



SN74LS240 (LX)

Octal Buffer/Line Driver; 3-state; Inverting

Product Specification

Specification Revision History:

Version	Date	Description
2021-06-A1	2021-06	New
2023-04-B1	2023-04	Update the template



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1、General Description

The SN74LS240 is an 8-bit inverting buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables ($1\overline{OE}$ and $2\overline{OE}$), each controlling four of the 3-state outputs. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

Features:

- Inverting 3-state outputs
- Specified from -40°C to $+125^{\circ}\text{C}$
- Packaging information: DIP20/SOP20/TSSOP20



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
SN74LS240N (LX)	DIP20	SN74LS240N	18 PCS/tube	40 tube/box	720 PCS/box	Dimensions of plastic enclosure: 26.3mm×6.4mm Pin spacing: 2.54mm
SN74LS240D(LX)	SOP20	LS240	35 PCS/tube	80 tube/box	2800 PCS/box	Dimensions of plastic enclosure: 12.8mm×7.5mm Pin spacing: 1.27mm
SN74LS240PW(LX)	TSSOP20	LS240	70 PCS/tube	200 tube/box	14000 PCS/box	Dimensions of plastic enclosure: 6.5mm×4.4mm Pin spacing: 0.65mm



Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
SN74LS240DWR(LX)	SOP20	LS240	2000PCS/reel	2000PCS/box	Dimensions of plastic enclosure: 12.8mm × 7.5mm Pin spacing: 1.27mm
SN74LS240PW(LX)	TSSOP20	LS240	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 6.5mm × 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

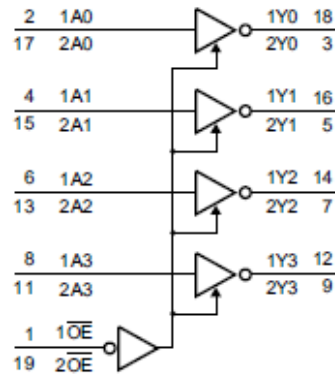


Figure 1. Logic symbol

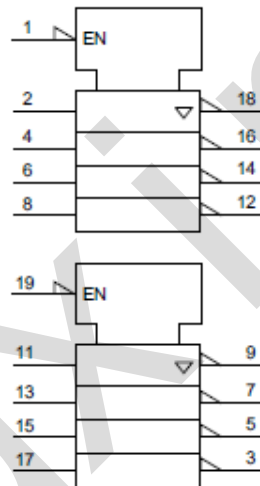


Figure 2. IEC logic symbol

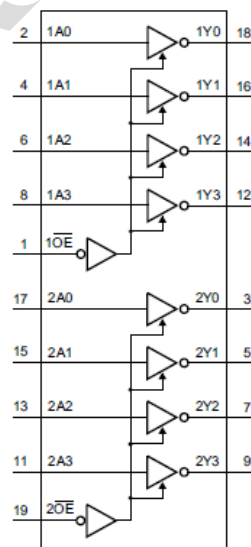
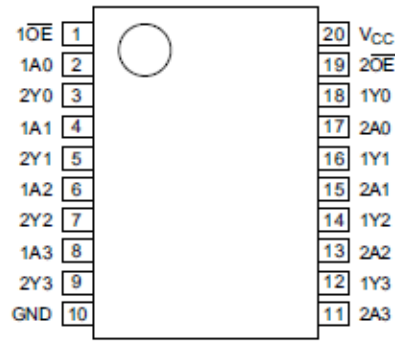


Figure 3. Functional diagram



2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	1OE	output enable input (active LOW)
2	1A0	data input
3	2Y0	bus output
4	1A1	data input
5	2Y1	bus output
6	1A2	data input
7	2Y2	bus output
8	1A3	data input
9	2Y3	bus output
10	GND	ground (0V)
11	2A3	data input
12	1Y3	bus output
13	2A2	data input
14	1Y2	bus output
15	2A1	data input
16	1Y1	bus output
17	2A0	data input
18	1Y0	bus output
19	2OE	output enable input (active LOW)
20	V _{CC}	supply voltage

2.4、Function Table

Input		Output
nOE	nAn	nYn
L	L	H
L	H	L
H	X	Z

Note: H=HIGH voltage level; L=LOW voltage level; X=don't care; Z=high-impedance OFF-state.



