 V,RL =60 Ω, Figure 1,and Figure 2	2.9	3.4	4.5	
CANL,the output voltage (dominance)	VoLD)		0.8		1.5	
Output voltage symmetry	VTXsym	VTXsym=VCANH+VCANL	0.9Vcc		1.1Vcc	V
Common mode output voltage	Voc	Rs=0V,Figure 8	2	2.5	3	V
Dominant recessive common-mode output voltage difference	▵Voc			30		mV

(VCC=5V±10%,-40 Tamb 125,typical value at VCC=+5V,Tamb =25).

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
ESD function						
CAN Bus Pin Human Discharge Model(HBM)	VESD_HBM		-8		+8	kV
Device switch characteristics						
Loop delay 1,drive input to receiver output,recessive to dominant	td(LOOP1)	Rs=0V,Figure 9	90		190	ns
Loop delay 2,drive input to receiver output,dominant to recessive	taLOOP2)		90		190	ns
Overtemperature protection						
Overtemperature off	Tjsd)			160		℃
Co-mode stable output						
Common-mode stable output voltage	Vo	-500μA<I_o <500μA	0.3Vcc		0.7Vcc	V
Leakage current	Io(Rs)	Rs=2V,-12V<VO <12V	-5		5	μA
Standby mode power consumption	Icc	Rs=VCC,Vi=VCC		5	12	μA
Explicit power consumption		VI=0V,Rs =0 V,and load =60		50	70	mA
Hidden power con-sumption		VI=VCC,Rs = 0 V,and no load		6	10	mA
Bus receiver switch characteristics						
Transmission delay (low to high)	tPLH	Rs =0V or VCC, Figure 6	60	100	130	ns
Transmission delay (high to low)	tpHL		45	70	90	ns
The RXD signal rise time	tr			8		ns
Time of the RXD signal decrease	tf			8		ns
The TXD pin properties						
The TXD port high-level input current	Ih(TXD)	VI=VCC	-2		2	μA
The TXD port has a low-level input current	Iπ(TXD)	VI=0	-50		-10	μA
Current of the TXD at VCC=0 V	Io(off)	VCC=0V,			1	μA
Enter the high-level lower limit	VIH		2		VCC+0.3	V
Enter the low-level upper limit	VIL		-0.3		0.8	V
The TXD port is suspended in the air voltage	TXDo		H			logic

Functional table

Table 1:CAN transceiver truth table						
Vcc	TXD(1)	Rs(1)	CANH(1)	CANL(1)	BUS STATE	RXD(1)
4.5V~5.5V	L	L	H	L	Dominance	L
4.5V~5.5V	H(or float em-pty)	X	0.5Vcc	0.5Vcc	Covert ge-nder	H
4.5V~5.5V	X	H(or floating)	GND	GND	Covert ge-nder	H
0<Vcc<4.5V	X	X	OV<VCANH<Vcc	OV<VCANL<Vcc	Covert ge-nder	X
(1)H=high level;L=low level;X=unconcerned						

Table 2.Drive functions table				
INPUTS		OUTPUTS		Bus State
TXD(1)	Rs(1)	CANH(1)	CANL(1)	
L	L	H	L	Dominate(Dominant)
H(or float em-pty)	X	Z	Z	Recessive(Hi-dden)
X	H(or float em-pty)	Z	Z	Recessive(Hi-dden)
(1)H=high level;L=low level;Z=high resistance;X=no concerned				

Table 3.Receiver functions table		
VID=CANH-CANL	RXD(1)	Bus State(1)
VID≥0.9V	L	Dominate(Dominant)
0.5<VID<0.9V	?	?
VID≤0.5V	H	Recessive(Hidden)
Open	H	Recessive(Hidden)
(1)H=high level;L=low level;?=indeterminacy		

