



AiP74LVC2G02

Dual 2-input Nor Gate

Product Specification

Specification Revision History:

Version	Date	Description
2017-05-A1	2017-05	New
2021-05-A2	2021-05	Add VSSOP8 ordering information
2021-12-A3	2021-12	Modify ordering information
2022-02-A4	2022-02	Modify ambient temperature to $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$ and add electrical characteristics of $-40^{\circ}\text{C}\sim+105^{\circ}\text{C}$
2022-03-A5	2022-03	Modify ordering information note 1



1、 General Description

The AiP74LVC2G02 provides a 2-input NOR gate function.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of these devices as translators in a mixed 3.3V and 5V environment.

This device is fully specified for partial power-down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

Features:

- Wide supply voltage range from 1.65V to 5.5V
- 5V tolerant outputs for interfacing with 5V logic
- ±24mA output drive (V_{CC}=3.0V)
- CMOS low power consumption
- Latch-up performance exceeds 250mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5V
- Specified from -40°C to +105°C
- Packaging information: TSSOP8/VSSOP8

Ordering Information:

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC2G02TA8.TR	TSSOP8	BLXX	3000 PCS/reel	3000 PCS/box	Dimensions of plastic enclosure: 3.0mm×3.0mm Pin spacing: 0.65mm
AiP74LVC2G02YA8.TR	VSSOP8	BLXX	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

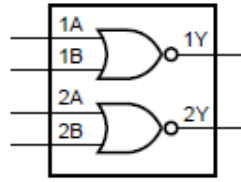


Figure 1. Logic symbol

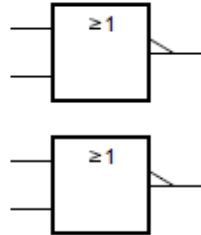


Figure 2. IEC logic symbol

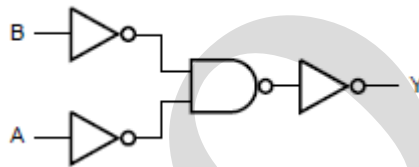
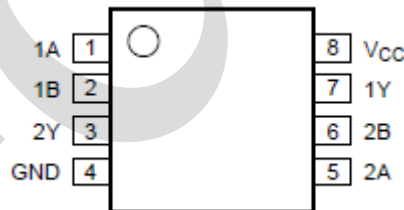


Figure 3. Logic diagram (one gate)

2.2、Pin Configurations



2.3、Pin Description

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



2.4、Function Table

Input		Output
nA	nB	nY
L	L	H
X	H	L
H	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	+6.5	V
input voltage	V_I	-	-0.5	+6.5	V
output voltage	V_O	Active mode	-0.5	$V_{CC}+0.5$	V
		Power-down mode; $V_{CC}=0V$	-0.5	+6.5	V
input clamping current	I_{IK}	$V_I < 0V$	-50	-	mA
output clamping current	I_{OK}	$V_O > V_{CC}$ or $V_O < 0V$	-	± 50	mA
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	$^{\circ}C$
total power dissipation	P_{tot}	-	-	300	mW
Soldering temperature	T_L	10s	250		$^{\circ}C$

Note:

[1] For TSSOP8 package: above $55^{\circ}C$ the value of P_{tot} derates linearly with 2.5mW/K.

[2] For VSSOP8 package: above $110^{\circ}C$ the value of P_{tot} derates linearly at 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	$^{\circ}C$
input transition rise and fall rate	$\Delta t/\Delta V$	$V_{CC}=1.65V$ to $2.7V$	-	-	20	ns/V
		$V_{CC}=2.7V$ to $5.5V$	-	-	10	ns/V