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	$-0.5V < V_O < V_{CC}+0.5V$	-	± 35	mA
supply current	I_{CC}	-	-	70	mA
ground current	I_{GND}	-	-70	-	mA
storage temperature	T_{stg}	-	-65	+150	°C
total power dissipation	P_{tot}	-	-	500	mW
Soldering temperature	T_L	10s	DIP	245	°C
			SOP/TSSOP	260	°C

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 =-6.0mA; V _{CC} =4.5V	3.98	4.32	-	V
			I _O =-7.8mA; 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 =6.0mA; V _{CC} =4.5V	-	0.15	0.26	V
			I _O =7.8mA; V _{CC} =6.0V	-	0.16	0.26	V
input leakage current	I _I	V _I =V _{CC} or GND; V _{CC} =6.0V		-	-	±1.0	uA
OFF-state output current	I _{OZ}	V _I =V _{IH} or V _{IL} ; V _{CC} =6.0V; V _O =V _{CC} or GND		-	-	±1.0	uA
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	8.0	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}	$V_{CC}=2.0\text{V}$	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
		$I_O = -6.0\text{mA}; V_{CC}=4.5\text{V}$	3.84	-	-	V
		$I_O = -7.8\text{mA}; V_{CC}=6.0\text{V}$	5.34	-	-	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
		$I_O = 6.0\text{mA}; V_{CC}=4.5\text{V}$	-	-	0.33	V
		$I_O = 7.8\text{mA}; V_{CC}=6.0\text{V}$	-	-	0.33	V
input leakage current	I_I	$V_I = V_{CC}$ or GND; $V_{CC}=6.0\text{V}$	-	-	± 1.0	μA
OFF-state output current	I_{OZ}	$V_I = V_{IH}$ or $V_{IL}; V_{CC}=6.0\text{V};$ $V_O = V_{CC}$ or GND	-	-	± 5.0	μA
supply current	I_{CC}	$V_I = V_{CC}$ or GND; $I_O = 0\text{A}; V_{CC}=6.0\text{V}$	-	-	80	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} =2.0V		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 =-20uA; V _{CC} =2.0V	1.9	-	-	V
			I _O =-20uA; V _{CC} =4.5V	4.4	-	-	V
			I _O =-20uA; V _{CC} =6.0V	5.9	-	-	V
			I _O =-6.0mA; V _{CC} =4.5V	3.7	-	-	V
			I _O =-7.8mA; V _{CC} =6.0V	5.2	-	-	V
LOW-level output voltage	V _{OL}	V _I = V _{IH} or V _{IL}	I _O =20uA; V _{CC} =2.0V	-	-	0.1	V
			I _O =20uA; V _{CC} =4.5V	-	-	0.1	V
			I _O =20uA; V _{CC} =6.0V	-	-	0.1	V
			I _O =6.0mA; V _{CC} =4.5V	-	-	0.4	V
			I _O =7.8mA; V _{CC} =6.0V	-	-	0.4	V
input leakage current	I _I	V _I =V _{CC} or GND; V _{CC} =6.0V		-	-	±1.0	uA
OFF-state output current	I _{OZ}	V _I =V _{IH} or V _{IL} ; V _{CC} =6.0V; V _O =V _{CC} or GND		-	-	±10	uA
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	160	uA



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
nAn to nYn propagation delay	t_{pd}	see Figure 5	$V_{CC}=2.0\text{V}$	-	30	100 ns
			$V_{CC}=4.5\text{V}$	-	11	20 ns
			$V_{CC}=5.0\text{V}; C_L=15\text{pF}$	-	9	- ns
			$V_{CC}=6.0\text{V}$	-	9	17 ns
nOE to nYn enable time	t_{en}	see Figure 6	$V_{CC}=2.0\text{V}$	-	39	150 ns
			$V_{CC}=4.5\text{V}$	-	14	30 ns
			$V_{CC}=6.0\text{V}$	-	11	26 ns
nOE to nYn disable time	t_{dis}	see Figure 6	$V_{CC}=2.0\text{V}$	-	41	150 ns
			$V_{CC}=4.5\text{V}$	-	15	30 ns
			$V_{CC}=6.0\text{V}$	-	12	26 ns
transition time	t_t	see Figure 5	$V_{CC}=2.0\text{V}$	-	14	60 ns
			$V_{CC}=4.5\text{V}$	-	5	12 ns
			$V_{CC}=6.0\text{V}$	-	4	10 ns
power dissipation capacitance	C_{PD}	per buffer; $V_I=\text{GND}$ to V_{CC}	-	30	-	pF

Note:

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

[2] t_{en} is the same as t_{PZL} and t_{PZH} .

