characteristic:

- Powered by a single power supply of 3.3V;
- Comply with ISO 11898-2 standard;
- Total lead ESD protection exceeds ±15kV human model (HBM);
- Up to 120 nodes can be connected on a single bus;
- The adjustable driver conversion time can improve the radiation performance;
- Low current standby mode: 650μA (typical value);
- Designed for data rates up to 1Mbps;
- Hot shutdown protection;
- Open circuit fault safety design;
- Non-scratch pulse power on and off protection for hot-swappable applications

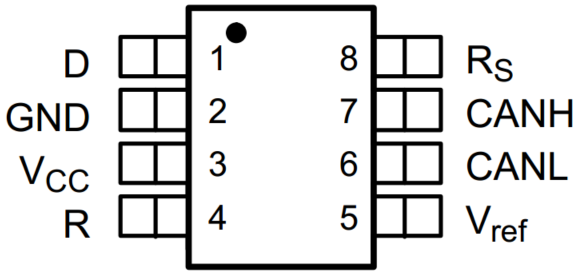
Product shape:

Provide green and lead-free packaging

description

SIT65HVD230 is an interface chip used between CAN protocol controllers and physical buses. It works with 3.3V microprocessors, microcontrollers (MCUs), and digital signal processors (DSPs) or equivalent protocol controllers equipped with CAN controllers. It is applied in industrial automation, control, sensor and drive systems, motor and robot control, building and temperature control, telecommunications and base station control, as well as status monitoring. It is suitable for applications that use the CAN serial communication physical layer compliant with the ISO 11898 standard.

Parameter	Symbol	Test condition	Minimum	Maximum	Unit
Service voltage	V_{cc}		3	3.6	V
Peak transfer rate	$1/t_{bit}$	Non-zero code	1		Mbaud
CANH、CANL Input and output voltage	V_{can}		-16	+16	V
Total line differential voltage	V_{diff}		1.5	3.0	V
Ambient temperature	T_{amb}		-40	125	℃


D
GND
VCC
R
1
2
3
4
8
7
6
5
RS
CANH
CANL
Vref

absolute rating

Parameter	Symbol	Big or small	Unit
Supply voltage	V_{CC}	-0.3~+6	V
MCU side port voltage	D，R	-0.5~VCC+0.5	V
Total input voltage on the bus	CANL，CANH	-18~18	V
6, Transient voltage at pin 7	V_{tr}	-25~+25	V
Receiver output current, IO		-11~11	mA
Storage working temperature range		-40~150	℃
Ambient temperature		-40~125	℃
Welding temperature range		300	℃
Continuous power consumption	SOP8	400	mW
	DIP8	700	mW

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.

Pin definition

Pin number	Pin name	Pin function
1	D	CAN sends data input (low level in explicit bus state; high level in implicit bus state), also known as TXD, driver input
2	GND	Grounding connection
3	VCC	Transceiver 3.3V, power supply voltage
4	R	The CAN receives data output (low level in the explicit bus state; high level in the implicit bus state), also known as RXD, driver output
5	Vref	Vcc/2 is the reference output pin
6	CANL	Low level CAN bus
7	CANH	High level CAN bus
8	R_S	Mode selection pin: Strong pull-down to GND= high speed mode; strong pull-up to VCC = low power mode; through 10 kΩ to 100kΩ, resistor pull-down to GND = slope control

		mode.

DC characteristics of the total signal transmitter

Symbol	Parameter		Test condition	Minimum	Typical case	Maximum	Unit
V_O (D)	Output voltage (dominance)	CANH	VI = 0V, RS = 0V, RL = 60Ω (see Figure 1 and Figure 2)	2.45		VCC	v
		CANL		0.5		1.25	
V_{OD} (D)	Differential output voltage (explicit)		VI = 0V, RS = 0V, RL = 60Ω (see Figure 1)	1.5	2	3	v
			VI=0V, RL=60Ω, RS =0V (see Figure 3)	1.2	2	3	v
V_O (R)	Output voltage (covert gender)	CANH	VI = 3V, RS = 0V, RL = 60Ω (see Figure 1)		2.3		v
		CANL			2.3		
V_{OD} (R)	Differential output voltage (hidden)		VI=3V, R_S=0V	-0.12		0.012	v
			VI=3V, R_S=0V,NO LOAD	-0.5		0.05	v
I_{IH}	High voltage input current		VI=2V	-30			μA
I_{IL}	Low voltage input current		VI=0.8V	-30			μA
I_{OS}	Short circuit output current		CANH=-2V	-250			mA
			CANH=7V			1	
			CANL=-2V	-1			
			CANL=7V			250	
C_O	Output capacitance		See receiver				
I_{CC}	Supply current		Await the opportune moment		650	950	μA
			VI=0V (dominant), no load		10	17	mA
			VI=VCC (heterozygous), no load		10	17	mA

