



SN74LS27(LX) Triple 3-input Nor Gate

Product Specification

Specification Revision History:

Version	Date	Description
2022-05-A1	2022-05	New
2023-04-B1	2023-04	Update the template



Contents

1、General Description.....	3
2、Block Diagram And Pin Description	5
2.1、Block Diagram	5
2.2、Pin Configurations.....	6
2.3、Pin Description.....	6
2.4、Function Table.....	6
3、Electrical Parameter	7
3.1、Absolute Maximum Ratings.....	7
3.2、Recommended Operating Conditions	7
3.3、Electrical Characteristics.....	8
3.3.1、DC Characteristics 1	8
3.3.2、DC Characteristics 2.....	9
3.3.3、DC Characteristics 3.....	10
3.3.4、AC Characteristics 1	11
3.3.5、AC Characteristics 2.....	12
3.3.6、AC Characteristics 3.....	12
4、Testing Circuit	13
4.1、AC Testing Circuit	13
4.2、AC Testing Waveforms.....	13
4.3、Measurement Points	14
4.4、Test Data	14
5、Package Information.....	15
5.1、DIP14	15
5.2、SOP14	16
5.3、TSSOP14.....	17
6、Statements And Notes	18
6.1、The name and content of Hazardous substances or Elements in the product.....	18
6.2、Notes	18



1、General Description

The SN74LS27 is a triple 3-input NOR gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

Features:

- Specified from -40°C to $+125^{\circ}\text{C}$
- Packaging information: DIP14/SOP14/TSSOP14

Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
SN74LS27N(LX)	DIP14	SN74LS27N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm



Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
SN74LS27DR(LX)	SOP14	LS27	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm
SN74LS27PW(LX)	TSSOP14	LS27	2000 PCS/reel	4000 PCS/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

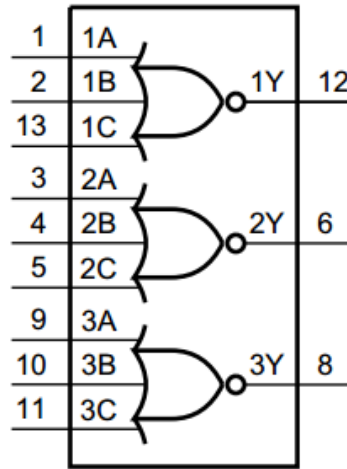


Figure 1. Logic symbol

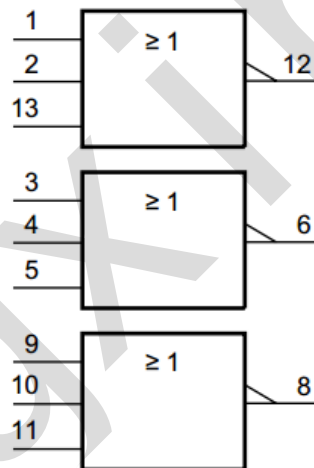


Figure 2. IEC logic symbol

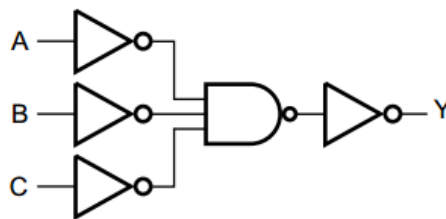
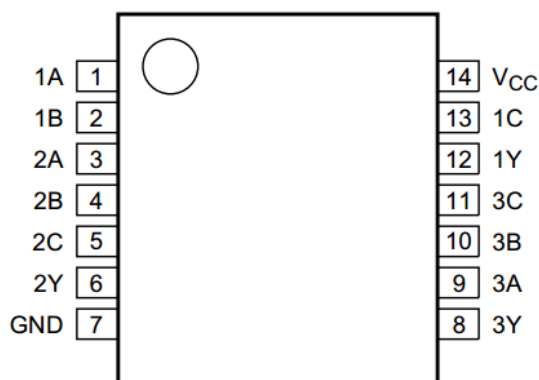


Figure 3. Logic diagram for one gate



2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1B	data input
3	2A	data input
4	2B	data input
5	2C	data input
6	2Y	data output
7	GND	ground (0V)
8	3Y	data output
9	3A	data input
10	3B	data input
11	3C	data input
12	1Y	data output
13	1C	data input
14	V _{CC}	supply voltage

2.4、Function Table

Input			Output
nA	nB	nC	nY
L	L	L	H
X	X	H	L
X	H	X	L
H	X	X	L

Note: H=HIGH voltage level; L=LOW voltage level; X=don't care.



