



AiP2003 7CH Darlington Arrays

Product Specification

Specification Revision History:

Version	Date	Description
2018-11-A0	2018-11	New
2023-11-A1	2023-11	Parameter modification
2024-09-A2	2024-09	Modify the content



Contents

1、General Description.....	3
2、Block Diagram And Pin Description	5
2.1、Block Diagram	5
Single channel	5
2.2、Pin Configurations.....	6
2.3、Pin Description.....	6
3、Electrical Parameter	7
3.1、Absolute Maximum Ratings.....	7
3.2、Recommended Operating Conditions.....	7
3.3、Electrical characteristics.....	8
4、Testing Circuit	9
4.1、DC Testing Circuit	9
4.2、AC Testing Circuit	10
5、Typical Application Circuit.....	11
6、Application Note	11
7、Package Information.....	12
7.1、DIP16	12
7.2、SOP16	13
7.3、TSSOP16.....	14
8、Statements And Notes	15
8.1、The name and content of Hazardous substances or Elements in the product	15
8.2、Notes	15



1、General Description

AiP2003 is high voltage, high current darlington arrays each containing seven open collector darlington pairs with common emitters.

Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout. These versatile devices are useful for driving a wide range of loads including solenoids, relays DC motors, LED displays filament lamps, stepper motor drive and high power buffers. Each channel rated at 500mA, The Darlington tube can be connected in parallel to achieve higher output current capability.

Each Darlington tube in AiP2003 is connected with a 2.7K base resistance in series. It can be directly connected with TTL/CMOS circuit at 5V working voltage, and can directly process data that originally required standard logic buffer to process.

Features:

- Output current 500mA per driver
- Output voltage 50V
- TTL/CMOS compatible inputs
- Packaging form: DIP16/SOP16/TSSOP16



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Tab: 835-12-B4

Number: AiP2003-AX-QT-N010EN

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP2003DA16.TB	DIP16	AiP2003	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP2003SA16.TB	SOP16	AiP2003	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP2003TA16.TB	TSSOP16	AiP2003	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

Reel packing specifications:

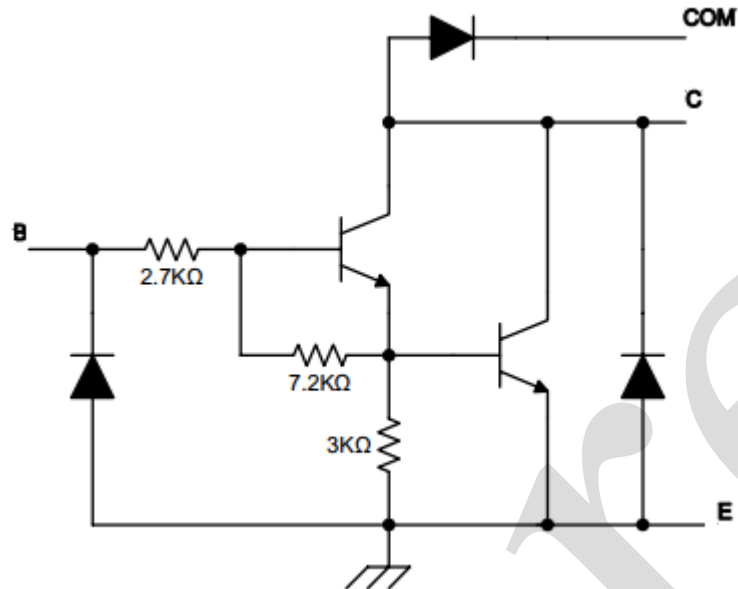
Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP2003SA16.TR	SOP16	AiP2003	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP2003TA16.TR	TSSOP16	AiP2003	5000PCS/reel	10000PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