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

Symbol	Parameter	Test condition	Minimum	Typical case	Maximum	Unit
t_{PLH}	Propagation delay (low to high)	R = 0, i.e. short circuit (see Figure 4)		35	85	ns
		R=10 kΩ		70	125	
		R=100 kΩ		500	870	
t_{PHL}	Propagation delay (high to low)	R = 0, i.e. short circuit (see Figure 4)		70	120	
		R=10 kΩ		130	180	
		R=100 kΩ		870	1200	
$t_{sk(p)}$	Propagation delay symmetry	R = 0, i.e. short circuit (see Figure 4)		35		

	(| t_{PLH} - t_{PHL} |)	R=10 kΩ		60		
		R=100 kΩ		370		
tr	Differential output rise time	R = 0, i.e. short circuit (see Figure 4)	25	50	100	
		R=10 kΩ	80	120	160	
		R=100 kΩ	600	800	1200	
tf	Differential output fall time	R = 0, i.e. short circuit (see Figure 4)	40	55	80	
		R=10 kΩ	80	125	150	
		R=100 kΩ	600	825	1000	

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

DC characteristics of the total signal receiver

Symbol	Parameter	Test condition	Minimum	Typical case	Maximum	Unit
V_{IT+}	Receiver is at threshold	See Table 1		750	900	mV
V_{IT-}	Receiver negative threshold	See Table 1	500	650		mV
V_{hys}	The lag range	VIT+- VIT-		100		mV
V_{OH}	High level output voltage	-6V<VID<500mV Io =-8mA (see Figure 5)	2.4			V
V_{OL}	Low level output voltage	900mV<VID<6V Io =8 mA (see Figure 5)			0.4	V
I_i	Total input current for the bus	VIH=7V，VCC=0V	100		350	μA
I_i		VIH=7V，VCC=3.3V	100		250	μA
I_i		VIH=-2V，VCC=0V	-100		-20	μA
I_i		VIH=-2V，VCC=3.3V	-200		-30	μA
R_i	Total input resistance of the bus	ISO 11898-2 corresponding standard	20	35	50	KΩ
R_{diff}	Differential input resistance	ISO 11898-2 corresponding standard	40		100	KΩ
C_i	Total input capacitance of the bus	ISO 11898-2 corresponding standard		40		pF

$C_{\mathbf{diff}}$	Differential-input capacita-nce	ISO 11898-2 corre-sponding standard		20		pF

I_{CC}	Supply current	See the driver				

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

Total line receiver switch characteristics

Symbol	Parameter	Test condition	Minimum	Typical case	Maximum	Unit
t_{PLH}	Receiver transmission delay (low-high)	See Figure 6		35	50	ns
t_{PHL}	Receiver transmission delay (high-low)	See Figure 6		35	50	ns
t_{sk}	Pulse shift	$\|t_{PHL} - t_{PLH}\|$			10	ns
t_r	Output signal rise time	See Figure 6		1.5		ns
t_f	Output signal fall time	See Figure 6		1.5		ns

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

Device switch characteristics

Symbol	Parameter	Test condition	Minimum	Typical case	Maximum	Unit
$t_{(LOOP1)}$	Loop delay 1, driver input to receiver output, implicit to explicit	R = 0, i.e. short circuit (see Figure 8)		70	115	ns
		R=10 kΩ		105	175	
		R=100 kΩ		535	920	
$t_{(LOOP2)}$	Loop delay 2, driver input to receiver output, explicit to implicit	R = 0, i.e. short circuit (see Figure 8)		100	135	ns
		R=10 kΩ		155	185	
		R=100 kΩ		830	990	

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

Over temperature protection

Symbol	Parameter	Test condition	Minimum	Typical case	Maximum	Unit
Overtemperature shutdown	Tj(sd)		155	165	180	℃