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	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
total power dissipation	P _{tot}	-		-	500	mW
storage temperature	T _{stg}	-		-65	+150	°C
soldering temperature	T _L	10s	DIP	245		°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
input transition rise and fall rate	$\Delta t/\Delta V$	$V_{CC}=2.0V$	-	-	625	ns/V
		$V_{CC}=4.5V$	-	1.67	139	ns/V
		$V_{CC}=6.0V$	-	-	83	ns/V
ambient temperature	T_{amb}	-	-40	-	+125	°C



3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, 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} =2.0V		1.5	1.2	-	V
		V _{CC} =4.5V		3.15	2.4	-	V
		V _{CC} =6.0V		4.2	3.2	-	V
LOW-level input voltage	V _{IL}	V _{CC} =2.0V		-	0.8	0.5	V
		V _{CC} =4.5V		-	2.1	1.35	V
		V _{CC} =6.0V		-	2.8	1.8	V
HIGH-level output voltage	V _{OH}	V _I =V _{IH} or V _{IL}	I _O =-20uA; V _{CC} =2.0V	1.9	2.0	-	V
			I _O =-20uA; V _{CC} =4.5V	4.4	4.5	-	V
			I _O =-20uA; V _{CC} =6.0V	5.9	6.0	-	V
			I _O =-4.0mA; V _{CC} =4.5V	3.98	4.32	-	V
			I _O =-5.2mA; V _{CC} =6.0V	5.48	5.81	-	V
LOW-level output voltage	V _{OL}	V _I =V _{IH} or V _{IL}	I _O =20uA; V _{CC} =2.0V	-	0	0.1	V
			I _O =20uA; V _{CC} =4.5V	-	0	0.1	V
			I _O =20uA; V _{CC} =6.0V	-	0	0.1	V
			I _O =4.0mA; V _{CC} =4.5V	-	0.15	0.26	V
			I _O =5.2mA; V _{CC} =6.0V	-	0.16	0.26	V
input leakage current	I _I	V _I =V _{CC} or GND; V _{CC} =6.0V		-	-	±1	uA
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	2.0	uA
input capacitance	C _I	-		-	3.5	-	pF



3.3.2、DC Characteristics 2

($T_{amb} = -40^{\circ}\text{C}$ 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}	$V_{CC}=2.0V$		1.5	-	-	V
		$V_{CC}=4.5V$		3.15	-	-	V
		$V_{CC}=6.0V$		4.2	-	-	V
LOW-level input voltage	V_{IL}	$V_{CC}=2.0V$		-	-	0.5	V
		$V_{CC}=4.5V$		-	-	1.35	V
		$V_{CC}=6.0V$		-	-	1.8	V
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	$I_O=-20\mu A$; $V_{CC}=2.0V$	1.9	-	-	V
			$I_O=-20\mu A$; $V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-20\mu A$; $V_{CC}=6.0V$	5.9	-	-	V
			$I_O=-4.0mA$; $V_{CC}=4.5V$	3.84	-	-	V
			$I_O=-5.2mA$; $V_{CC}=6.0V$	5.34	-	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}	$I_O=20\mu A$; $V_{CC}=2.0V$	-	-	0.1	V
			$I_O=20\mu A$; $V_{CC}=4.5V$	-	-	0.1	V
			$I_O=20\mu A$; $V_{CC}=6.0V$	-	-	0.1	V
			$I_O=4.0mA$; $V_{CC}=4.5V$	-	-	0.33	V
			$I_O=5.2mA$; $V_{CC}=6.0V$	-	-	0.33	V
input leakage current	I_I	$V_I=V_{CC}$ or GND; $V_{CC}=6.0V$		-	-	± 1	μA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0A$; $V_{CC}=6.0V$		-	-	20	μA



3.3.3、DC Characteristics 3

($T_{amb} = -40^{\circ}\text{C}$ 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
		$I_O=-4.0\text{mA}; V_{CC}=4.5\text{V}$	3.7	-	-	V
		$I_O=-5.2\text{mA}; V_{CC}=6.0\text{V}$	5.2	-	-	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
input leakage current	I_I	$V_I=V_{CC}$ or GND; $V_{CC}=6.0\text{V}$	-	-	± 1	μA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; $I_O=0\text{A};$ $V_{CC}=6.0\text{V}$	-	-	40	μA



