AiP74LVC1G57
Low-Power Configurable Multiple Function Gate

Product Specification

Specification Revision History：

Version	Date	Description
2021-10-A1	2021-10	New
2023-04-B1	2023-04	Update the template

Contents

1、General Description

The AiP74LVC1G57 provides configurable multiple functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer. All inputs can be connected to V_{CC} or GND.

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.

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.

All inputs (A, B and C) are Schmitt trigger inputs. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

Features:

- Wide supply voltage range from 1.65V to 5.5V
- 5V tolerant input/output for interfacing with 5V logic
- ±24mA output drive (V_{CC}=3.0V)
- CMOS low power consumption
- Direct interface with TTL levels
- Inputs accept voltages up to 5V
- Specified from -40℃ to +125℃
- Packaging information: SOT23-6/SOT363/XSON6

Ordering Information:

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74LVC1G57GB236.TR	SOT23-6	DJXX	3000 PCS/reel	30000 PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP74LVC1G57GC363.TR	SOT363	DJXX	3000 PCS/reel	30000 PCS/box	Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm
AiP74LVC1G57EA6.TR	XSON6	DJXX	5000 PCS/reel	25000 PCS/box	Dimensions of plastic enclosure: 1.45mm×1.0mm Pin spacing: 0.5mm

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

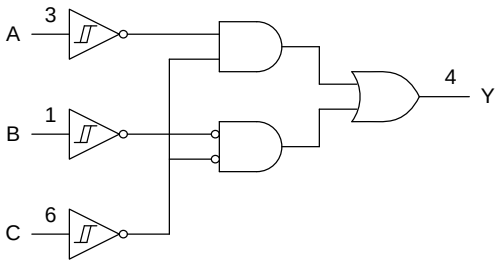
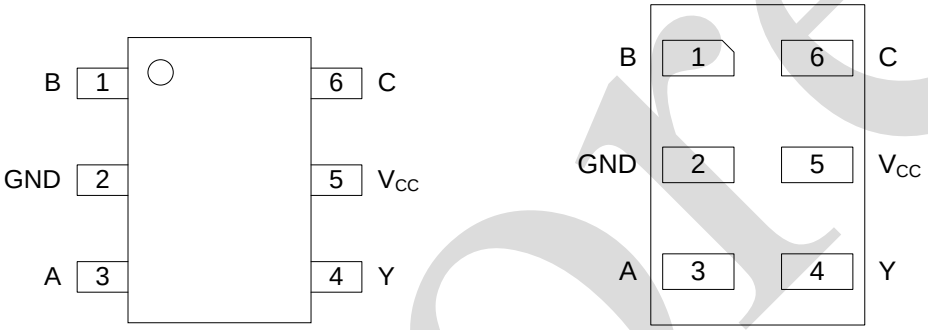


Figure 1. Logic symbol

2.2、Pin Configurations



SOT23-6/SOT363 XSON6

Figure 2. Pin configuration

2.3、Pin Description

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

2.4、Function Table

Input			Output
C	**B**	**A**	**Y**
L	L	L	H
L	L	H	L
L	H	L	H
L	H	H	L
H	L	L	L
H	L	H	L
H	H	L	H
H	H	H	H

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)

Characteristic	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	+6.5	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	℃

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
LOW-level output voltage	V_{OL}	V_I=V_{T+} or V_{T-}	I_O=100uA; V_{CC}=1.65V to 5.5V	-	-	0.1	V
			I_O=4mA; V_{CC}=1.65V	-	-	0.45	V
			I_O=8mA; V_{CC}=2.3V	-	-	0.3	V
			I_O=12mA; V_{CC}=2.7V	-	-	0.4	V
			I_O=24mA; V_{CC}=3.0V	-	-	0.55	V
			I_O=32mA; V_{CC}=4.5V	-	-	0.55	V
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
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	-		-	2.5	-	uF

Note: [1] Typical values are measured at maximum V_{CC} and T_{amb}=25℃.

