



SN74LS48 (LX) BCD-to-Seven-Segment Common Cathode LED Decodes/Drivers

Product Specification

Specification Revision History:

Version	Date	Description
2022-06-A1	2022-06	New
2024-06-B1	2024-06	Update the template



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1、General Description

The SN74LS48 feature active-low outputs designed for driving common-anode LEDs or incandescent indicators directly. Display patterns for BCD input counts above 9 are unique symbols to authenticate input conditions.

The SN74LS48 incorporate automatic leading and/or trailing-edge zero-blanking control ($\overline{\text{RBI}}$ and $\overline{\text{RBO}}$). Lamp test (LT) of these types may be performed at any time when the $\overline{\text{BI}}/\overline{\text{RBO}}$ node is at a high level. The SN74LS48 contain an overriding blanking input ($\overline{\text{BI}}$), which can be used to control the lamp intensity by pulsing or to inhibit the outputs.

Features:

- Internal pull-ups eliminate need for external resistors
- Lamp-test provision
- Leading/trailing zero suppression
- Specified from -40°C to $+125^{\circ}\text{C}$
- Packaging information: DIP16/SOP16



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
SN74LS48N(LX)	DIP16	SN74LS48N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
SN74LS48DR(LX)	SOP16	LS48	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
SN74LS48DR(LX)	SOP16	LS48	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm

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

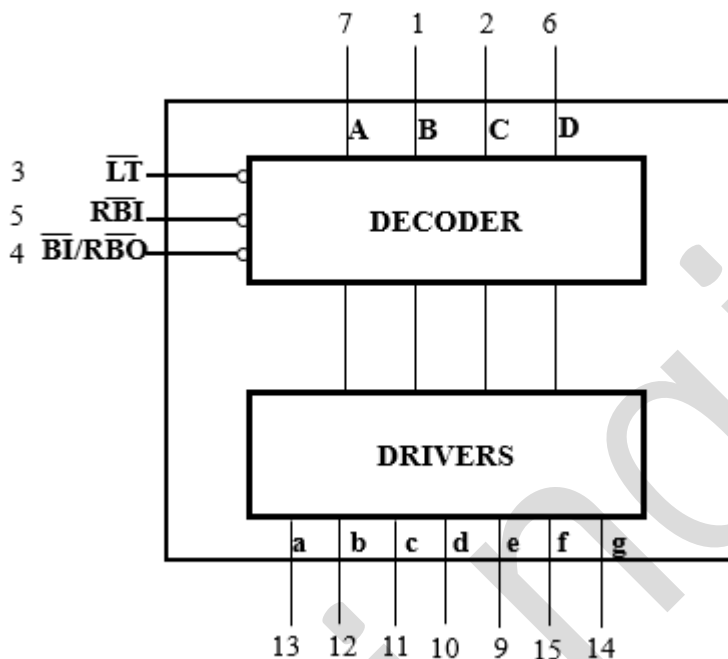
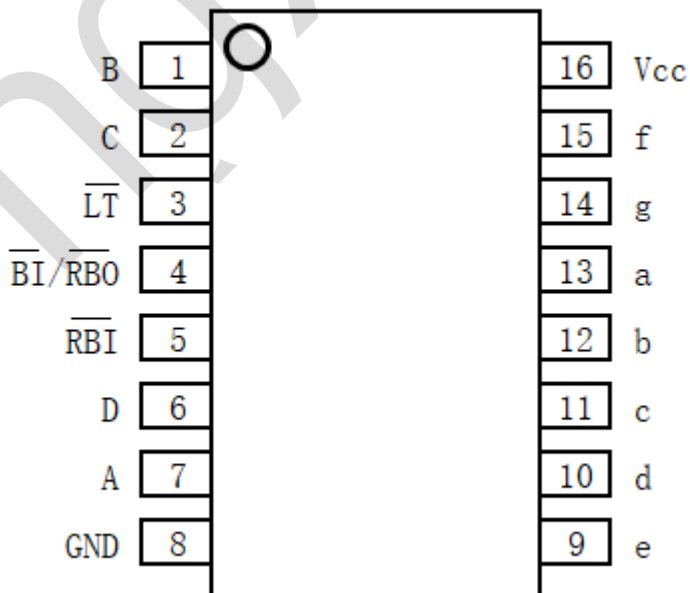


Figure 1. Logic symbol

2.2、Pin Configurations





2.3、Pin Description

Pin No.	Pin Name	Description
1	B	data input
2	C	data input
3	$\overline{\text{LT}}$	lamp test
4	$\overline{\text{BI/RBO}}$	blanking input/ripple blanking output
5	$\overline{\text{RBI}}$	ripple blanking input
6	D	data input
7	A	data input
8	GND	ground (0V)
9	e	data output
10	d	data output
11	c	data output
12	b	data output
13	a	data output
14	g	data output
15	f	data output
16	V_{CC}	supply voltage

