

钍地半导体
Tudi Semiconductor

Product Specification

TUDI-ADM202E

EMI/EMC-Compliant, ±15 kV, ESD-Protected
RS-232 Line Drivers/Receivers

网址 www.sztdbdt.com

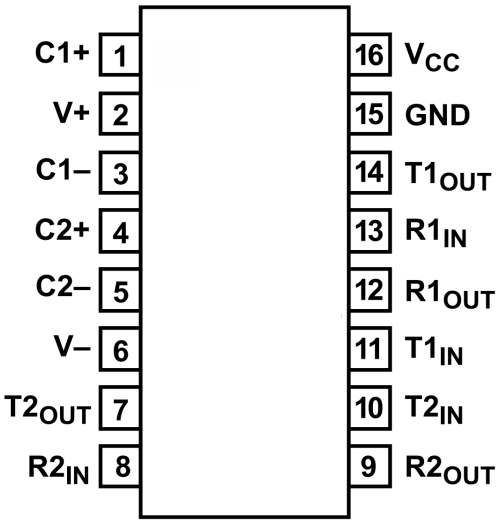
用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

FEATURES

- Complies with 89/336/EEC EMCdirective
- ESD protection to IEC1000-4-2 (801.2)
- ±8 kV: contact discharge
- ±15 kV: air-gap discharge
- ±15 kV: human body model
- EFT fast transient/burst immunity (IEC1000-4-4)
- Low EMI emissions (EN55022)
- 230 kbits/s data rate guaranteed
- TSSOP package option
- Upgrade for MAX202E, 232E



SOP16/DIP16/TSSOP16

DESCRIPTION

The ADM202E is a robust, high speed,2-channel RS-232/V.28 interface device that operates from asingle 5 V power supply. The product is suitable for operationin harsh electrical environments and is compliant with the EUdirective on EMC (89/336/EEC). Both the level of electromagneticemissions and immunity are in compliance. EM immunityincludes ESD protection in excess of ±15 kV on all I/O lines,fast transient/burst protection (IEC1000-4-4), and radiatedimmunity (IEC1000-4-3). EM emissions include radiated andconducted emissions as required by Information TechnologyEquipment EN55022, CISPR22.

The ADM202E conforms to the EIA-232Eand CCITT V.28 specifications and operates at data rates upto 230 kbps.

Four external 0.1 µF charge-pump capacitors are used for the voltage doubler/inverter, permitting operation from a single5 V supply.

The ADM202E provides a robust pin-compatible upgrade for existing ADM202, ADM232L, or MAX202E/MAX232E sockets.

APPLICATIONS

- General-purpose RS-232 data link
- Portable instruments
- PDAs

ABSOLUTE MAXIMUM RATINGS

T_A= 25°C, unless otherwise noted.

Table 1.

Parameter	Values
Vcc	-0.3Vto +6V
V+	(Vcc-0.3V)to +14V
V-	+0.3 Vto-14V
Input Voltages	
T_{IN}	0.3 V to(V+,+0.3V)
R_{IN}	±30V
Output Voltages	
T_{OUT}	±15V
R_{OUT}	-0.3 Vto(Vcc+0.3 V)
Short-Circuit Duration	
T_{OUT}	Continuous
Power Dissipation N-16	450 mW
(Derate 6mW/Above 50)	
θ_{JA},Thermal Impedance	117/W
Power Dissipation R-16	450 mW
(Derate 6mW/Above 50)	
θ_{JA},Thermal Impedance	158/W
Power Dissipation RU-16	500 mW
(Derate 6mW/ Above 50)	
θ_{JA},Thermal Impedance	158/W
Operating Temperature Range	
Industrial(A Version)	-40 to +85
Storage Temperature Range	-65 to+150
Lead Temperature (Soldering,10 sec)	300
ESD Rating(MIL-STD-883B)(I/O Pins)	±15kV
ESD Rating(IEC1000-4-2 Air)(I/O Pins)	±15kV
ESD Rating(IEC1000-4-2 Contact)(I/O Pins)	±8 kV
EFT Rating(IEC1000-4-4)(I/O Pins)	±2 kV

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

SPECIFICATIONS

V_{CC}= 5.0 V ± 10%, C1 to C4 = 0.1 µF. All specifications T_{MIN} to T_{MAX}, unless otherwise noted.

