钛地半导体
Tudi Semiconductor

Product Specification

TUDI-MAX3232

3V to 5.5V multi-channel RS-232 line driver and receiver with ±15kV E protection function

网址 www.sztdbdt.com

用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features

● RS-232 bus line ESD protection greater than ± 15kV Human Body Model (HBM)
● Meets or exceeds of TIA/EIA-232-F and ITU V.28
● Powered from 3V to 5.5V VCC supply
● rates up to 250kbit/s
● Two drivers and two receivers
● Low power current: 300μA (typical)
● capacitors: 4 × 0.1μF
● Accepts 5V logic inputs and 3.3V power
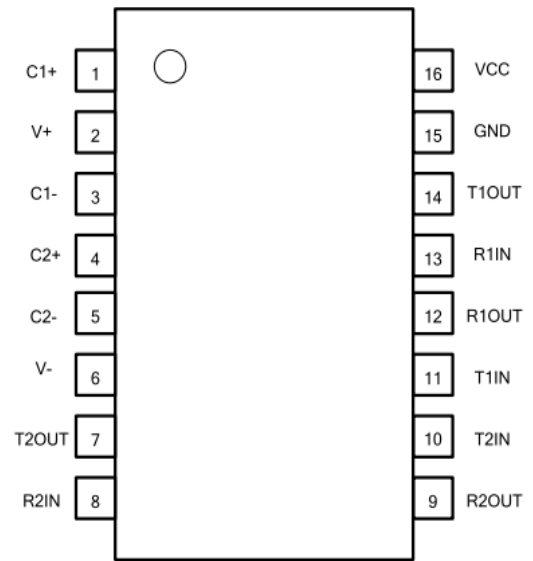
Figure 1. Pin Diagram

Description

The MAX3232 device contains two line drivers, two line receivers, and a dual-path charge pump circuit with ±15kV E protection between terminals (serial port connector terminals including GND). The device meets the requirements of TIA/EIA-232-F and provides an electrical interface asynchronous communication controllers and serial port connectors. The charge pump and four small external capacitors support single 3V to 5.5V power supply. The device operates at signal transmission rates up to 250kbit/s and the driver output slew rate is maximized at 30V/μs.

Applications

● Industrial PC
● Wired network
● Data center and enterprise-level networking
● Battery-powered system
● PDA
● Notebook computer? Portable computer
● Handheld computer
● Handheld device

Pin description

PIN	SYMBOL	DESCRIPTION
1	C1+	Positive Terminal for the first Charge Pump Capacitor
2	V+	Doubled Voltage Terminal
3	C1-	Negative Terminal for the first Charge Pump Capacitor
4	C2+	Positive Terminal for the second Charge Pump Capacitor
5	C2-	Negative Terminal for the second Charge Pump Capacitor
6	V-	Inverted Voltage Terminal
7	T2OUT	Second Transmitter Output Voltage
8	R2IN	Second Receiver Input Voltage
9	R2OUT	Second Receiver Output Voltage
10	T2IN	Second Transmitter Input Voltage
11	T1IN	First Transmitter Input Voltage
12	R1OUT	First Receiver Output Voltage
13	R1IN	First Receiver Input Voltage
14	T1OUT	First Transmitter Output Voltage
15	GND	Ground
16	VCC	Supply Voltage

Parameter limit

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	VCC	-0.3~+6	V
Doubled Voltage Terminal	V+	VCC-0.3~+7	V
Inverted Voltage Terminal	V-	+0.3~-7	V
V++|V-I		+13	V
Transmitter Input Voltage Range	T1IN,T2IN	-0.3~+6	V
Receiver Input Voltage Range	R1IN,R2IN	±25	V
Transmitter Output Voltage Range	T1OUT,T2OUT	±13.2	V
Receiver Output Voltage Range	R1OUT,R2OUT	-0.3~VCC+0.3	V
Operating Temerature		-40~85	℃
Storage Temperature		-60~150	℃
Soldering Temperature		300	℃
Continuous Power	SOP16	760	mW
	DIP16	840	mW

The maximum limit parameters means that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conducive to the normal opration of the device. The continuous operation of the device at the maximum allowable rating may affect the reliability of the device. The reference point for all voltages is ground.