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
LOW-level output voltage	V_{OL}	V_I=V_{T+} or V_{T-}	I_O=100uA; V_{CC}=1.65V to 5.5V	-	-	0.1	V
			I_O=4mA; V_{CC}=1.65V	-	-	0.7	V
			I_O=8mA; V_{CC}=2.3V	-	-	0.45	V
			I_O=12mA; V_{CC}=2.7V	-	-	0.6	V
			I_O=24mA; V_{CC}=3.0V	-	-	0.8	V
			I_O=32mA; V_{CC}=4.5V	-	-	0.8	V
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
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: [1] 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
A, B and C to Y propagation delay	t_{pd}	see Figure 4[2]	V_{CC}=1.65V to 1.95V	1.0	6.0	14.4	ns
			V_{CC}=2.3V to 2.7V	0.5	3.5	8.3	ns
			V_{CC}=2.7V	0.5	4.2	8.5	ns
			V_{CC}=3.0V to 3.6V	0.5	3.8	6.3	ns
			V_{CC}=4.5V to 5.5V	0.5	3.0	5.1	ns
power dissipation capacitance	C_{PD}	V_{CC}=3.3V; V_I=GND to V_{CC}[3]		-	22	-	pF

Note:

[1] Typical values are measured at nominal V_{CC} and at T_{amb}=25℃.

[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℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
A, B and C to Y propagation delay	t_{pd}	see Figure 4[2]	V_{CC}=1.65V to 1.95V	1.0	-	18	ns
			V_{CC}=2.3V to 2.7V	0.5	-	10.4	ns
			V_{CC}=2.7V	0.5	-	10.6	ns
			V_{CC}=3.0V to 3.6V	0.5	-	7.9	ns
			V_{CC}=4.5V to 5.5V	0.5	-	6.4	ns

Note:

[1] Typical values are measured at nominal V_{CC} and at T_{amb}=25℃.

[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 5, Figure 6, Figure 7 and Figure 8	V_{CC}=1.8V	0.70	1.02	1.20	V
			V_{CC}=2.3V	1.11	1.42	1.60	V
			V_{CC}=3.0V	1.50	1.79	2.00	V
			V_{CC}=4.5V	2.16	2.52	2.74	V
			V_{CC}=5.5V	2.61	2.99	3.33	V
negative-going threshold voltage	V_{T-}	see Figure 5, Figure 6, Figure 7 and Figure 8	V_{CC}=1.8V	0.30	0.53	0.72	V
			V_{CC}=2.3V	0.58	0.77	1.00	V
			V_{CC}=3.0V	0.80	1.04	1.30	V
			V_{CC}=4.5V	1.21	1.55	1.90	V
			V_{CC}=5.5V	1.45	1.86	2.29	V
hysteresis voltage	V_H	(V_{T+}-V_{T-}); see Figure 5, Figure 6, Figure 7 and Figure 8	V_{CC}=1.8V	0.30	0.48	0.62	V
			V_{CC}=2.3V	0.40	0.64	0.80	V
			V_{CC}=3.0V	0.50	0.75	1.00	V
			V_{CC}=4.5V	0.71	0.97	1.20	V
			V_{CC}=5.5V	0.71	1.13	1.40	V

Note:

[1] Typical values are measured at T_{amb}=25℃.

