AiP74AUP1G08
Low Power Single 2-input And Gate

Product Specification

Specification Revision History:

Version	Date	Description
2019-12-A1	2019-12	New
2023-04-B1	2023-04	Update the template

Contents

1、General Description

The AiP74AUP1G08 provides the single 2-input AND function.

This device ensures a very low static and dynamic power consumption across the entire V_{CC} range from 0.8V to 3.6V.

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 0.8V to 3.6V
- Low static power consumption; I_{CC}=1uA (maximum)
- Inputs accept voltages up to 3.6V
- I_{OFF} circuitry provides partial Power-down mode operation
- Specified from -40℃ to +125℃
- Packaging information: SOT23-5/SOT353

Ordering Information:

Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74AUP1G08GB235.TR	SOT23-5	CTXX	3000 PCS/reel	30000 PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP74AUP1G08GC353.TR	SOT353	CTXX	3000 PCS/reel	30000 PCS/box	Dimensions of plastic enclosure: 2.1mm×1.3mm Pin spacing: 0.65mm

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

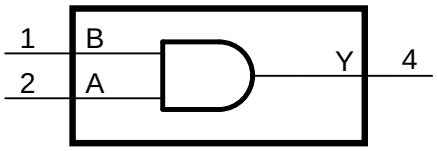


Figure 1. Logic symbol

Figure 2. IEC logic symbol

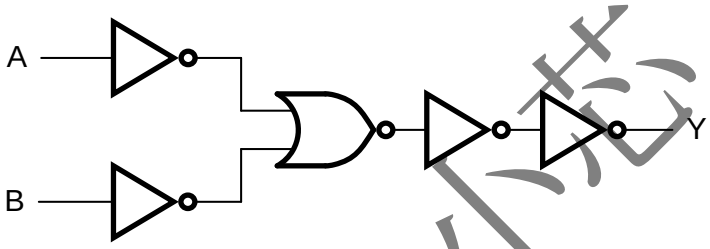
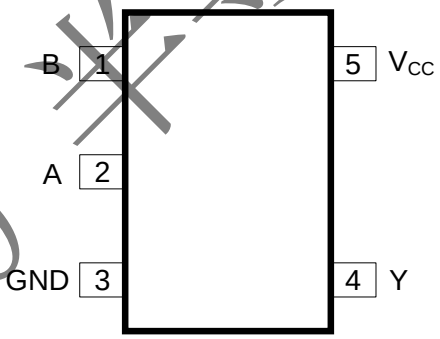


Figure 3. Logic diagram

2.2、Pin Configurations



2.3、Pin Description

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

2.4、Function Table

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

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

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Characteristic	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{CC}	-	-0.5	+4.6	V
input clamping current	I_{IK}	V_I<0V	-50	-	mA
input voltage	V_I	-[1]	-0.5	+4.6	V
output clamping current	I_{OK}	V_O<0V	-	±20	mA
output voltage	V_O	Active mode and Power-down mode[1]	-0.5	+4.6	V
output current	I_O	V_O=0V to V_{CC}	-	±20	mA
supply current	I_{CC}	-	-	+50	mA
ground current	I_{GND}	-	-50	-	mA
storage temperature	T_{stg}	-	-65	+150	℃
total power dissipation	P_{tot}	-	-	250	mW
soldering temperature	T_L	-	260		℃

Note:

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

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	0.8	-	3.6	V
input voltage	V_I	-	0	-	3.6	V
output voltage	V_O	Active mode	0	-	V_{CC}	V
		Power-down mode; V_{CC}=0V	0	-	3.6	V
ambient temperature	T_{amb}	-	-40	-	+125	℃
input transition rise and fall rate	Δt/ΔV	V_{CC}=0.8V to 3.6V	0	-	200	ns/V

