



SN74LS251(LX) 8-input Multiplexer; 3-state

Product Specification

Specification Revision History:

Version	Date	Description
2022-06-A1	2022-06	New
2023-04-B1	2023-04	Update the template



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1、General Description

The SN74LS251 is an 8-bit multiplexer with eight binary inputs (I0 to I7), three select inputs (S0 to S2) and an output enable input ($\overline{OE}$). The select inputs select one of the eight binary inputs and route it to the complementary outputs (Y and $\overline{Y}$). A HIGH on $\overline{OE}$ 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:

- Low-power dissipation
- Non-inverting data path
- Specified from -40°C to +125°C
- Packaging information: DIP16/SOP16/TSSOP16



Ordering Information:

Tube packing specifications:

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
SN74LS251N(LX)	DIP16	SN74LS251N	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
SN74LS251DR(LX)	SOP16	LS251	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
SN74LS251PW(LX)	TSSOP16	LS251	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
SN74LS251DR(LX)	SOP16	LS251	2500 PCS/reel	5000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
SN74LS251PW(LX)	TSSOP16	LS251	5000 PCS/reel	10000 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

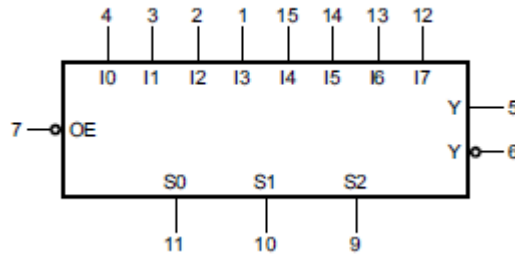


Figure 1. Logic symbol

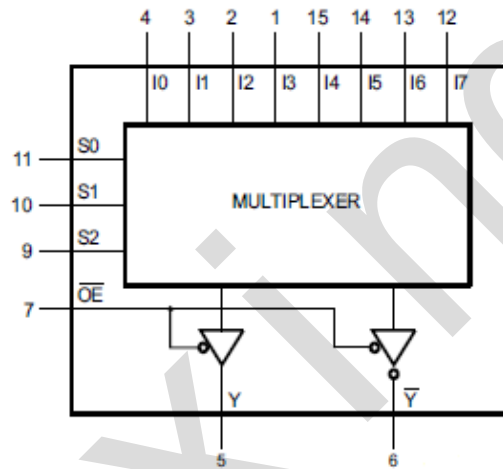


Figure 2. Functional diagram

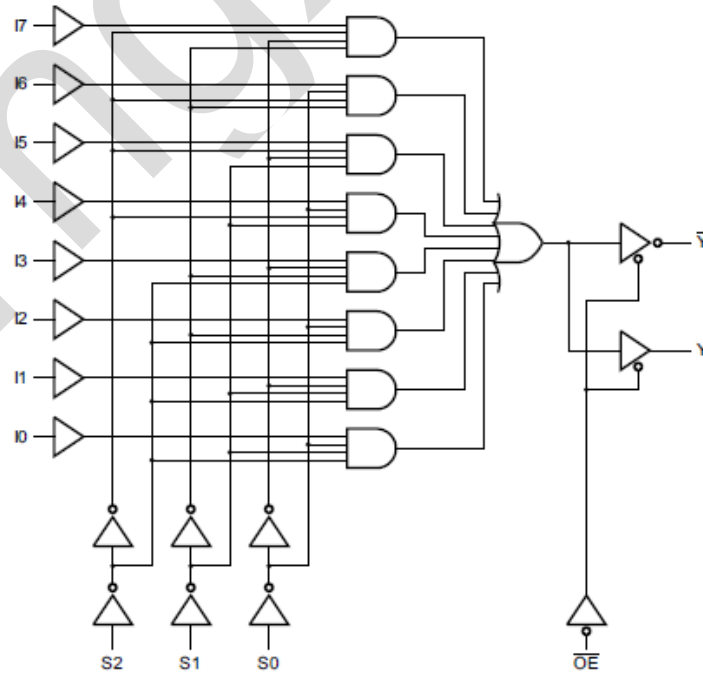
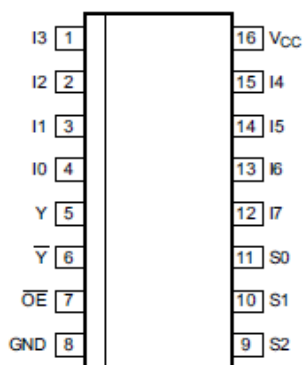


