AiP74LVC3G14
Triple Inverter Schmitt Trigger

Product Specification

Specification Revision History:

Version	Date	Description
2017-04-A1	2017-04	New
2021-12-A2	2021-12	Modify ordering information
2022-02-A3	2022-02	Modify ambient temperature to -40℃~+105℃ and add electrical characteristics of -40℃~+105℃
2022-03-A4	2022-03	Modify ordering information note 1

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
- ±24mA output drive (V_{CC}=3.0V)
- CMOS low power consumption
- Direct interface with TTL levels
- Unlimited rise and fall times
- Specified from -40℃ to +105℃
- Packaging information:TSSOP8/VSSOP8

Ordering Information:

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC3G14TA8.TR	TSSOP8	DBXX	3000 PCS/reel	6000 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

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

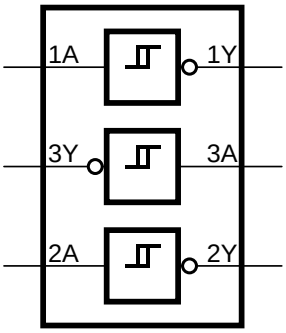


Figure 1. Logic symbol

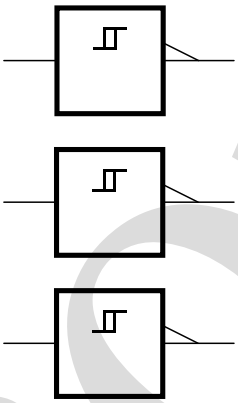
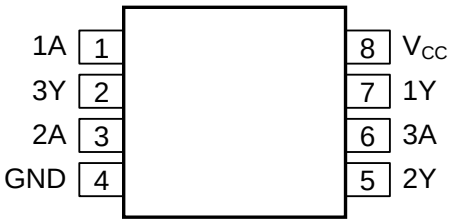


Figure 2. IEC logic symbol

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}	-[3]	-	250	mW
soldering temperature	T_L	10s	250		℃

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] For TSSOP8 package: above 55℃ the value of P_{tot} derates linearly with 2.5mW/K.
For VSSOP8 package: above 110℃ the value of P_{tot} derates linearly with 8mW/K.

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	-	+105	℃

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

(T_{amb}=-40℃ to +85℃, 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=-100uA; 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=100uA; 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		-	±0.1	±1	uA
power-off leakage current	I_{OFF}	V_I or V_O=5.5V; V_{CC}=0V		-	±0.1	±2	uA
supply current	I_{CC}	V_I=5.5V or GND; I_O=0A; V_{CC}=1.65V to 5.5V		-	0.1	4	uA
additional supply current	ΔI_{CC}	V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=2.3V to 5.5V		-	5	500	uA
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℃.

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +105℃, 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=-100uA; V_{CC}=1.65V to 5.5V	V_{CC}-0.1	-	-	V
			I_O=-4mA; V_{CC}=1.65V	0.95	-	-	V
			I_O=-8mA; V_{CC}=2.3V	1.7	-	-	V
			I_O=-12mA; V_{CC}=2.7V	1.9	-	-	V
			I_O=-24mA; V_{CC}=3.0V	2.0	-	-	V
			I_O=-32mA; V_{CC}=4.5V	3.4	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{T+} or V_{T-}	I_O=100uA; V_{CC}=1.65V to 5.5V	-	-	0.10	V
			I_O=4mA; V_{CC}=1.65V	-	-	0.70	V
			I_O=8mA; V_{CC}=2.3V	-	-	0.45	V
			I_O=12mA; V_{CC}=2.7V	-	-	0.60	V
			I_O=24mA; V_{CC}=3.0V	-	-	0.80	V
			I_O=32mA; V_{CC}=4.5V	-	-	0.80	V
input leakage current	I_I	V_I=5.5V or GND; V_{CC}=0V to 5.5V		-	-	±1	uA
power-off leakage current	I_{OFF}	V_I or V_O=5.5V; V_{CC}=0V		-	-	±2	uA
supply current	I_{CC}	V_I=5.5V or GND; I_O=0A; V_{CC}=1.65V to 5.5V		-	-	4	uA
additional supply current	ΔI_{CC}	V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=2.3V to 5.5V		-	-	500	uA

Note: All typical values are measured at maximum V_{CC} and T_{amb}=25℃.