Test Circuit

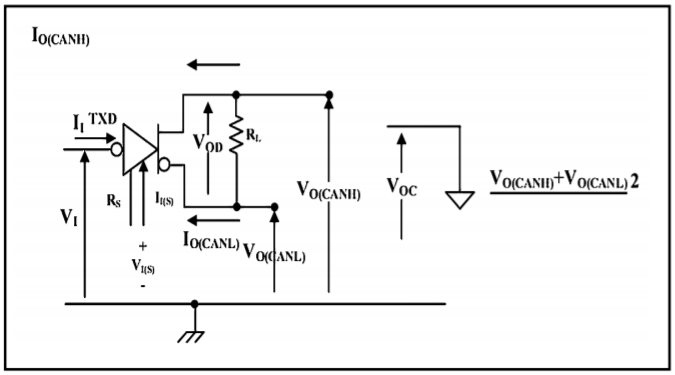


Figure 1 Definition of drive voltage and current test

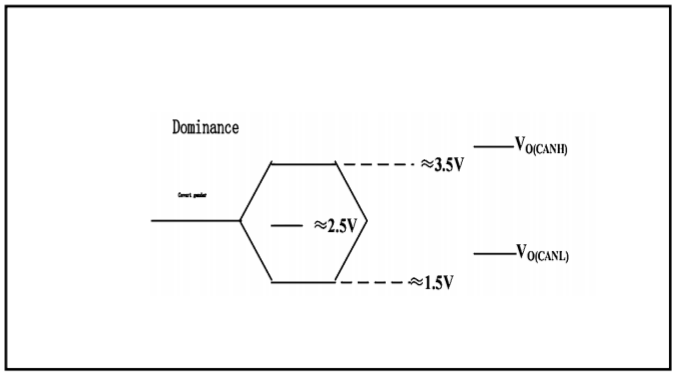


Figure 2 The bus logic voltage definition

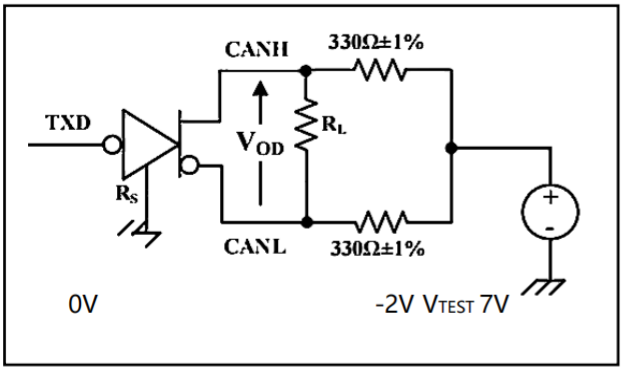


Figure 3 Drive VOD test circuit

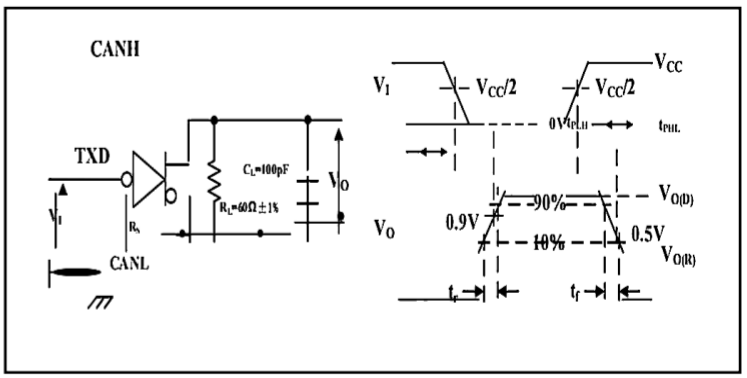


Figure. 4 Driver test circuit and voltage waveform

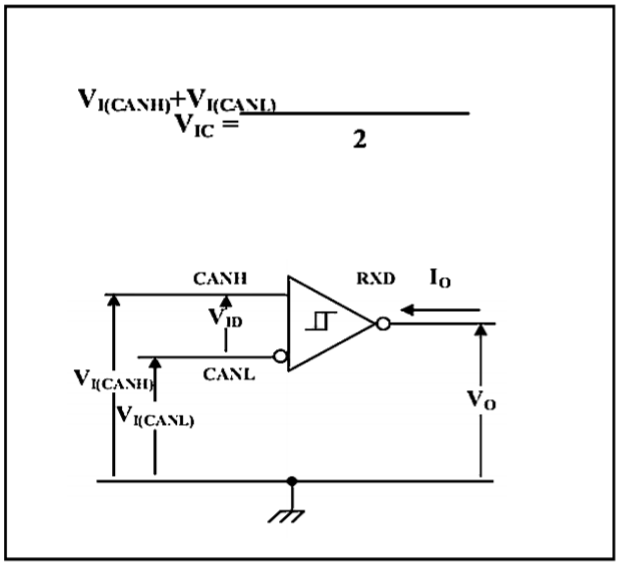