Figure 3. Logic diagram



2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	I3	data input
2	I2	data input
3	I1	data input
4	I0	data input
5	Y	multiplexer output
6	$\bar{Y}$	complementary multiplexer output
7	$\bar{OE}$	output enable input (active LOW)
8	GND	ground (0V)
9	S2	common data select input
10	S1	common data select input
11	S0	common data select input
12	I7	data input
13	I6	data input
14	I5	data input
15	I4	data input
16	V _{CC}	supply voltage



2.4、Function Table

Input												Output	
$\overline{OE}$	S2	S1	S0	I0	I1	I2	I3	I4	I5	I6	I7	$\overline{Y}$	Y
H	X	X	X	X	X	X	X	X	X	X	X	Z	Z
L	L	L	L	L	X	X	X	X	X	X	X	H	L
L	L	L	L	H	X	X	X	X	X	X	X	L	H
L	L	L	H	X	L	X	X	X	X	X	X	H	L
L	L	L	H	X	H	X	X	X	X	X	X	L	H
L	L	H	L	X	X	L	X	X	X	X	X	H	L
L	L	H	L	X	X	H	X	X	X	X	X	L	H
L	L	H	H	X	X	X	L	X	X	X	X	H	L
L	L	H	H	X	X	X	H	X	X	X	X	L	H
L	H	L	L	X	X	X	X	L	X	X	X	H	L
L	H	L	L	X	X	X	X	H	X	X	X	L	H
L	H	L	H	X	X	X	X	X	L	X	X	H	L
L	H	L	H	X	X	X	X	X	H	X	X	L	H
L	H	H	L	X	X	X	X	X	X	L	X	H	L
L	H	H	L	X	X	X	X	X	X	H	X	L	H
L	H	H	H	X	X	X	X	X	X	X	L	H	L
L	H	H	H	X	X	X	X	X	X	X	H	L	H

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	V _O = -0.5V to (V _{CC} +0.5V)		-	±25	mA
supply current	I _{CC}	-		-	+50	mA
ground current	I _{GND}	-		-50	-	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		



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

($T_{amb}=25^{\circ}C$, 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		-	-	±1.0	uA
OFF-state output current	I _{OZ}	V _I =V _{IH} or V _{IL} ; V _O =V _{CC} or GND; V _{CC} =6.0V		-	-	±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} =2.0V		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 =-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 =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 =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		-	-	±1.0	uA
OFF-state	I _{OZ}	V _I =V _{IH} or V _{IL} ; V _O =V _{CC} or GND; V _{CC} =6.0V		-	-	±5.0	uA
output current							
supply current	I _{CC}	V _I =V _{CC} or GND; I _O =0A; V _{CC} =6.0V		-	-	80	uA



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 =-4.0mA; V _{CC} =4.5V	3.7	-	-	V
			I _O =-5.2mA; 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 =4.0mA; V _{CC} =4.5V	-	-	0.4	V
			I _O =5.2mA; 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 _O =V _{CC} or GND; V _{CC} =6.0V		-	-	±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

($T_{amb}=25^{\circ}\text{C}$, $GND=0\text{V}$, $C_L=50\text{pF}$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t _{pd}	In to Y; see Figure 5	V _{CC} =2.0V	-	50	170	ns
			V _{CC} =4.5V	-	18	34	ns
			V _{CC} =5.0V; C _L =15pF	-	15	-	ns
			V _{CC} =6.0V	-	14	29	ns
		In to $\bar{Y}$; see Figure 5	V _{CC} =2.0V	-	55	175	ns
			V _{CC} =4.5V	-	20	35	ns
			V _{CC} =5.0V; C _L =15pF	-	17	-	ns
			V _{CC} =6.0V	-	16	30	ns
		Sn to Y; see Figure 6	V _{CC} =2.0V	-	66	205	ns
			V _{CC} =4.5V	-	24	41	ns
			V _{CC} =5.0V; C _L =15pF	-	20	-	ns
			V _{CC} =6.0V	-	19	35	ns
		Sn to $\bar{Y}$; see Figure 6	V _{CC} =2.0V	-	69	205	ns
			V _{CC} =4.5V	-	25	41	ns
			V _{CC} =5.0V; C _L =15pF	-	21	-	ns
			V _{CC} =6.0V	-	20	35	ns
$\bar{OE}$ to Y, $\bar{Y}$ enable time	t _{en}	see Figure 6	V _{CC} =2.0V	-	36	140	ns
			V _{CC} =4.5V	-	13	28	ns
			V _{CC} =6.0V	-	10	24	ns
$\bar{OE}$ to Y, $\bar{Y}$ disable time	t _{dis}	see Figure 6	V _{CC} =2.0V	-	39	140	ns
			V _{CC} =4.5V	-	14	28	ns
			V _{CC} =6.0V	-	11	24	ns
transition time	t _t	Y, $\bar{Y}$; see Figure 5	V _{CC} =2.0V	-	19	75	ns
			V _{CC} =4.5V	-	7	15	ns
			V _{CC} =6.0V	-	6	13	ns
power dissipation capacitance	C _{PD}	C _L =50pF; f=1MHz; V _I =GND to V _{CC}		-	44	-	pF

Note:

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

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

[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 μW).