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

(T_{amb}=25℃, 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}=0.8V		0.70×V_{CC}	-	-	V
		V_{CC}=0.9V to 1.95V		0.65×V_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V		1.6	-	-	V
		V_{CC}=3.0V to 3.6V		2.0	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=0.8V		-	-	0.30×V_{CC}	V
		V_{CC}=0.9V to 1.95V		-	-	0.35×V_{CC}	V
		V_{CC}=2.3V to 2.7V		-	-	0.7	V
		V_{CC}=3.0V to 3.6V		-	-	0.9	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=0.8V to 3.6V	V_{CC}-0.1	-	-	V
			I_O=-1.1mA; V_{CC}=1.1V	0.75×V_{CC}	-	-	V
			I_O=-1.7mA; V_{CC}=1.4V	1.11	-	-	V
			I_O=-1.9mA; V_{CC}=1.65V	1.32	-	-	V
			I_O=-2.3mA; V_{CC}=2.3V	2.05	-	-	V
			I_O=-3.1mA; V_{CC}=2.3V	1.9	-	-	V
			I_O=-2.7mA; V_{CC}=3.0V	2.72	-	-	V
			I_O=-4.0mA; V_{CC}=3.0V	2.6	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA; V_{CC}=0.8V to 3.6V	-	-	0.1	V
			I_O=1.1mA; V_{CC}=1.1V	-	-	0.3×V_{CC}	V
			I_O=1.7mA; V_{CC}=1.4V	-	-	0.31	V
			I_O=1.9mA; V_{CC}=1.65V	-	-	0.31	V
			I_O=2.3mA; V_{CC}=2.3V	-	-	0.31	V
			I_O=3.1mA; V_{CC}=2.3V	-	-	0.44	V
			I_O=2.7mA; V_{CC}=3.0V	-	-	0.31	V
			I_O=4.0mA; V_{CC}=3.0V	-	-	0.44	V
input leakage current	I_I	V_I=GND to 3.6V; V_{CC}=0V to 3.6V		-	-	±1.0	uA
power-off leakage current	I_{OFF}	V_I or V_O=0V to 3.6V; V_{CC}=0V		-	-	±1.0	uA
additional power-off leakage current	ΔI_{OFF}	V_I or V_O=0V to 3.6V; V_{CC}=0V to 0.2V		-	-	±1.0	uA
supply current	I_{CC}	V_I=GND or V_{CC}; I_O=0A; V_{CC}=0.8V to 3.6V		-	-	1.0	uA
additional supply current	ΔI_{CC}	V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=3.3V[1]		-	-	40	uA
input capacitance	C_I	V_{CC}=0V to 3.6V; V_I=GND or V_{CC}		-	0.8	-	pF
output capacitance	C_O	V_O=GND; V_{CC}=0V		-	1.7	-	pF

Note:

[1] One input at V_{CC}-0.6V, other input at V_{CC} or GND.

3.3.2、DC Characteristics 2

(T_{amb}=-40℃ to +85℃, 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}=0.8V		0.70×V_{CC}	-	-	V
		V_{CC}=0.9V to 1.95V		0.65×V_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V		1.6	-	-	V
		V_{CC}=3.0V to 3.6V		2.0	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=0.8V		-	-	0.30×V_{CC}	V
		V_{CC}=0.9V to 1.95V		-	-	0.35×V_{CC}	V
		V_{CC}=2.3V to 2.7V		-	-	0.7	V
		V_{CC}=3.0V to 3.6V		-	-	0.9	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=0.8V to 3.6V	V_{CC}-0.1	-	-	V
			I_O=-1.1mA; V_{CC}=1.1V	0.7×V_{CC}	-	-	V
			I_O=-1.7mA; V_{CC}=1.4V	1.03	-	-	V
			I_O=-1.9mA; V_{CC}=1.65V	1.30	-	-	V
			I_O=-2.3mA; V_{CC}=2.3V	1.97	-	-	V
			I_O=-3.1mA; V_{CC}=2.3V	1.85	-	-	V
			I_O=-2.7mA; V_{CC}=3.0V	2.67	-	-	V
			I_O=-4.0mA; V_{CC}=3.0V	2.55	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA; V_{CC}=0.8V to 3.6V	-	-	0.1	V
			I_O=1.1mA; V_{CC}=1.1V	-	-	0.3×V_{CC}	V
			I_O=1.7mA; V_{CC}=1.4V	-	-	0.37	V
			I_O=1.9mA; V_{CC}=1.65V	-	-	0.35	V
			I_O=2.3mA; V_{CC}=2.3V	-	-	0.33	V
			I_O=3.1mA; V_{CC}=2.3V	-	-	0.45	V
			I_O=2.7mA; V_{CC}=3.0V	-	-	0.33	V
			I_O=4.0mA; V_{CC}=3.0V	-	-	0.45	V
input leakage current	I_I	V_I=GND to 3.6V; V_{CC}=0V to 3.6V		-	-	±1.0	uA
power-off leakage current	I_{OFF}	V_I or V_O=0V to 3.6V; V_{CC}=0V		-	-	±1.0	uA
additional power-off leakage current	ΔI_{OFF}	V_I or V_O=0V to 3.6V; V_{CC}=0V to 0.2V		-	-	±1.0	uA
supply current	I_{CC}	V_I=GND or V_{CC}; I_O=0A; V_{CC}=0.8V to 3.6V		-	-	1.0	uA
additional supply current	ΔI_{CC}	V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=3.3V[1]		-	-	50	uA

Note:

[1] One input at V_{CC}-0.6V, other input at V_{CC} or GND.