3.3. Electrical Characteristics

3.3.1. DC 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.	Max.	Unit	
HIGH-level input voltage	V_{IH}	$V_{CC}=1.65\text{V}$ to 1.95V	$0.65 \times V_{CC}$	-	-	V	
		$V_{CC}=2.3\text{V}$ to 2.7V	1.7	-	-	V	
		$V_{CC}=2.7\text{V}$ to 3.6V	2.0	-	-	V	
		$V_{CC}=4.5\text{V}$ to 5.5V	$0.7 \times V_{CC}$	-	-	V	
LOW-level input voltage	V_{IL}	$V_{CC}=1.65\text{V}$ to 1.95V	-	-	$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3\text{V}$ to 2.7V	-	-	0.7	V	
		$V_{CC}=2.7\text{V}$ to 3.6V	-	-	0.8	V	
		$V_{CC}=4.5\text{V}$ to 5.5V	-	-	$0.3 \times V_{CC}$	V	
HIGH-level output voltage	V_{OH}	$V_I = V_{IH}$ or V_{IL}	$I_O = -100\mu\text{A}$; $V_{CC}=1.65\text{V}$ to 5.5V	$V_{CC} - 0.1$	-	-	V
			$I_O = -4\text{mA}$; $V_{CC}=1.65\text{V}$	1.2	1.53	-	V
			$I_O = -8\text{mA}$; $V_{CC}=2.3\text{V}$	1.9	2.13	-	V
			$I_O = -12\text{mA}$; $V_{CC}=2.7\text{V}$	2.2	2.50	-	V
			$I_O = -24\text{mA}$; $V_{CC}=3.0\text{V}$	2.3	2.60	-	V
			$I_O = -32\text{mA}$; $V_{CC}=4.5\text{V}$	3.8	4.10	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{IH}$ or V_{IL}	$I_O = 100\mu\text{A}$; $V_{CC}=1.65\text{V}$ to 5.5V	-	-	0.10	V
			$I_O = 4\text{mA}$; $V_{CC}=1.65\text{V}$	-	0.08	0.45	V
			$I_O = 8\text{mA}$; $V_{CC}=2.3\text{V}$	-	0.14	0.30	V
			$I_O = 12\text{mA}$; $V_{CC}=2.7\text{V}$	-	0.19	0.40	V
			$I_O = 24\text{mA}$; $V_{CC}=3.0\text{V}$	-	0.37	0.55	V
			$I_O = 32\text{mA}$; $V_{CC}=4.5\text{V}$	-	0.43	0.55	V
input leakage current	I_I	$V_I = 5.5\text{V}$ or GND; $V_{CC} = 0\text{V}$ to 5.5V	-	± 0.1	± 1	μA	
power-off leakage current	I_{OFF}	V_I or $V_O = 5.5\text{V}$; $V_{CC} = 0\text{V}$	-	± 0.1	± 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 5.5V	-	0.1	4	μA	
additional supply current	ΔI_{CC}	per pin; $V_I = V_{CC} - 0.6\text{V}$; $I_O = 0\text{A}$; $V_{CC} = 2.3\text{V}$ to 5.5V	-	5	500	μA	
input capacitance	C_I	-	-	2.5	-	pF	

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



3.3.2、DC Characteristics 2

($T_{amb} = -40^{\circ}\text{C}$ to $+105^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
HIGH-level input voltage	V_{IH}	$V_{CC}=1.65\text{V}$ to 1.95V	$0.65 \times V_{CC}$	-	-	V	
		$V_{CC}=2.3\text{V}$ to 2.7V	1.7	-	-	V	
		$V_{CC}=2.7\text{V}$ to 3.6V	2.0	-	-	V	
		$V_{CC}=4.5\text{V}$ to 5.5V	$0.7 \times V_{CC}$	-	-	V	
LOW-level input voltage	V_{IL}	$V_{CC}=1.65\text{V}$ to 1.95V	-	-	$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3\text{V}$ to 2.7V	-	-	0.7	V	
		$V_{CC}=2.7\text{V}$ to 3.6V	-	-	0.8	V	
		$V_{CC}=4.5\text{V}$ to 5.5V	-	-	$0.3 \times V_{CC}$	V	
HIGH-level output voltage	V_{OH}	$V_I = V_{IH}$ or V_{IL}	$I_O = -100\mu\text{A}$; $V_{CC}=1.65\text{V}$ to 5.5V	$V_{CC}-0.1$	-	-	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}	$V_I = V_{IH}$ or V_{IL}	$I_O = 100\mu\text{A}$; $V_{CC}=1.65\text{V}$ to 5.5V	-	-	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 5.5V	-	-	± 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 5.5V	-	-	4	μA	
additional supply current	ΔI_{CC}	per pin; $V_I = V_{CC} - 0.6\text{V}$; $I_O = 0\text{A}$; $V_{CC}=2.3\text{V}$ to 5.5V	-	-	500	μA	

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



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.	Max.	Unit	
nA, nB to nY propagation delay	t_{pd}	see Figure 5	$V_{CC}=1.65\text{V}$ to 1.95V	1.2	3.8	8.9	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	0.8	2.4	5.4	ns
			$V_{CC}=2.7\text{V}$	0.8	3.2	6.0	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	0.6	2.4	4.9	ns
			$V_{CC}=4.5\text{V}$ to 5.5V	0.6	1.8	4.3	ns
Power dissipation capacitance	C_{PD}	per gate; $V_I=\text{GND}$ to V_{CC}	-	14	-	pF	

Note:

[1] Typical values are measured at normal V_{CC} and $T_{amb}=25^{\circ}\text{C}$.