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

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 $+85^{\circ}\text{C}$, $GND = 0V$, $C_L = 50pF$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit	
propagation delay	t_{pd}	In to Y; see Figure 5	$V_{CC}=2.0V$	-	-	215	ns	
			$V_{CC}=4.5V$	-	-	43	ns	
			$V_{CC}=6.0V$	-	-	37	ns	
		In to $\bar{Y}$; see Figure 5	$V_{CC}=2.0V$	-	-	220	ns	
			$V_{CC}=4.5V$	-	-	44	ns	
			$V_{CC}=6.0V$	-	-	37	ns	
		Sn to Y; see Figure 6	$V_{CC}=2.0V$	-	-	255	ns	
			$V_{CC}=4.5V$	-	-	51	ns	
			$V_{CC}=6.0V$	-	-	43	ns	
		Sn to $\bar{Y}$; see Figure 6	$V_{CC}=2.0V$	-	-	255	ns	
			$V_{CC}=4.5V$	-	-	51	ns	
			$V_{CC}=6.0V$	-	-	43	ns	
$\bar{OE}$ to Y, $\bar{Y}$ enable time	t_{en}	see Figure 6	$V_{CC}=2.0V$	-	-	175	ns	
$\bar{OE}$ to Y, $\bar{Y}$ disable time	t_{dis}		see Figure 6	$V_{CC}=4.5V$	-	-	35	ns
				$V_{CC}=6.0V$	-	-	30	ns
		transition time		t_t	Y, $\bar{Y}$; see Figure 5	$V_{CC}=2.0V$	-	-
$V_{CC}=4.5V$	-		-			19	ns	
$V_{CC}=6.0V$	-		-			16	ns	

Note:

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] t_{en} is the same as t_{PZH} and t_{PZL} .
- [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 $+125^{\circ}\text{C}$, $GND = 0V$, $C_L = 50pF$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit	
propagation delay	t_{pd}	In to Y; see Figure 5	$V_{CC}=2.0V$	-	-	255	ns	
			$V_{CC}=4.5V$	-	-	51	ns	
			$V_{CC}=6.0V$	-	-	43	ns	
		In to $\bar{Y}$; see Figure 5	$V_{CC}=2.0V$	-	-	265	ns	
			$V_{CC}=4.5V$	-	-	53	ns	
			$V_{CC}=6.0V$	-	-	45	ns	
		Sn to Y; see Figure 6	$V_{CC}=2.0V$	-	-	310	ns	
			$V_{CC}=4.5V$	-	-	62	ns	
			$V_{CC}=6.0V$	-	-	53	ns	
		Sn to $\bar{Y}$; see Figure 6	$V_{CC}=2.0V$	-	-	310	ns	
			$V_{CC}=4.5V$	-	-	62	ns	
			$V_{CC}=6.0V$	-	-	53	ns	
$\bar{OE}$ to Y, $\bar{Y}$ enable time	t_{en}	see Figure 6	$V_{CC}=2.0V$	-	-	210	ns	
$\bar{OE}$ to Y, $\bar{Y}$ disable time	t_{dis}		see Figure 6	$V_{CC}=4.5V$	-	-	42	ns
				$V_{CC}=6.0V$	-	-	36	ns
		$V_{CC}=2.0V$		-	-	210	ns	
$\bar{OE}$ to Y, $\bar{Y}$ disable time	t_{dis}	see Figure 6	$V_{CC}=4.5V$	-	-	42	ns	
			$V_{CC}=6.0V$	-	-	36	ns	
			transition time	t_t	Y, $\bar{Y}$; see Figure 5	$V_{CC}=2.0V$	-	-
$V_{CC}=4.5V$	-	-				22	ns	
$V_{CC}=6.0V$	-	-				19	ns	

Note:

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

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

[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

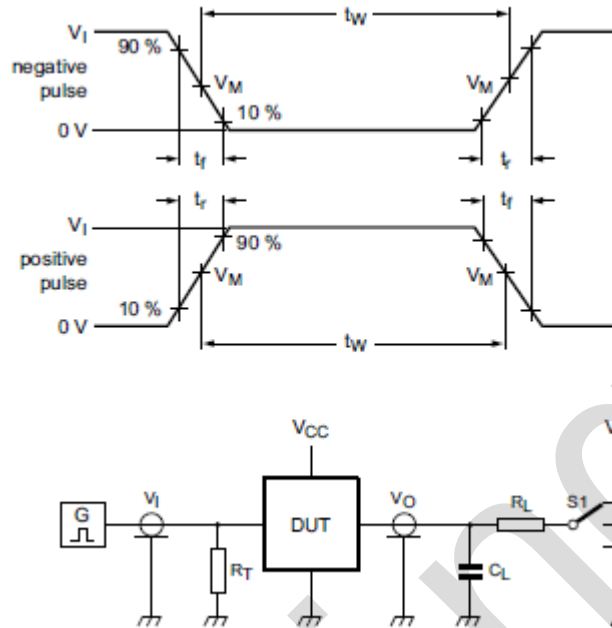


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

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

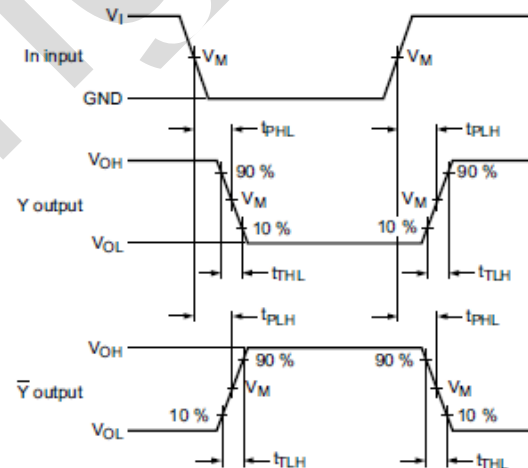


Figure 5. Propagation delay input (In) to output (Y, $\bar{Y}$) and the output (Y, $\bar{Y}$) transition time

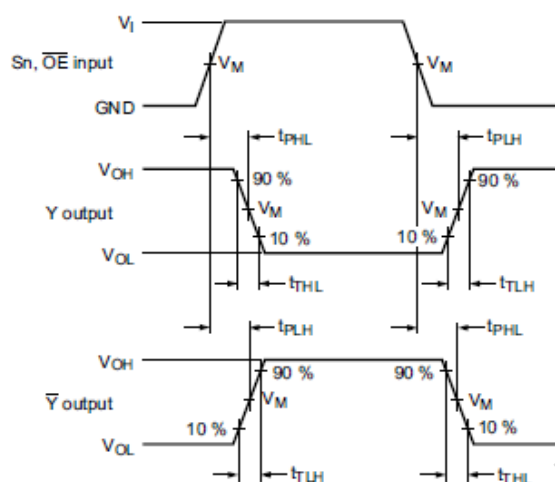


Figure 6. Propagation delay input (Sn, OE) to output (Y, Y-bar)