3.3.3、DC Characteristics 3

(T_{amb}=-40℃ to +125℃, 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}=0.8V		0.75×V_{CC}	-	-	V
		V_{CC}=0.9V to 1.95V		0.70×V_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V		1.6	-	-	V
		V_{CC}=3.0V to 3.6V		2.0	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=0.8V		-	-	0.25×V_{CC}	V
		V_{CC}=0.9V to 1.95V		-	-	0.30×V_{CC}	V
		V_{CC}=2.3V to 2.7V		-	-	0.7	V
		V_{CC}=3.0V to 3.6V		-	-	0.9	V
HIGH-level output voltage	V_{OH}	V_I=V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=0.8V to 3.6V	V_{CC}-0.11	-	-	V
			I_O=-1.1mA; V_{CC}=1.1V	0.6×V_{CC}	-	-	V
			I_O=-1.7mA; V_{CC}=1.4V	0.93	-	-	V
			I_O=-1.9mA; V_{CC}=1.65V	1.17	-	-	V
			I_O=-2.3mA; V_{CC}=2.3V	1.77	-	-	V
			I_O=-3.1mA; V_{CC}=2.3V	1.67	-	-	V
			I_O=-2.7mA; V_{CC}=3.0V	2.40	-	-	V
			I_O=-4.0mA; V_{CC}=3.0V	2.30	-	-	V
LOW-level output voltage	V_{OL}	V_I=V_{IH} or V_{IL}	I_O=20uA; V_{CC}=0.8V to 3.6V	-	-	0.11	V
			I_O=1.1mA; V_{CC}=1.1V	-	-	0.33×V_{CC}	V
			I_O=1.7mA; V_{CC}=1.4V	-	-	0.41	V
			I_O=1.9mA; V_{CC}=1.65V	-	-	0.39	V
			I_O=2.3mA; V_{CC}=2.3V	-	-	0.36	V
			I_O=3.1mA; V_{CC}=2.3V	-	-	0.50	V
			I_O=2.7mA; V_{CC}=3.0V	-	-	0.36	V
			I_O=4.0mA; V_{CC}=3.0V	-	-	0.50	V
input leakage current	I_I	V_I=GND to 3.6V; V_{CC}=0V to 3.6V		-	-	±1.0	uA
power-off leakage current	I_{OFF}	V_I or V_O=0V to 3.6V; V_{CC}=0V		-	-	±1.0	uA
additional power-off leakage current	ΔI_{OFF}	V_I or V_O=0V to 3.6V; V_{CC}=0V to 0.2V		-	-	±1.0	uA
supply current	I_{CC}	V_I=GND or V_{CC}; I_O=0A; V_{CC}=0.8V to 3.6V		-	-	1.4	uA
additional supply current	ΔI_{CC}	V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=3.3V[1]		-	-	75	uA

Note:

[1] One input at V_{CC}-0.6V, other input at V_{CC} or GND.