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

Control pin characteristics

Symbol	Parameter	Test condition	Minimum	Typical case	Maximum	Unit
T_{WAKE}	Wait until the wake time	RS Joining square wave (see Figure 7)		0.55	1.5	us
V_{ref}	Base output voltage	$-5uA<I_{ref}<5uA$	$0.45V_{CC}$		$0.55V_{CC}$	V
		$-50uA<I_{ref}<50uA$	$0.4V_{CC}$		$0.6V_{CC}$	V
I_{RS}	High speed mode input current	$V_{RS}<1V$	-450		0	μA
V_{RS}	Standby/hibernate input voltage	$0<V_{RS}<V_{CC}$	$0.75V_{CC}$		V_{CC}	V
I_{off}	Dropping leakage current	Vcc=0V , $V_{CANH}=V_{CANL}=5V$	-250		250	μA

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical values in VCC=+3.3V, Temp = 25)

supply current

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Standby power consumption	I_{CC}	R_S=VCC, V_I=VCC		650	950	μA
Visible power consumption		V_I=0V, R_S=0V, LOAD=60Ω		50	70	mA
Hidden power consumption		V_I=VCC, R_S=0V, NO LOAD		6	10	mA

(If not otherwise stated, VCC=3.3V±10%, Temp=TMIN~TMAX, typical value in VCC=+3.3V, Temp = 25)

Function table

Table 1 Receiver characteristics in common mode mode (V(RS)=1.2V)

V_{IC}	V_{ID}	V_{CANH}	V_{CANL}	R OUTPUT	
-2 V	900mV	-1.55V	-2.45V	L	VOL
7 V	900mV	8.45V	6.55V	L	
1 V	6V	4V	-2V	L	
4 V	6V	7V	1V	L	
-2 V	500mV	-1.75V	-2.25V	H	VOH
7 V	500mV	7.25V	6.75V	H	
1 V	-6V	-2V	4V	H	
4 V	-6V	1V	7V	H	
X	X	Open	Open	H	

(1) H= high level; L= low level; X= not related

Table 2 Working mode

RS pin	Pattern	Actuator	Acceptor	RXD pin
Low level, V (Rs) <1.2 V, strong pull down to GND	High speed mode	Enable (on) high	Enable (turn on)	Reflects the bus status
Low level, V (Rs) <1.2 V, pulled down to GND through a resistor in the range of 10kΩ to 100kΩ	Slope control mode	Enable (on) high, with slope control	Enable (turn on)	Reflects the bus status
High level, V (Rs)> 0.75 VCC	Standby mode	Disallowed (disabled)	Enable (turn on)	Reflects the bus status

Table 3 Driver functions

Import D	R_S	Output		General vehicle status
		CANH	CANL	
L	V (Rs) <1.2V (including pull-down to GND through a resistor in the range of 10k Ω to 100kΩ)	H	L	Dominance
H		Z	Z	Covert gender
Open a way	Standby mode	Z	Z	Covert gender
X	$V_{(Rs)}$ >0.75V_{CC}	Z	Z	Covert gender