[3] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

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

[5] 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
nAn to nYn propagation delay	t_{pd}	see Figure 5	$V_{CC}=2.0\text{V}$	-	-	125 ns
			$V_{CC}=4.5\text{V}$	-	-	25 ns
			$V_{CC}=6.0\text{V}$	-	-	21 ns
$\overline{\text{nOE}}$ to nYn enable time	t_{en}	see Figure 6	$V_{CC}=2.0\text{V}$	-	-	190 ns
			$V_{CC}=4.5\text{V}$	-	-	38 ns
			$V_{CC}=6.0\text{V}$	-	-	33 ns
$\overline{\text{nOE}}$ to nYn disable time	t_{dis}	see Figure 6	$V_{CC}=2.0\text{V}$	-	-	190 ns
			$V_{CC}=4.5\text{V}$	-	-	38 ns
			$V_{CC}=6.0\text{V}$	-	-	33 ns
transition time	t_t	see Figure 5	$V_{CC}=2.0\text{V}$	-	-	75 ns
			$V_{CC}=4.5\text{V}$	-	-	15 ns
			$V_{CC}=6.0\text{V}$	-	-	13 ns

Note:

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] t_{en} is the same as t_{PZL} and t_{PZH} .
- [3] t_{dis} is the same as t_{PLZ} and t_{PHZ} .
- [4] 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
nAn to nYn propagation delay	t_{pd}	see Figure 5	$V_{CC}=2.0\text{V}$	-	-	150 ns
			$V_{CC}=4.5\text{V}$	-	-	30 ns
			$V_{CC}=6.0\text{V}$	-	-	26 ns
$\overline{\text{nOE}}$ to nYn enable time	t_{en}	see Figure 6	$V_{CC}=2.0\text{V}$	-	-	225 ns
			$V_{CC}=4.5\text{V}$	-	-	45 ns
			$V_{CC}=6.0\text{V}$	-	-	38 ns
$\overline{\text{nOE}}$ to nYn disable time	t_{dis}	see Figure 6	$V_{CC}=2.0\text{V}$	-	-	225 ns
			$V_{CC}=4.5\text{V}$	-	-	45 ns
			$V_{CC}=6.0\text{V}$	-	-	38 ns
transition time	t_t	see Figure 5	$V_{CC}=2.0\text{V}$	-	-	90 ns
			$V_{CC}=4.5\text{V}$	-	-	18 ns
			$V_{CC}=6.0\text{V}$	-	-	15 ns

Note:

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] t_{en} is the same as t_{PZL} and t_{PZH} .
- [3] t_{dis} is the same as t_{PLZ} and t_{PHZ} .
- [4] t_t is the same as t_{THL} and t_{TLH} .

4、Testing Circuit

4.1、AC Testing Circuit

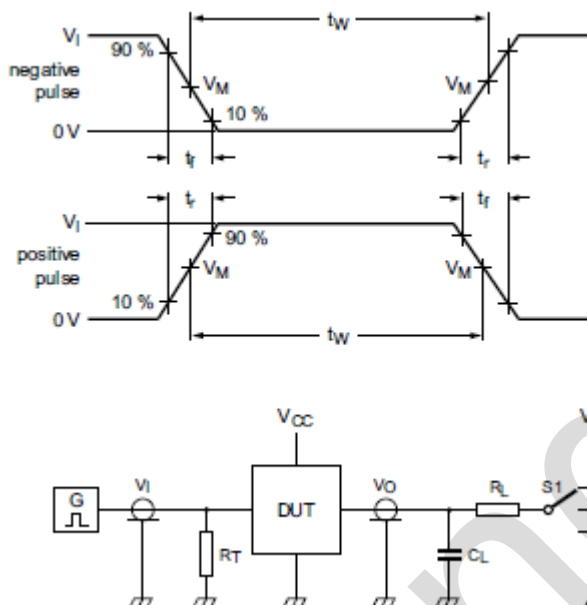


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

R_L =Load resistance.

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.

S1=Test selection switch.

