V2.5
2017.06

FEATURES

- **5V Power Supply, Half-duplex**
- **1/8-unit-load, allows up to 256 transceivers on the bus**
- **Short-circuit protection**
- **Thermal shutdown protection**
- **Low-Current Shutdown Mode**
- **Hot-Swap Input Structures on DE and /RE**
- **True Fail-Safe Receiver**
- **Excellent noise immunity**
- **Integrated transient voltage suppression;**
- **500-kbps in Electrically Noisy Environments**
- **ESD Protection for Bus Terminals：**
  Contact Discharge ±15KV； HBM ±15KV

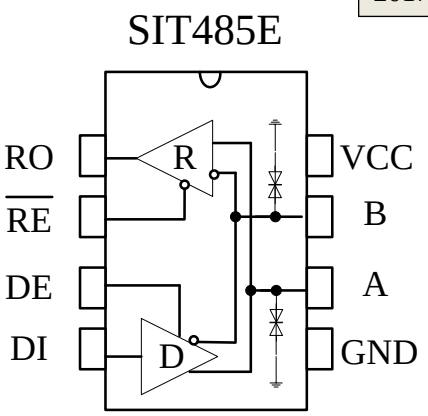


Fig1 FUNCTIONAL BLOCK

APPLICATIONS

- **Power meter, Water meter, Gas meter Remote Meter Reading Applications**
- **Level Translators**
- **Industrial-Control Local Area Networks**
- **Intelligent Instrument**
- **Central Air-Conditioning**
- **Transceivers for EMI-Sensitive Applications**
- **Fire-alarm**
- **Lighting system**
- **Electric lift controller**
- **Entrance guard system**

General Description

SIT485E is a 5V power supply, half-duplex, low power, low slew rate RS485 Transceiver. SIT485E Fully meets the TIA/EIA-485 standard

SIT485E includes a driver and a receiver, both of which can be independently enabled and disabled. When both are disabled, the driver and receiver outputs are high-impedance state. SIT485E has a 1/8-unit-load receiver input impedance, that allows up to 256 transceivers on the bus. The SIT485E features reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 500kbps.

SIT485E operates under the supply voltage of 4.75V to 5.25V. SIT485E is a true fail-safe transceiver. SIT485E also has the function of thermal shutdown protection, current limiting protection, overvoltage protection. DE and /RE control port input features such as hot-swappable

The transceiver is intergraded with TVS device, the contact discharge voltage is ±15KV, and HBM is ±15KV, air discharge is ±15KV.

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
SIT485EESA	-40℃~85℃	8 SO
SIT485EEPA	-40℃~85℃	DIP8

Tape and Reel: Pack quantity is 2,500.

ABSOLUTE MAXIMUM RATINGS：

PARAMETER	Symbol	Value	Unit
Supply Voltage	VCC	+7	V
CTR Port	/RE，DE，DI	-0.3~VCC+0.3	V
Driver Output Voltage	A、B	-7~13	V
Receiver Output Voltage	RO	-0.3~VCC+0.3	V
Temperature Range		-40~85	℃
Storage Temperature Range		-60~150	℃
Soldering Temperature (reflow)		300	℃
Continuous Power Dissipation	SOP8	400	mW
	DIP8	700	mW

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Pin Description：

Pin Number	Pin Name	FUNCTION
1	RO	Receiver Output. When enabled, if A –B > -50 mV, then RO = high. If A -B < -200 mV, then RO = low.
2	/RE	Receiver Output Enable. A low level enables the RO; a high level places it in a high impedance state.
3	DE	Driver Output Enable. A high level enables the driver differential outputs, Pin A and Pin B; a low level places the driver in a high impedance state.
4	DI	Driver Input. When the driver is enabled, a logic low on DI forces Pin A low and Pin B high; a logic high on DI forces Pin A high and Pin B low.
5	GND	Ground Connection (0 V).
6	A	No inverting Receiver Input A/Driver Output A.
7	B	Inverting Receiver Input B/Driver Output B.
8	VCC	Power Supply

DC ELECTRICAL CHARACTERISTICS

（VCC = +5V ±5%, $T_A = T_{MIN}$ to T_{MAX}, unless otherwise noted. Typical values are at VCC = +5V and T_A = +25℃.）