3.3.3、AC Characteristics 1

(T_{amb}=-40℃ to +85℃, 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}=1.65V to 1.95V	1.0	4.2	11.0	ns
			V_{CC}=2.3V to 2.7V	0.5	3.0	6.5	ns
			V_{CC}=2.7V	0.5	3.8	7.0	ns
			V_{CC}=3.0V to 3.6V	0.5	3.2	6.0	ns
			V_{CC}=4.5V to 5.5V	0.5	2.4	4.3	ns
Power dissipation capacitance	C_{PD}	V_{CC}=3.3V; V_I=GND to V_{CC}[3]		-	18.1	-	pF

Note:

[1] Typical values are measured at T_{amb}=25℃ and V_{CC}=1.8V, 2.5V, 2.7V, 3.3V 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 uW).

P_D=C_{PD}×V_{CC}^2×f_i×N+∑(C_L×V_{CC}^2×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.

3.3.4、AC Characteristics 2

(T_{amb}=-40℃ to +105℃, 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}=1.65V to 1.95V	1.0	-	12.0	ns
			V_{CC}=2.3V to 2.7V	0.5	-	7.2	ns
			V_{CC}=2.7V	0.5	-	7.7	ns
			V_{CC}=3.0V to 3.6V	0.5	-	6.7	ns
			V_{CC}=4.5V to 5.5V	0.5	-	4.7	ns

Note:

[1] Typical values are measured at T_{amb}=25℃ and V_{CC}=1.8V, 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℃ to +85℃, 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℃

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

3.3.6、Transfer Characteristics 2

(T_{amb}=-40℃ to +105℃, 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℃

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

4、Testing Circuit

4.1、AC Testing Circuit

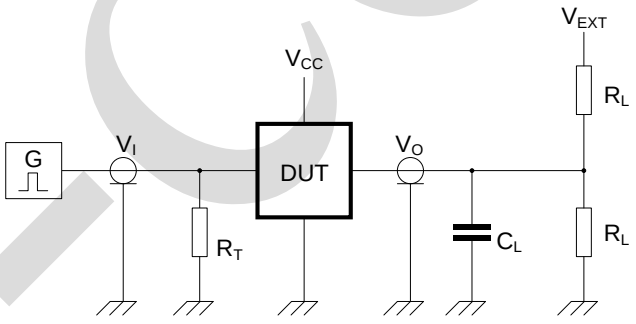


Figure 4. Test circuit for measuring switching times

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

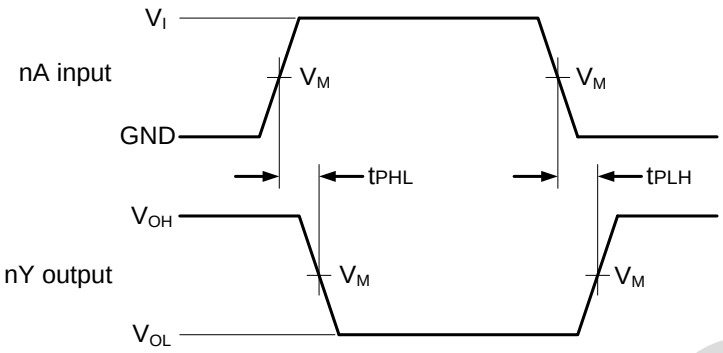


Figure 5. The input nA to output nY propagation delays

4.3、Transfer Characteristics Waveforms

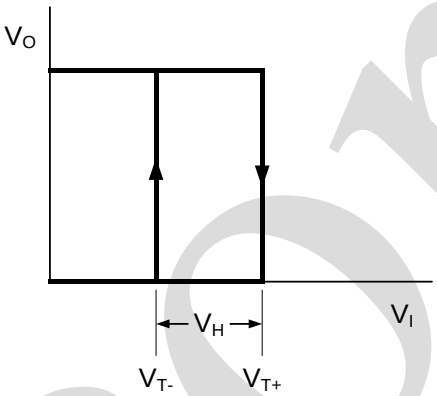


Figure 6. Transfer characteristic

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

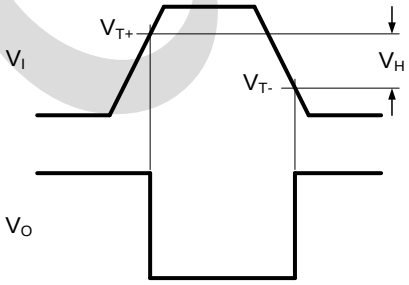


Figure 7. Definition of V_{T+}, V_{T-} and V_H

V_{CC}=3.0V:

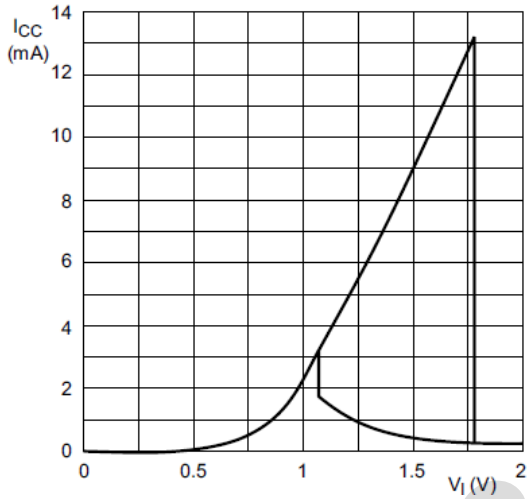


Figure 8. Typical transfer characteristics

4.4、Measurement Points

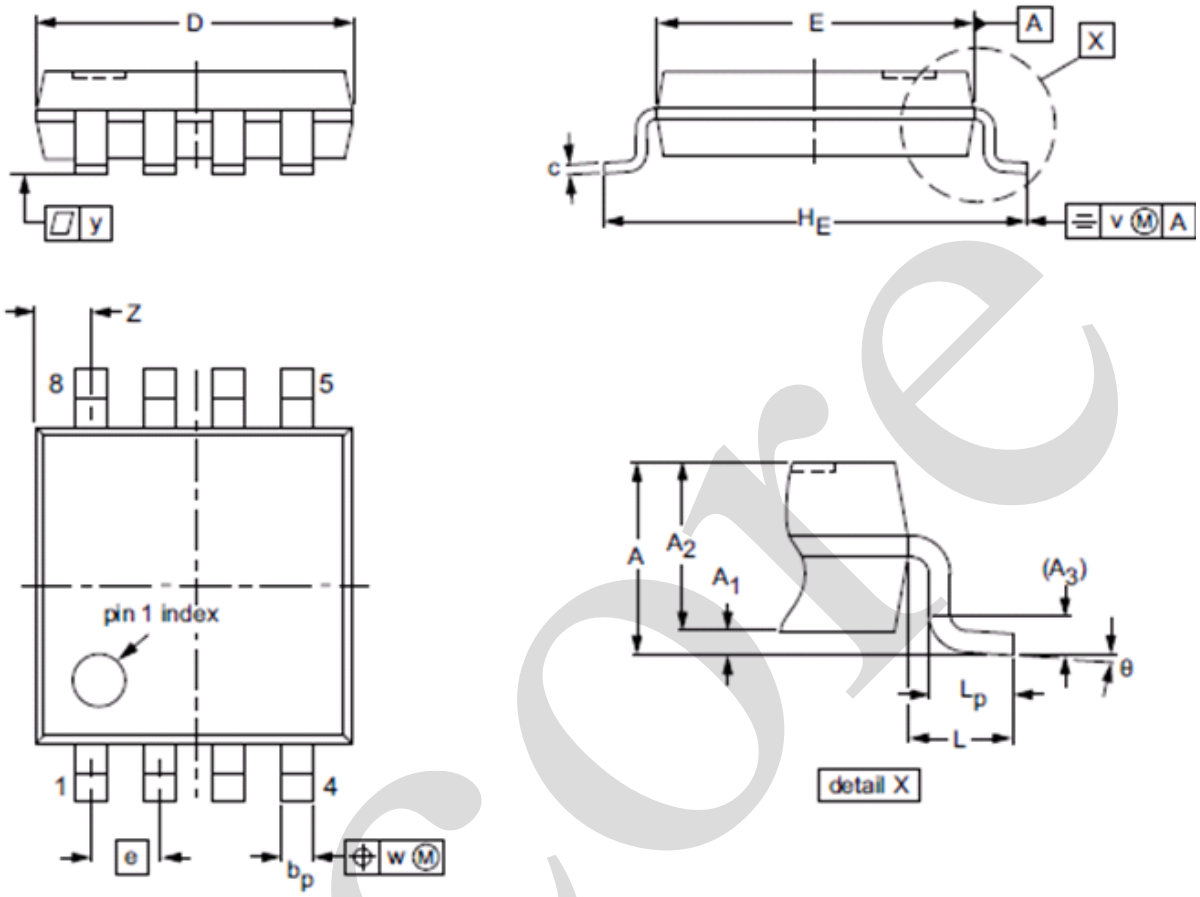
Supply voltage	Input	Output
V_{CC}	V_M	V_M
1.65V to 1.95V	0.5×V_{CC}	0.5×V_{CC}
2.3V to 2.7V	0.5×V_{CC}	0.5×V_{CC}
2.7V	1.5V	1.5V
3.0V to 3.6V	1.5V	1.5V
4.5V to 5.5V	0.5×V_{CC}	0.5×V_{CC}

