



AiP74LVC3G14

Triple Inverter Schmitt Trigger

Product Specification

Specification Revision History:

Version	Date	Description
2017-04-A1	2017-04	New
2023-04-B1	2023-04	Update the template



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1、General Description

The AiP74LVC3G14 provides three inverting buffers with Schmitt trigger input. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

The inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device in a mixed 3.3V and 5V environment. Schmitt trigger action at the inputs makes the circuit tolerant of slower input rise and fall time. This device is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

Features:

- Wide supply voltage range from 1.65V to 5.5V
- 5 V tolerant input/output for interfacing with 5V logic
- $\pm 24\text{mA}$ output drive ($V_{CC}=3.0\text{V}$)
- CMOS low power consumption
- Direct interface with TTL levels
- Unlimited rise and fall times
- Specified from -40°C to $+125^{\circ}\text{C}$
- Packaging information: TSSOP8/VSSOP8/XSON8

**Ordering Information:****Tube packing specifications:**

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74LVC3G14TA8.TB	TSSOP8	DBXX	100 PCS/tube	200 tube/box	20000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC3G14TA8.TR	TSSOP8	DBXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing:0.65mm
AiP74LVC3G14YA8.TR	VSSOP8	DBXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 2.0mm×2.3mm Pin spacing:0.50mm
AiP74LVC3G14EB8.TR	XSON8	DBXX	5000 PCS/reel	25000 PCS/box	Dimensions of plastic enclosure: 1.35mm×1.0mm Pin spacing:0.35mm

Note 1: "XX" refers to variable content, meaning year and package batch serial number.

Note 2: 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

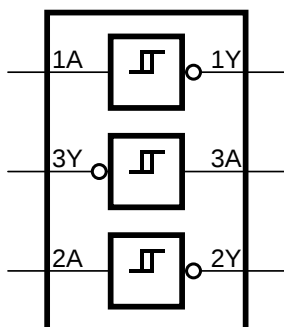


Figure 1. Logic symbol

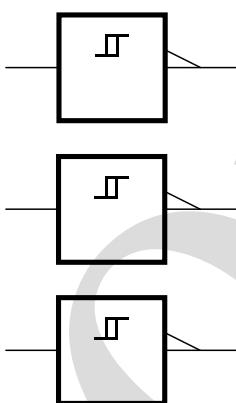
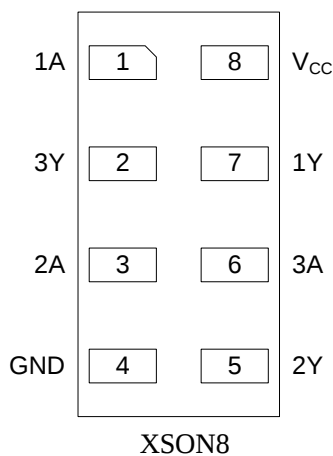
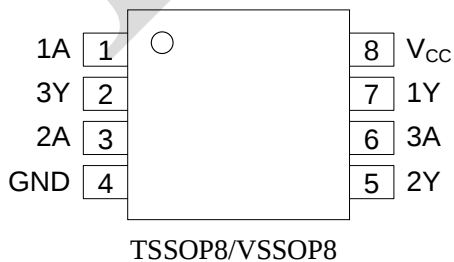


Figure 2. IEC logic symbol



Figure 3. Logic diagram (one Schmitt trigger)

2.2、Pin Configurations





2.3、Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	3Y	data output
3	2A	data input
4	GND	ground (0V)
5	2Y	data output
6	3A	data input
7	1Y	data output
8	V _{CC}	supply voltage

2.4、Function Table

Input nA	Output nY
L	H
H	L

Note: H=HIGH voltage level; L=LOW voltage level

3、Electrical Parameter

3.1、Absolute Maximum Ratings

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V _{CC}	-	-0.5	+6.5	V
input clamping current	I _{IK}	V _I <0V	-50	-	mA
input voltage	V _I	[1]	-0.5	+6.5	V
output clamping current	I _{OK}	V _O >V _{CC} or V _O <0V	-	±50	mA
output voltage	V _O	Active mode ^{[1][2]}	-0.5	V _{CC} +0.5	V
		Power-down mode ^{[1][2]}	-0.5	+6.5	V
output current	I _O	V _O =0V to V _{CC}	-	±50	mA
supply current	I _{CC}	-	-	100	mA
ground current	I _{GND}	-	-100	-	mA
storage temperature	T _{stg}	-	-65	+150	℃
total power dissipation	P _{tot}	-	-	250	mW
soldering temperature	T _L	10s	260		℃

Note:

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] When V_{CC}=0V (Power-down mode), the output voltage can be 5.5V in normal operation.