3.3.6、Transfer Characteristics 2

(T_{amb}=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

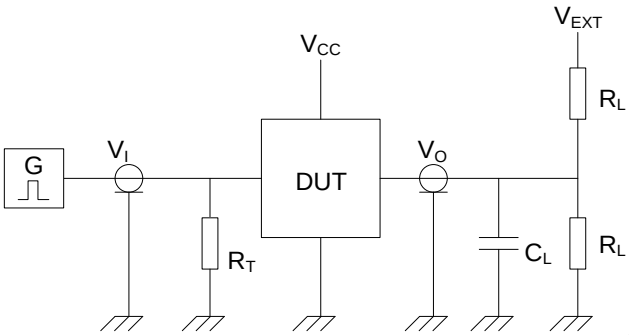
Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
positive-going threshold voltage	V_{T+}	see Figure 5, Figure 6, Figure 7 and Figure 8	V_{CC}=1.8V	0.67	-	1.20	V
			V_{CC}=2.3V	1.08	-	1.60	V
			V_{CC}=3.0V	1.47	-	2.00	V
			V_{CC}=4.5V	2.13	-	2.74	V
			V_{CC}=5.5V	2.58	-	3.33	V
negative-going threshold voltage	V_{T-}	see Figure 5, Figure 6, Figure 7 and Figure 8	V_{CC}=1.8V	0.30	-	0.75	V
			V_{CC}=2.3V	0.58	-	1.03	V
			V_{CC}=3.0V	0.80	-	1.33	V
			V_{CC}=4.5V	1.21	-	1.93	V
			V_{CC}=5.5V	1.45	-	2.32	V
hysteresis voltage	V_H	(V_{T+}-V_{T-}); see Figure 5, Figure 6, Figure 7 and Figure 8	V_{CC}=1.8V	0.23	-	0.62	V
			V_{CC}=2.3V	0.34	-	0.80	V
			V_{CC}=3.0V	0.44	-	1.00	V
			V_{CC}=4.5V	0.65	-	1.20	V
			V_{CC}=5.5V	0.65	-	1.40	V

Note:

[1] Typical values are measured at T_{amb}=25℃.

4、Testing Circuit

4.1、AC Testing Circuit



Definitions test circuit:

R_L=Load resistance.

C_L=Load capacitance including jig and probe capacitance.

R_T=Termination resistance should be equal to output impedance Z_o of the pulse generator.

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

Figure 3. Test circuit for measuring switching times

4.2、AC Testing Waveforms

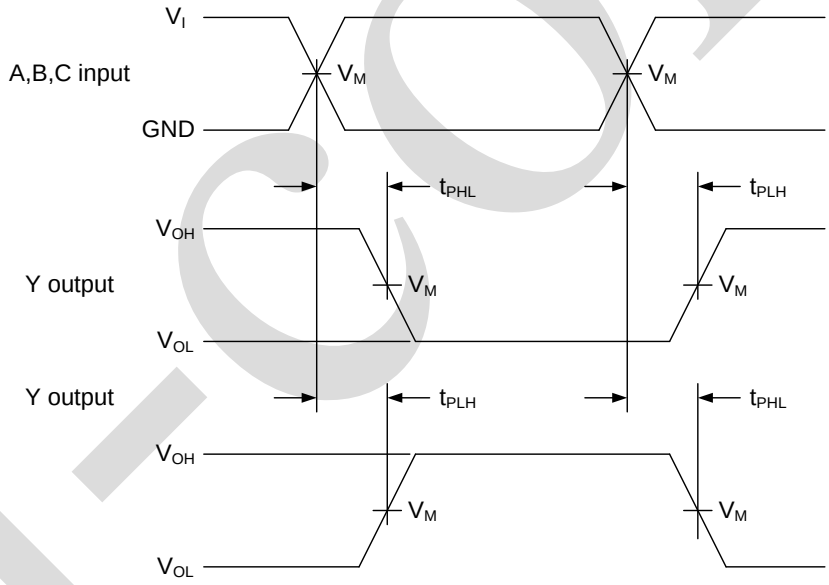


Figure 4. Input A, B and C to output Y propagation delay times

4.3、Transfer Characteristics Waveforms

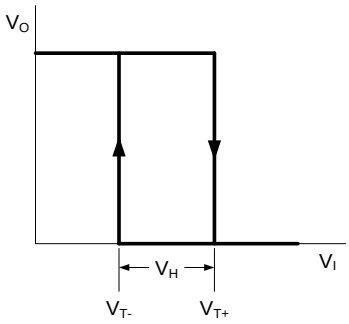
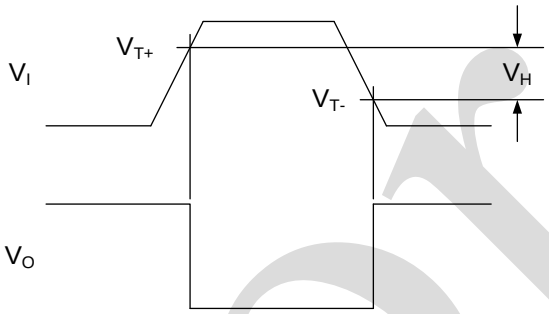