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS`	CONDITIONS
DRIVER						
Differential Driver Output (no load)	V_{OD1}		5		V	
Differential Driver Output	V_{OD2}	1.5		5	V	Fig2，RL = 27 Ω
		2				Fig2，RL = 50 Ω
Change in Magnitude of Differential Output Voltage (NOTE1)	ΔV_{OD}			0.2	V	Fig2，RL = 27 Ω
Driver Common-Mode Output Voltage	V_{OC}			3	V	Fig2，RL = 27 Ω
Change In Magnitude of Common-Mode Voltage (NOTE1)	ΔV_{OC}			0.2	V	Fig2，RL = 27 Ω
Input High Voltage	V_{IH}	2.0			V	DE，DI，/RE
Input Low Voltage	V_{IL}			0.8	V	DE，DI，/RE
Input Current(RE,DI,/RE)	I_{IN1}	-2		2	uA	DE，DI，/RE
Driver Short-Circuit Output Current（short to high）	I_{OSD1}	35		250	mA	Short to 0V~12V
Driver Short-Circuit Output Current（short to low）	I_{OSD2}	-250		-35	mA	Short to -7V~0V
Thermal-Shutdown Threshold			150		℃	
Thermal-Shutdown Hysteresis			20		℃	
RECEIVER						
Input Current(A，B)	I_{IN2}			125	uA	DE = 0 V，VCC=0 or 5V，VIN=12 V
	I_{IN2}	-100			uA	DE = 0 V，VCC=0 or 5V，VIN = -7 V
Positive-going input threshold voltage	V_{IT+}			-50	mV	-7V≦V_{CM}≦12V
Negative-going input threshold voltage	V_{IT-}	-200			mV	
Receiver Input Hysteresis	V_{hys}	10	30		mV	-7V≦V_{CM}≦12V
RO Output-High Voltage	V_{OH}	VCC-1.5			V	I_{OUT} = −4mA，V_{ID} = +200 mV
RO Output-Low Voltage	V_{OL}			0.4	V	I_{OUT} = +4mA，V_{ID} = -200 mV

Three-State Output Current at Receiver	I_{OZR}			±1	uA	0.4V < V_O < 2.4 V
Receiver Input Resistance	R_{IN}	96			kΩ	-7V≦V_{CM}≦12V
Receiver Output Short-Circuit	I_{OSR}	±7		±95	mA	0 V≤V_O≤VCC
SUPPLY CURRENT						
Supply Current	I_{CC}		180	500	uA	/RE=0V or VCC, DE = 0 V
			170	400	uA	/RE=VCC，DE=VCC
Supply Current in Shutdown Mode	I_{SHDN}		0.5	10	uA	DE =0 V，/RE= VCC
ESD PROTECTION						
A、B			15		KV	HBM
			15		KV	Contact discharge
Other port		4			KV	HBM

NOTE1：ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC}, respectively, when the DI input changes state

SWITCHING CHARACTERISTICS

(VCC = +5.0V ±5%, $T_A = T_{MIN}$ to T_{MAX}, unless otherwise noted. Typical values are at VCC = +5.0V and T_A = +25℃）

PARAMETER	SYMBOL	MIN	TYP	TYP	UNITS	CONDITIONS
DRIVER						
Driver Propagation Delay（low to high）	t_{DPLH}			1000	ns	R_{DIFF} = 54 Ω, C_{L1}=C_{L2}=100pF（Fig3,4）
Driver Propagation Delay（high to low））	t_{DPHL}			1000	ns	
$\|t_{DPLH} - t_{DPHL}\|$	t_{SKEW1}			±100	ns	
Driver Differential Output Rise or Fall Time	t_{DR}, t_{DF}	200	500	700	ns	
Driver Enable to Output High	t_{DZH}			2500	ns	C_L=100 pF, S1 closed（Fig 5,6）
Driver Enable to Output Low	t_{DZL}			2500	ns	
Driver Disable Time from Low	t_{DLZ}			100	ns	C_L=15 pF, S2 closed（Fig 5,6）
Driver Disable Time from High	t_{DHZ}			100	ns	
Driver Enable from Shutdown to Output High	$t_{DZH(SHDN)}$			4500	ns	C_L=15 pF, S2 closed（Fig5,6）
Driver Enable from Shutdown to Output Low	$t_{DZL(SHDN)}$			4500	ns	C_L=15 pF, S1 closed（Fig5,6）