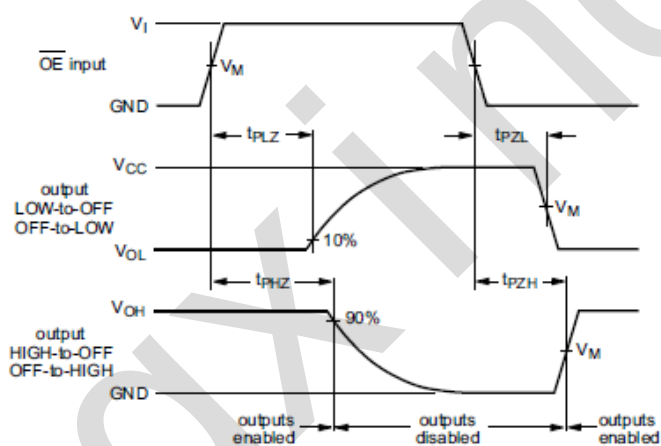


Figure 7. Enable and disable times

4.3、Measurement Points

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

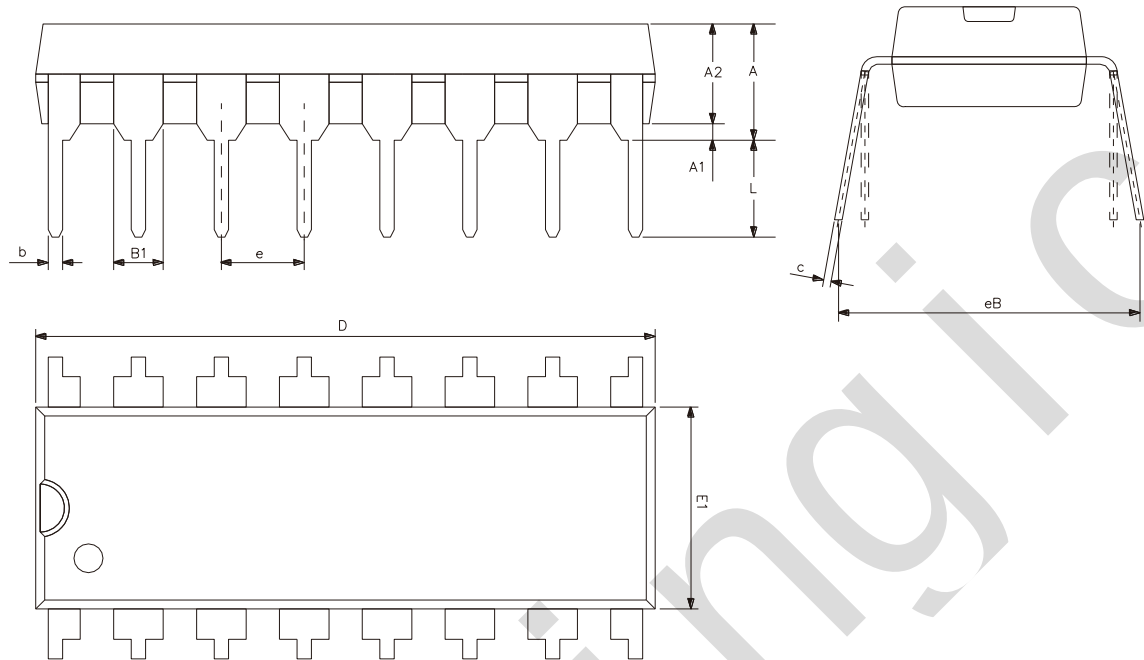
4.4、Test Data

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	1kΩ	open	GND	V_{CC}



5、Package Information

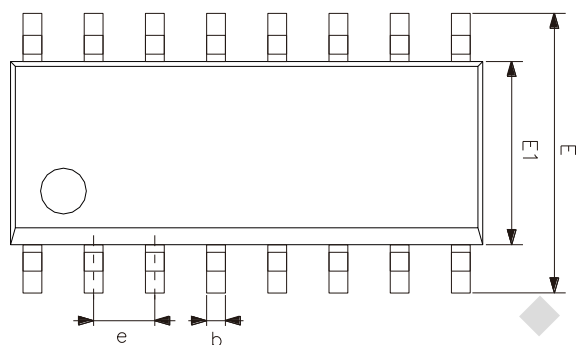
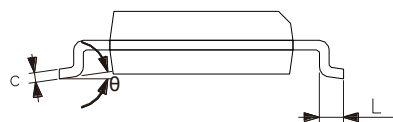
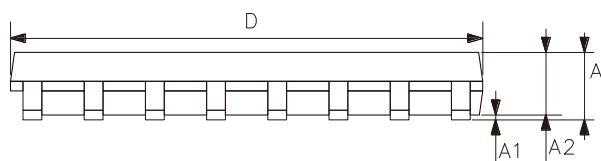
5.1、DIP16



Symbol	Dimensions (mm)	
	Min.	Max.
A2	3.20	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



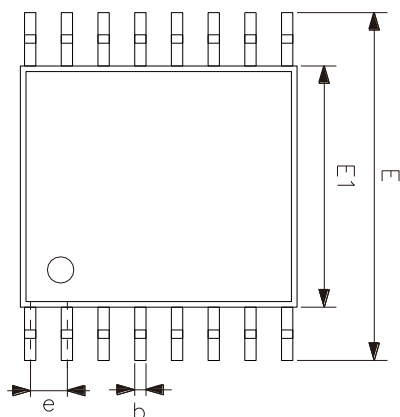
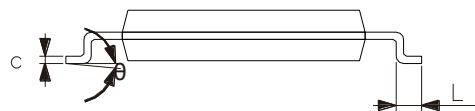
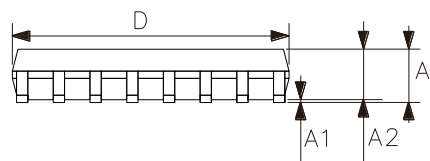
5.2、SOP16



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°



5.3、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°



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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