Table 2.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
DC CHARACTERISTICS					
Operating Voltage Range	4.5	5.0	5.5	V	
V_{CC} Power Supply Current		2.5	6.0	mA	No load
		13	18	mA	R_L=3kΩ to GND
LOGIC					
Input Logic Threshold Low,V_{INL}			0.8	V	T_{IN}
Input Logic Threshold High,V_{INH}	2.4			V	T_{IN}
CMOS Output Voltage Low,V_{OL}			0.4	V	I_{OUT}=3.2 mA
CMOS Output Voltage High, V_{OH} Logic Pull-Up Current	3.5			V	I_{OUT} =-1 mAT_{IN}=0V
		+12	±25	µA	
RS-232 RECEIVER					
EIA-232 Input Voltage Range	-30		+30	V	
EIA-232 Input Threshold Low	0.4	1.2		V	
EIA-232 Input Threshold High		1.6	2.4	V	
EIA-232 Input Hysteresis		0.65		V	
EIA-232 Input Resistance	3	5	7	kΩ	T_A=0℃ to 85℃
RS-232 TRANSMITTER					
Output Voltage Swing	±5.0	±9.0		V	All transmitter outputs loaded with 3kΩ toground
Transmitter Output Resistance	300			KΩ	V_{cc}=0V,V_{OUT}=±2V
RS-232 Output Short-Circuit Current		± 10	± 60	mA	
TIMING CHARACTERISTICS					
Maximum Data Rate	230			kbps	R_L=3kΩ to 7 kΩ,C_L=50 pF to 1000 pF
Receiver Propagation Delay					
T_{PHL}		0.1	1	µs	
T_{PLH}		0.3	1	µ s	
Transmitter Propagation Delay		1.0	1.5	µ s	R_L=3 kΩ,C_L=1000 pF
Transition Region Slew Rate	3	8	30	V/µs	R_L=3kΩ,C_L=1000pF Measured from+3V to-3V,or-3V to+3V

Table 2.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
EM IMMUNITY					
ESD Protection(I/O Pins)		±15		kV	Human body model
		±15		kV	IEC1000-4-2 air discharge
		± 8 kV		kV	IEC1000-4-2 contact discharge
EFT Protection(I/O Pins)		±2		kV	IEC1000-4-4
EMI Immunity		10		V/m	IEC1000-4-3

Table 3. Pin Function Descriptions

Pin No.	Mnemonic	Description
16	V_{CC}	Power Supply Input:5V±10%.
2	V+	Internally Generated Positive Supply(+9Vnominal).
6	V-	Internally Generated Negative Supply(-9 Vnominal).
15	GND	Ground Pin.Must be connected to 0V.
1,3	C1+,C1-	External Capacitor 1 is connected between these pins.A 0.1 μF capacitor is recommended,but largercapacitors of up to 47μF can be used.
4,5	C2+,C2-	External Capacitor 2 is connected between these pins.A 0.1 μF capacitor is recommended,but largercapacitors of up to 47μF can be used.
10,11	T_{IN}	Transmitter(Driver)Inputs.These inputs accept TTL/CMOS levels.
7,14	T_{OUT}	Transmitter(Driver)Outputs.These are RS-232 signal levels (typically±9V).
8,13	R_{IN}	Receiver Inputs.These inputs accept RS-232 signal levels.An internal 5 kΩ pull-down resistor to GND isconnected on each input.
9,12	R_{OUT}	Receiver Outputs.These are CMOS output logic levels.