Logic Input Electrical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Control Low Level	VTTIN_L	T1IN,T2IN			0.8	**V**
Logic Control High Level	VTTINH	T1IN,T2IN	2			V
Logic Control Hysteresis		T1IN,T2IN		0.3		V
Input Logic Current	ITIN	T1IN,T2IN			±1	µA

If there is no additional explanation,typical value is tested when VCC=+3.3V,Temp=25 ,C1-C4=Iμ F

Receiver Output Electrical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Receiver Output Logic-Low Voltage	VROL	IOUT=1.6mA, VCC=5V or 3.3V			0.4	V
Receiver Output Logic-High Voltage	VROH	IOUT=-0.5mA, VCC=5V or 3.3V	VCC-0.6	VCC-0.1		V

If there is no additional explanation,typical value is tested when VCC=+3.3V,Temp=25 ,C1-C4=1μF

Receiver Input Electrical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Receiver Input Range	VRIN		-25		+25	V
Receiver Input Low Threshold	VRL	VCC=3.3V	0.6	1.1		V
		VCC=5V	0.8	1.5		V
Receiver Input High Threshold	VRIH	VCC=3.3V		1.5	2.4	V
		VCC=5V		1.9	2.4	V
Receiver Input Hysteresis				0.4		V
Receiver Input Impedance	RRIN		3	5	7	kΩ

If there is no additional explanation,typical value is tested when VCC=+3.3V,Temp=25 ,C1-C4=1μF

Transmitter Output Electrical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Transmitter Output Swing	VTOUT	All output ports of transmitter connect 3kΩload to ground	±4		±5	V
Transmitter Output Impedance	RTOUT	VCC=0V, Transmitter Input=±2V	300			Ω
Transmitter Short-Circuit Current	Itsc				60	mA

If there is no additional explanation,typical value is tested when VCC=+3.3V,Temp=25 ,C1-C4=1μF

Supply Current

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current with no Load	Isup			2		mA

If there is no additional explanation,typical value is tested when VCC=+3.3V,Temp=25 ,C1-C4=lμF

ESD Protection

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
R1IN、R2IN T1OUT、T2OUT		HBM		±15		KV
		Air Discharge		±15		KV
		Contact Discharge		±8		KV

Switching Characteristics Parameter

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Rate	Speed	RL=3kΩ, CL=1000pF		120		kbps
Receiver Propagation delay	tRPHL	CL=150pF		300		ns
	tRPLH			300		ns
|tRPHL-tRPLHl				150		ns
tTPHL-tTPLH|				150		ns
Transmitter Slew Rate	SR	RL=3kΩ~7kΩ, CL=150pF~1000pF from-3.0V~3.0V or from3.0V~-3.0V See figures 2 and 3	4		30	V/μs

If there is no additional explanation,typical value is tested when VCC=+3.3V,Temp=25 ,C1-C4=lμF
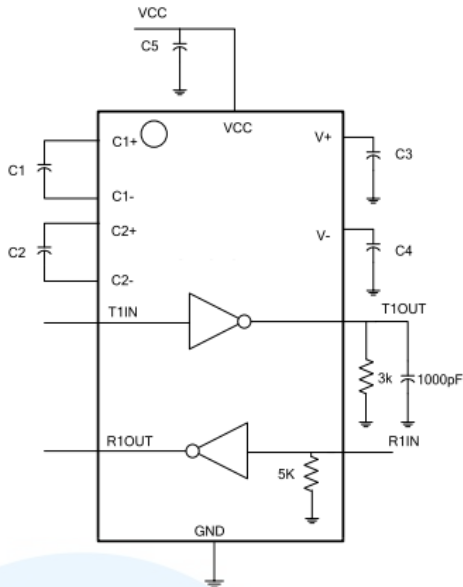
TEST CIRCUIT