RECEIVER						
Receiver Propagation Delay (low to high)	t_{RPLH}		127	200	ns	Fig7 and Fig 8 VID≥2.0V; Rise and fall time VID≤15ns
Receiver Propagation Delay (high to low)	t_{RPHL}		127	200	ns	
$\|t_{RPLH} - t_{RPHL}\|$	t_{SKEW2}		3	30	ns	Fig 7,8
Receiver Enable to Output Low	t_{RZL}		20	50	ns	C_L = 100 pF, S1 Closed (Fig 9,10)
Receiver Enable to Output High	t_{RZH}		20	50	ns	C_L=100 pF, S2 closed (Fig 9,10)
Receiver Disable Time from Low	t_{RLZ}		20	50	ns	C_L=100 pF, S1 closed (Fig 9,10)
Receiver Disable Time from High	t_{RHZ}		20	50	ns	C_L =100 pF, S2 closed (Fig 9,10)
Receiver Enable from shutdown to Output High	$t_{RZH(SHDN)}$			3500	ns	C_L=100 pF, S2 close (Fig 9,10)
Receiver Enable from Shutdown to Output Low	$t_{RZL(SHDN)}$			3500	ns	C_L =100 pF, S1 closed (Fig 9,10)
Time to Shutdown	t_{SHDN}	50	200	600	ns	NOTE2

NOTE2：

The device is put into shutdown by bringing RE high and DE low. If the enable inputs are in this state for less than 50ns, the device is guaranteed not to enter shutdown. If the enable inputs are in this state for at least 600ns, the device is guaranteed to have entered shutdown.

SIT485E Function Tables：

TRANSMITTING				
CTR		INPUTS	OUTPUTS	
/RE	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	Z	Z
1	0	X	Z（Shutdown）	
X：Don’t care；Z：high impedance.				

RECEIVING			
CTR		INPUTS	OUTPUTS
/RE	DE	A-B	RO
0	X	≥-50mV	1
0	X	≤-200mV	0
0	X	Open/shorted	1
1	1	X	Z
1	0	X	Z（Shutdown）