3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	1.65	-	5.5	V
input voltage	V_I	-	0	-	5.5	V
output voltage	V_O	Active mode	0	-	V_{CC}	V
		Power-down mode; $V_{CC}=0V$	0	-	5.5	V
ambient temperature	T_{amb}	-	-40	-	+125	°C

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

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

Parameter	Symbol	Conditions	Min.	Typ. ^[1]	Max.	Unit
HIGH-level output voltage	V_{OH}	$V_I=V_{T+}$ or V_{T-}	$I_O=-100\mu A$; $V_{CC}=1.65V$ to $5.5V$	$V_{CC}-0.1$	-	V
			$I_O=-4mA$; $V_{CC}=1.65V$	1.2	-	V
			$I_O=-8mA$; $V_{CC}=2.3V$	1.9	-	V
			$I_O=-12mA$; $V_{CC}=2.7V$	2.2	-	V
			$I_O=-24mA$; $V_{CC}=3.0V$	2.3	-	V
			$I_O=-32mA$; $V_{CC}=4.5V$	3.8	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{T+}$ or V_{T-}	$I_O=100\mu A$; $V_{CC}=1.65V$ to $5.5V$	-	-	0.10 V
			$I_O=4mA$; $V_{CC}=1.65V$	-	-	0.45 V
			$I_O=8mA$; $V_{CC}=2.3V$	-	-	0.30 V
			$I_O=12mA$; $V_{CC}=2.7V$	-	-	0.40 V
			$I_O=24mA$; $V_{CC}=3.0V$	-	-	0.55 V
			$I_O=32mA$; $V_{CC}=4.5V$	-	-	0.55 V
input leakage current	I_I	$V_I=5.5V$ or GND; $V_{CC}=0V$ to $5.5V$	-	-	± 1	μA
power-off leakage current	I_{OFF}	V_I or $V_O=5.5V$; $V_{CC}=0V$	-	-	± 2	μA
supply current	I_{CC}	$V_I=5.5V$ or GND; $I_O=0A$; $V_{CC}=1.65V$ to $5.5V$	-	-	4	μA
additional supply current	ΔI_{CC}	$V_I=V_{CC}-0.6V$; $I_O=0A$; $V_{CC}=2.3V$ to $5.5V$	-	-	500	μA
input capacitance	C_I	$V_{CC}=3.3V$; $V_I=GND$ to V_{CC}	-	3.5	-	pF

Note: All typical values are measured at maximum V_{CC} and $T_{amb}=25^{\circ}C$.