CIRCUIT DESCRIPTION

The internal circuitry consists of four main sections:

- A charge-pump voltage converter
- 5 V logic to EIA-232 transmitters
- EIA-232 to 5 V logic receivers.
- Transient protection circuit on all I/O lines

Charge-Pump DC-to-DC Voltage Converter

The charge-pump voltage converter consists of a 200 kHz oscillator and a switching matrix. The converter generates a ±10 V supply from the input 5 V level. This is done in two stages, using a switched capacitor technique, as illustrated in Figure 6 and Figure 7. First, the 5 V input supply is doubled to 10 V, using Capacitor C1 as the charge storage element. The 10 V level is then inverted to generate 10 V, using C2 as the storage element.

Capacitor C3 and Capacitor C4 are used to reduce the output ripple. Their values are not critical and can be increased if desired. On the ADM202E, capacitor C3 is connected between V+ and VCC. Larger capacitors (up to 47 µF) can be used for capacitor C1 to capacitor C4 if desired. This facilitates direct substitution with older generation charge-pump RS-232 transceivers.

Receiver Section

The receivers are inverting level shifters that accept RS-232 input levels and translate them into 5 V logic output levels. The inputs have internal 5 kΩ pull-down resistors to ground and are also protected against overvoltages of up to ±30 V. Unconnected inputs are pulled to 0 V by the internal 5 kΩ pull-down resistor. Therefore, unconnected inputs and those connected to GND have a Logic 1 output level.

The receivers have Schmitt-trigger inputs with a hysteresis level of 0.65 V. This ensures error-free reception for both noisy inputs and inputs with slow transition times.

HIGH BAUD RATE

The ADM202E feature high slew rates, permitting data transmission at rates well in excess of the EIA/RS-232-E specifications. RS-232 voltage levels are maintained at data rates of up to 230 kbps , even under worst case loading conditions. This allows for high speed data links between two terminals and is also suitable for the new generation ISDN modem standards, which require data rates of 230 kbps. The slew rate is internally controlled to less than 30 V/µs to minimize EMI interference.

Transmitter (Driver) Section

The drivers convert 5 V logic input levels into RS-232 output levels. When driving an RS-232 load with VCC= 5 V, the output voltage swing is typically ±9 V.

ESD/EFT TRANSIENT PROTECTION SCHEME

The ADM202E use protective clamping structures on all inputs and outputs to clamp the voltage to a safe level and dissipate the energy present in electrostatic (ESD) and electrical fast transients (EFT) discharges. A simplified schematic of the protection structure is shown in Figure 8 and Figure 9. Each input and output contains two back-to-back high speed clamping diodes. During normal operation with maximum RS-232 signal levels, the diodes have no effect because one or the other is reverse biased depending on the polarity of the signal. However, if the voltage exceeds about 50 V in either direction, reverse breakdown occurs and the voltage is clamped at this level. The diodes are large p-n junctions that are designed to handle instantaneous current surges that exceed several amperes.
The transmitter outputs and receiver inputs have a similar protection structure. The receiver inputs can dissipate some of the energy through the internal 5 kΩ resistor to GND, as well as through the protection diodes.
The protection structure achieves ESD protection up to ±15 kV and EFT protection up to ±2 kV on all RS-232 I/O lines. The methods used to test the protection scheme are discussed in the ESD Testing (IEC1000-4-2) and Fast Transient/Burst Testing (IEC1000-4-4) sections.