(1) H=high level; L=low level; Z=high resistance state

Table 4 Receiver functions

V_{ID}=CANH-CANL	R_S	Output R
V_{ID}≥0.9V	X	L
0.5< V_{ID}<0.9V	X	?
V_{ID}≤0.5V	X	H
Open	X	H

(2) H= high level; L= low level;? = uncertain; X= not related

test circuit

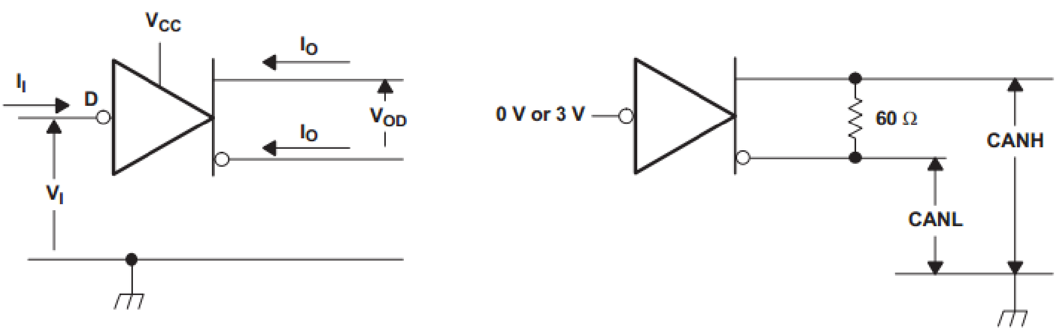


Figure 1 Definition of driver voltage and current test

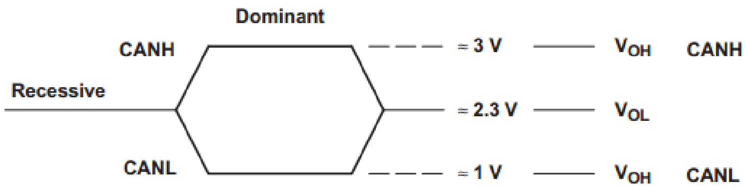


Figure 2 Bus logic voltage definition

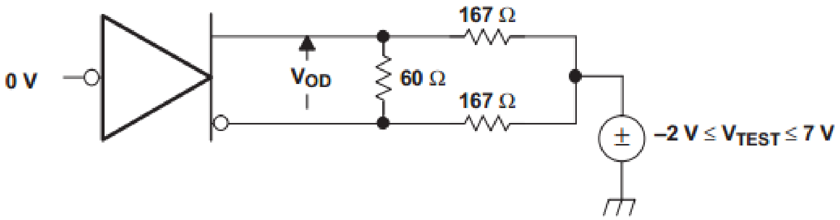
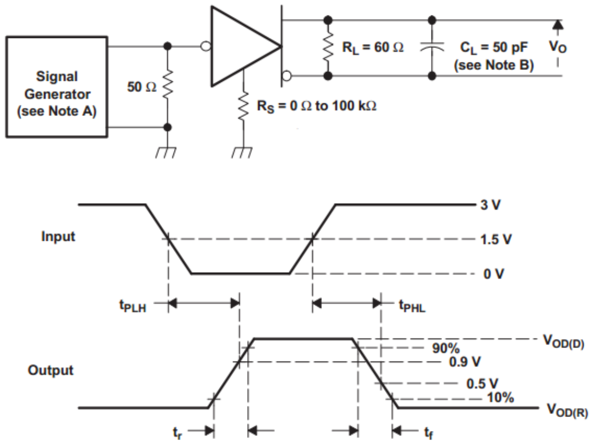


Figure 3 Driver VOD test circuit



A. Characteristics of input pulse generator: PRR is less than or equal to 500KHz, duty cycle is 50%, tr is less than 6ns, tf is less than 6ns, Zo is 50Ω

B and CL include instruments and fixed capacitors with an error of less than 20%.

Figure 4 Driver test circuit and voltage waveform

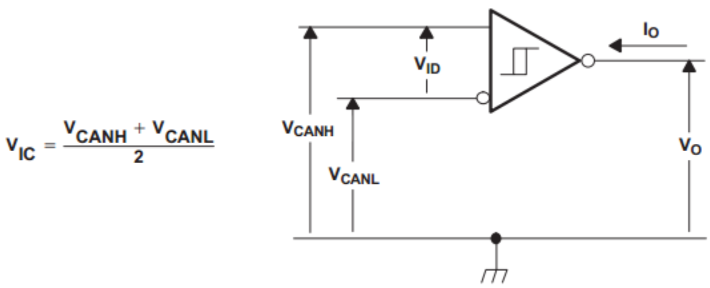
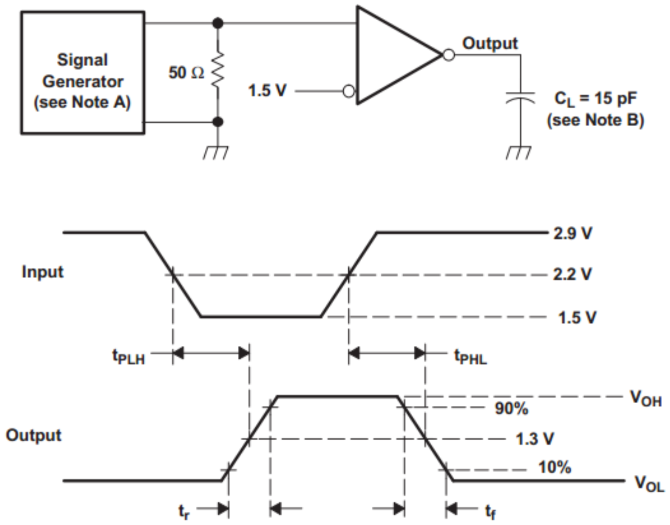


Figure 5 Receiver voltage and current definition



A. Characteristics of input pulse generator: PRR is less than or equal to 500KHz, duty cycle is 50%, tr is less than 6ns, tf is less than 6ns, Zo is 50Ω

B and CL include instruments and fixed capacitors with an error of less than 20%.