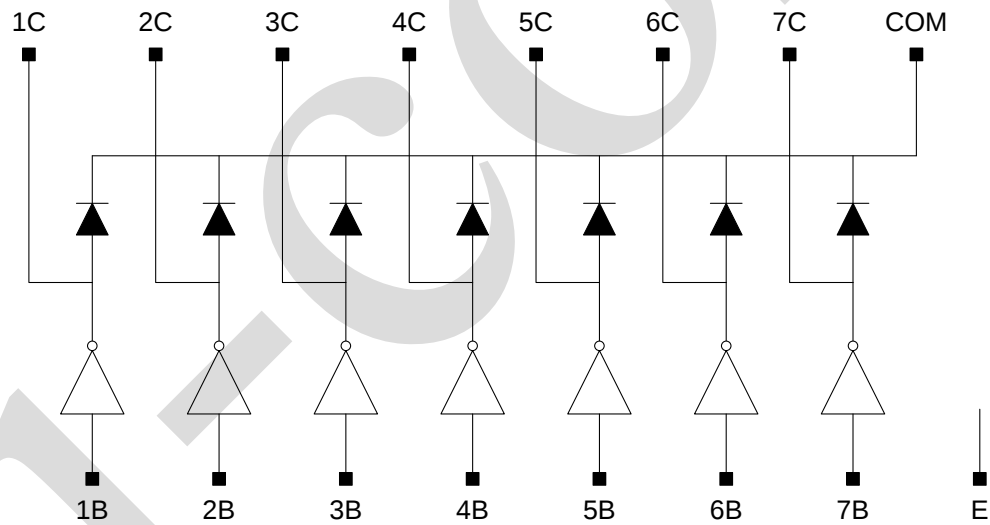


2、Block Diagram And Pin Description

2.1、Block Diagram



Single channel





1B	1		16	1C
2B	2		15	2C
3B	3		14	3C
4B	4		13	4C
5B	5		12	5C
6B	6		11	6C
7B	7		10	7C
E	8		9	COM

Pin No.	Pin Name	Description
1	1B	INPUT1
2	2B	INPUT2
3	3B	INPUT3
4	4B	INPUT4
5	5B	INPUT5
6	6B	INPUT6
7	7B	INPUT7
8	E	Ground
9	COM	Common Free Wheeling Diodes
10	7C	OUTPUT7
11	6C	OUTPUT6
12	5C	OUTPUT5
13	4C	OUTPUT4
14	3C	OUTPUT3
15	2C	OUTPUT2
16	1C	OUTPUT1



3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, All voltage referenced to E, unless otherwise specified)

Characteristic		Symbol	Conditions		Value	Unit
collector-emitter voltage (1C~7C)		V _{CE}	-		-0.5 to 50	V
COM voltage		V _{COM}	-		50	V
input voltage		V _I	-		-0.5 to 30	V
collector peak current		I _{CP}	-		500	mA/ch
forward peak current of output clamp diode		I _{OK}	-		500	mA
Maximum working junction temperature (Note 2)		T _J	-		150	℃
storage temperature		T _{stg}	-		-56 to 150	℃
Thermal resistance	T	θ _{JA}	-		90	℃/W
	SOP16		-		115	
	TSSOP16		-		155	
soldering temperature		T _L	10s	DIP	245	℃
				SOP/TSSOP	260	

Note:

1、the maximum power consumption can be calculated according to the following relationship.

$$P_D = (T_j - T_A) / \theta_{JA}$$

3.2、Recommended Operating Conditions

(T_{amb}=25℃, unless otherwise specified)

Characteristic		Symbol	Conditions		Min.	Typ.	Max.	Unit
collector-emitter voltage		V _{CE}	—		0	—	50	V
COM voltage		V _{COM}	—		0	—	50	V
input voltage (1B~7B)		V _{IN}	—		0	—	24	V
output current	DIP16	I _{OUT}	T _{PW} =25ms 7 channel T _{amb} =85℃ T _J =120℃	Duty=10%	0	—	350	mA
				Duty=50%	0	—	100	
	SOP16			Duty=10%	0	—	300	
				Duty=50%	0	—	90	
	TSSOP16			Duty=10%	0	—	200	
				Duty=50%	0	—	60	
clamp diode reverse voltage		V _R	—		—	—	50	V
clamp diode forward current		I _F	—		—	—	350	mA
working temperature range		T _{amb}	—		-40	—	85	℃



