Features

- Meets the Requirements of TIA/EIA- 232-F and ITU V.28 Standards
- Wide Power Supply Range: Single +3V to +5.5V
- Two Drivers and Two Receivers
- Operates up to 250 kbps
- Requires Only Four External 0.1μF Capacitors
- ESD Protection for RS-232 Bus Pins
  ±15 kV (HBM)
  ±12 kV (IEC61000-4-2, Contact Discharge)
  ±15 kV (IEC61000-4-2, Air-Gap Discharge)

Description

The TPT3232E is IEC61000 ESD protected, 3.0V to 5.5V powered transceivers that meet the RS-232 standards for balanced communication. Each receiver converts TIA/RS-232 inputs to TTL/CMOS levels.

The devices have a typical threshold of 1.25V, a typical hysteresis of 0.3V, and can accept ±15V inputs. The device operates at data signaling rates up to 250 kbps. The TPT3232E is available in SOP16, SSOP16 and TSSOP16 package, and is characterized from –40°C to 125°C.

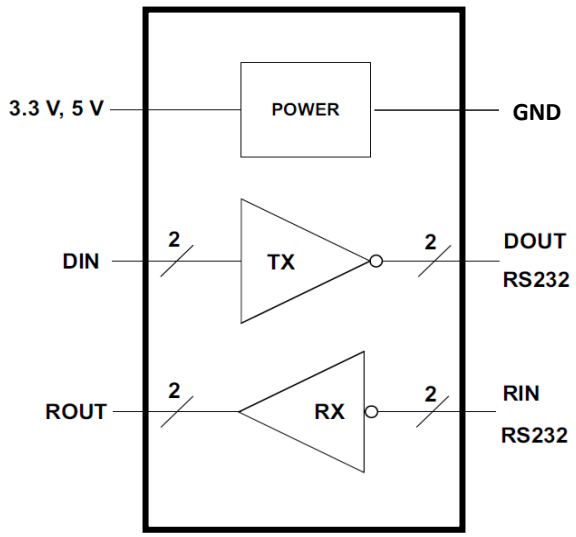
Applications

- Battery-Powered Equipment
- Industry Human Machine Interface
- Notebook, Computers
- Printers

Device Table

Device	Package	Body size
TPT3232E-SS3R	SSOP16	6.2 mm x 5.3 mm
TPT3232E-TS3R	TSSOP16	5.0 mm x 4.4 mm
TPT3232E-SO3R	SOP16	9.9 mm x 3.9 mm

Function Block



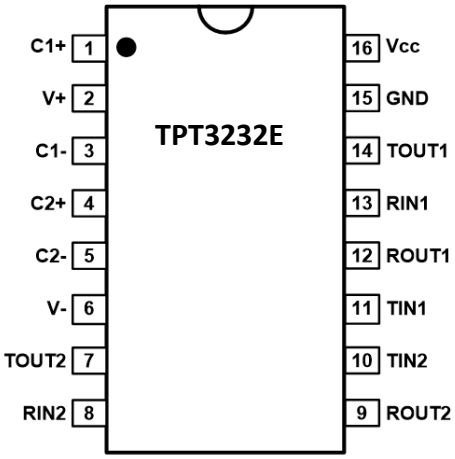
Revision History

Date	Revision	Notes
2019/02/22	Rev. Prelim	Definition Draft
2019/02/23	Rev. Prelim V0.2	Add SSOP16 package
2019/05/06	Rev. Prelim V0.3	Add order information
2019/06/24	Rev. Prelim V0.4	Add package and thermal information
2019/08/19	Rev. Prelim V0.5	Update ESD level
2019/10/21	Rev. 0	Final datasheet Rev. 0
2020/02/18	Rev. A	Update RIN1/2 voltage range
2020/04/24	Rev. B	Update C1~C4 recommended value
2021/06/02	Rev. B.1	Update HBM all pin: ±6 kV