Figure 6 Receiver test circuit and voltage waveform

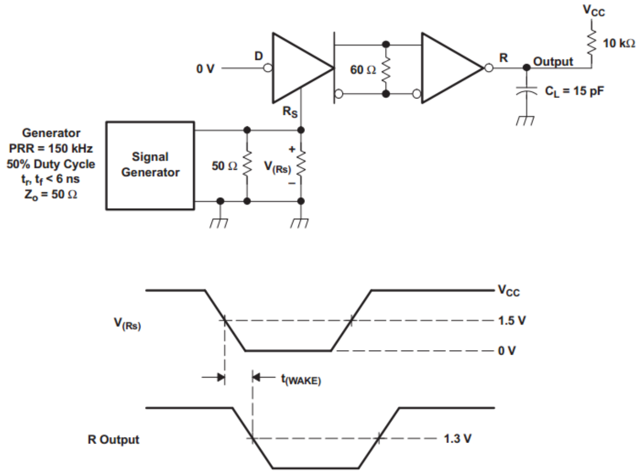
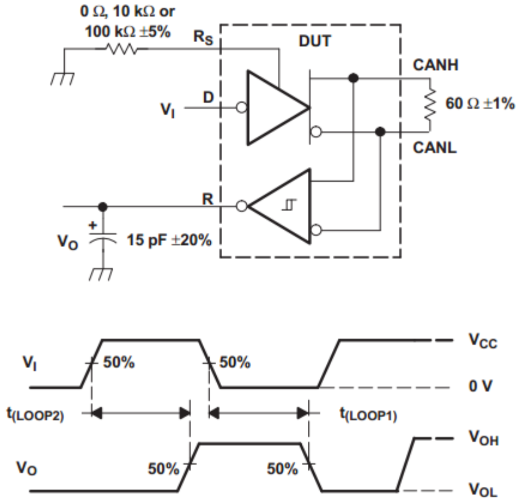


Figure 7 t (WAKE) test circuit and voltage waveform



A. Characteristics of input pulse generator: PRR is less than or equal to 125KHz, duty cycle is 50%, tr is less than 6ns, tf is less than 6ns, Zo is 50Ω

Figure 8 t (LOOP) test circuit and voltage waveform explain

1 resume

SIT65HVD230 is an interface chip used between CAN protocol controllers and physical buses. When combined with 3.3V microprocessors, microcontrollers (MCUs), and digital signal processors (DSPs) or equivalent protocol controllers equipped with CAN controllers, it can be applied in industrial automation, control, sensor and drive systems, motor and robot control, building and temperature control, telecommunicati-ons and base station control, as well as status monitoring. It supports speeds up to 1Mbps and fully complies with the "ISO 11898" standard.

2 short-circuit protection

The drive level of SIT65HVD230 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. The short circuit protection function can protect the drive level from damage.

3 Over temperature protection

SIT65HVD230 It has overtemperature protection function. When the junction tempe-rature exceeds 160℃, 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 power consumption and thus reduce the chip temperature. At the same time, other parts of the chip still work normally.

4 Electrical transient protection

Electrical transients often occur in automotive applications, and SIT65HVD230's CANH and CANL have the function of preventing electrical transients from damaging.

5 control model

Three different operating modes are provided by the RS pin (pin 8): high speed mode, slope control mode and low power mode.

(1) High speed mode:

Applying a logic low level to the RS pin (pin 8) selects high-speed mode. High-speed operation is typically used in industrial applications. High-speed mode allows for output switching at the fastest possible rate and imposes no internal limits on the rise and fall times of the output. If high-speed transitions affect radiation performance, slope control mode can be employed.

If the application requires both high-speed and low-power standby modes, the mode selection pin can be directly connected to a general-purpose output pin of the microprocessor, MCU, or DSP. When the controller outputs a logic low level (<1.2 V), the device enters high-speed mode; when the controller outputs a logic high level (> 0.75 VCC), the device enters standby mode.