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. ^[1]	Max.	Unit
HIGH-level output voltage	V_{OH}	$V_I = V_{T+}$ or V_{T-}	$I_O = -100\mu\text{A}; V_{CC} = 1.65\text{V to } 5.5\text{V}$	$V_{CC} - 0.1$	-	V
			$I_O = -4\text{mA}; V_{CC} = 1.65\text{V}$	0.95	-	V
			$I_O = -8\text{mA}; V_{CC} = 2.3\text{V}$	1.7	-	V
			$I_O = -12\text{mA}; V_{CC} = 2.7\text{V}$	1.9	-	V
			$I_O = -24\text{mA}; V_{CC} = 3.0\text{V}$	2.0	-	V
			$I_O = -32\text{mA}; V_{CC} = 4.5\text{V}$	3.4	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{T+}$ or V_{T-}	$I_O = 100\mu\text{A}; V_{CC} = 1.65\text{V to } 5.5\text{V}$	-	-	0.10 V
			$I_O = 4\text{mA}; V_{CC} = 1.65\text{V}$	-	-	0.70 V
			$I_O = 8\text{mA}; V_{CC} = 2.3\text{V}$	-	-	0.45 V
			$I_O = 12\text{mA}; V_{CC} = 2.7\text{V}$	-	-	0.60 V
			$I_O = 24\text{mA}; V_{CC} = 3.0\text{V}$	-	-	0.80 V
			$I_O = 32\text{mA}; V_{CC} = 4.5\text{V}$	-	-	0.80 V
input leakage current	I_I	$V_I = 5.5\text{V or GND}; V_{CC} = 0\text{V to } 5.5\text{V}$	-	-	± 1	μA
power-off leakage current	I_{OFF}	V_I or $V_O = 5.5\text{V}; V_{CC} = 0\text{V}$	-	-	± 2	μA
supply current	I_{CC}	$V_I = 5.5\text{V or GND}; I_O = 0\text{A}; V_{CC} = 1.65\text{V to } 5.5\text{V}$	-	-	4	μA
additional supply current	ΔI_{CC}	$V_I = V_{CC} - 0.6\text{V}; I_O = 0\text{A}; V_{CC} = 2.3\text{V to } 5.5\text{V}$	-	-	500	μA

Note: All typical values are measured at maximum V_{CC} and $T_{amb} = 25^{\circ}\text{C}$.

3.3.3、AC 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. ^[1]	Max.	Unit
nA to nY propagation delay	t_{pd}	see Figure 5 ^[2]	$V_{CC} = 1.65\text{V to } 1.95\text{V}$	1.0	4.2	11.0 ns
			$V_{CC} = 2.3\text{V to } 2.7\text{V}$	0.5	3.0	6.5 ns
			$V_{CC} = 2.7\text{V}$	0.5	3.8	7.0 ns
			$V_{CC} = 3.0\text{V to } 3.6\text{V}$	0.5	3.2	6.0 ns
			$V_{CC} = 4.5\text{V to } 5.5\text{V}$	0.5	2.4	4.3 ns
Power dissipation capacitance	C_{PD}	$V_{CC} = 3.3\text{V}; V_I = \text{GND to } V_{CC}$ ^[3]	-	18.1	-	pF

Note:

[1] Typical values are measured at $T_{amb} = 25^{\circ}\text{C}$ and $V_{CC} = 1.8\text{V}, 2.5\text{V}, 2.7\text{V}, 3.3\text{V}$ and 5.0V respectively.

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

[3] 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.

3.3.4、AC 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. ^[1]	Max.	Unit
nA to nY propagation delay	t_{pd}	$V_{CC}=1.65\text{V}$ to 1.95V	1.0	-	12.0	ns
		$V_{CC}=2.3\text{V}$ to 2.7V	0.5	-	7.2	ns
		$V_{CC}=2.7\text{V}$	0.5	-	7.7	ns
		$V_{CC}=3.0\text{V}$ to 3.6V	0.5	-	6.7	ns
		$V_{CC}=4.5\text{V}$ to 5.5V	0.5	-	4.7	ns

Note:

[1] Typical values are measured at $T_{amb}=25^{\circ}\text{C}$ and $V_{CC}=1.8\text{V}$, 2.5V , 2.7V , 3.3V and 5.0V respectively.

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

3.3.5、Transfer 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. ^[1]	Max.	Unit
positive-going threshold voltage	V _{T+}	see Figure 6 and Figure 7	V _{CC} =1.8V	0.70	1.10	1.50	V
			V _{CC} =2.3V	1.00	1.40	1.80	V
			V _{CC} =3.0V	1.30	1.76	2.20	V
			V _{CC} =4.5V	1.90	2.47	3.10	V
			V _{CC} =5.5V	2.20	2.91	3.60	V
negative-going threshold voltage	V _{T-}	see Figure 6 and Figure 7	V _{CC} =1.8V	0.25	0.61	0.90	V
			V _{CC} =2.3V	0.40	0.80	1.15	V
			V _{CC} =3.0V	0.60	1.04	1.50	V
			V _{CC} =4.5V	1.00	1.55	2.00	V
			V _{CC} =5.5V	1.20	1.86	2.30	V
hysteresis voltage	V _H ^[2]	(V _{T+} -V _{T-}); see Figure 6, Figure 7 and Figure 8	V _{CC} =1.8V	0.15	0.49	1.00	V
			V _{CC} =2.3V	0.25	0.60	1.10	V
			V _{CC} =3.0V	0.40	0.73	1.20	V
			V _{CC} =4.5V	0.60	0.92	1.50	V
			V _{CC} =5.5V	0.70	1.02	1.70	V

Note:

[1] All typical values are measured at $T_{amb}=25^{\circ}\text{C}$

[2] $V_H=V_{T+}-V_{T-}$.