3.3.4、AC Characteristics 1

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
propagation delay	t_{pd}	A, B to Y; see Figure 5[2]	C_L=5pF				
			V_{CC}=0.8V	-	17.0	-	ns
			V_{CC}=1.1V to 1.3V	2.6	5.1	10.8	ns
			V_{CC}=1.4V to 1.6V	1.6	3.7	6.5	ns
			V_{CC}=1.65V to 1.95V	1.3	3.0	5.2	ns
			V_{CC}=2.3V to 2.7V	1.1	2.4	4.0	ns
			V_{CC}=3.0V to 3.6V	1.0	2.2	3.5	ns
			C_L=10pF				
			V_{CC}=0.8V	-	20.6	-	ns
			V_{CC}=1.1V to 1.3V	2.4	6.0	12.5	ns
			V_{CC}=1.4V to 1.6V	2.0	4.3	7.6	ns
			V_{CC}=1.65V to 1.95V	1.7	3.6	6.1	ns
			V_{CC}=2.3V to 2.7V	1.4	2.9	4.8	ns
			V_{CC}=3.0V to 3.6V	1.3	2.7	4.2	ns
			C_L=15pF				
			V_{CC}=0.8V	-	24.1	-	ns
			V_{CC}=1.1V to 1.3V	3.4	6.8	14.2	ns
			V_{CC}=1.4V to 1.6V	2.3	4.9	8.6	ns
			V_{CC}=1.65V to 1.95V	1.9	4.0	6.9	ns
			V_{CC}=2.3V to 2.7V	1.7	3.4	5.5	ns
			V_{CC}=3.0V to 3.6V	1.5	3.1	4.8	ns
			C_L=30pF				
			V_{CC}=0.8V	-	34.4	-	ns
			V_{CC}=1.1V to 1.3V	4.6	9.1	19.4	ns
			V_{CC}=1.4V to 1.6V	3.4	6.4	11.5	ns
			V_{CC}=1.65V to 1.95V	2.6	5.3	9.1	ns
			V_{CC}=2.3V to 2.7V	2.3	4.5	7.2	ns
			V_{CC}=3.0V to 3.6V	2.2	4.2	6.2	ns
power dissipation capacitance	C_{PD}	f=1MHz; V_I=GND to V_{CC}[3]	V_{CC}=0.8V	-	2.5	-	pF
			V_{CC}=1.1V to 1.3V	-	2.7	-	pF
			V_{CC}=1.4V to 1.6V	-	2.8	-	pF
			V_{CC}=1.65V to 1.95V	-	2.9	-	pF
			V_{CC}=2.3V to 2.7V	-	3.5	-	pF
			V_{CC}=3.0V to 3.6V	-	4.0	-	pF

Note:

[1] All typical values are measured at nominal V_{CC}.

[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).

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

$\Sigma(C_L \times V_{CC}^2 \times f_o)$=sum of the outputs.

3.3.5、AC Characteristics 2

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t_{pd}	A, B to Y; see Figure 5[1]	C_L=5pF				
			V_{CC}=1.1V to 1.3V	2.1	-	11.7	ns
			V_{CC}=1.4V to 1.6V	1.5	-	7.5	ns
			V_{CC}=1.65V to 1.95V	1.3	-	6.1	ns
			V_{CC}=2.3V to 2.7V	1.0	-	4.8	ns
			V_{CC}=3.0V to 3.6V	0.9	-	4.3	ns
			C_L=10pF				
			V_{CC}=1.1V to 1.3V	2.2	-	13.6	ns
			V_{CC}=1.4V to 1.6V	1.8	-	8.9	ns
			V_{CC}=1.65V to 1.95V	1.6	-	7.2	ns
			V_{CC}=2.3V to 2.7V	1.3	-	5.7	ns
			V_{CC}=3.0V to 3.6V	1.2	-	4.7	ns
			C_L=15pF				
			V_{CC}=1.1V to 1.3V	3.1	-	15.7	ns
			V_{CC}=1.4V to 1.6V	2.1	-	10.1	ns
			V_{CC}=1.65V to 1.95V	1.8	-	8.2	ns
			V_{CC}=2.3V to 2.7V	1.6	-	6.5	ns
			V_{CC}=3.0V to 3.6V	1.5	-	5.9	ns
			C_L=30pF				
			V_{CC}=1.1V to 1.3V	4.1	-	21.8	ns
			V_{CC}=1.4V to 1.6V	2.9	-	13.6	ns
			V_{CC}=1.65V to 1.95V	2.4	-	10.9	ns
			V_{CC}=2.3V to 2.7V	2.2	-	8.6	ns
			V_{CC}=3.0V to 3.6V	2.1	-	7.5	ns

Note:

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

3.3.6、AC Characteristics 3

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t_{pd}	A, B to Y; see Figure 5[1]	C_L=5pF				
			V_{CC}=1.1V to 1.3V	2.1	-	12.9	ns
			V_{CC}=1.4V to 1.6V	1.5	-	8.3	ns
			V_{CC}=1.65V to 1.95V	1.3	-	6.7	ns
			V_{CC}=2.3V to 2.7V	1.0	-	5.3	ns
			V_{CC}=3.0V to 3.6V	0.9	-	4.8	ns
			C_L=10pF				
			V_{CC}=1.1V to 1.3V	2.2	-	15.0	ns
			V_{CC}=1.4V to 1.6V	1.8	-	9.8	ns
			V_{CC}=1.65V to 1.95V	1.6	-	7.9	ns
			V_{CC}=2.3V to 2.7V	1.3	-	6.3	ns
			V_{CC}=3.0V to 3.6V	1.2	-	5.2	ns
			C_L=15pF				
			V_{CC}=1.1V to 1.3V	3.1	-	17.3	ns
			V_{CC}=1.4V to 1.6V	2.1	-	11.2	ns
			V_{CC}=1.65V to 1.95V	1.8	-	9.0	ns
			V_{CC}=2.3V to 2.7V	1.6	-	7.2	ns
			V_{CC}=3.0V to 3.6V	1.5	-	6.5	ns
			C_L=30pF				
			V_{CC}=1.1V to 1.3V	4.1	-	24.0	ns
			V_{CC}=1.4V to 1.6V	2.9	-	15.0	ns
			V_{CC}=1.65V to 1.95V	2.4	-	12.1	ns
			V_{CC}=2.3V to 2.7V	2.2	-	9.5	ns
			V_{CC}=3.0V to 3.6V	2.1	-	8.3	ns

Note:

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

4、Testing Circuit

4.1、AC Testing Circuit

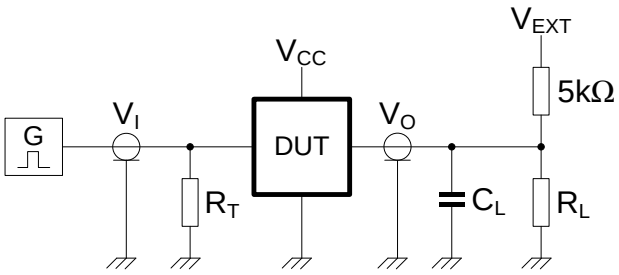


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

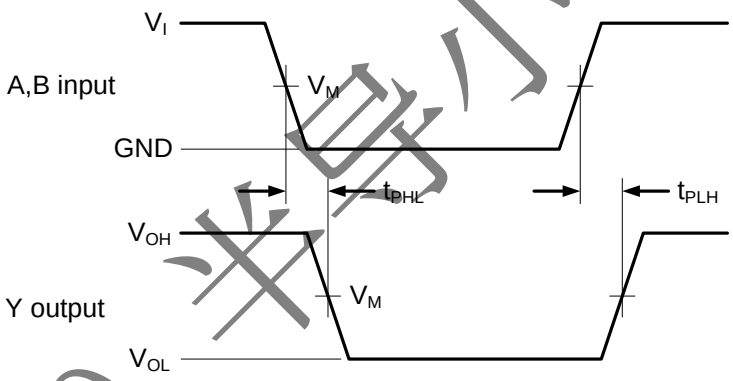
R_L=Load resistance.

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



Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Figure 5. The data input (A or B) to output (Y) propagation delays

4.3、Measurement Points

Supply voltage	Output	Input		
V_{CC}	V_M	V_M	V_I	$t_r=t_f$
0.8V to 3.6V	0.5×V_{CC}	0.5×V_{CC}	V_{CC}	≤3.0ns