4.2、AC Testing Waveforms

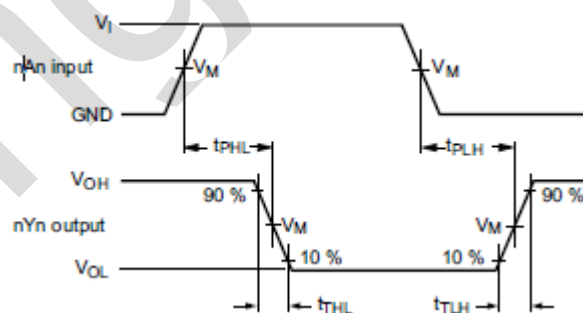


Figure 5. Input (nAn) to output (nYn) propagation delays and output transition times

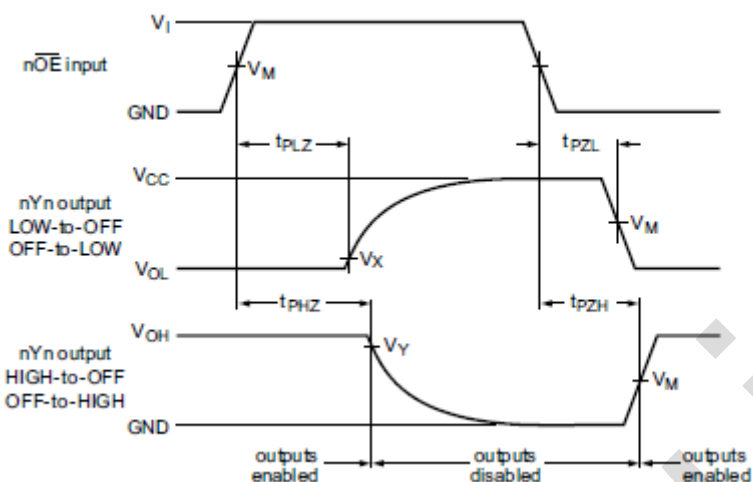


Figure 6. 3-state enable and disable times

4.3、Measurement Points

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

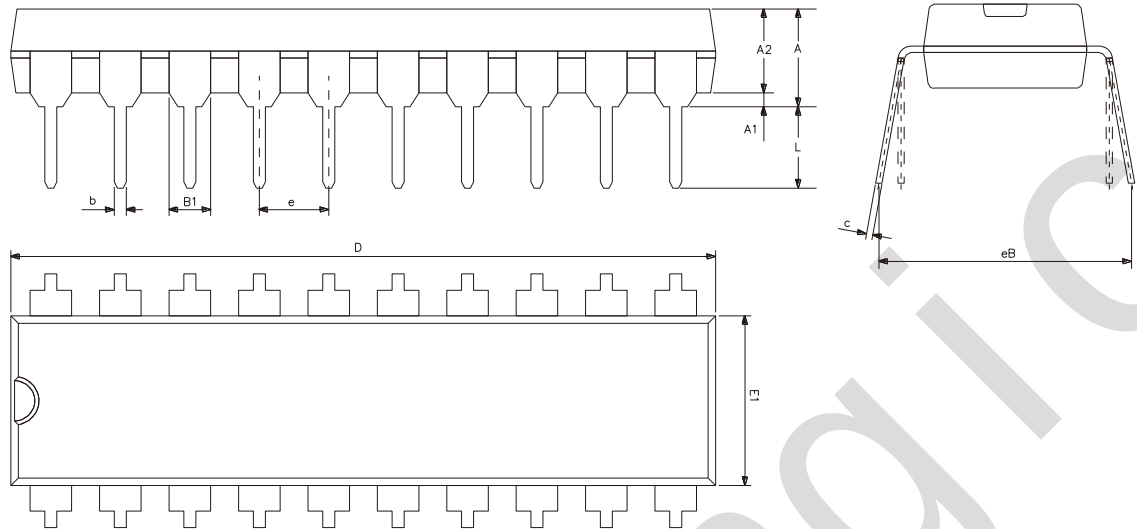
4.4、Test Data

Input		Load		S1 position		
V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
V_{CC}	6ns	15pF, 50pF	1k Ω	open	GND	V_{CC}