3.3.4、AC Characteristics 1

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
nA, nB, nC to nY propagation delay	t_{pd}	see Figure 5 ^[1]	$V_{CC}=2.0\text{V}$	-	28	90 ns
			$V_{CC}=4.5\text{V}$	-	10	18 ns
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	8	- ns
			$V_{CC}=6.0\text{V}$	-	8	15 ns
transition time	t_t	see Figure 5 ^[2]	$V_{CC}=2.0\text{V}$	-	19	75 ns
			$V_{CC}=4.5\text{V}$	-	7	15 ns
			$V_{CC}=6.0\text{V}$	-	6	13 ns
power dissipation capacitance	C_{PD}	per package; $V_I=\text{GND to } V_{CC}$ ^[3]	-	24	-	pF

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL} .

[2] t_t is the same as t_{THL} and t_{TLH} .

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in uW).

$P_D=(C_{PD} \times V_{CC}^2 \times f_i \times N) + \sum(C_L \times V_{CC}^2 \times f_o)$ where:

f_i =input frequency in MHz;

f_o =output frequency in MHz;

C_L =output load capacitance in pF;

V_{CC} =supply voltage in V;

N=number of inputs switching;

$\sum(C_L \times V_{CC}^2 \times f_o)$ =sum of outputs.



3.3.5、AC Characteristics 2

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
nA, nB, nC to nY propagation delay	t_{pd}	see Figure 5 ^[1]	$V_{CC}=2.0\text{V}$	-	-	115 ns
			$V_{CC}=4.5\text{V}$	-	-	23 ns
			$V_{CC}=6.0\text{V}$	-	-	20 ns
transition time	t_t	see Figure 5 ^[2]	$V_{CC}=2.0\text{V}$	-	-	95 ns
			$V_{CC}=4.5\text{V}$	-	-	19 ns
			$V_{CC}=6.0\text{V}$	-	-	16 ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL} .

[2] t_t is the same as t_{THL} and t_{TLH} .

3.3.6、AC Characteristics 3

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
nA, nB, nC to nY propagation delay	t_{pd}	see Figure 5 ^[1]	$V_{CC}=2.0\text{V}$	-	-	135 ns
			$V_{CC}=4.5\text{V}$	-	-	27 ns
			$V_{CC}=6.0\text{V}$	-	-	23 ns
transition time	t_t	see Figure 5 ^[2]	$V_{CC}=2.0\text{V}$	-	-	110 ns
			$V_{CC}=4.5\text{V}$	-	-	22 ns
			$V_{CC}=6.0\text{V}$	-	-	19 ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL} .

[2] t_t is the same as t_{THL} and t_{TLH} .

4、Testing Circuit

4.1、AC Testing Circuit

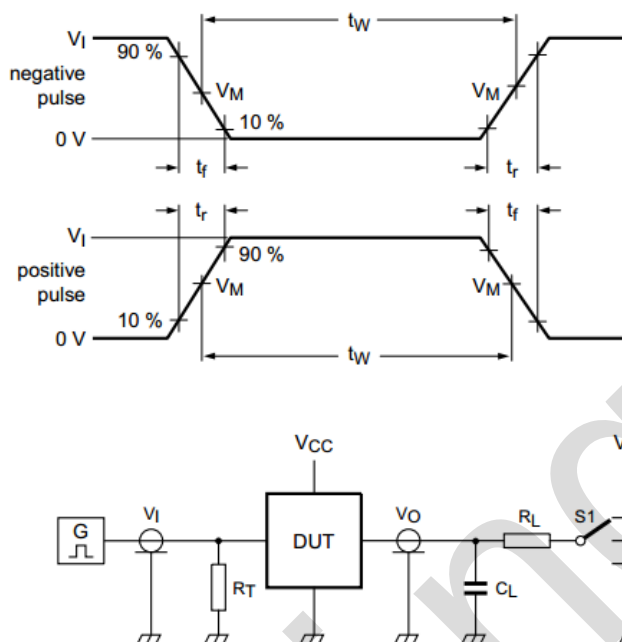


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

C_L =load capacitance including jig and probe capacitance.