[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).

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

3.3.4、 AC Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+105^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
nA, nB to nY propagation delay	t_{pd}	see Figure 5	$V_{CC}=1.65\text{V}$ to 1.95V	1.2	-	11.2	ns
			$V_{CC}=2.3\text{V}$ to 2.7V	0.8	-	6.8	ns
			$V_{CC}=2.7\text{V}$	0.8	-	7.5	ns
			$V_{CC}=3.0\text{V}$ to 3.6V	0.6	-	6.2	ns
			$V_{CC}=4.5\text{V}$ to 5.5V	0.6	-	5.5	ns

Note:

[1] Typical values are measured at normal V_{CC} and $T_{amb}=25^{\circ}\text{C}$.

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



4、 Testing Circuit

4.1、 AC Testing Circuit

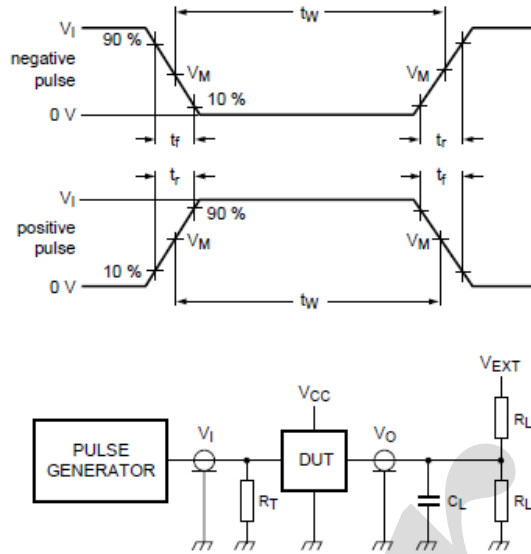


Figure 4. Test circuit for measuring switching times

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

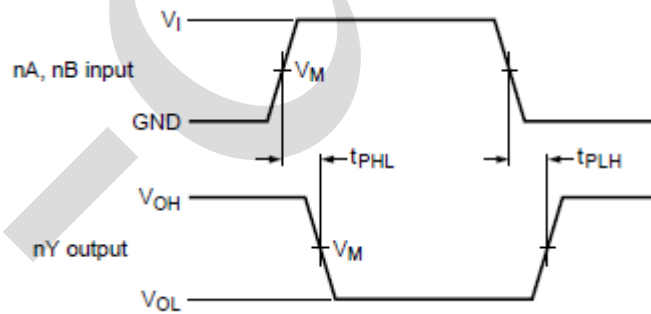


Figure 5. The input (nA, nB) to output (nY) propagation delays



4.3、 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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