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
TPT3232E-SS3R	-40 to 125°C	SS3R 16-Pin SSOP	3232E	MSL3	Tape and Reel, 2000
TPT3232E-TS3R	-40 to 125°C	TS3R 16-Pin TSSOP	3232E	MSL3	Tape and Reel, 3000
TPT3232E-SO3R	-40 to 125°C	SO3R 16-Pin SOP	3232E	MSL3	Tape and Reel, 2500

Pin Configuration and Functions



Pin No.	Symbol	I/O Type	Description
1	C1+		Positive lead of C1 capacitor
2	V+	Output	Positive charge pump output for storage capacitor only
3	C1-		Negative lead of C1 capacitor
4	C2+		Positive lead of C2 capacitor
5	C2-		Negative lead of C2 capacitor
6	V-	Output	Negative charge pump output for storage capacitor only
7	TOUT2	Output	Output of RS232 driver, RS232 level
8	RIN2	Input	Input of RS232 receiver, RS232 level
9	ROUT2	Output	Output of RS232 receiver, TTL/CMOS level
10	TIN2	Input	Input of RS232 driver, TTL/CMOS level
11	TIN1	Input	Input of RS232 driver, TTL/CMOS level
12	ROUT1	Output	Output of RS232 receiver, TTL/CMOS level
13	RIN1	Input	Input of RS232 receiver, RS232 level
14	TOUT1	Output	Output of RS232 driver, RS232 level
15	GND		Ground
16	V_{CC}		Supply voltage

Absolute Maximum Ratings

SYMBOL	DESCRIPTION	MIN	MAX	UNIT
V_{CC}	Supply voltage	-0.3	6	V
V+	Positive output supply voltage	-0.3	7	V
V–	Negative output supply voltage	-7	0.3	V
V+ – V–	Supply voltage difference		13	V
TIN1, TIN2	Input voltage of driver, TTL/CMOS level	-0.3	6	V
TOUT1, TOUT2	Output voltage of driver, RS232 level	-13.2	13.2	V
RIN1, RIN2	Input voltage of receiver, RS232 level	-15	15	V
ROUT1, ROUT2	Output voltage of receiver, TTL/CMOS level	-0.3	V_{CC} +0.3	V
T_J	Operating virtual junction temperature		150	°C

(1) Stresses beyond the *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*.

Thermal Resistance

PART NUMBER	PACKAGE TYPE	θ_{JA}	θ_{JC}	UNIT
TPT3232E -SS3R	16-Pin SSOP	103	45	°C/W
TPT3232E -TS3R	16-Pin TSSOP	115	48	°C/W
TPT3232E -SO3R	16-Pin SOP	91	43	°C/W

ESD Rating

		Value	UNIT
RS232 Bus Pin: TOUT1, TOUT2, RIN1, RIN2	HBM, Human body model	±15	kV
RS232 Bus Pin: TOUT1, TOUT2, RIN1, RIN2	IEC-61000-4-2, Contact Discharge	±12	kV
RS232 Bus Pin: TOUT1, TOUT2, RIN1, RIN2	IEC-61000-4-2, Air-Gap Discharge	±15	kV
All Pin except RS232 Bus Pin	HBM, Human body model	±6	kV
All Pin	CDM, Charge device model	±1.5	kV