3.3.6、Transfer 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. ^[1]	Max.	Unit
positive-going threshold voltage	V _{T+}	see Figure 6 and Figure 7	V _{CC} =1.8V	0.70	-	1.70	V
			V _{CC} =2.3V	1.00	-	2.00	V
			V _{CC} =3.0V	1.30	-	2.40	V
			V _{CC} =4.5V	1.90	-	3.30	V
			V _{CC} =5.5V	2.20	-	3.80	V
negative-going threshold voltage	V _{T-}	see Figure 6 and Figure 7	V _{CC} =1.8V	0.25	-	1.10	V
			V _{CC} =2.3V	0.40	-	1.35	V
			V _{CC} =3.0V	0.60	-	1.70	V
			V _{CC} =4.5V	1.00	-	2.20	V
			V _{CC} =5.5V	1.20	-	2.50	V
hysteresis voltage	V _H ^[2]	(V _{T+} -V _{T-}); see Figure 6, Figure 7 and Figure 8	V _{CC} =1.8V	0.15	-	1.20	V
			V _{CC} =2.3V	0.25	-	1.30	V
			V _{CC} =3.0V	0.40	-	1.40	V
			V _{CC} =4.5V	0.60	-	1.70	V
			V _{CC} =5.5V	0.70	-	1.90	V

Note:

[1] All typical values are measured at $T_{amb}=25^{\circ}\text{C}$

[2] $V_H = V_{T+} - V_{T-}$

4、Testing Circuit

4.1、AC Testing Circuit

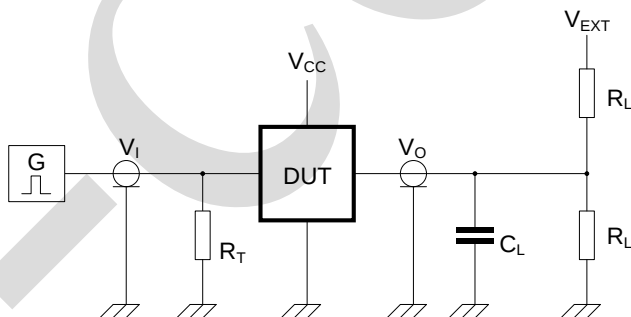


Figure 4. Test circuit for measuring switching times

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.

V_{EXT} =External voltage for measuring switching times.



4.2、AC Testing Waveforms

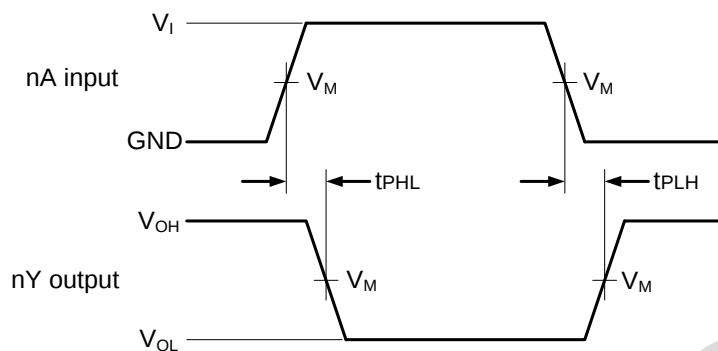


Figure 5. The input nA to output nY propagation delays

4.3、Transfer Characteristics Waveforms

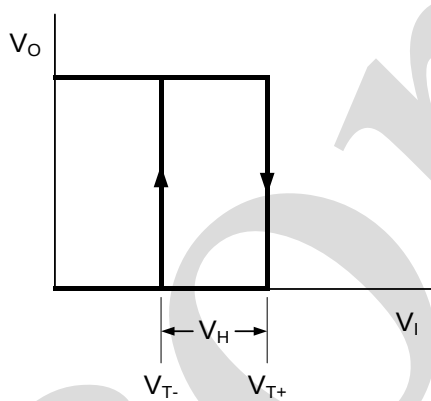


Figure 6. Transfer characteristic

V_{T+} and V_{T-} limits at 70% and 20%:

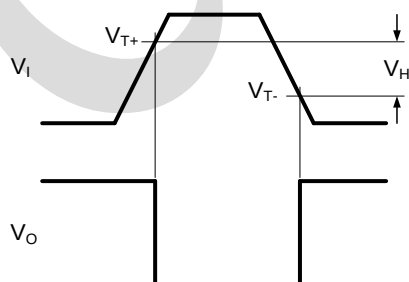


Figure 7. Definition of V_{T+} , V_{T-} and V_H

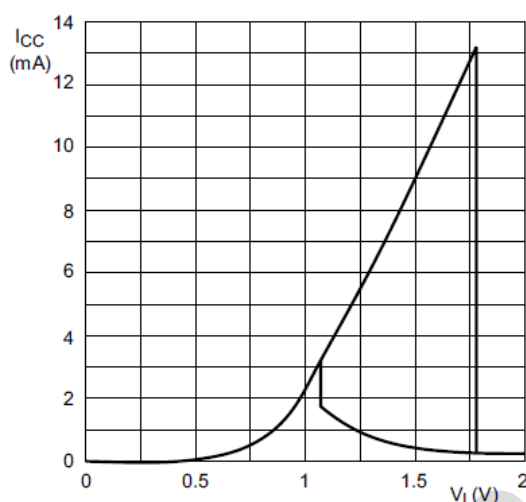
 $V_{CC}=3.0V$:

Figure 8. Typical transfer characteristics

4.4、Measurement Points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
1.65V to 1.95V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3V to 2.7V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.7V	1.5V	1.5V
3.0V to 3.6V	1.5V	1.5V
4.5V to 5.5V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