(2) Slope control mode

For many applications that still use unshielded twisted pair bus cables to reduce system costs, electromagnetic compatibility is critical. The device has added a slope control mode, which can reduce the electromagnetic interference caused by the rise and fall times of the driver and the harmonics generated as a result. By connecting a resistor between RS (pin 8) and ground or logic low voltage, the rise and fall slopes of the driver output can be adjusted. The slope of the driver output signal is proportional to the output current of the pin, and this slope control is achieved through an external resistor (typically 10kΩ~100kΩ).

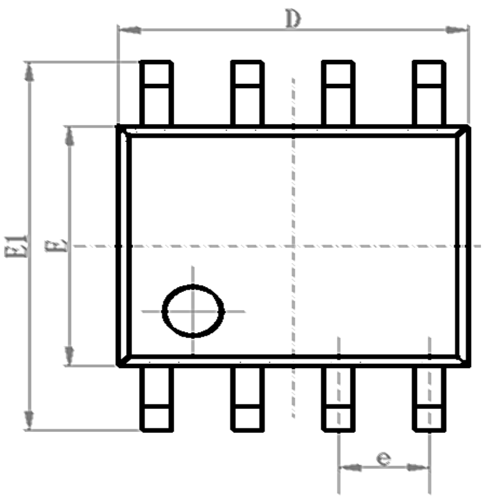
(3) standby mode

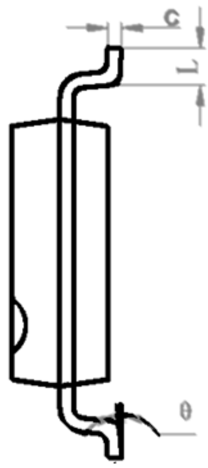
If a logic high level (> 0.75 VCC) is applied to the RS (pin 8), the device circuit will enter low current, listen-only standby mode. During this mode, the driver will be turned off, and the receiver will remain active. In this listen-only state, the transceiver is completely passive with respect to the bus. There will be no difference whether or not a slope control resistor is placed. When a rising edge of an active state (bus differential voltage> 900mV (typical value)) appears on the bus, the microprocessor can cause the transceiver to exit this low-power standby mode.The microprocessor senses bus activity and reactivates the driver circuit by applying a logic low level (<1.2V) to RS (pin 8).

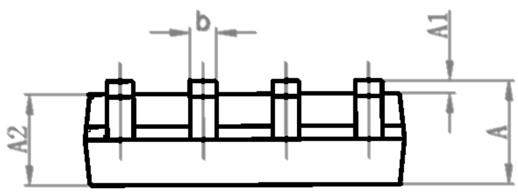
SOP8, external dimensions

Package size

Symbol	Least value /mm	Representative va-lue /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°



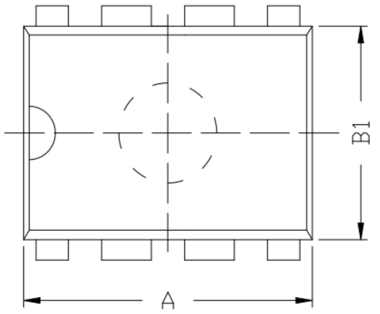


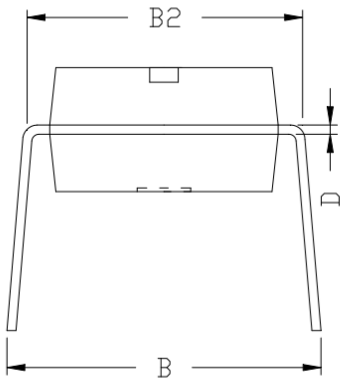


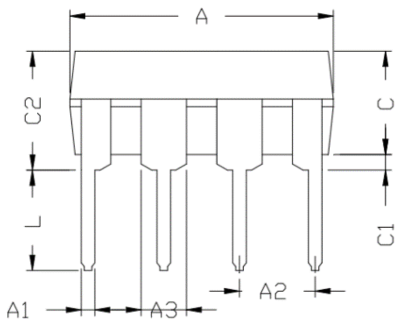
DIP8, external dimensions

Package size

Symbol	Least value /mm	Representative value /mm	Crest value /mm
A	9.00	9.20	9.40
A1	0.33	0.45	0.51
A2	2.54TYP		
A3	1.525TYP		
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







Order information

Order code	Temperature	Package
SIT65HVD230DR	-40℃~125℃	SOP8
SIT65HVD230P	-40℃~125℃	DIP8

The tape packaging is 2500 beads per disc