Figure 5. Transfer characteristic



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

Figure 6. Definition of V_{T+}, V_{T-} and V_H

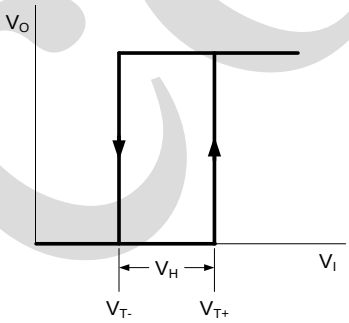
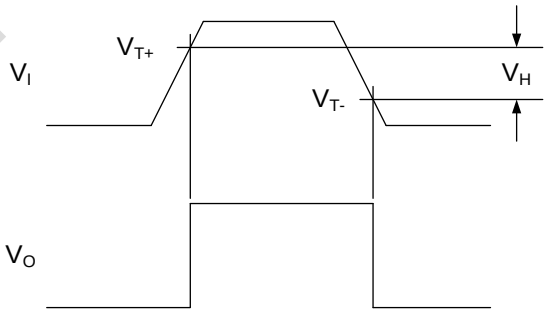


Figure 7. Transfer characteristic



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

Figure 8. Definition of V_{T+}, V_{T-} and V_H

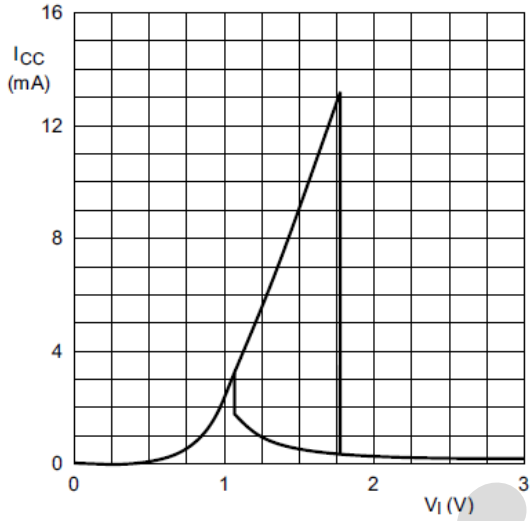


Figure 9. Typical AiP74LVC1G57 transfer characteristic; V_{CC}=3.0V

4.3、Measurement Points

Supply voltage	Input		Output
V_{CC}	V_M	V_I	V_M
1.65V to 1.95V	0.5×V_{CC}	V_{CC}	0.5×V_{CC}
2.3V to 2.7V	0.5×V_{CC}	V_{CC}	0.5×V_{CC}
2.7V	1.5V	2.7V	1.5V
3.0V to 3.6V	1.5V	2.7V	1.5V
4.5V to 5.5V	0.5×V_{CC}	V_{CC}	0.5×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}	≤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、Typical Application Circuit And Application Note

5.1、Function Selection Table

Logic function	Figure
2-input AND	see Figure 10
2-input AND with both inputs inverted	see Figure 13
2-input NAND with inverted input	see Figure 11 and Figure 12
2-input OR with inverted input	see Figure 11 and Figure 12
2-input NOR	see Figure 13
2-input NOR with both inputs inverted	see Figure 10
2-input XNOR	see Figure 14
Inverter	see Figure 15
Buffer	see Figure 16