Test Circuit

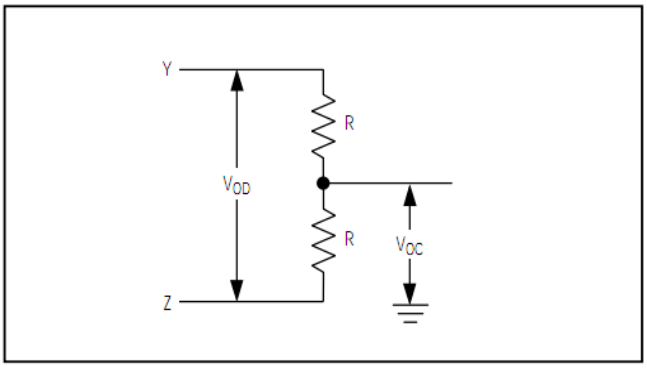


Fig2 Driver DC Test Load

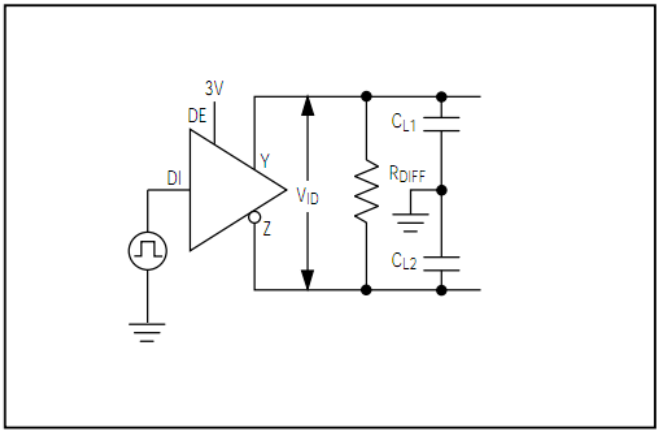


Fig 3 Driver Timing Test Circuit

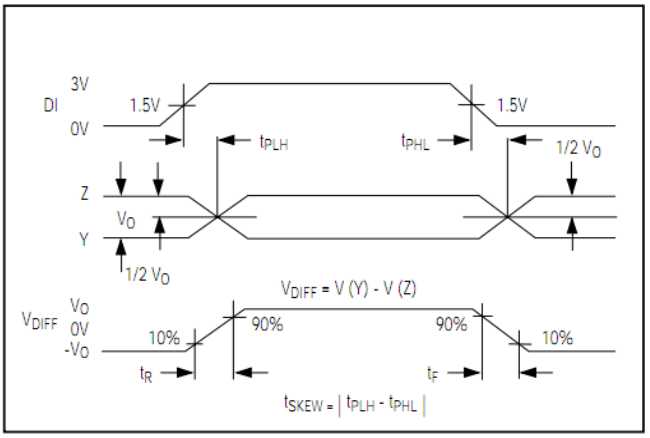


Fig 4 Driver Propagation Delays

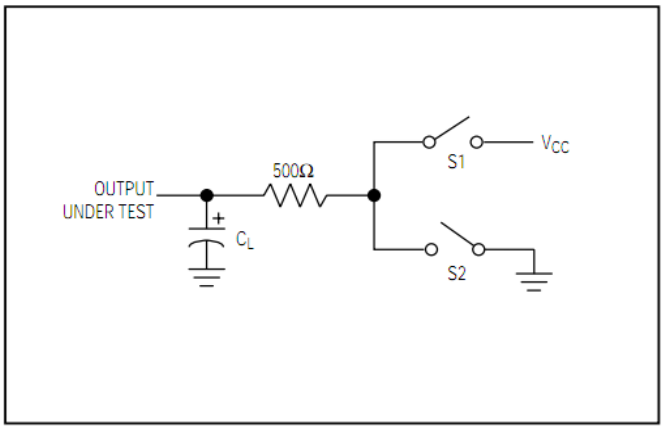


Fig 5 Driver Enable/Disable Timing Test Load

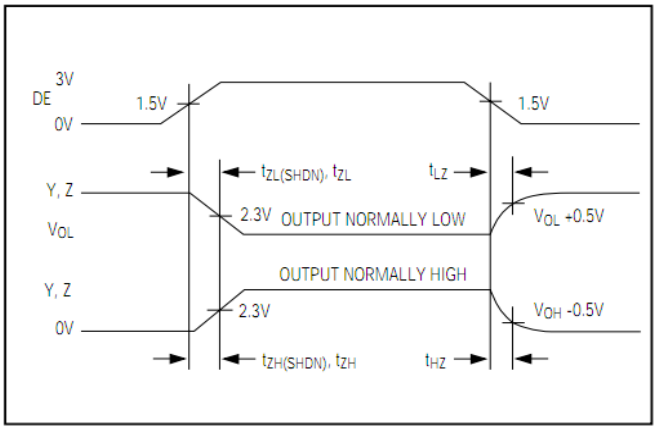


Fig 6 Driver Enable and Disable Times

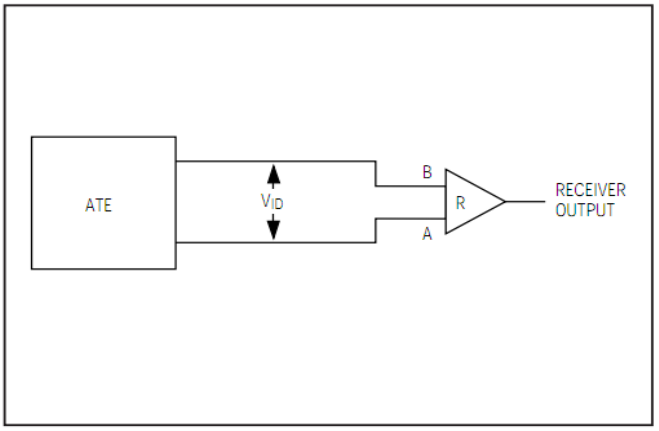


Fig 7 Receiver Propagation Delay Test Circuit

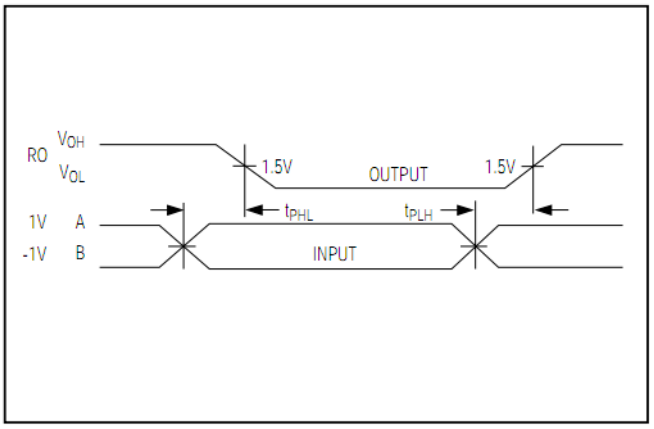


Fig 8 Receiver Propagation Delays

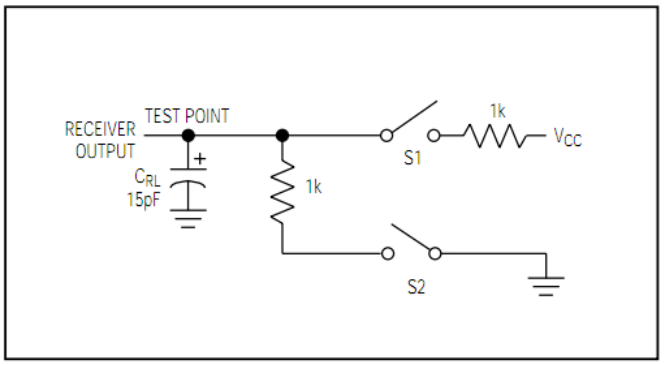


Fig 9 Receiver Enable/Disable Timing Test Load

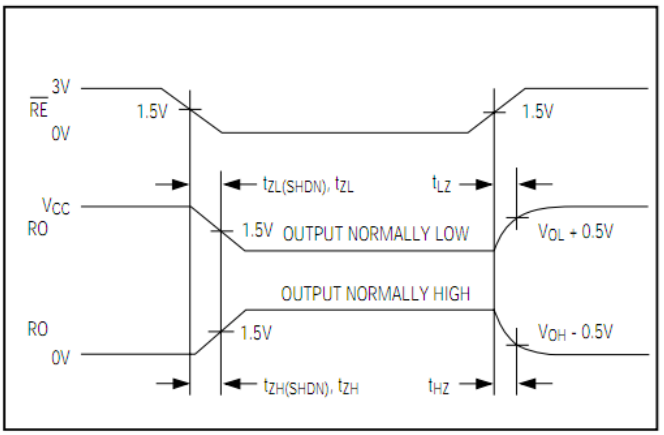


Fig 10 Receiver Enable and Disable Times

1 DESCRIPTION

SIT485E, including a driver and a receiver, is a half-duplex high-speed transceivers for RS-485 / RS-422 communications. SIT485E features fail-safe, overvoltage protection, overcurrent protection, thermal protection, and allows / RE, DE hot-swappable.

The SIT485E features reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 500kbps.

2 Fail Safe

When the receiver inputs are shorted or open, or when they are connected to a terminated transmission line with all drivers disabled, SIT485E guarantees a logic-high receiver output. This is done by the receiver input thresholds are set between -50mV and -200mV. If the differential receiver input voltage (A-B) ≥-50mV, RO is logic high; if the voltage (A-B) ≤-200mV, RO is logic low. When attached to the terminal all transmitters on the bus are disabled, the receiver differential input voltage is pulled to 0V by the termination resistor. With the receiver threshold of the SIT485E, this results in a logic-high with a 50mV minimum noise margin. The -50mV to -200mV threshold complies with the ±200mV EIA/TIA-485 standard.