Figure 2 minimum swing rate test circuit
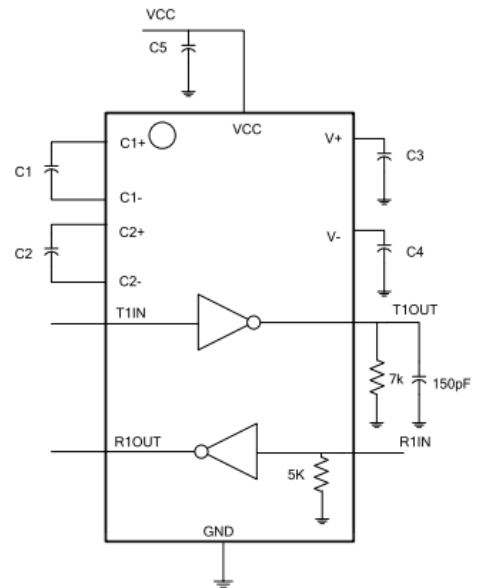
Figure 3 maximum swing rate test circuit
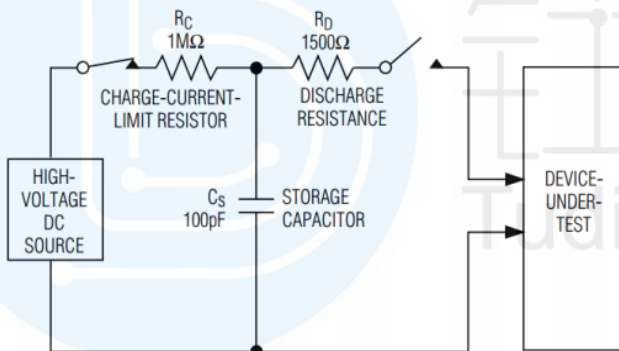
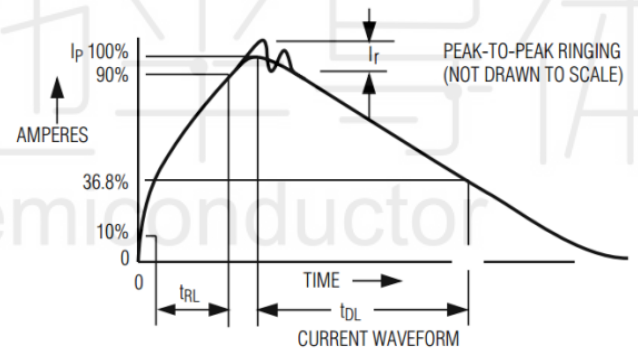

Figure 4 ESD test model of human body mode
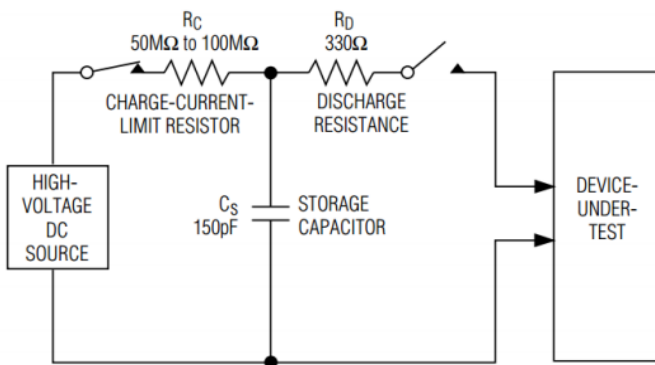

Figure 5 human body mode current waveform

Figure 6 ESD test model of IEC 1000-4-2

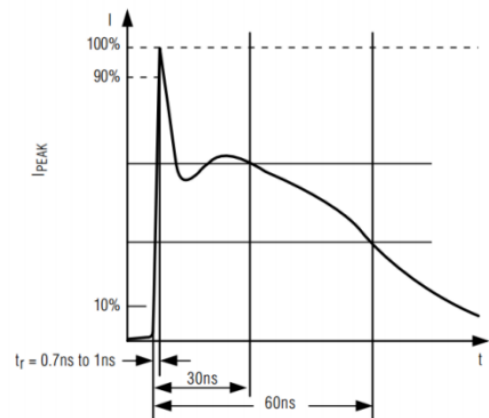Figure 7 current waveform of IEC 1000-4-2 ESD

Description

RS232 Receiver
The 3232 has two separate receivers that convert the RS-232 signal to the CMOS logic output level.

ESD Protection
All pins of 3232 adopt ESD protection structure,and all driver outputs and receiver inputs have additional electrostatic protection capability.It can withstand± 15kV ESD (HBM)discharge,contact discharge above±8KV and air gap dischargeabove±15kV.The ESD protection structure can withstand the impact of high voltageESD under all conditions,including standard working mode and power-off mode.

Typical Application
Typical dual-Path application scenarios are shown in Figure 8,where the C1-C5 typical capacitance value is 0.1μ F.