R_T =termination resistance should be equal to the output impedance Z_o of the pulse generator.

R_L =Load resistance.

S1=Test selection switch.

4.2、AC Testing Waveforms

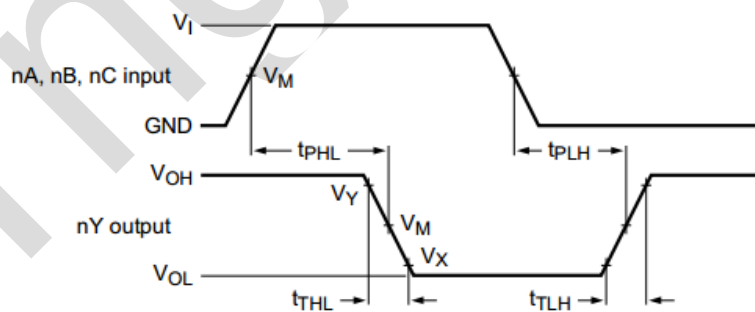


Figure 5. Input to output propagation delays



4.3、Measurement Points

Input	Output		
V_M	V_M	V_X	V_Y
$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$

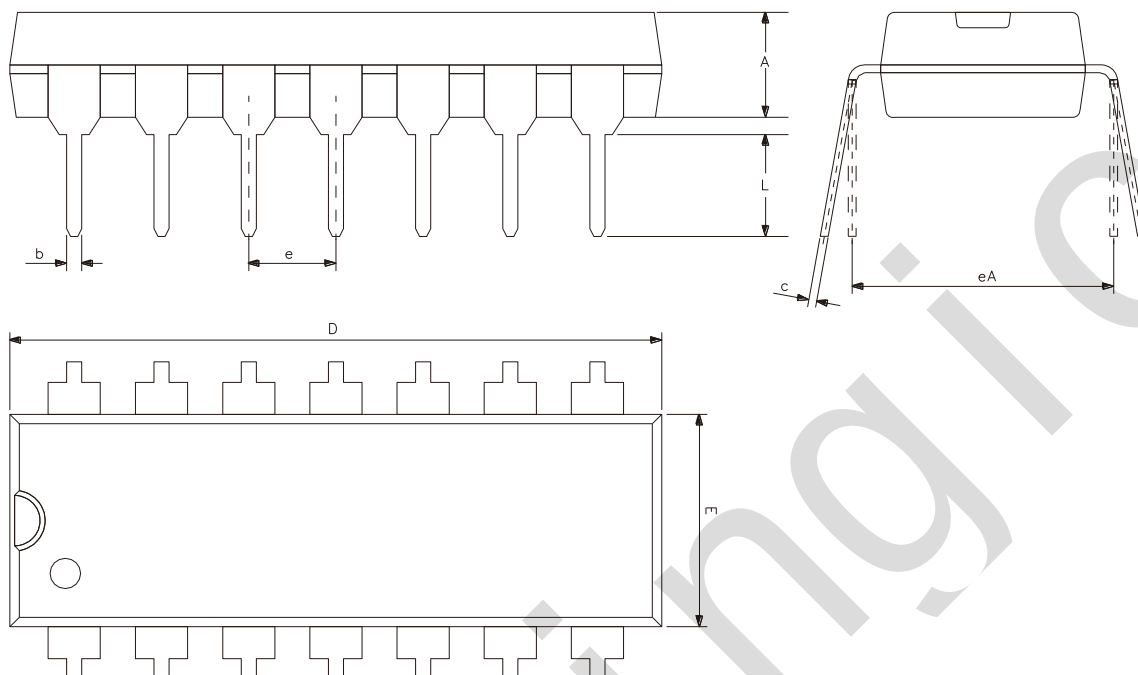
4.4、Test Data

Input		Load		S1 position
V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}
V_{CC}	6.0ns	15pF, 50pF	1k Ω	open