5.1、Application Circuit

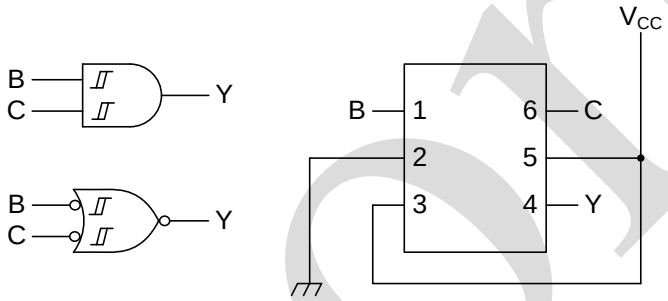


Figure 10. 2-input AND gate or 2-input NOR gate with both inputs inverted

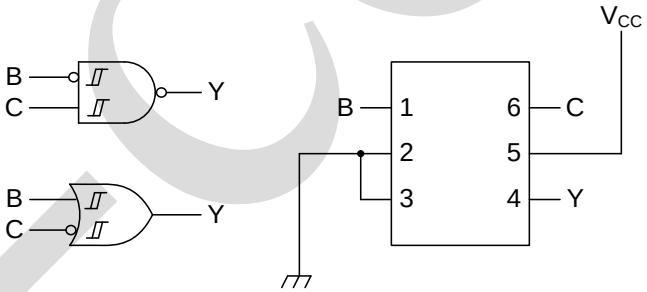


Figure 11. 2-input NAND gate with input B inverted or 2-input OR gate with inverted C input

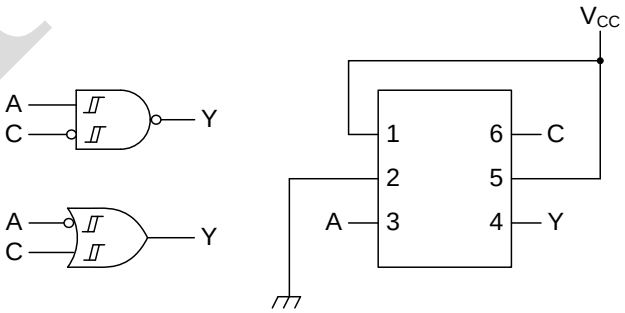


Figure 12. 2-input NAND gate with input C inverted or 2-input OR gate with inverted A input