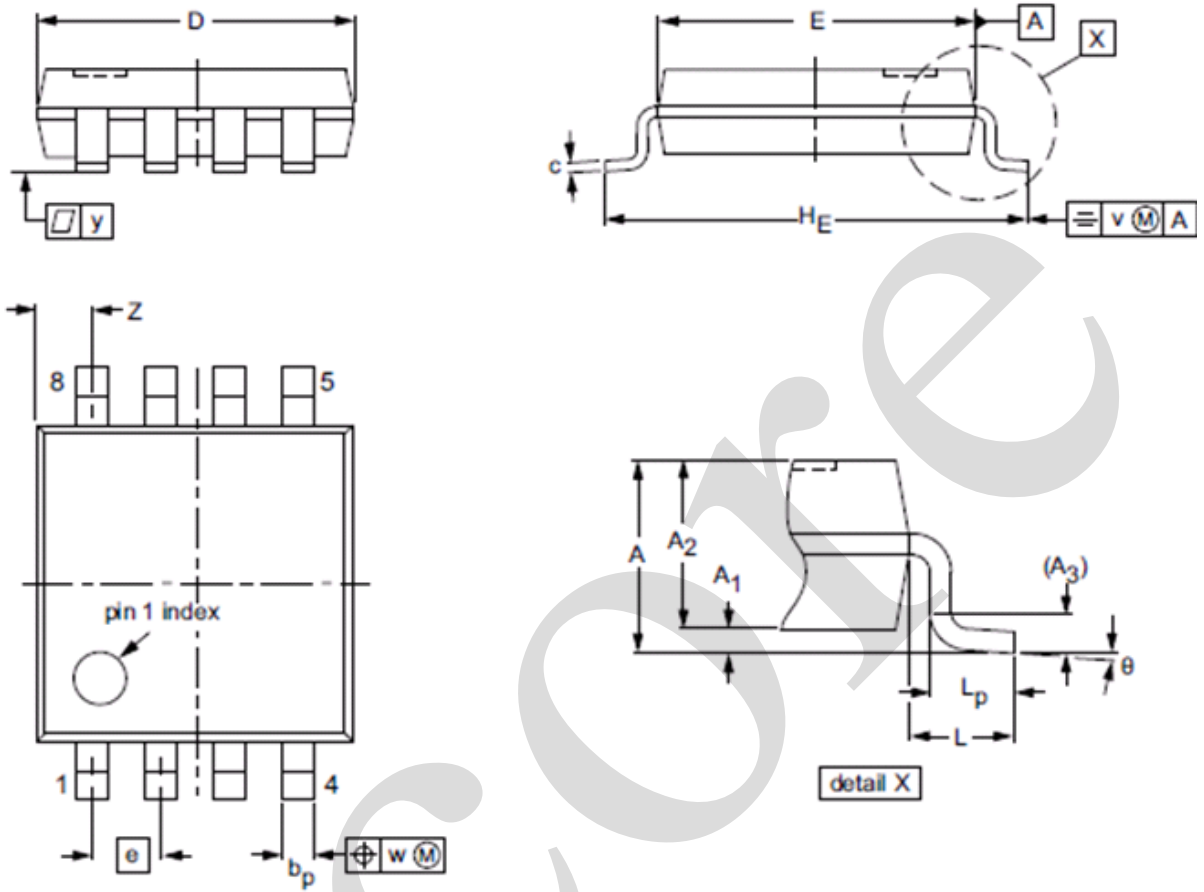
4.4、 Test Data

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

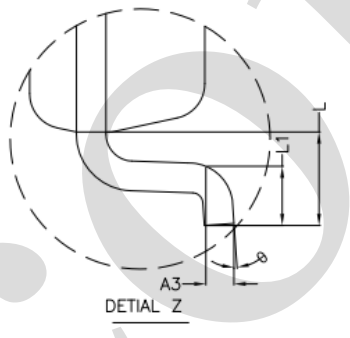
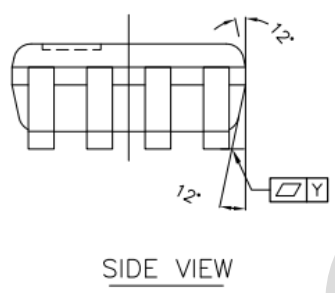
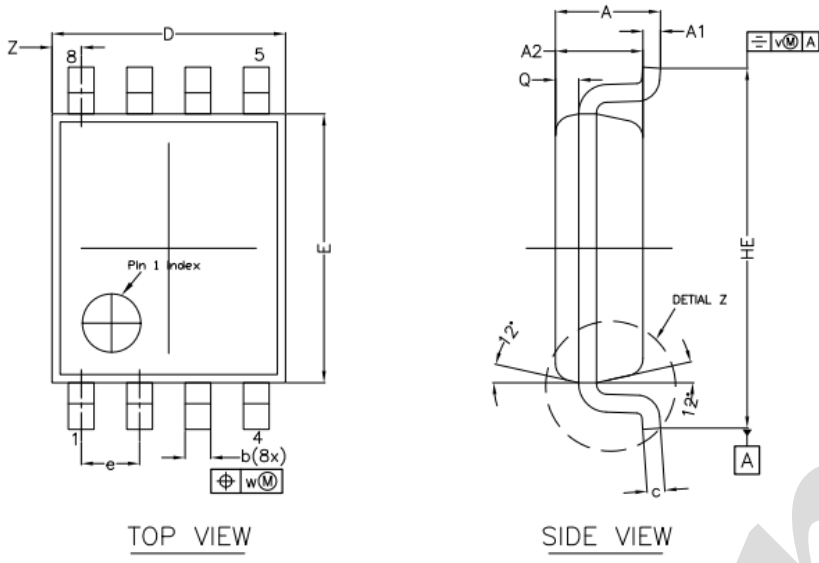
5.1、TSSOP8



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



* 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

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