2.4、Function Table

Decimal or function	Input						$\overline{\text{BI/RBO}}$	Output						
	$\overline{\text{LT}}$	$\overline{\text{RBI}}$	D	C	B	A		a	b	c	d	e	f	g
0	H	H	L	L	L	L	H	H	H	H	H	H	H	L
1	H	X	L	L	L	H	H	L	H	H	L	L	L	L
2	H	X	L	L	H	L	H	H	H	L	H	H	L	H
3	H	X	L	L	H	H	H	H	H	H	H	L	L	H
4	H	X	L	H	L	L	H	L	H	H	L	L	H	H
5	H	X	L	H	L	H	H	H	L	H	H	L	H	H
6	H	X	L	H	H	L	H	L	L	H	H	H	H	H
7	H	X	L	H	H	H	H	H	H	H	L	L	L	L
8	H	X	H	L	L	L	H	H	H	H	H	H	H	H
9	H	X	H	L	L	H	H	H	H	H	L	L	H	H
10	H	X	H	L	H	L	H	L	L	L	H	H	L	H
11	H	X	H	L	H	H	H	L	L	H	H	L	L	H
12	H	X	H	H	L	L	H	L	H	L	L	L	H	H
13	H	X	H	H	L	H	H	H	L	L	H	L	H	H
14	H	X	H	H	H	L	H	L	L	L	H	H	H	H
15	H	X	H	H	H	H	H	L	L	L	L	L	L	L
$\overline{\text{BI}}$	X	X	X	X	X	X	L	L	L	L	L	L	L	L
$\overline{\text{RBI}}$	H	L	L	L	L	L	L	L	L	L	L	L	L	L
$\overline{\text{LT}}$	L	X	X	X	X	X	H	H	H	H	H	H	H	H

Note:

[1] H=HIGH voltage level; L=LOW voltage level; X=don't care.

[2] The blanking input ($\overline{\text{BI}}$) must be open or held at a high logic level when output functions 0 through 15

are desired. The ripple-blanking input ($\overline{\text{RBI}}$) must be open or high if blanking of a decimal zero is not desired.

[3] When a low logic level is applied directly to the blanking input ($\overline{\text{BI}}$), all segment outputs are off regardless of the level of any other input.

[4] When ripple-blanking input ($\overline{\text{RBI}}$) and inputs A, B, C, D are at a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output ($\overline{\text{RBO}}$) goes to a low level (response condition).

[5] When the blanking input/ripple blanking output ($\overline{\text{BI/RBO}}$) is open or held high and a low is applied to the lamp test input, all segment outputs are on.

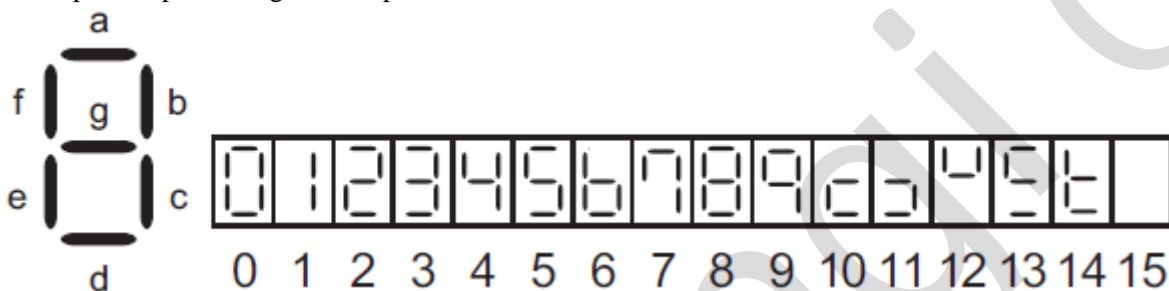


Figure 2. Segment identification

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{CC}	-	-0.5	+7.0	V
input clamping current	I_{IK}	$V_I < -0.5V$ or $V_I > V_{CC}+0.5V$	-	± 20	mA
output clamping current	I_{OK}	$V_O < -0.5V$ or $V_O > V_{CC}+0.5V$	-	± 20	mA
output current	I_O	$-0.5V < V_O < V_{CC}+0.5V$	-	± 25	mA
supply current	I_{CC}	-	-	+50	mA
ground current	I_{GND}	-	-50	-	mA
storage temperature	T_{stg}	-	-65	+150	$^{\circ}\text{C}$
total power dissipation	P_{tot}	-	-	500	mW
soldering temperature	T_L	10s	DIP	245	$^{\circ}\text{C}$
			SOP/TSSOP	260	