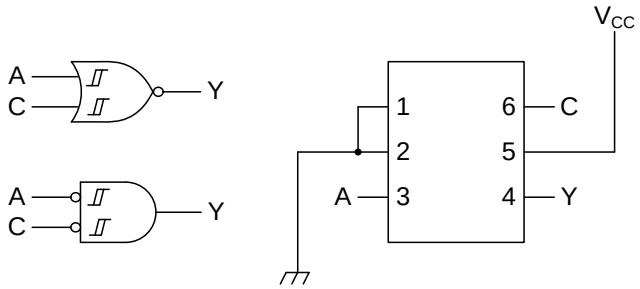


Figure 13. 2-input NOR gate or 2-input AND gate with both inputs inverted

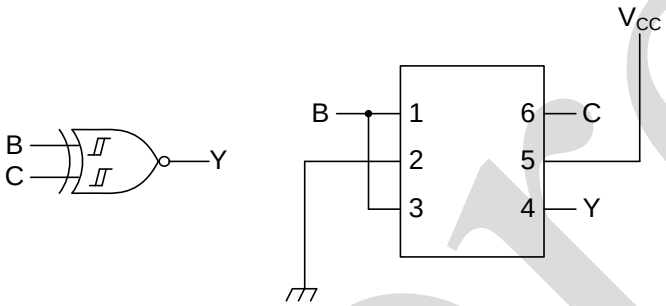


Figure 14. 2-input XNOR gate

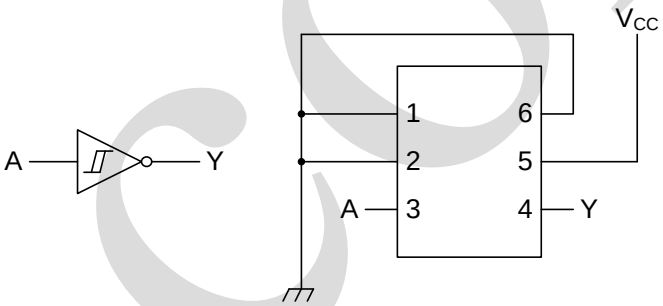


Figure 15. Inverter

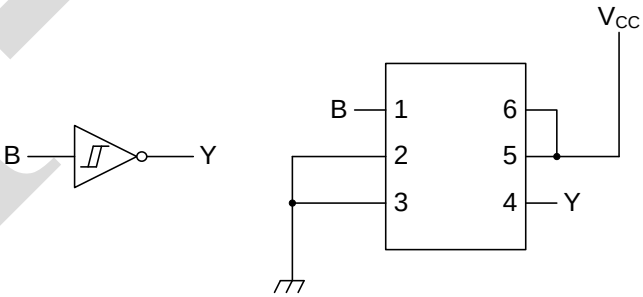
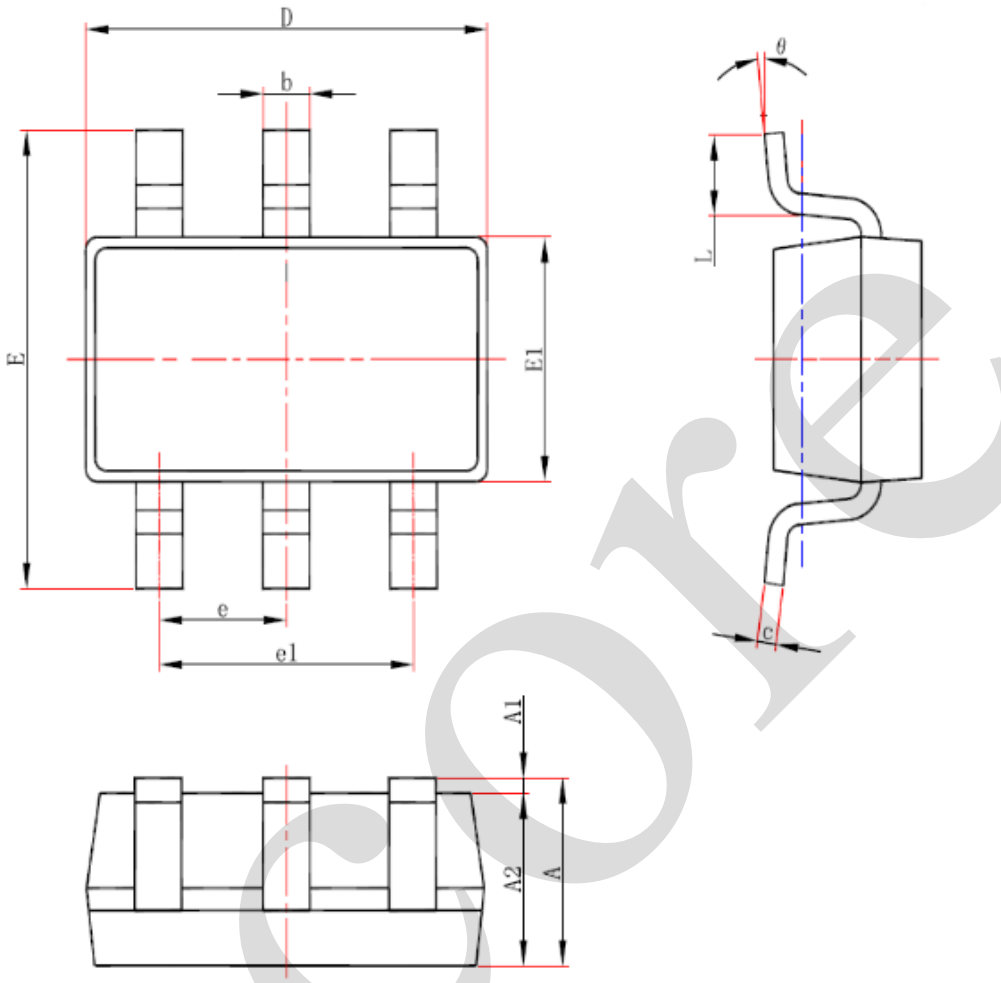