3 Connecting 256 transceivers on one bus

The standard RS-485 receiver input impedance is 12kΩ (1 unit load), the standard driver can drive up to 32 unit loads. Receiver SIT485E transceiver has a 1/8 unit load receiver input impedance (96kΩ), allowing up to 256 transceivers to be connected in parallel on one bus. These devices can be any combination, or in combination with other RS-485 transceiver combination, as long as the total load does not load more than 32 units, can be connected on the same bus.

4 Reduce EMI and reflection

SIT485E low slew-rate drivers can reduce EMI, and reduce reflected by improperly terminated cables.

5 Drive Output Protection

Through two mechanisms to avoid failure or a bus contention causes power consumption is too high. First, in the entire common Mode voltage range, overcurrent protection circuit provides a fast short protection. Second, when the die temperature exceeds 150 ℃, driver output is forced into a high impedance state by the thermal shutdown circuit.

6 Typical applications

SIT485E transceiver is designed for multi-point bi-directional data communication bus transmission lines. Figure 11 shows a typical network application circuit. These devices can also be used as a cable longer than 4,000 feet of line repeater, to reduce the reflection, the transmission line should be in its ends terminated in its characteristic impedance, and stub lengths off the main line should be as short as possible.

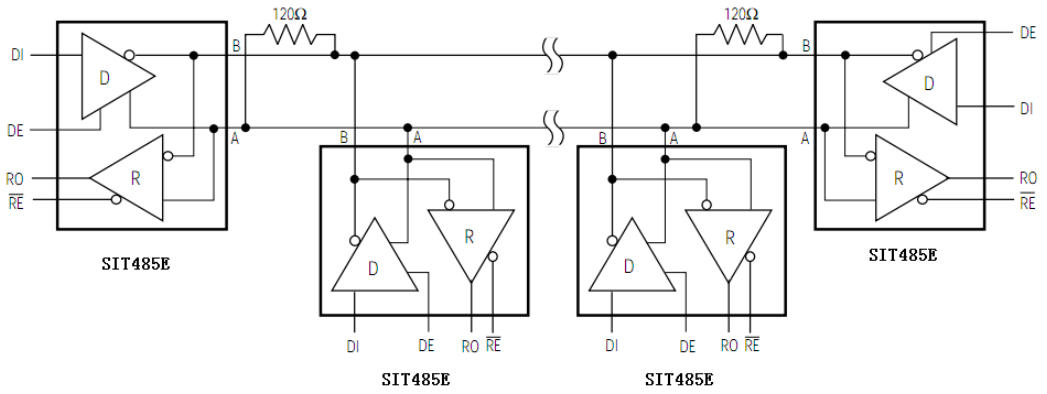
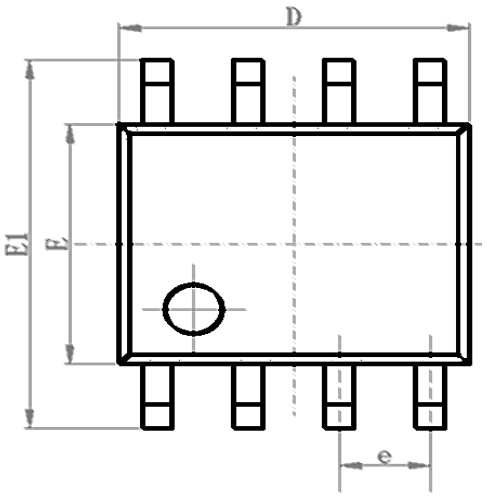
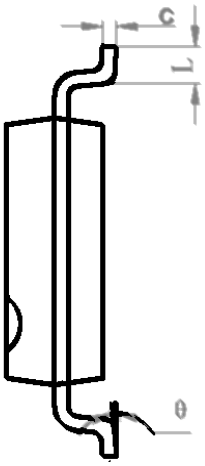