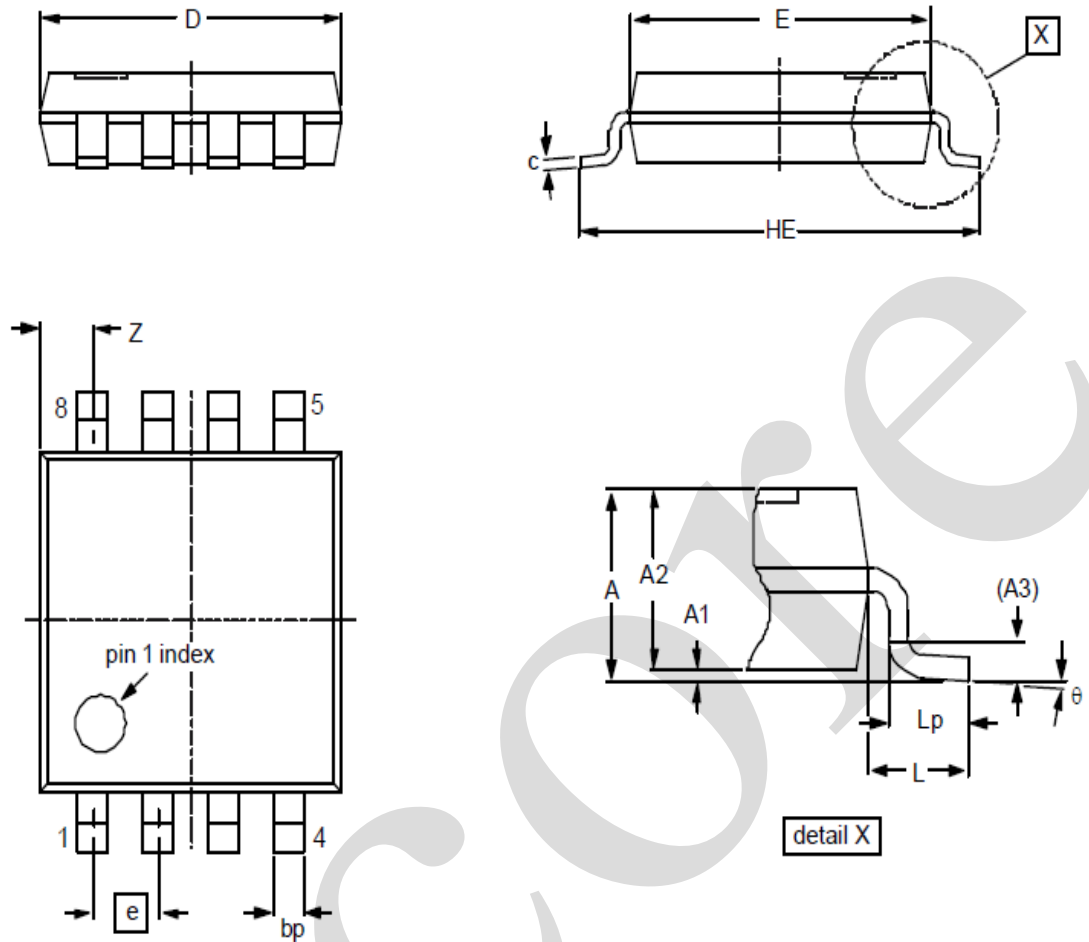
4.5、Test Data

Supply voltage	Input		Load		V_{EXT}
V_{CC}	V_I	$t_r=t_f$	C_L	R_L	t_{PLH}, t_{PHL}
1.65V to 1.95V	V_{CC}	$\leq 2.0ns$	30pF	1k Ω	open
2.3V to 2.7V	V_{CC}	$\leq 2.0ns$	30pF	500 Ω	open
2.7V	2.7V	$\leq 2.5ns$	50pF	500 Ω	open
3.0V to 3.6V	2.7V	$\leq 2.5ns$	50pF	500 Ω	open
4.5V to 5.5V	V_{CC}	$\leq 2.5ns$	50pF	500 Ω	open