3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	2.0	5.0	6.0	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	V_{CC}	V
ambient temperature	T_{amb}	-	-40	-	+125	°C

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

($T_{amb}=-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	V_{IH}	$V_{CC}=2.0\text{V}$	1.5	1.2	-	V	
		$V_{CC}=4.5\text{V}$	3.15	2.4	-	V	
		$V_{CC}=6.0\text{V}$	4.2	3.2	-	V	
LOW-level input voltage	V_{IL}	$V_{CC}=2.0\text{V}$	-	0.8	0.5	V	
		$V_{CC}=4.5\text{V}$	-	2.1	1.35	V	
		$V_{CC}=6.0\text{V}$	-	2.8	1.8	V	
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	$I_O=-20\mu\text{A}; V_{CC}=2.0\text{V}$	1.9	2.0	-	V
			$I_O=-20\mu\text{A}; V_{CC}=4.5\text{V}$	4.4	4.5	-	V
			$I_O=-20\mu\text{A}; V_{CC}=6.0\text{V}$	5.9	6.0	-	V
			$I_O=-4.0\text{mA}; V_{CC}=4.5\text{V}$	3.98	4.32	-	V
			$I_O=-5.2\text{mA}; V_{CC}=6.0\text{V}$	5.48	5.81	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}	$I_O=20\mu\text{A}; V_{CC}=2.0\text{V}$	-	0	0.1	V
			$I_O=20\mu\text{A}; V_{CC}=4.5\text{V}$	-	0	0.1	V
			$I_O=20\mu\text{A}; V_{CC}=6.0\text{V}$	-	0	0.1	V
			$I_O=4.0\text{mA}; V_{CC}=4.5\text{V}$	-	0.15	0.33	V
			$I_O=5.2\text{mA}; V_{CC}=6.0\text{V}$	-	0.16	0.33	V
HIGH-level input current	I_{IH}	$V_{CC}=6.0\text{V}, V_I=V_{CC}$	-	-	20	μA	
LOW-level input current	$I_{IL}(A/B/C/D)$	$V_{CC}=6.0\text{V}, V_I=\text{GND}$	-	-	-20	μA	
	$I_{IL}(\overline{B}/\overline{RBO}/\overline{RBI}/\overline{LT})$	$V_{CC}=6.0\text{V}, V_I=\text{GND}$	-	-	-1.2	mA	
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0\text{A}; V_{CC}=6.0\text{V}$	-	-	13	mA	



3.3.2、DC Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	V_{IH}	$V_{CC}=2.0\text{V}$	1.5	-	-	V	
		$V_{CC}=4.5\text{V}$	3.15	-	-	V	
		$V_{CC}=6.0\text{V}$	4.2	-	-	V	
LOW-level input voltage	V_{IL}	$V_{CC}=2.0\text{V}$	-	-	0.5	V	
		$V_{CC}=4.5\text{V}$	-	-	1.35	V	
		$V_{CC}=6.0\text{V}$	-	-	1.8	V	
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	$I_O=-20\mu\text{A}; V_{CC}=2.0\text{V}$	1.9	-	-	V
			$I_O=-20\mu\text{A}; V_{CC}=4.5\text{V}$	4.4	-	-	V
			$I_O=-20\mu\text{A}; V_{CC}=6.0\text{V}$	5.9	-	-	V
			$I_O=-4.0\text{mA}; V_{CC}=4.5\text{V}$	3.98	-	-	V
			$I_O=-5.2\text{mA}; V_{CC}=6.0\text{V}$	5.48	-	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}	$I_O=20\mu\text{A}; V_{CC}=2.0\text{V}$	-	-	0.1	V
			$I_O=20\mu\text{A}; V_{CC}=4.5\text{V}$	-	-	0.1	V
			$I_O=20\mu\text{A}; V_{CC}=6.0\text{V}$	-	-	0.1	V
			$I_O=4.0\text{mA}; V_{CC}=4.5\text{V}$	-	-	0.4	V
			$I_O=5.2\text{mA}; V_{CC}=6.0\text{V}$	-	-	0.4	V
HIGH-level input current	I_{IH}	$V_{CC}=6.0\text{V}, V_I=V_{CC}$	-	-	20	μA	
LOW-level input current	$I_{IL}(A/B/C/D)$	$V_{CC}=6.0\text{V}, V_I=\text{GND}$	-	-	-20	μA	
	$I_{IL}(\overline{\text{BI}}/\overline{\text{RBO}}/\overline{\text{RBI}}/\overline{\text{LT}})$	$V_{CC}=6.0\text{V}, V_I=\text{GND}$	-	-	-1.2	mA	
supply current	I_{CC}	$V_I=V_{CC}$ or $\text{GND}; I_O=0\text{A}; V_{CC}=6.0\text{V}$	-	-	13	mA	