Dual Charge-Pump Operation
3232 has a two-way charge pump inside to support the chip's voltage conversion work. Dual-electric pump provides +5.5V and-5.5V output voltage in the range of 3.0-5.5V, Each charge pump requires a capacitor(C1,C2)and an energy storage capacitor(C3,C4)to generate V+and V-power supplies,as shown in Fig 8.

| RS232 Transmitter |
| --- |
| Convert the TTL/CMOS logic voltage to a voltage compatible with the EIA/TIA-232 standard.3232 Transmiter can guarantee 250kbps data rate under the worstoperating conditions(Parallel load of 3kQresistor and 1000pf capacitor).Transmitter can drive multiple receivers in parallel.There is no pull-up resistance inside the input terminals T1IN and T2IN of 3232 transmitter.If the transmitter is not used,theunused input terminals T1IN and T2IN can be connected to GND or VCC. |
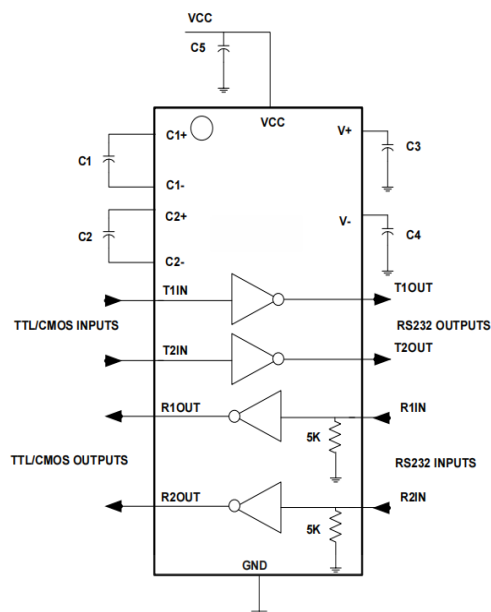
Figure 8 Typical dual-Path application scenarios

Order information

Order Number	Package	Package Quantity	Marking On The park	Temperature
MAX3232CDBR-TUDI	SSOP16	Tape,Reel,2000	MA3232C	0℃ to 70℃
MAX3232CDR-TUDI	SOP16	Tape,Reel,2500	MAX3232C	
MAX3232CDWR-TUDI	SMD16	Tape,Reel,1000	MAX3232C	
MAX3232CPWR-TUDI	TSSOP16	Tape,Reel,2000	MA3232C	
MAX3232IDBR-TUDI	SSOP16	Tape,Reel,2000	MB3232I	- 40℃ to 85℃
MAX3232IDR-TUDI	SOP16	Tape,Reel,2500	MAX3232I	
MAX3232IDWR-TUDI	SMD16	Tape,Reel,1000	MAX3232I	
MAX3232IPWR-TUDI	TSSOP16	Tape,Reel,2000	MB3232I	

Package SSOP16
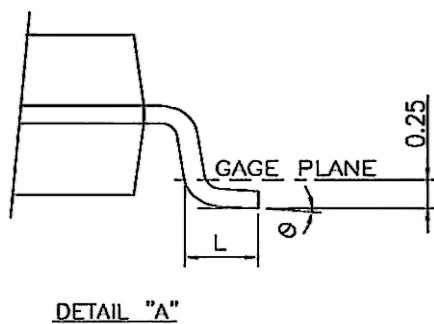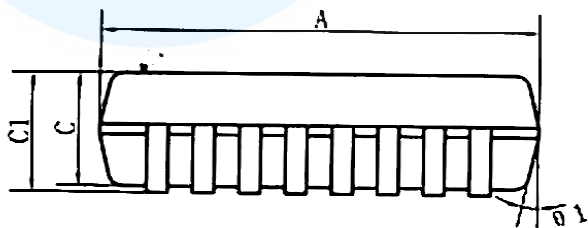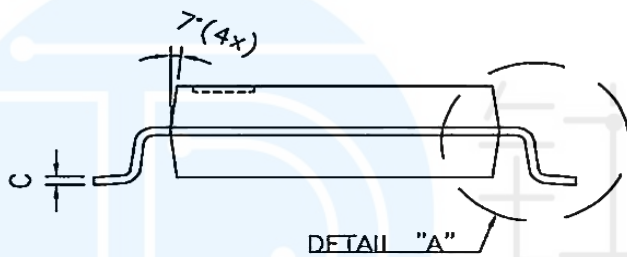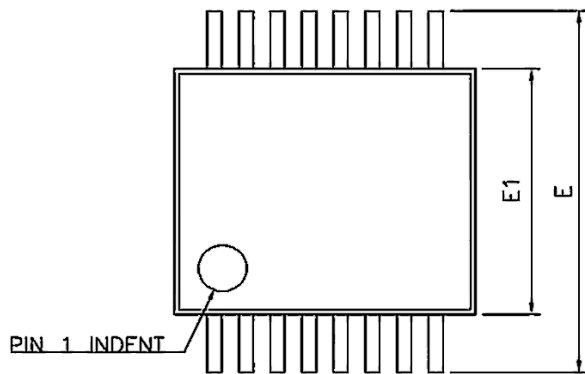
SIZE SYMBOL	MIN/mm	MAX/mm
A	6.15	6.25
A1	0.30TYP	
A2	0.65TYP	
A3	0.675TYP	
B	5.25	5.35
B1	7.65	7.95
B2	0.60	0.80
C	1.70	1.80
C1	1.75	1.95
C2	0.799	
C3	0.152	
C4	0.172	
H	0.05	0.15
θ	12°TYP4	
01	12°TYP4	
02	10°TYP	
03	0°~8°	
R	0.20°TYP	
R	0.15°TYP	