3.3、Electrical characteristics

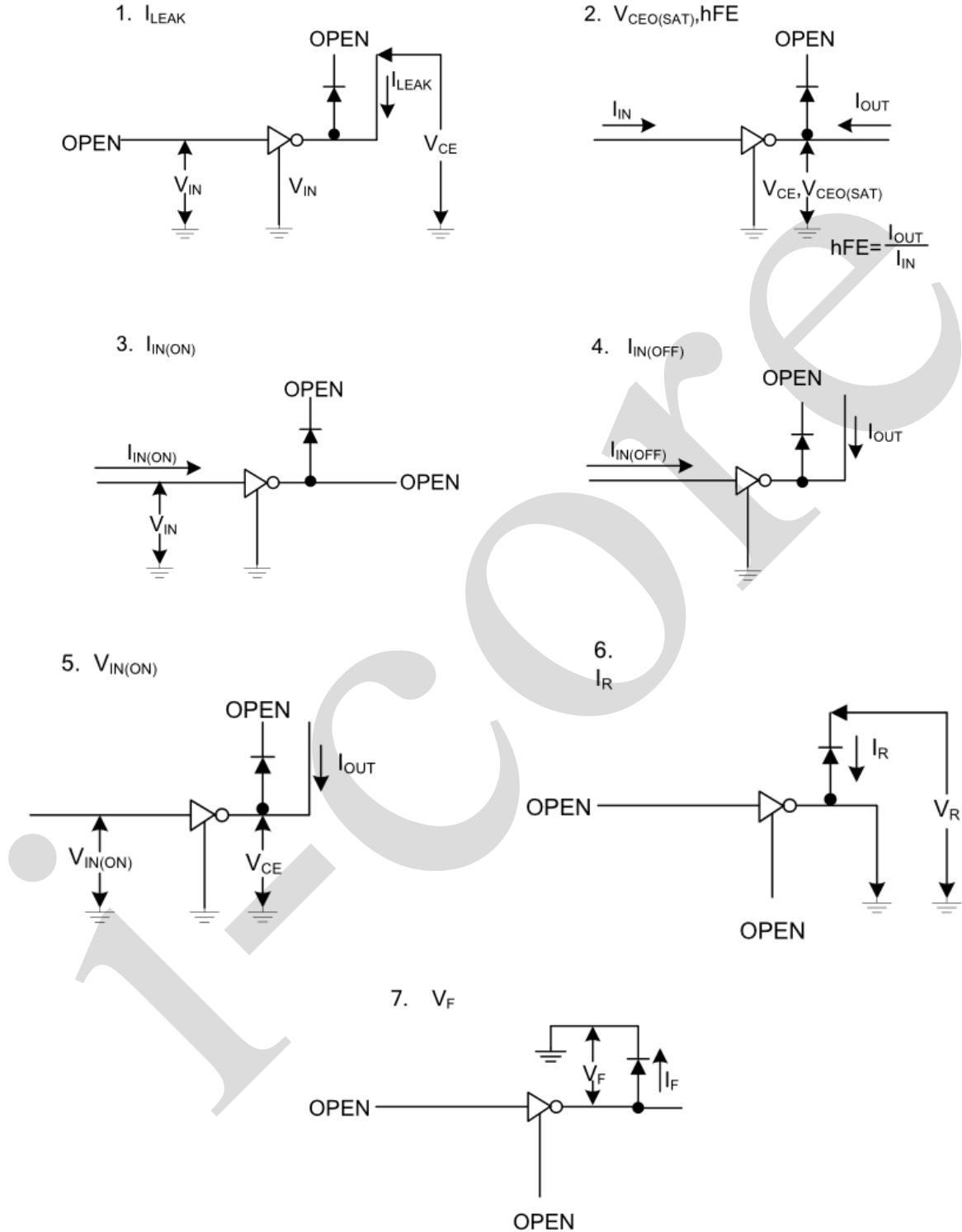
($T_{amb}=25^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Circuit	Test Conditions		Min.	Typ.	Max.	Unit
collector turn off leakage current	I _{LEAK}	Circuit 1	V _{CE} =50V, V _{IN} =0V		—	—	50	uA
			V _{CE} =50V, V _{IN} =0V, T _{amb} =85℃		—	—	100	
collector Emitter Saturation Voltage	V _{CEO} (SAT)	Circuit2	I _{OUT} =350mA, I _{IN} =500uA		—	1.3	1.6	V
			I _{OUT} =200mA, I _{IN} =350uA		—	1.1	1.3	
			I _{OUT} =100mA, I _{IN} =250uA		—	0.9	1.1	
DC forward current Gain	h _{FE}		V _{CE} =2V, I _{OUT} =350mA		1000	-	-	-
input current	I _{IN(ON)}	Circuit 3	V _{IN} =2.4V, I _{OUT} =350mA		—	0.4	0.7	mA
input current	I _{IN(OFF)}	Circuit 4	I _{OUT} =500uA, T _{amb} =85℃		50	65	-	uA
input voltage	V _{IN(ON)}	Circuit 5	V _{CE} =2V	I _{OUT} =350mA	—	—	2.4	V
				I _{OUT} =200mA	—	—	2.0	
clamp diode leakage current	I _R	Circuit 6	V _R =50V, T _{amb} =25℃		-	-	50	uA
clamp diode forward voltage	V _F	Circuit 7	I _R =350mA		-	-	2.0	V
input capacitance	C _{IN}	-	-		-	15	-	pF
opening delay	t _{ON}	Circuit 8	V _{OUT} =50V, R _L =125Ω, C _L =15pF		-	100	-	ns
turn off delay	t _{OFF}		V _{OUT} =50V, R _L =125Ω, C _L =15pF		-	200	-	