4.4、Test Data

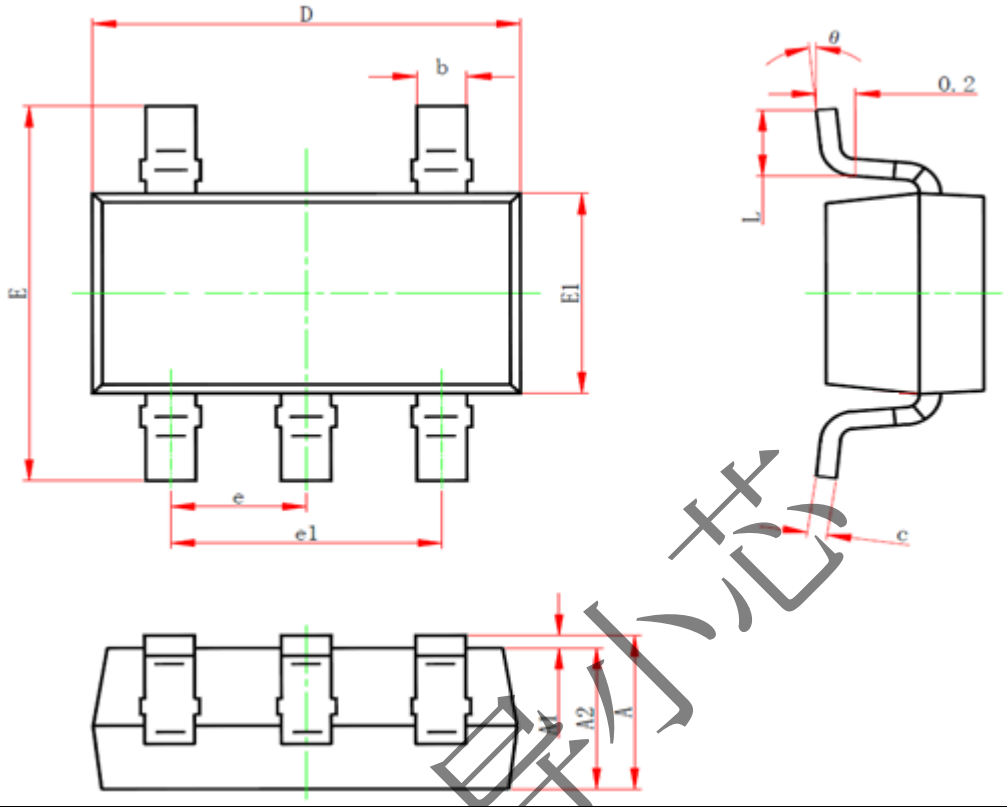
Supply voltage	Load		V_{EXT}		
V_{CC}	C_L	R_L[1]	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
0.8V to 3.6V	5pF, 10pF, 15pF and 30pF	5kΩ or 1MΩ	open	GND	2×V_{CC}

Note:

[1] For measuring enable and disable times R_L=5kΩ, for measuring propagation delays, setup and hold times and pulse width R_L=1MΩ.

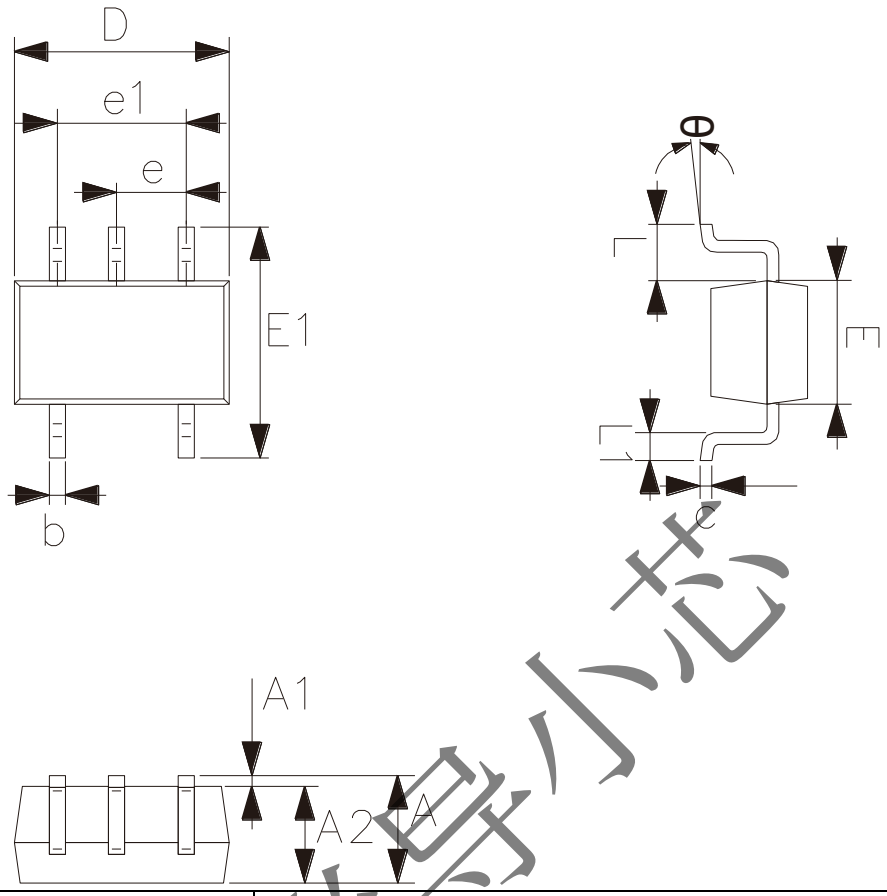
5、Package Information

5.1、SOT23-5



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.26
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°

5.2、SOT353



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
E	1.15	1.35
E1	2.15	2.45
e	0.65	
e1	1.20	1.40
L	0.525	
L1	0.26	0.46
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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