Package TSSOP16
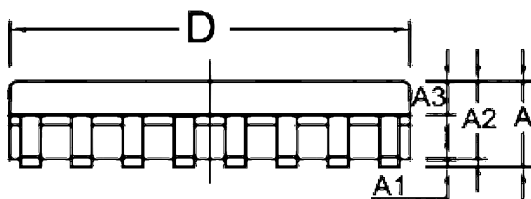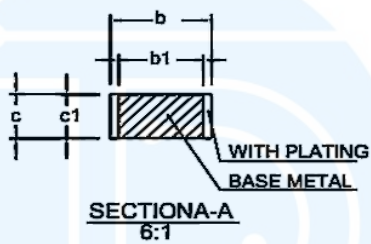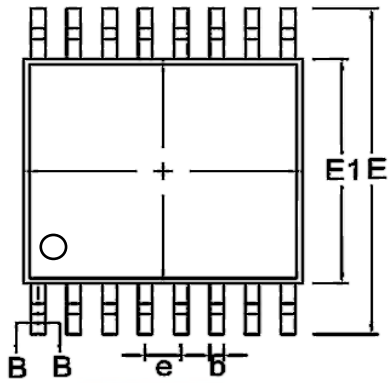
SIZE SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	--	--	1.20
A1	0.05		0.15
A2	0.90	1.00	1.05
b	0.20	--	0.30
b1	0.19	0.22	0.25
C	0.110	0.127	0.145
cl	0.12	0.13	0.14
D	4.86	4.96	5.06
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00BSC		
	0°	--	8°

Package SOP16
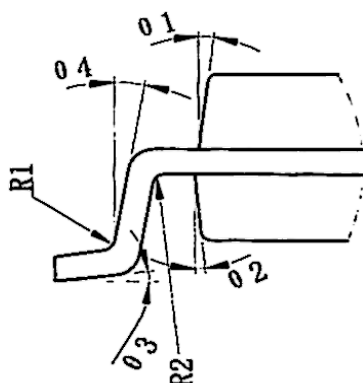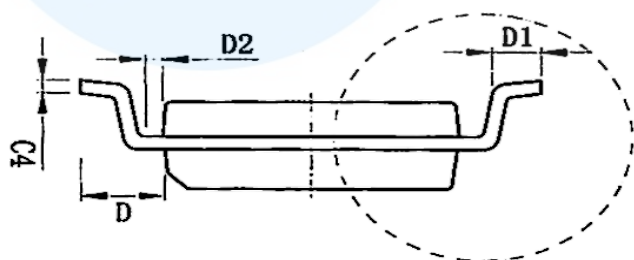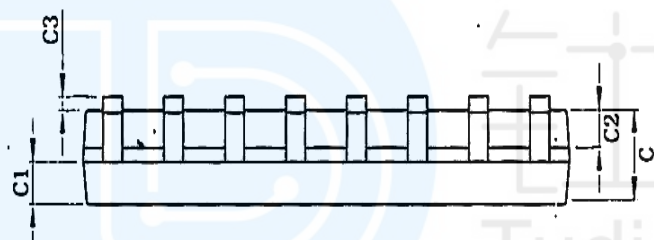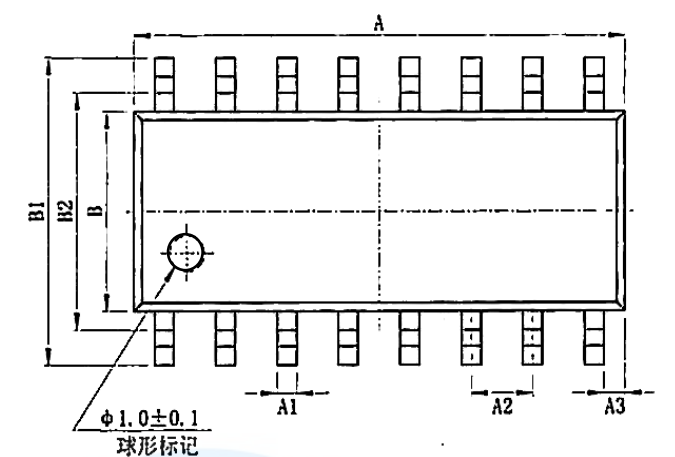
SIZE SYMBOL	MIN./mm	MAX./mm
A	9.80	10.00
A1	0.356	0.456
A2	1.27TYP	
A3	0.302TYP	
B	3.85	3.95
B1	5.84	6.24
B2	5.00 TYP	
C	1.40	1.60
C1	0.61	0.71
C2	0.54	0.64
C3	0.05	0.25
C4	0.203	0.233
D	1.05 TYP	
D1	0.40	0.70
D2	0.15	0.25
R1	0.20TYP	
R2	0.20TYP	
01	8°~12°TYP4	
02	8°~12°TYP4	
03	0°~8°	
04	4°~12°	