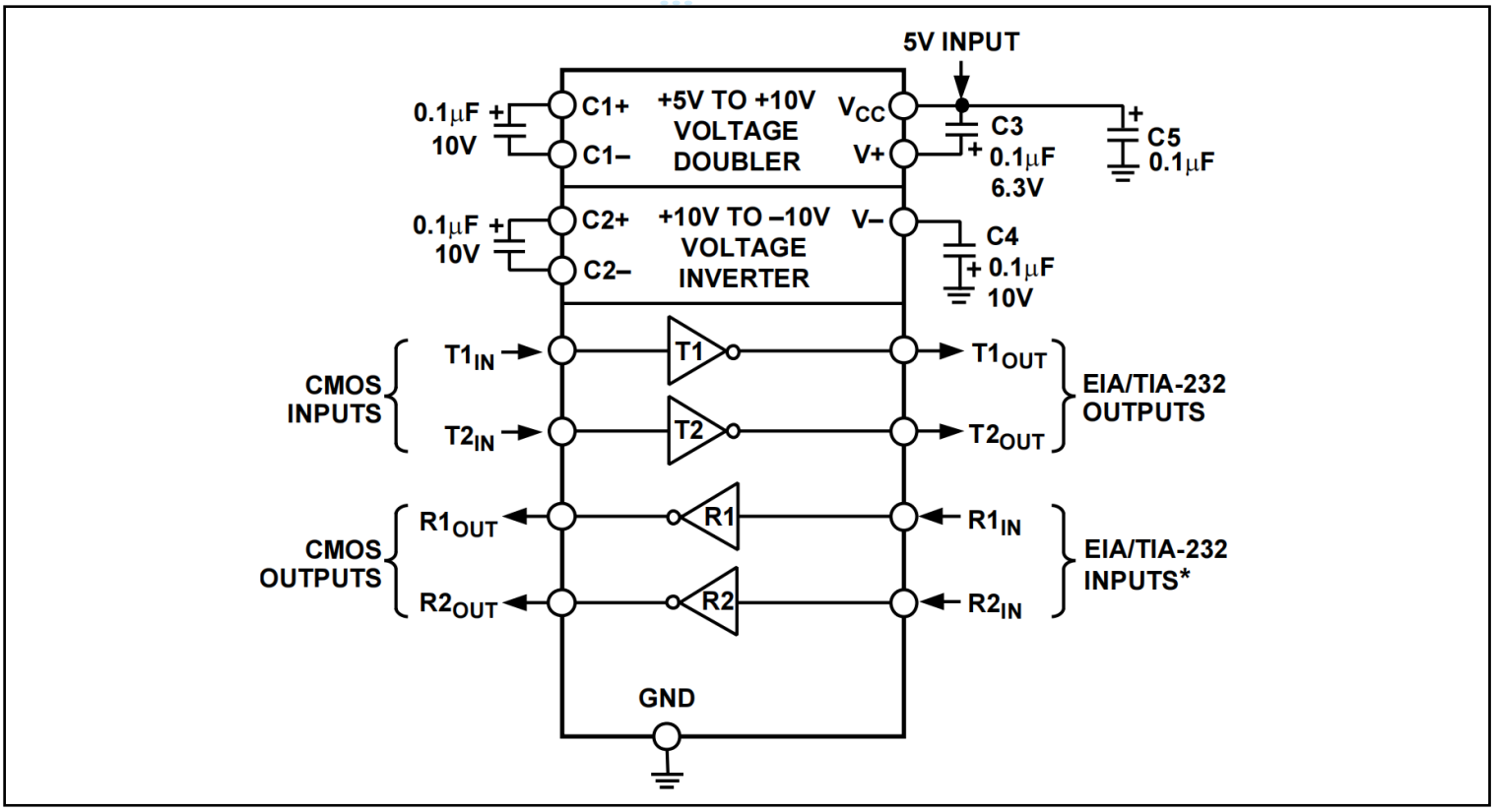


Figure 1.FUNCTIONAL BLOCK DIAGRAMS

*INTERNAL 5kΩ PULL-DOWN RESISTOR ON EACH RS-232 INPUT

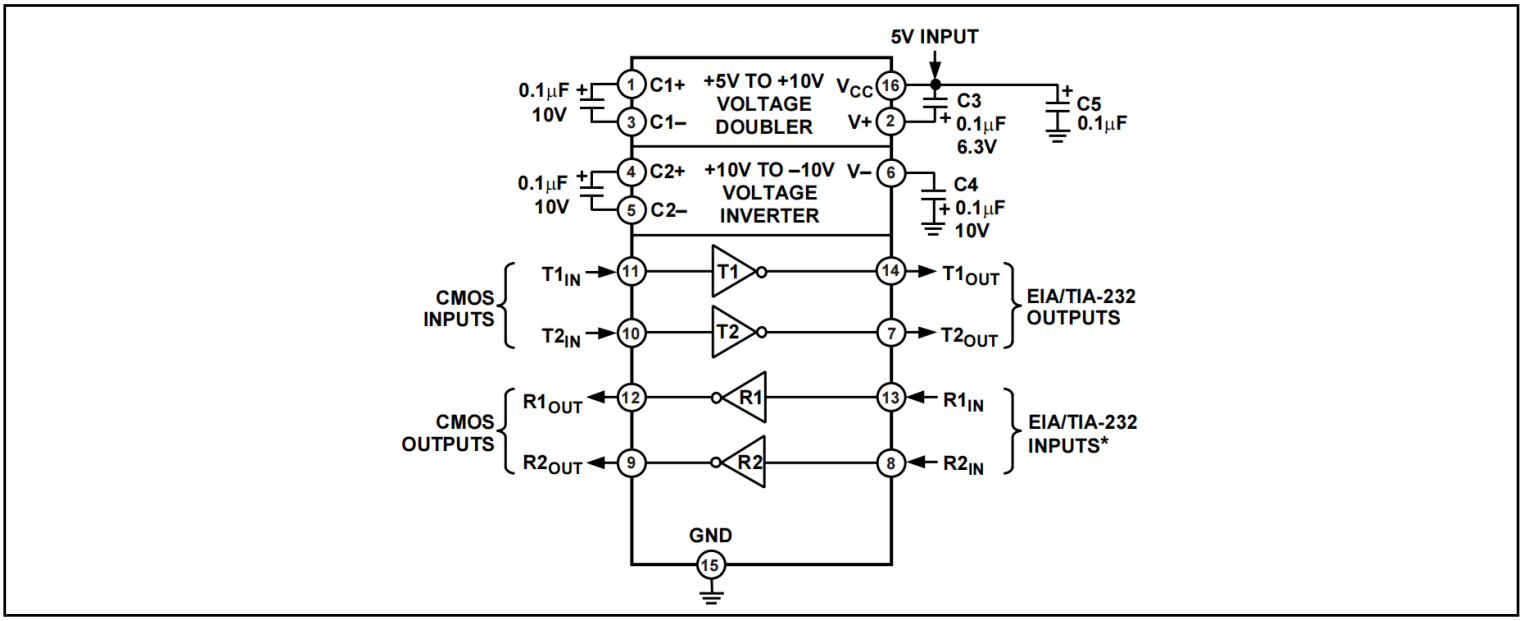


Figure 2. ADM202E Typical Operating Circuit