Electrical Characteristics

The following specifications apply for V_{CC} = 3.0V to 3.6V, 4.5 to 5.5V, C1 - C4 = 0.2μF, T_A = -40°C to 125°C, unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Units
DC Characteristics					
Icc = Supply Current	no load, VCC = 3.3V, TINx = GND or V_{CC}, T_A = 25°C		1.2	15	mA
Logic Inputs and Receiver Outputs					
Input Voltage of Logic Low	TIN1, TIN2			0.8	V
Input Voltage of Logic High	TIN1, TIN2, V_{CC} = 3.3V	2			V
Input Voltage of Logic High	TIN1, TIN2, V_{CC} = 5.0V	2.4			V
Input Leakage Current	TIN1, TIN2, V_{IN} = 0V to V_{CC}, T_A = 25°C	-1		15	μA
Output Leakage Current	Rout1,Rout2, VCC=3.3V	-15		10	uA
Output Voltage Low	I_{OUT} = -1.5mA			0.3	V
Output Voltage High	I_{OUT} = 1.5mA	V_{CC}-0.3			V
Driver Outputs					
Output Voltage Swing	R_L = 3kΩ, TINx = GND	±5.0	±5.4		V
Output Resistance	V_{CC} = V+ = V- = 0V, TOUTx=+2V, note1		2.4M		Ω
Output Short-Circuit Current	V_{OUT} = 0V	-60		60	mA
Receiver Inputs					
Input Voltage Range		-15		15	V
Input Threshold Low	V_{CC} = 3.3V,	0.6	1.30		V
	V_{CC} = 5.0V	0.8	1.30		
Input Threshold High	V_{CC} = 3.3V,		1.60	2.4	V
	V_{CC} = 5.0V		1.60	2.4	
Input Hysteresis			0.3		V
Input Resistance	note1	3	5	7	kΩ
Timing Characteristics					
Maximum Data Rate	R_L = 3kΩ, C_L = 1000pF, one driver switching, Note1			250	kbps
Driver Propagation Delay, high to low output, t_{DPHL}	Driver input to receiver output, C_L = 150pF		700	1000	ns
Driver Propagation Delay, low to high output, t_{DPLH}	Driver input to receiver output, C_L = 150pF		500	700	ns
Driver Skew	$\lvert t_{DPHL} - t_{DPLH} \rvert$		200	400	ns
Transition-Region Slew Rate	Vcc = 3.3V, R_L = 3kΩ, C_L = 1000pF, T_A = 25°C, note1	6	10	30	V/μs
Receiver Propagation Delay, high to low output, t_{RPHL}	Receiver input to receiver output, C_L = 150pF		180	300	ns
Receiver Propagation Delay, low to high output, t_{RPLH}	Receiver input to receiver output, C_L = 150pF		210	400	ns
Receiver Skew	$\lvert t_{RPHL} - t_{RPLH} \rvert$		30	100	ns

Note1: based on Bench characterization and design simulation

Note2: Icc =3mA with no load; and Icc=15mA with max load, R_L = 3kΩ, C_L = 1000pF