Figure 5. Definition of the receiver voltage and current

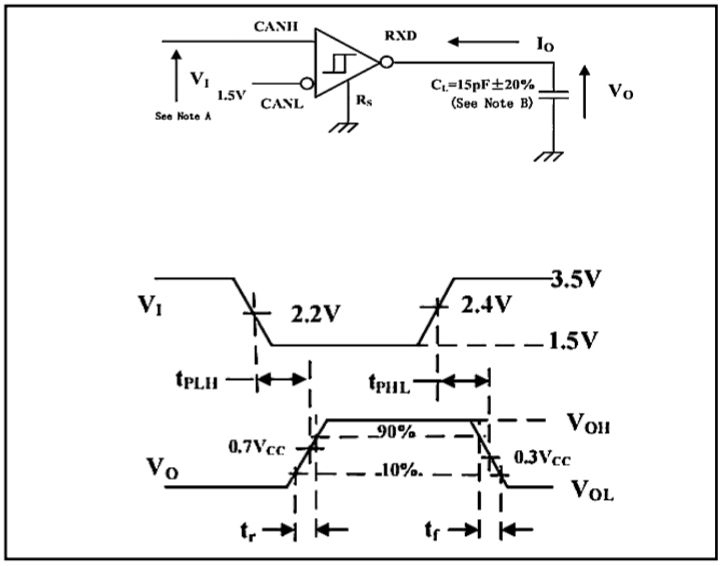


Figure. 6 Receiver test circuit and voltage waveform

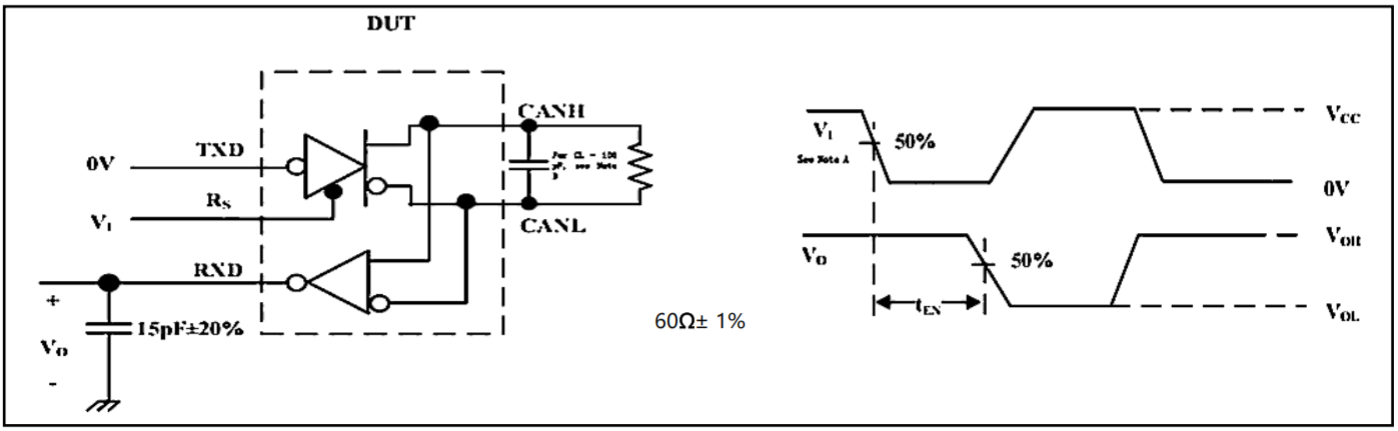


Figure 7 tEN test circuit and voltage waveform

A, Features of all VI input pulse generator: PRR 25 kHz, 50% duty cycle, tr <6ns, tf <6ns;
B, CL includes instrument and fixed volume, with error within 20%.