Fig11. A typical half-duplex RS485 communications network

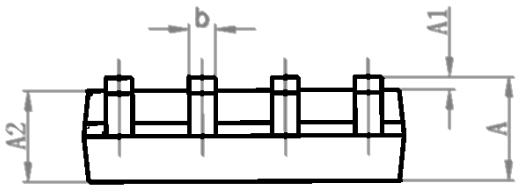
SO8 Package Outline：



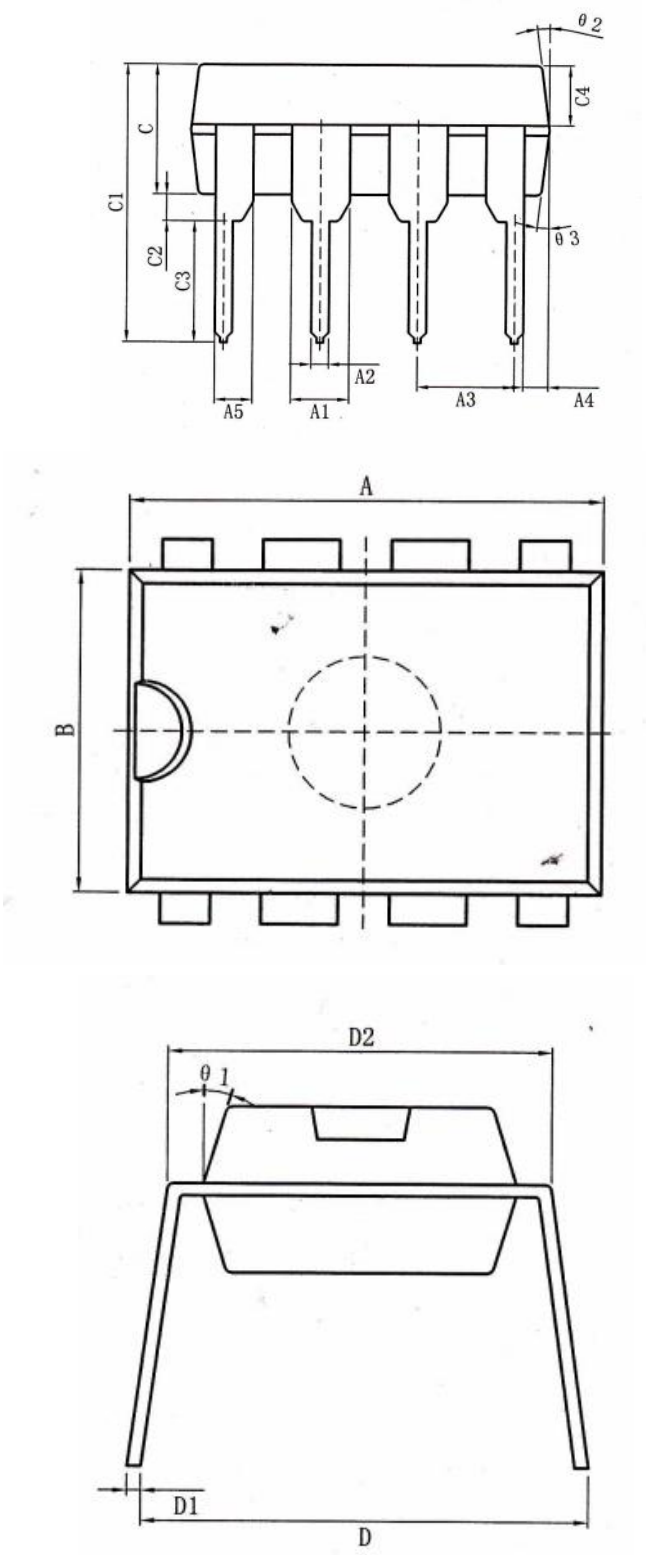


Package DIMENSIONS

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 **Package Outline：**



Symbol	Min/mm	Typ/mm	Max/mm
A	9.00		9.20
A1	1.474		1.574
A2	0.41		0.51
A3	2.44		2.64
A4		0.51 TYP	
A5		0.99 TYP	
B	6.10		6.30
C	3.20		3.40
C1	7.10		7.30
C2		0.50 TYP	
C3	3.20		3.40
C4	1.47		1.57
D	8.20		8.80
D1	0.244		0.264
D2	7.62		7.87
θ1		17° TYP4	
θ2		10° TYP4	
θ3		8° TYP4	