Parameter Measurement Information

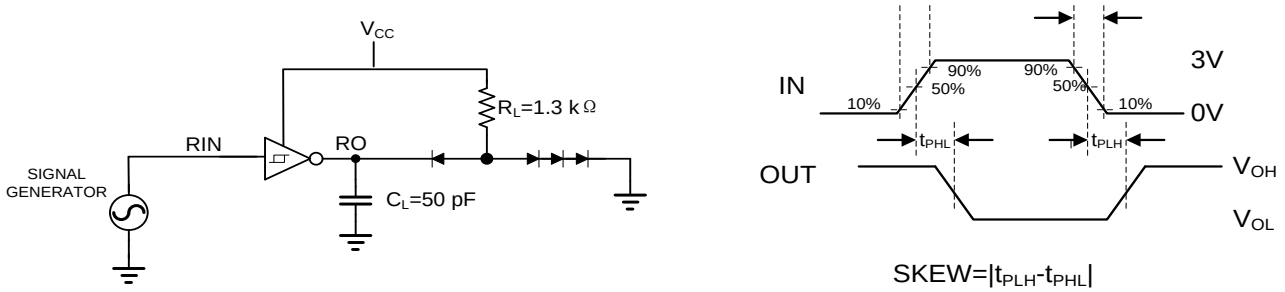


Figure 1 Receiver Propagation Delay and Receiver Skew

Typical Application Circuit

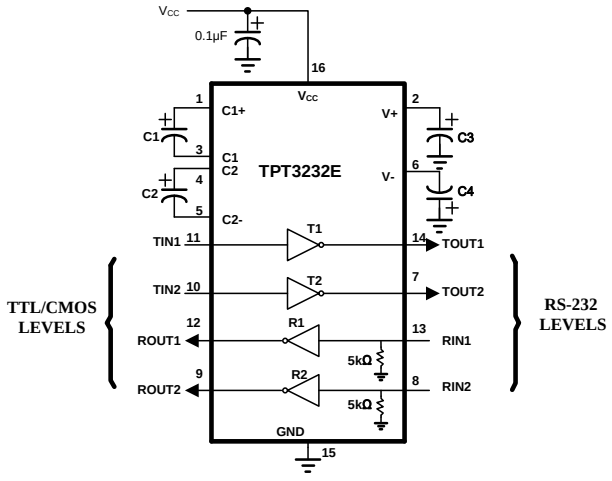


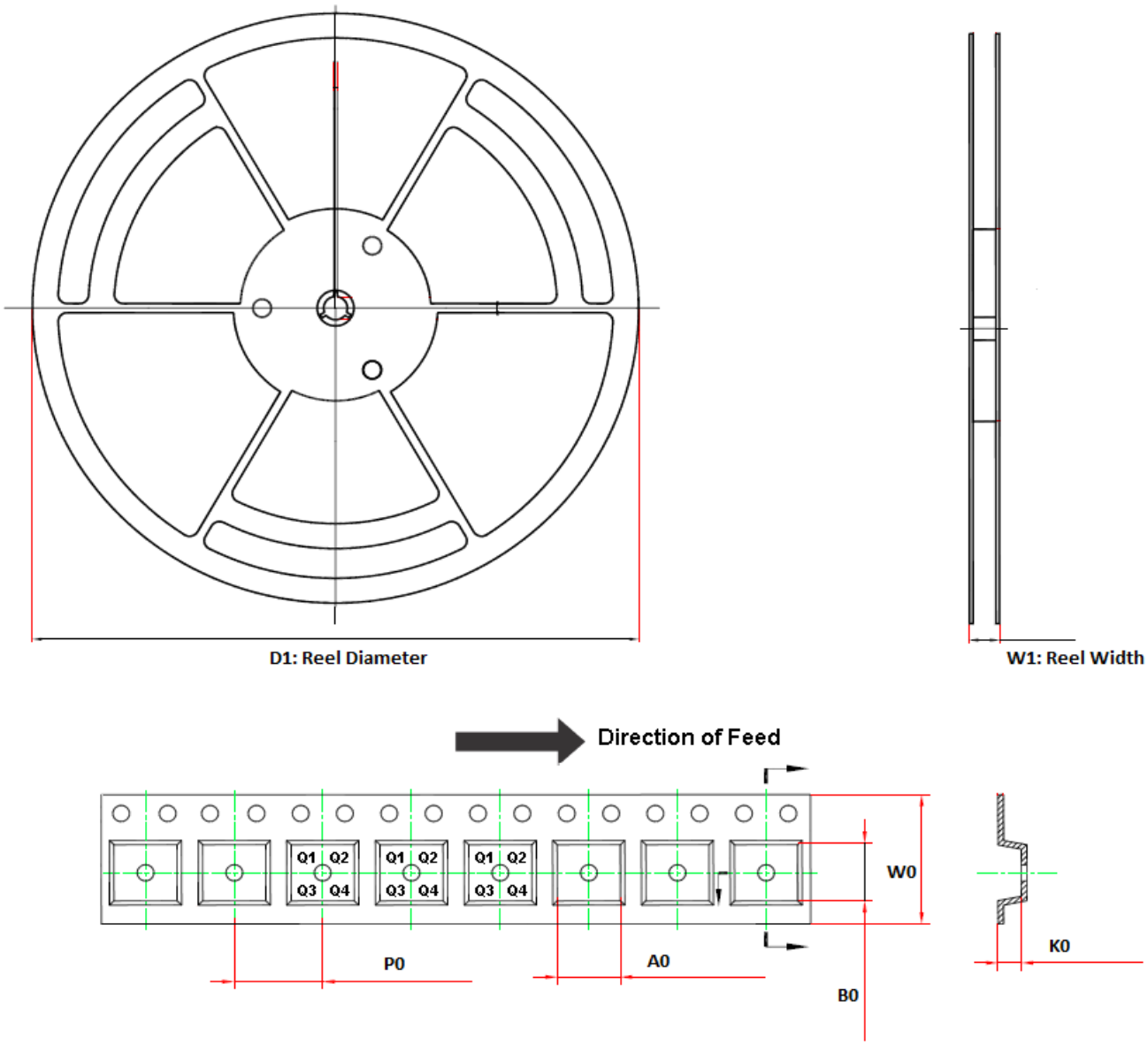
Figure 1 Typical application circuit

Non-polarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown in Figure 1. The recommended capacitor value of C1 to C4 is in Table 1. All cap is 0.2uF for TPT3232E