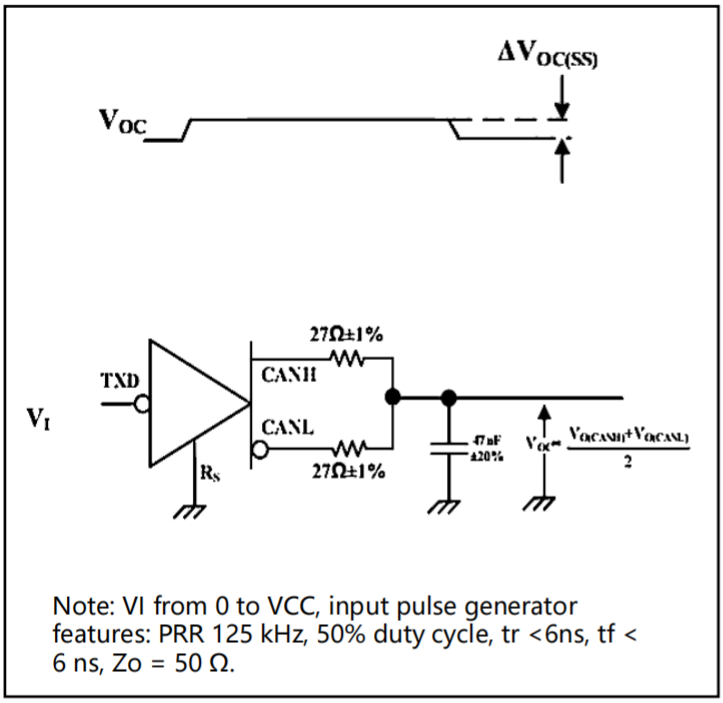


Figure 8. Common-mode output voltage test and waveform

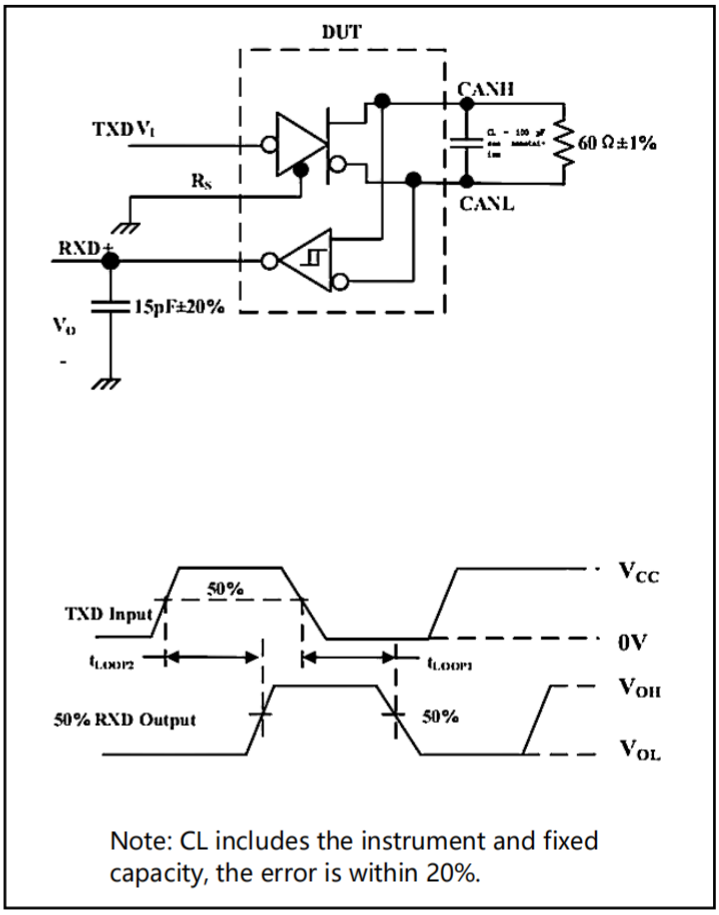


Figure 9 t (LOOP) test circuit and waveform

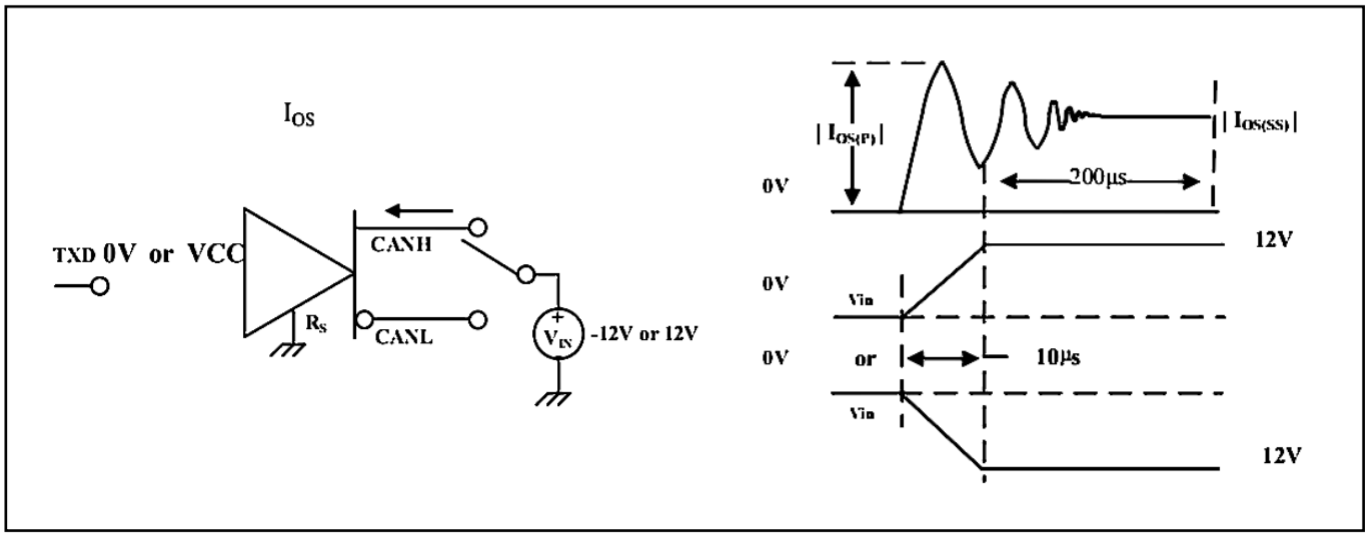


Figure 10 Drive short circuit current test circuit and waveform

Additional description

resume

MCP2551 is an interface chip applied between CAN protocol controllers and physical buses, which can be used in on-board, industrial control and fields, with a rate of up to 1Mbps, and has the ability to transmit differential signals between the bus and the CAN protocol controller, fully compatible with ISO 11898 standard.

short-circuit protection

The driving stage of the MCP2551 has a current limiting protection function to prevent the driving circuit from short-circuiting to the positive negative power supply voltages. When a short circuit occurs, the power consumption increases, and the short-circuit protection function can protect the driving stage from damage

Overtemperature protection

MCP2551 has over-temperature protection function, when the junction temperature exceeds 160℃, the current of the driving stage will, because the driving tube is the main power-consuming part, the current reduction can reduce the power consumption and thus reduce the chip temperature. At the same time, parts of the chip still maintain normal operation.