5、Package Information

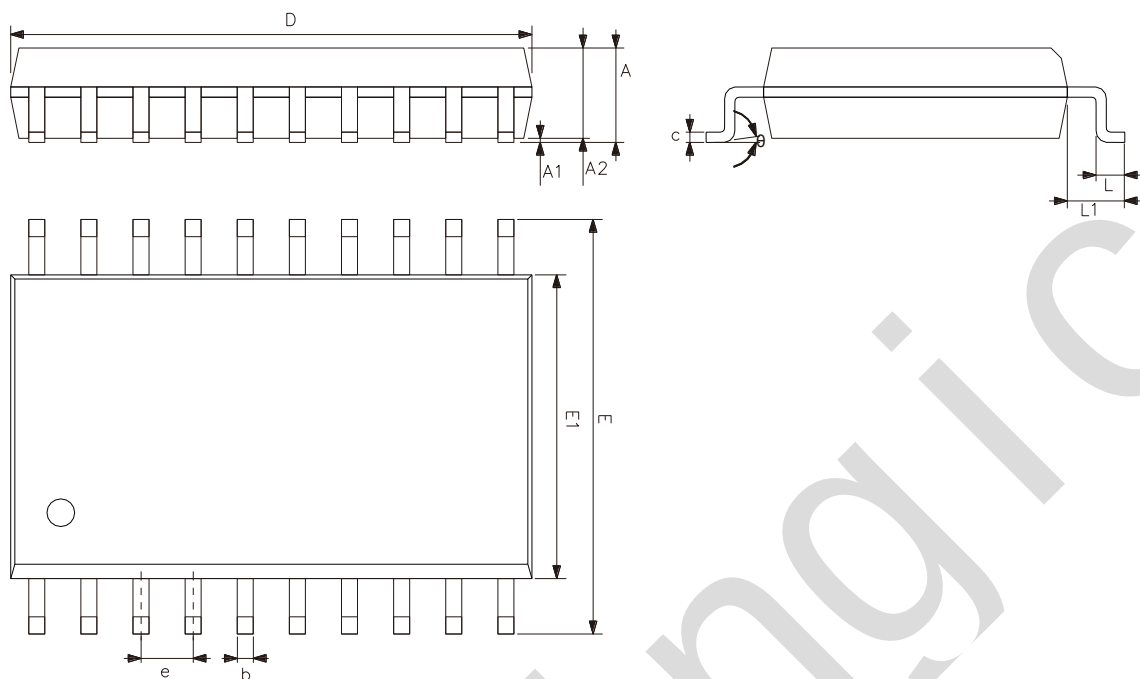
5.1、DIP20



Symbol	Dimensions (mm)	
	Min.	Max.
A	3.60	5.33
A1	0.51	-
A2	3.20	3.60
b	0.36	0.53
B1	1.52	
c	0.204	0.36
D	25.70	26.54
E1	6.20	6.75
e	2.54	
eB	7.62	9.30
L	3.00	3.60



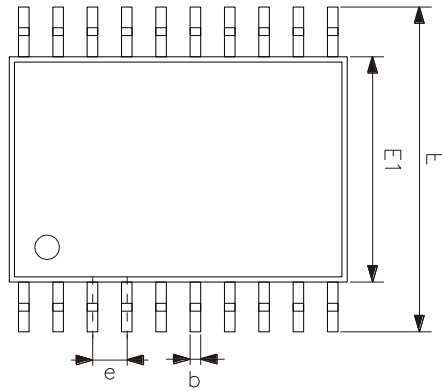
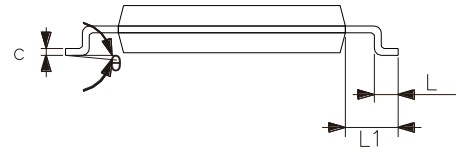
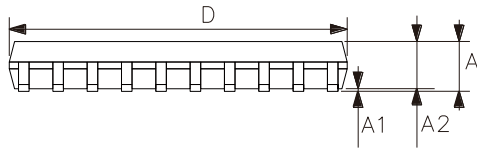
5.2、SOP20



Symbol	Dimensions (mm)	
	Min.	Max.
A	2.47	2.65
A1	0.05	0.30
A2	2.20	2.44
b	0.35	0.50
c	0.15	0.30
D	12.54	12.94
E	10.00	10.60
E1	7.30	7.70
e	1.27	
L	0.40	1.05
L1	1.30	1.50
θ	0°	8°



5.3、TSSOP20



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	6.40	6.60
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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