V_{CC}(V)	C1(μF)	C2, C3, C4(μF)
3.0 to 3.6	0.2	0.1
4.5 to 5.5	0.1	0.1
3.0 to 5.5	0.2	0.2

Table 1 Required Minimum Capacitor Values

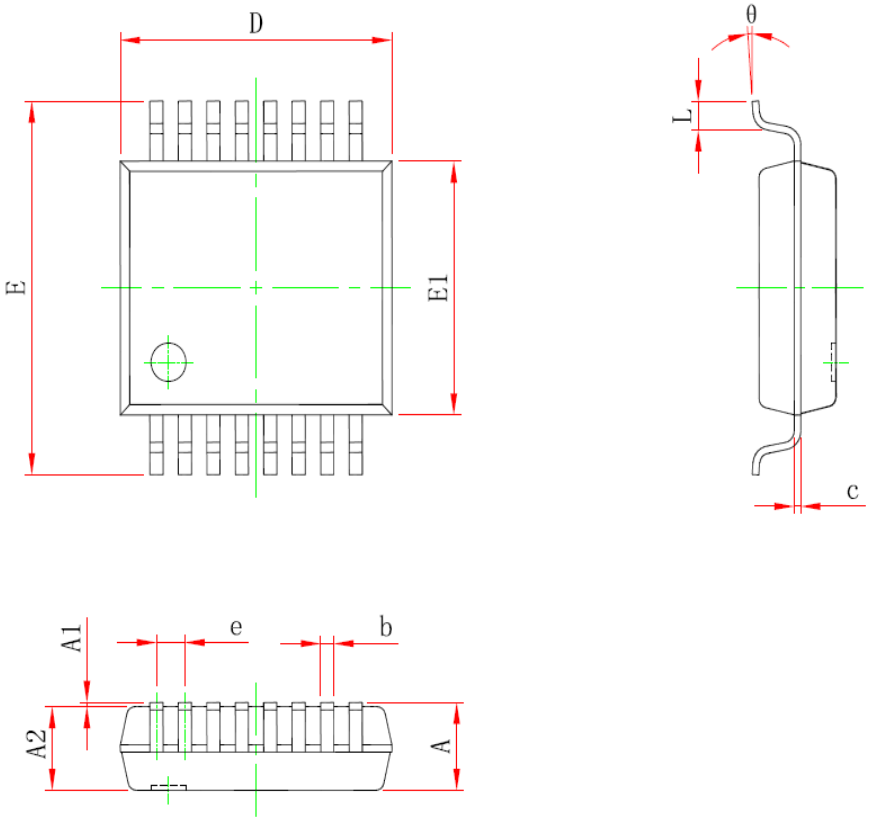
Tape and Reel Information



Order Number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 Quadrant
TPT3232E-SO3R	SOP16	330	21.6	6.7±0.1	10.4±0.1	2.1±0.1	8.0±0.1	16.0±0.3	Q1
TPT3232E-TS3R	TSSOP16	330	17.6	6.8±0.1	5.4±0.1	1.3±0.1	8.0±0.1	12.0±0.1	Q1
TPT3232E-SS3R	SSOP16	330	21.6	8.5	6.8	2.37	12.00	16.00	Q1