Electrical transient protection

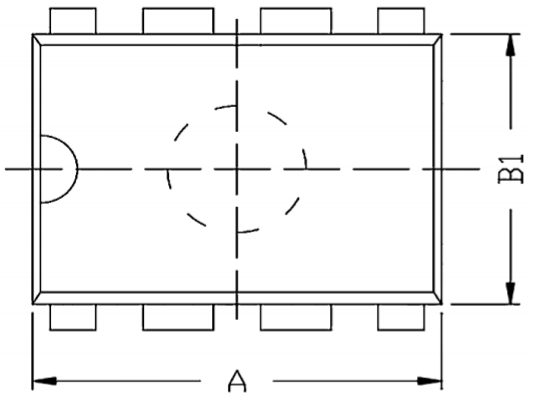
Control mode

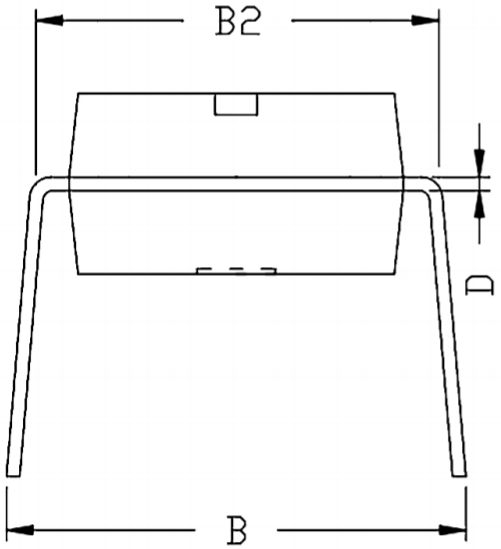
The control pin Rs allows the selection of two operating modes:
High-speed mode or low-power standby mode.
The-speed mode is the normal operating mode and is selected by connecting the pin Rs to ground. The transceiver is then able to transmit and receive data via the bus CANH and CANL. The differential receiver converts the analog data on the bus into digital data and outputs it via the multiplexer (MUX) to the pinD.
If the pin Rs is left floating or pulled high, the device operates in low-power standby mode. In the low-power standby mode, transmitter is switched off
and the receiver enters a low-current state. If the receiver detects the bus dominant (bus differential voltage > 0.9), RXD switches to low level, the MCU must then respond to this action by controlling the Rs pin to enter the normal operating mode. As the current very small in the standby condition, the response time is longer, and the first signal may be lost at higher baud rates.