Figure 16. Buffer

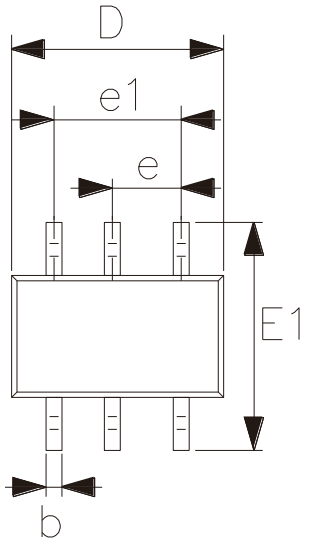
6、Package Information

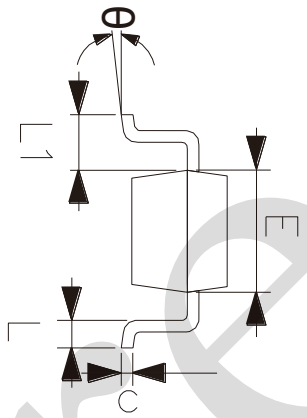
6.1、SOT-23-6

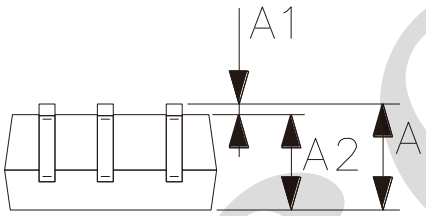


Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.25
A1	0.00	0.12
A2	1.00	1.20
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°

6.2、SOT-363

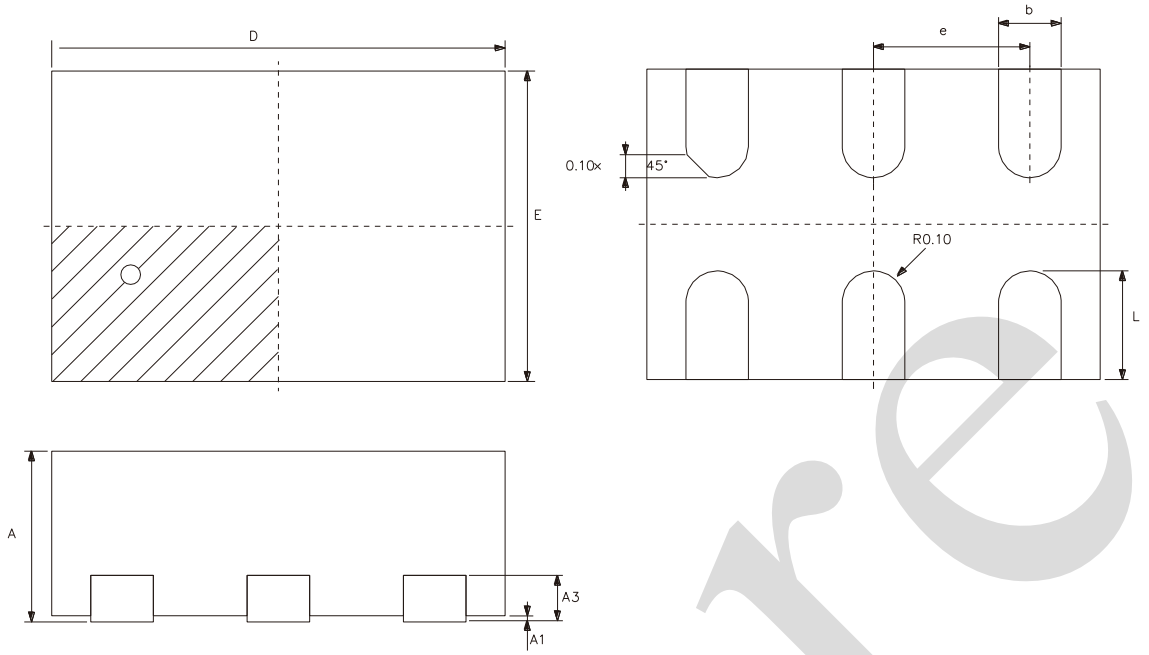






Symbol	Dimensions (mm)	
	Min.	Max.
A	0.90	1.10
A1	0.00	0.10
A2	0.90	1.00
b	0.15	0.35
c	0.11	0.175
D	2.00	2.20
E1	2.15	2.45
E	1.15	1.35
e	0.65	
e1	1.20	1.40
L	0.26	0.46
L1	0.525	
θ	0°	8°

6.3、XSON6



Symbol	Dimensions (mm)	
	Min.	Max.
A	0.51	0.60
A1	0.00	0.05
A3	0.15	
b	0.15	0.25
D	1.45	
E	1.00	
e	0.50	
L	0.25	0.45

7、Statements And Notes

7.1、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.									

7.2、Notes

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