5、Package Information

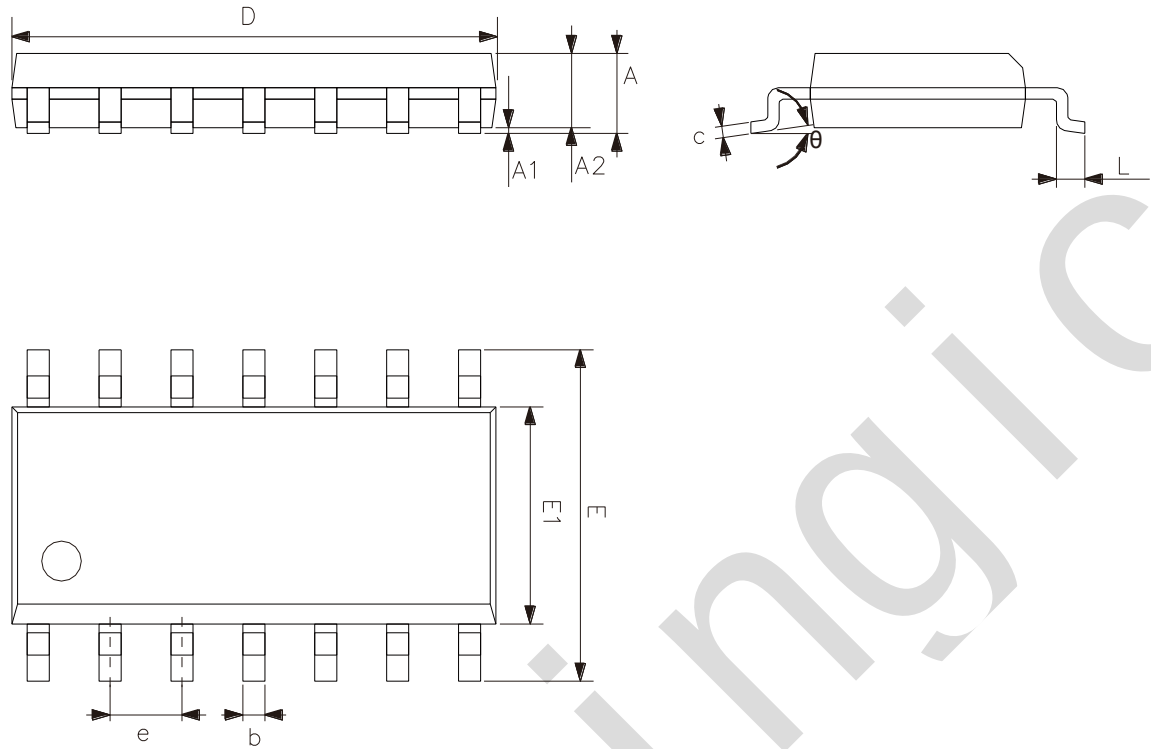
5.1、DIP14



Symbol	Dimensions (mm)	
	Min.	Max.
A	3.05	3.60
b	0.33	0.56
c	0.20	0.36
D	18.80	19.40
E	6.20	6.60
e	2.54	
eA	7.62	10.90
L	2.92	-



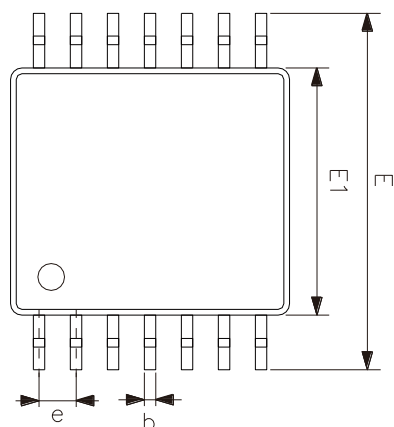
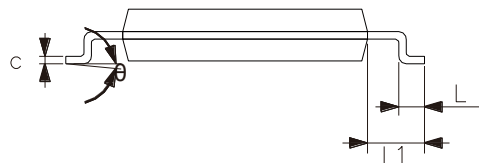
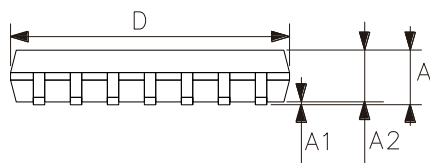
5.2、SOP14



Symbol	Dimensions (mm)	
	Min.	Max.
A	1.50	1.75
A1	0.05	0.25
A2	1.30	-
b	0.33	0.50
c	0.19	0.25
D	8.43	8.76
E	5.80	6.25
E1	3.75	4.00
e	1.27	
L	0.40	0.89
θ	0°	8°



5.3、TSSOP14



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
L1	1.00	
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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