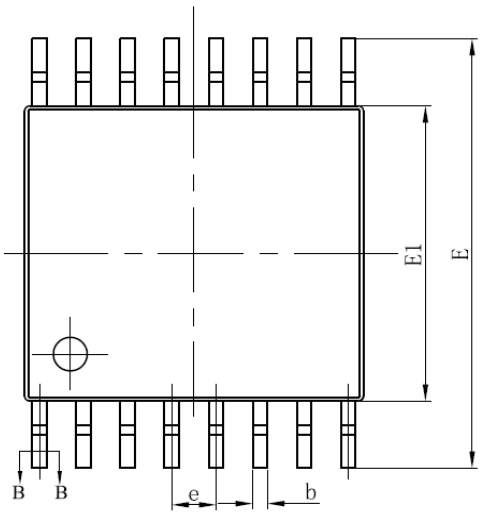
Package Outline Dimensions

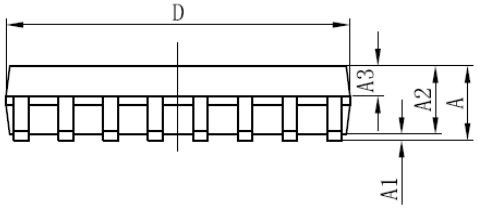
SS3R (SSOP16)

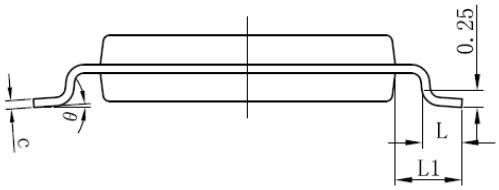


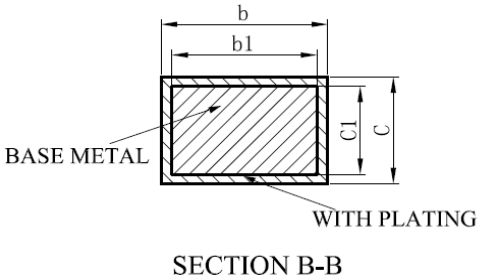
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	——	2.000	——	0.079
A1	0.050	——	0.002	——
A2	1.650	1.850	0.065	0.073
b	0.220	0.380	0.009	0.015
c	0.090	0.250	0.004	0.010
D	5.900	6.500	0.232	0.256
E	7.400	8.200	0.291	0.323
E1	5.000	5.600	0.197	0.220
e	0.650(BSC)		0.026(BSC)	
L	0.550	0.950	0.022	0.037
θ	0°	8°	0°	8°

TS3R (TSSOP16)





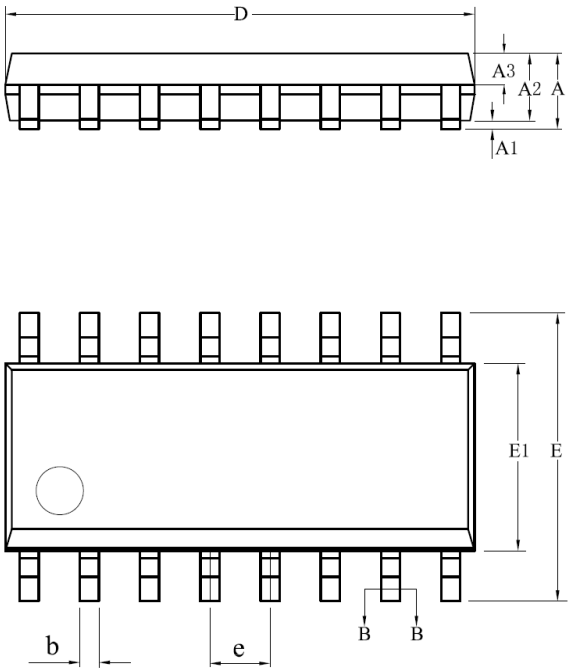




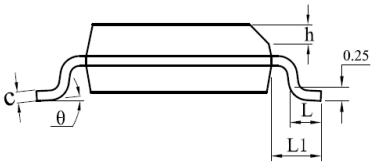
SECTION B-B

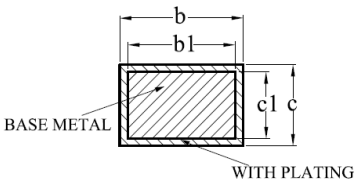
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	—	0.28
b1	0.19	0.22	0.25
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	4.90	5.00	5.10
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00BSC		
θ	0	—	8°

SO3R (SOP16)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°





SECTION B-B

单击下面可查看定价，库存，交付和生命周期等信息

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