5、Package Information

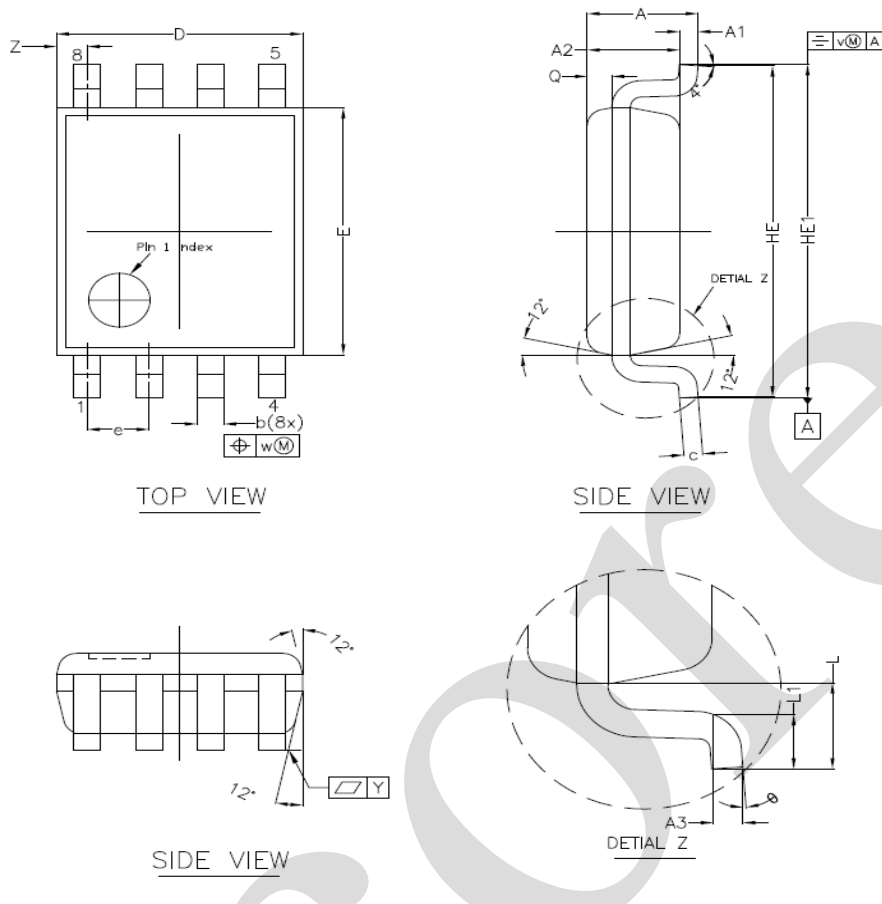
5.1、TSSOP8



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.10
A1	0	0.15
A2	0.75	0.95
A3	0.25	
bp	0.22	0.38
c	0.08	0.18
D	2.90	3.10
E	2.90	3.10
HE	3.90	4.10
L	0.50	
Lp	0.33	0.47
e	0.65	
Z	0.35	0.70
θ	0°	8°



5.2、VSSOP8

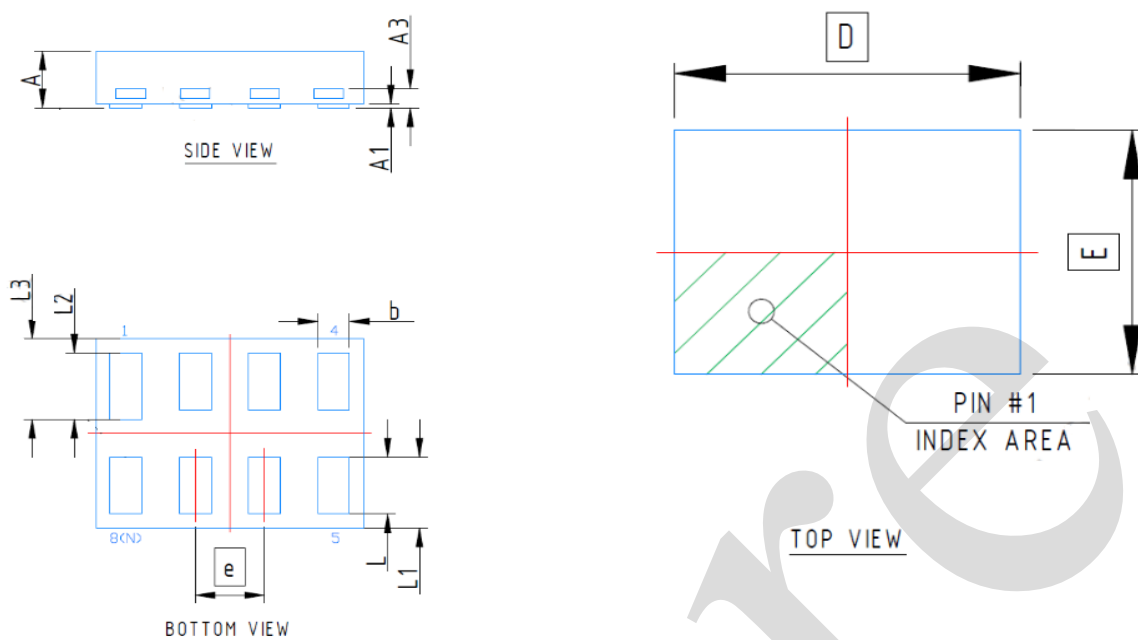


NOTES
1.0 COP
DIE ATTA
2.0 D E

Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.00
A1	0.00	0.15
A2	0.60	0.85
A3	0.12	
Q	0.19	0.21
b	0.17	0.27
c	0.08	0.23
D	1.90	2.10
E	2.20	2.40
HE	3.00	3.20
e	0.50	
L	0.40	
L1	0.15	0.40
Y	0.10	
Z	0.10	0.40
θ	0°	8°



5.3、XSON8



Symbol	Dimensions (mm)	
	Min.	Max.
A	0.28	0.32
A1	0.00	0.05
A3	0.10	
b	0.11	0.21
D	1.35	
E	1.00	
e	0.35	
L	0.25	0.35
L1	0.275	0.475
L2	0.30	0.40
L3	0.325	0.525



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

We recommend you to read this chapter carefully before using this product.

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