*INTERNAL 5kΩ PULL-DOWN RESISTOR ON EACH RS-232 INPUT

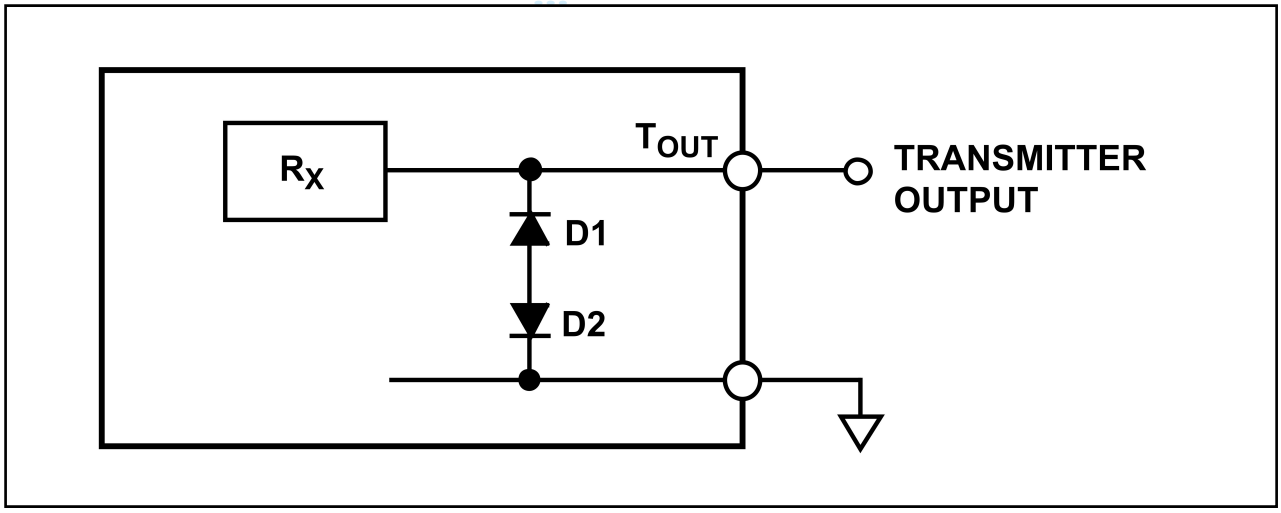


Figure 3. Receiver Input Protection Scheme

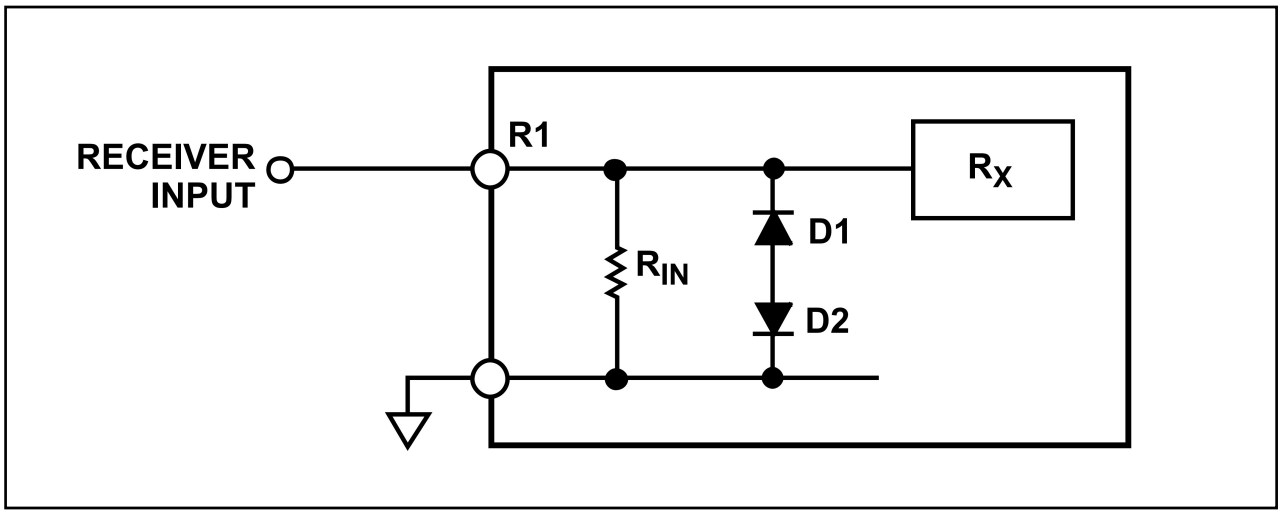


Figure 4. Transmitter Output Protection Scheme