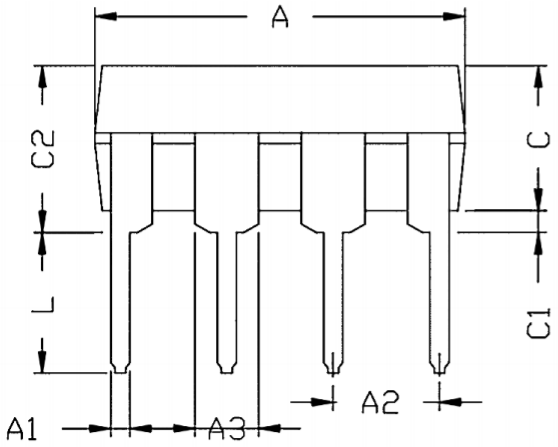
Order information

Order Number	Package	Package Quantity	Marking On The park
MCP2551T-I/SN-TUDI	SOP8	Tape,Reel,2500	2551-I/SN
MCP2551T-E/SN-TUDI	SOP8	Tape,Reel,2500	2551-E/SN
MCP2551T-I/P-TUDI	DIP8	Tube,50,A box of 2000	2551-I/P
MCP2551T-E/P-TUDI	DIP8	Tube,50,A box of 2000	2551-E/P

Package DIP8

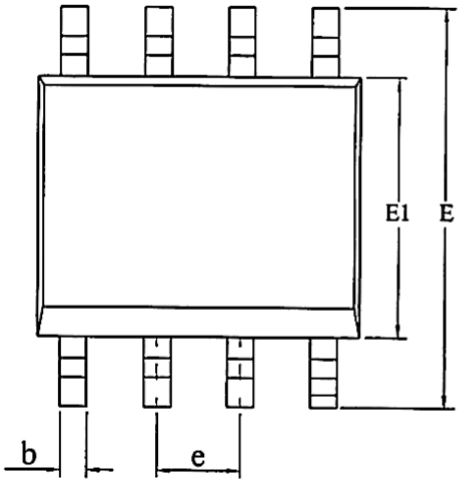


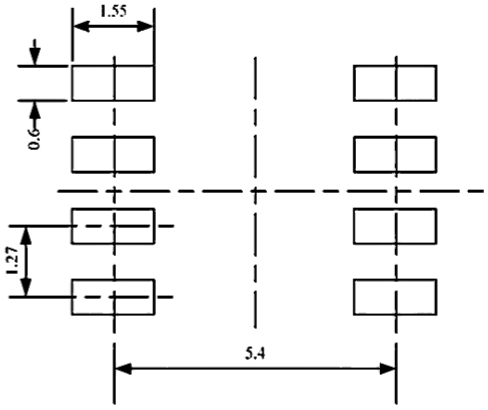


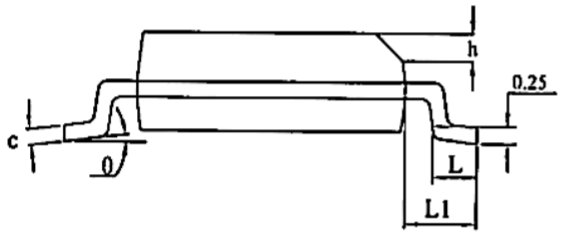


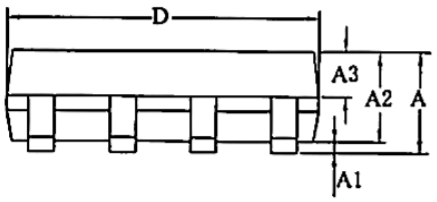
Symbol	Least value /mm	Representative va-lue /mm	Crest value /mm
A	9.00	9.20	9.40
A1	0.38	0.47	0.57
A2	2.54TYP		
A3	1.524TYP		
B	8.40	8.70	9.10
B1	6.20	6.40	6.60
B2	7.32	7.62	7.92
C	3.20	3.40	3.60
C1	0.50	0.60	0.80
C2	3.71	4.00	4.31
D	0.20	0.28	0.36
L	3.00	3.30	3.60

Package SOP8









Symbol	Least value /mm	Representative va-lue /mm	Crest value /mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.38	-	0.51
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	-	0.50
L	0.40	0.60	0.80
L1	1.05REF		
C	0.20	-	0.25
θ	0°	-	8°

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