Package SMD16
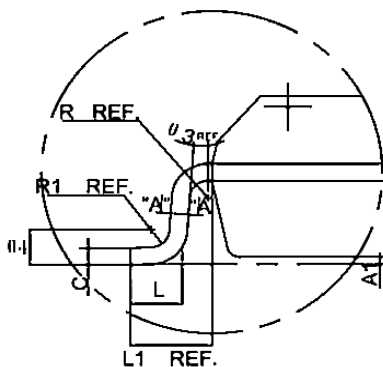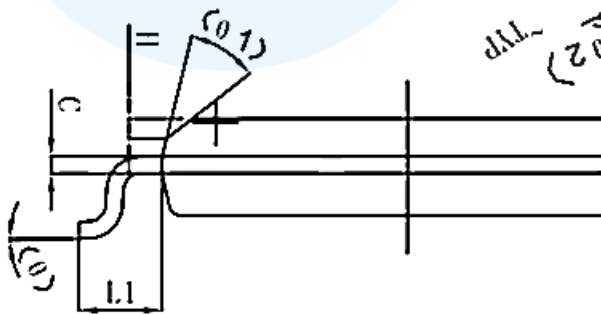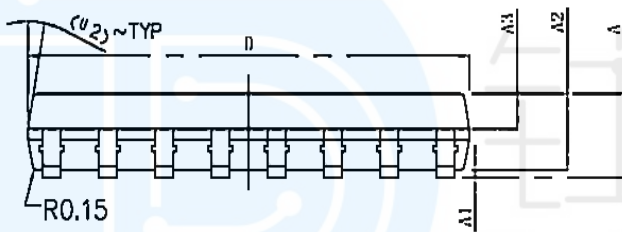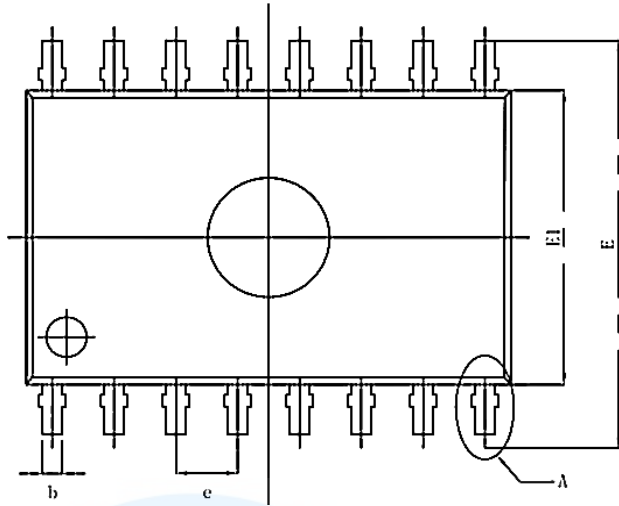
SIZE SYMBOL	MIN./mm	MAX./mm
A	–	2.65
A1	0.10	0.30
A2	2.25	2.35
A3	0.97	1.07
D	10.10	10.50
E	10.26	10.60
E1	7.30	7.70
e	1.27BSC	
L	0.55	0.85
L1	1.4BSC	
H	0.345	0.365
R	0.20TYP	
R1	0.30TYP	
θ	0°	8°
θ1	45° TYP	
02	12° TYP	
03	0°	8°
04	0°	10°

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