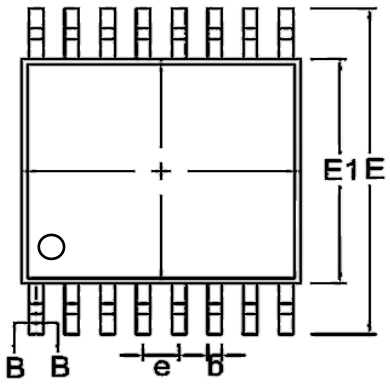
Order information

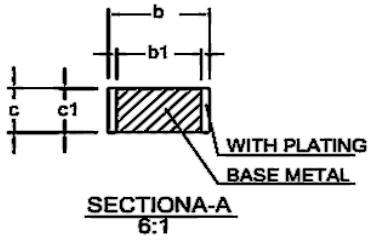
Order Number	Package	Package Quantity	Marking On The park	Temperature
ADM202EANZ-TUDI	DIP16	Tube,25,A box of 1000	ADM202EANZ	−40°C to +85°C
ADM202EARNZ-REEL-TUDI	SOP16	Tape,Reel,4000	ADM202EA	
ADM202EARUZ-REEL-TUDI	TSSOP16	Tape,Reel,4000	ADM202E	

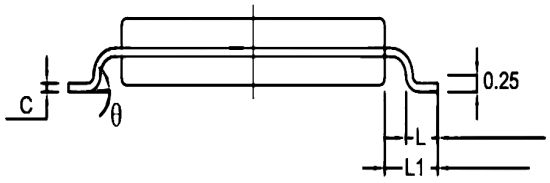
Revision history

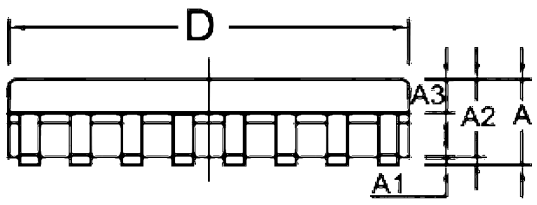
	Date	Revision	Page
V1.0	2023/7	New	1-14