4、Testing Circuit

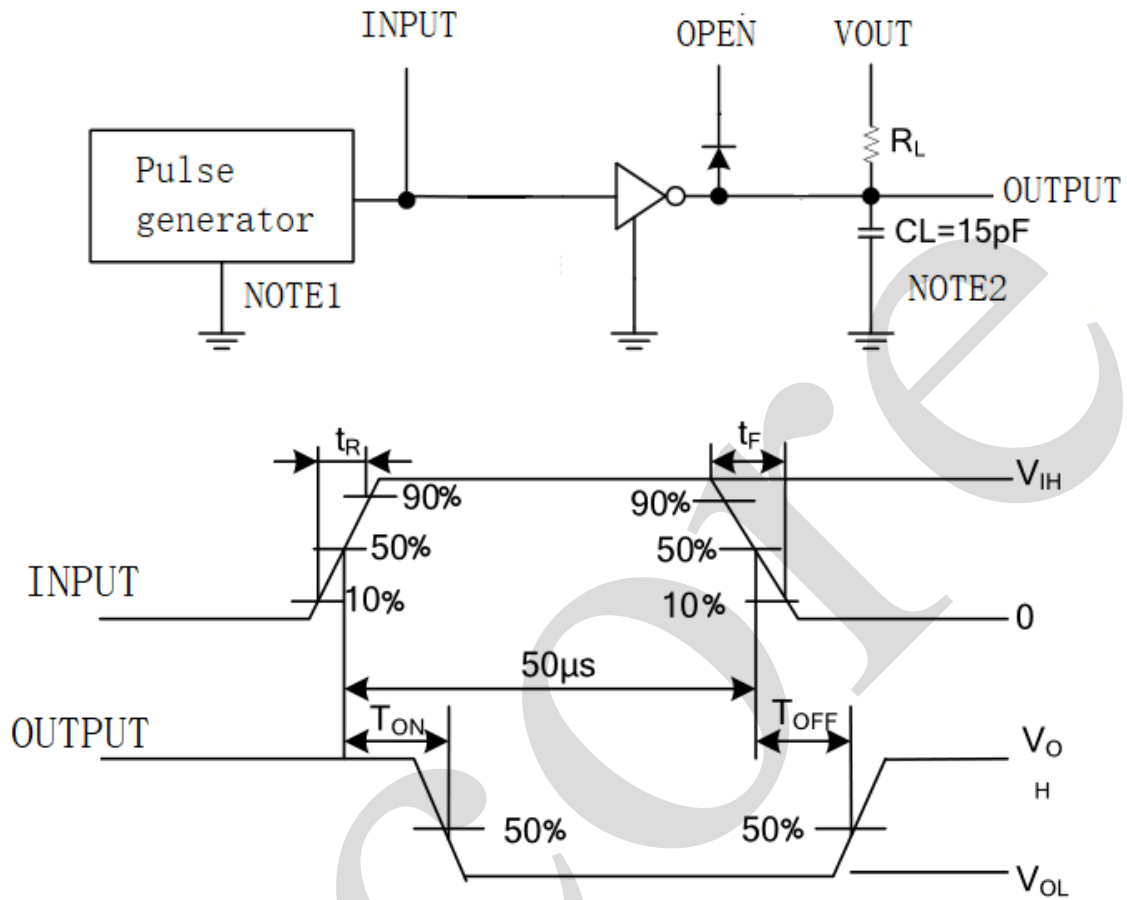
4.1、DC Testing Circuit





4.2、AC Testing Circuit

8. t_{ON} , t_{OFF}

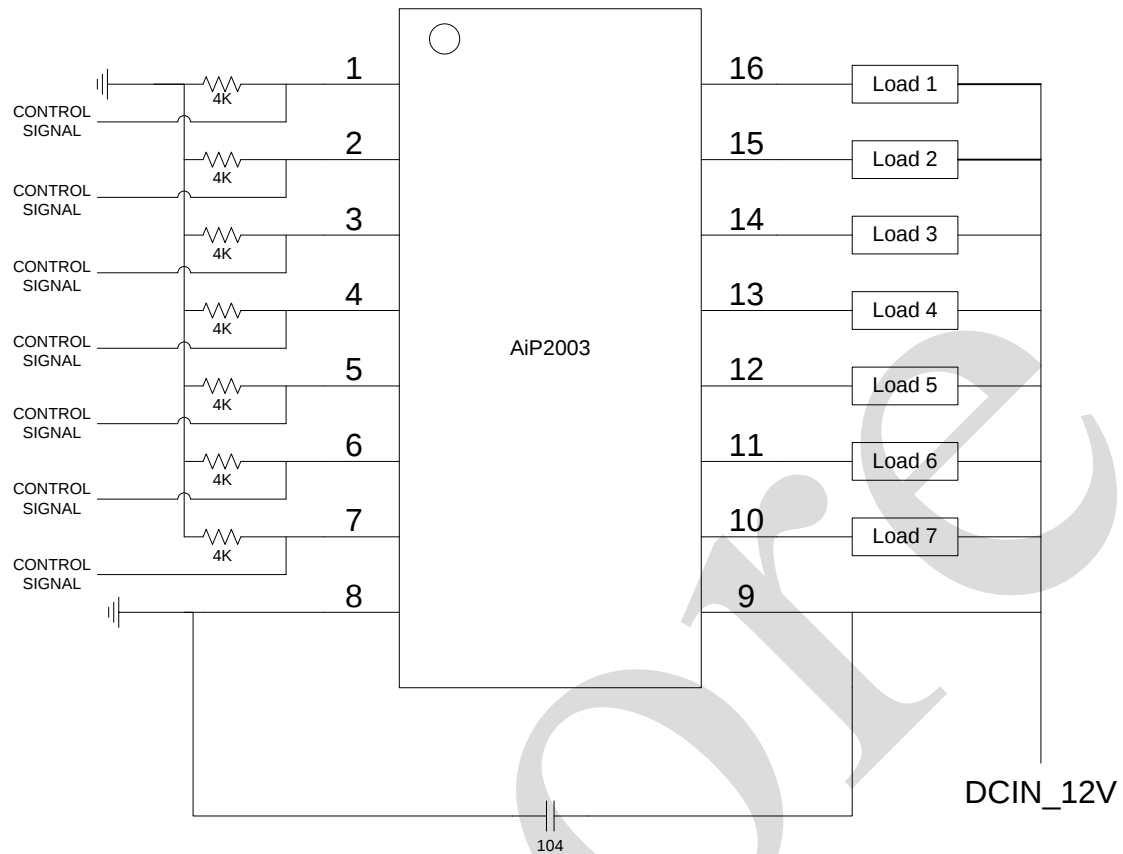


Note 1: pulse width 50uS, duty cycle 10%, output impedance 50 ohm, $t_R \leq 5ns$, $t_F \leq 10ns$ input voltage 3V

Note 2: C_L includes probes and capacitors on the fixture.



5、Typical Application Circuit



6、Application Note

Note1: There is no overcurrent and overvoltage protection inside the circuit.

if the applied situation includes overcurrent、 overvoltage, AiP2003 may be destroyed.

So we should take care of the application with this IC.