3.3.3、AC Characteristics

($T_{amb}=25^{\circ}C$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH to LOW propagation delay	t_{PHL}	$V_{CC}=5.0V$; $C_L=15pF$; $R_L=4K\Omega$; See Figure 4	from A input	-	-	100	ns
		from \bar{RBI} input, outputs (a-f only)	-	-	100	ns	
LOW to HIGH propagation delay	t_{PLH}	$V_{CC}=5.0V$; $C_L=15pF$; $R_L=4K\Omega$; See Figure 4	from A input	-	-	100	ns
		from \bar{RBI} input, outputs (a-f only)	-	-	100	ns	

4、Testing Circuit

4.1、AC Testing Circuit

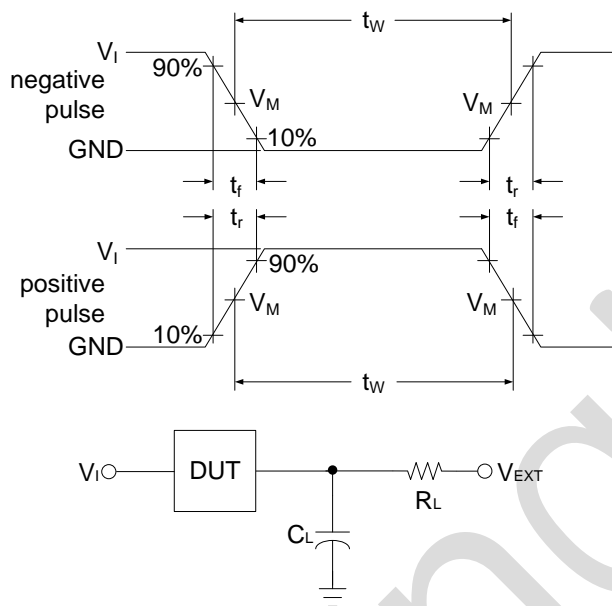


Figure 3. Test circuit for measuring switching times

C_L includes probe and jig capacitance.

4.2、Test Data

Input		Load		V_{EXT}
V_I	$t_r = t_f$	C_L	R_L	t_{PHL}/t_{PLH}
V_{CC}	3.0ns	15pF	4K Ω	V_{CC}