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}	≤2.0ns	30pF	1kΩ	open
2.3V to 2.7V	V_{CC}	≤2.0ns	30pF	500Ω	open
2.7V	2.7V	≤2.5ns	50pF	500Ω	open
3.0V to 3.6V	2.7V	≤2.5ns	50pF	500Ω	open
4.5V to 5.5V	V_{CC}	≤2.5ns	50pF	500Ω	open

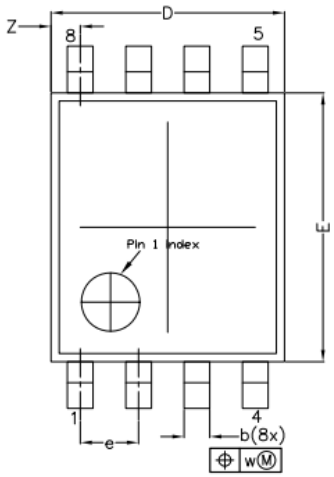
5、Package Information

5.1、TSSOP8

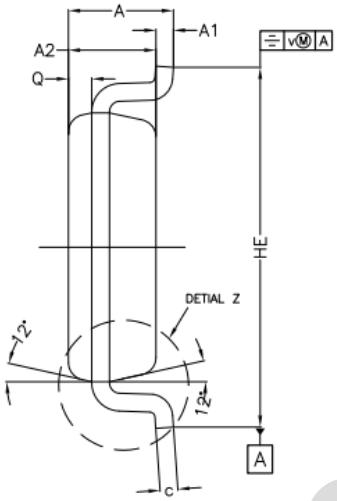


UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.15 0.00	0.95 0.75	0.25	0.38 0.22	0.18 0.08	3.1 2.9	3.1 2.9	0.65	4.1 3.9	0.5	0.47 0.33	0.2	0.13	0.1	0.70 0.35	8° 0°

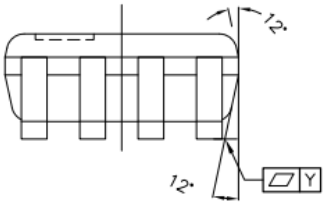
5.2、VSSOP8



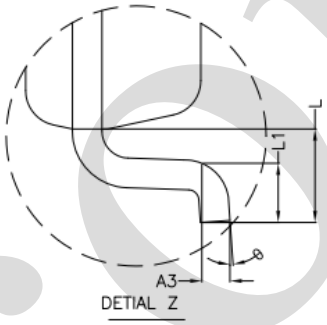
TOP VIEW



SIDE VIEW



SIDE VIEW



* CONTROLLING DIMENSION : MM

SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	---	---	1.00
A1	0.00	---	0.15
A2	0.60	0.75	0.85
A3	---	0.12	---
Q	0.19	0.20	0.21
b	0.17	0.22	0.27
c	0.08	---	0.23
D	1.90	2.00	2.10
E	2.20	2.30	2.40
HE	3.00	3.10	3.20
e	0.50 bsc		
L	0.40 bsc		
L1	0.15	---	0.40
Y	---	0.10	---
v	---	0.20	---
w	---	0.08	---
Z	0.10	---	0.40
θ	0°	---	8°

NOTES

1.0 COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD.

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、Notion

Recommended carefully reading this information before the use of this product；

The information in this document are subject to change without notice；

This information is using to the reference only, the company is not responsible for any loss；

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.