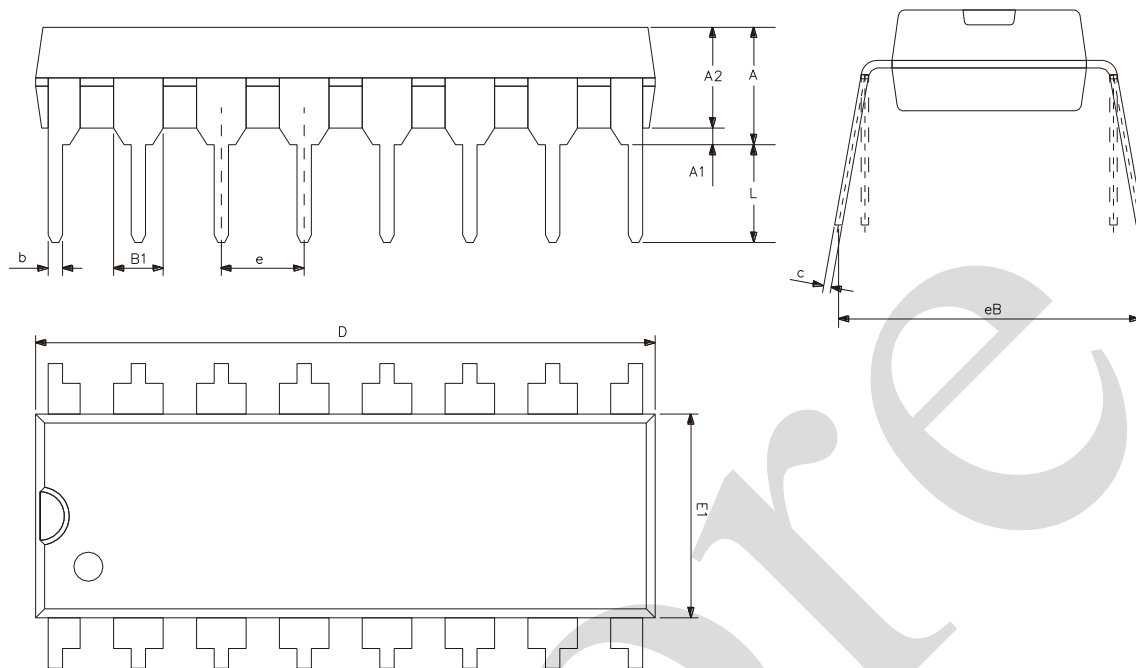
Note2: When it is applied with a general logic circuit such as TTL or COMS, pull-down resistors should be connected in series to avoid misoperation.

Note3: The COM pin should be shorted to the power supply to protect the IC from extra swing voltage.



7、Package Information

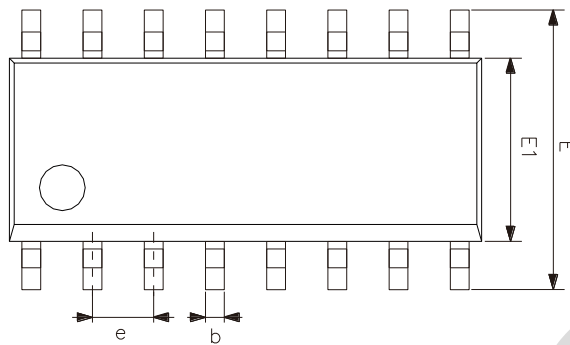
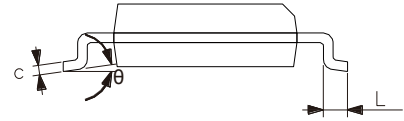
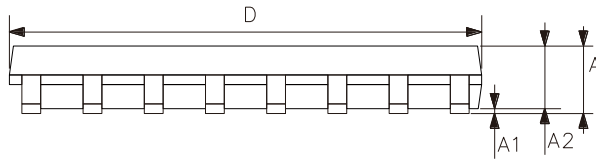
7.1、DIP16



Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	3.60
A1	0.51	—
A	3.60	5.33
L	3.00	—
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



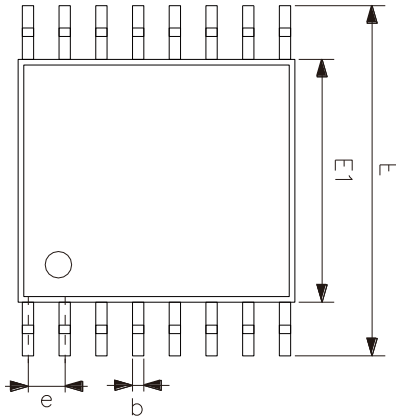
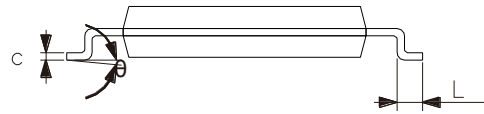
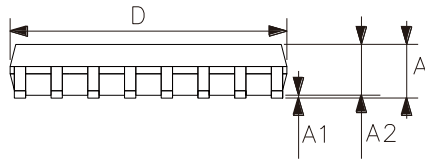
7.2、SOP16



Symbol	Dimensions (mm)	
	Min.	Max.
A	1.35	1.80
A1	0.10	0.25
A2	1.25	1.55
b	0.33	0.51
c	0.19	0.25
D	9.50	10.10
E	5.80	6.30
E1	3.70	4.10
e	1.27	
L	0.35	0.89
θ	0°	8°



7.3、TSSOP16



Symbol	Dimensions (mm)	
	Min.	Max.
A	—	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	4.90	5.10
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
θ	0°	8°



8、Statements And Notes

8.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

8.2、Notes

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