4.3、AC Testing Waveforms

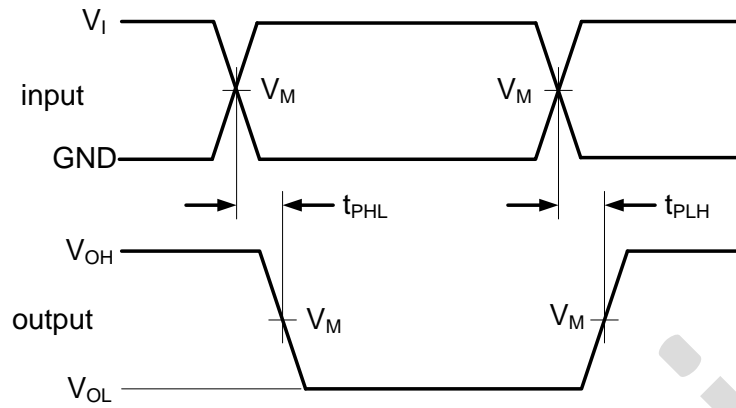


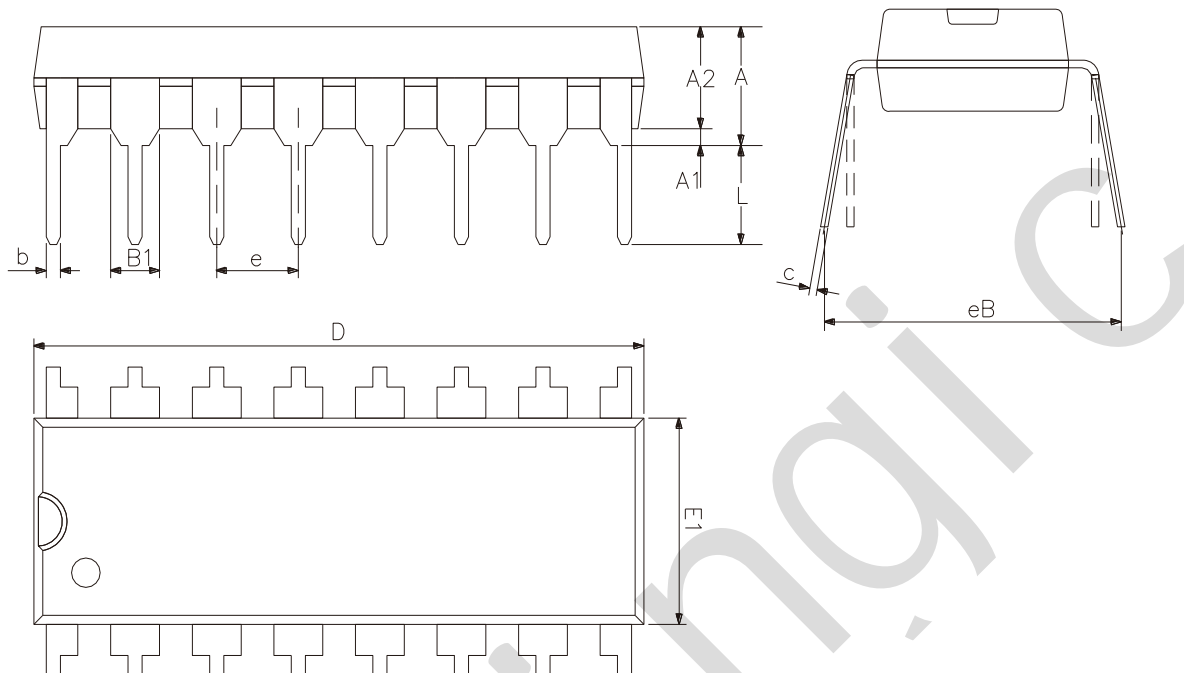
Figure 4. The data input to output propagation delays

4.4、Measurement Points

Input	Output
V_M	V_M
$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

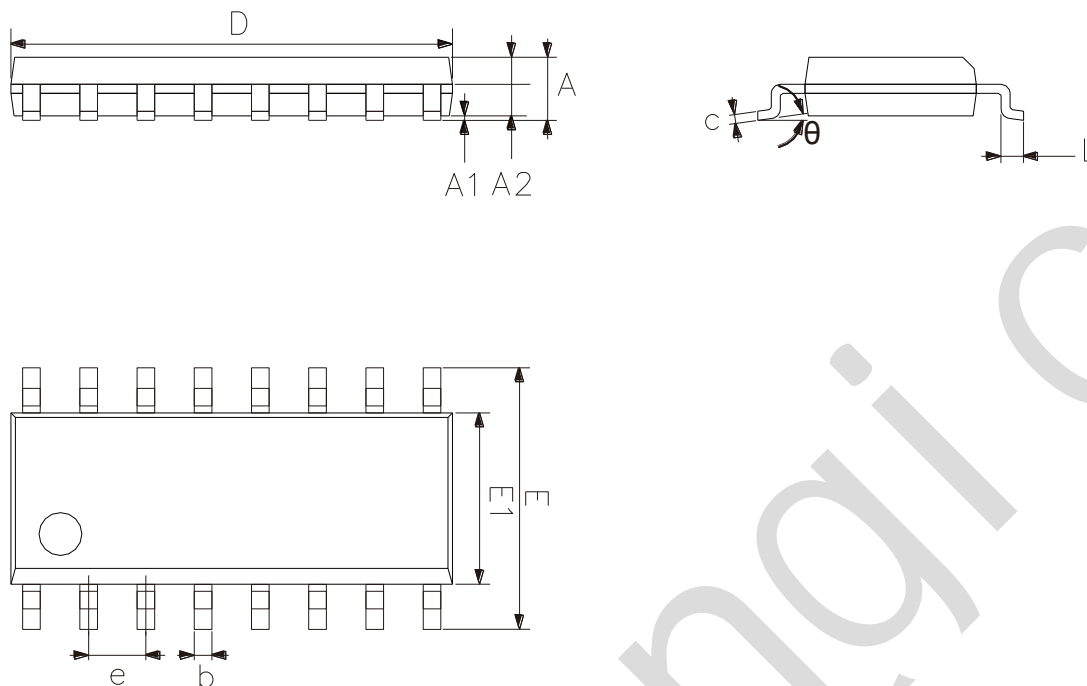
5、Package Information

5.1、DIP16



2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A2	3.00	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

5.2、SOP16



2023/12/A	Dimensions In Millimeters	
Symbol	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°



6、Statements And Notes

6.1、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.									

6.2、Notes

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