Package TSSOP16



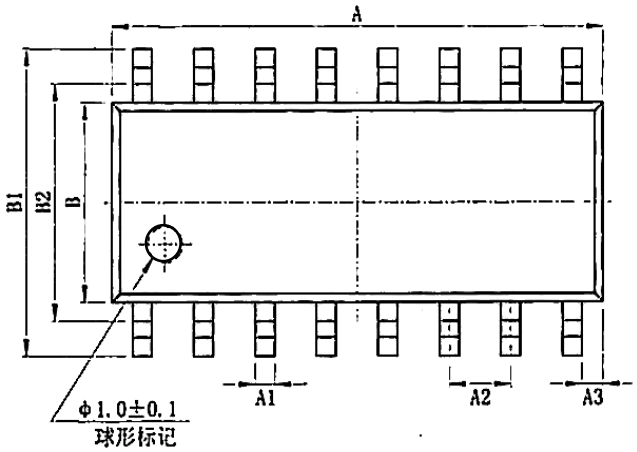


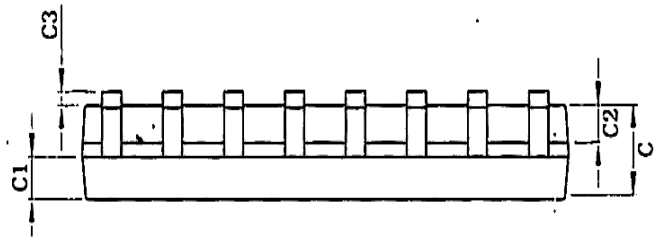


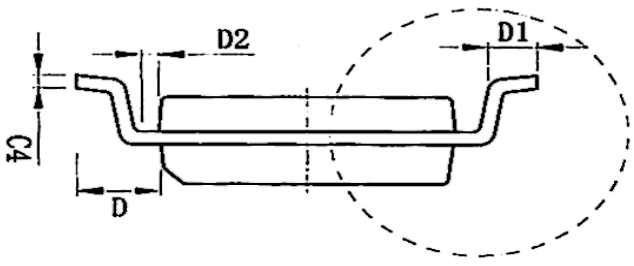


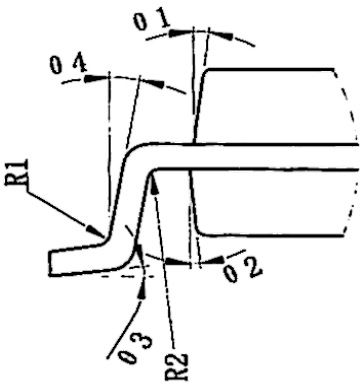
SIZE / SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	--	--	1.20
A1	0.05		0.15
A2	0.90	1.00	1.05
b	0.20	--	0.30
b1	0.19	0.22	0.25
C	0.110	0.127	0.145
cl	0.12	0.13	0.14
D	4.86	4.96	5.06
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00BSC		
	0°	--	8°

Package SOP16



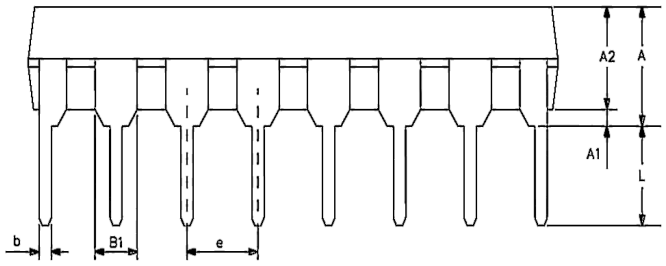


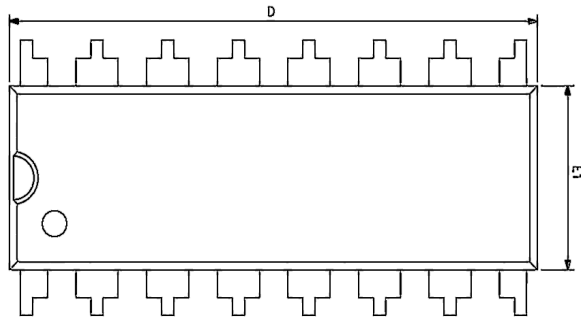


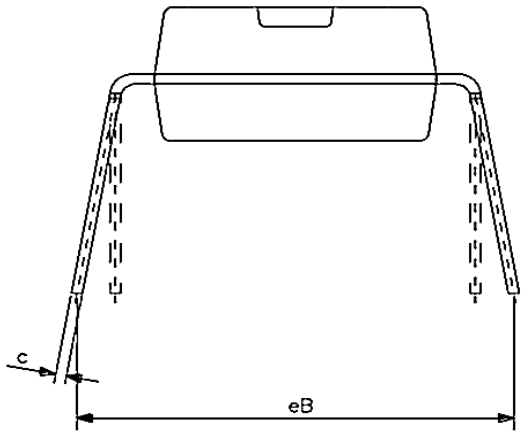


SIZE / SYMBOL	MIN./mm	MAX./mm
A	9.80	10.00
A1	0.356	0.456
A2	1.27TYP	
A3	0.302TYP	
B	3.85	3.95
B1	5.84	6.24
B2	5.00 TYP	
C	1.40	1.60
C1	0.61	0.71
C2	0.54	0.64
C3	0.05	0.25
C4	0.203	0.233
D	1.05 TYP	
D1	0.40	0.70
D2	0.15	0.25
R1	0.20TYP	
R2	0.20TYP	
01	8°~12°TYP4	
02	8°~12°TYP4	
03	0°~8°	
04	4°~12°	

Package DIP16







SIZE / SYMBOL	MIN./mm	MAX./mm
A2	3.20	3.60
A1	0.51	___
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
C	0.20	0.36
eB	7.62	9.30
R	0.20TYP	
R1	0.30TYP	
θ	0°	8°
θ1	45°TYP	
02	12°TYP	
03	0°	8°
04	0°	10°

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