2-input Single Supply Translating AND Gate

CJ74LV1T08 Logic

1 Introduction

The CJ74LV1T08 is a single, level translating 2-input AND gate. The low threshold inputs support 1.8V input logic at V_{CC}=3.3V and can be used in 1.8V to 3.3V level up translation. In addition, the 5V tolerant input pins enable level down translation (3.3V to 2.5V output at V_{CC}=2.5V). The output level is referenced to the supply voltage and supports 1.8V, 2.5V, 3.3V and 5.0V CMOS levels. The wide V_{CC} range permits the generation of output levels to connect to controllers or processors.

2 Available Packages

PART NUMBER	PACKAGE
CJ74LV1T08	SOT-23-5L
	SOT-353
	DFNWB0.8x0.8-4L

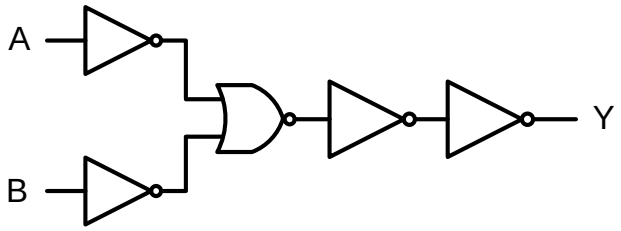
Note: For all available packages, please refer to the part Orderable Information.

3 Features

- Single supply voltage translator at 1.8V, 2.5V, 3.3V and 5.0V
- Up translation
  - 1.2V to 1.8V at V_{CC}=1.8V
  - 1.5V to 2.5V at V_{CC}=2.5V
  - 1.8V to 3.3V at V_{CC}=3.3V
  - 3.3V to 5.0V at V_{CC}=5.0V
- Down translation
  - 3.3V to 1.8V at V_{CC}=1.8V
  - 3.3V to 2.5V at V_{CC}=2.5V
  - 5.0V to 3.3V at V_{CC}=3.3V
- 5V tolerant inputs
- Specified from -40°C to +125°C

4 Applications

- Telecom
- Portable applications
- Servers
- PC and notebooks



Logic diagram

5 Orderable Information

DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJ74LV1T08M5N	SOT-23-5L	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 3000 Units / Reel	Active
CJ74LV1T08R5N	SOT-353	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 3000 Units / Reel	Active
CJ74LV1T08DJN	DFNWB0.8x0.8-4L	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 12000 Units / Reel	Active

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:
Active: Recommended for new products;
Customized: Products manufactured to meet the specific needs of customers;
Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;
NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;
Obsolete: The device has been discontinued.

6 Pin Configuration and Marking Information

6.1 Pin Configuration

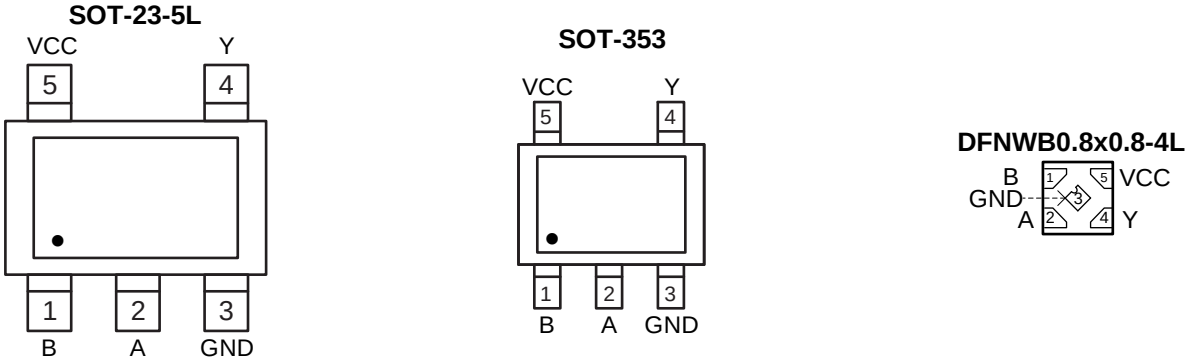


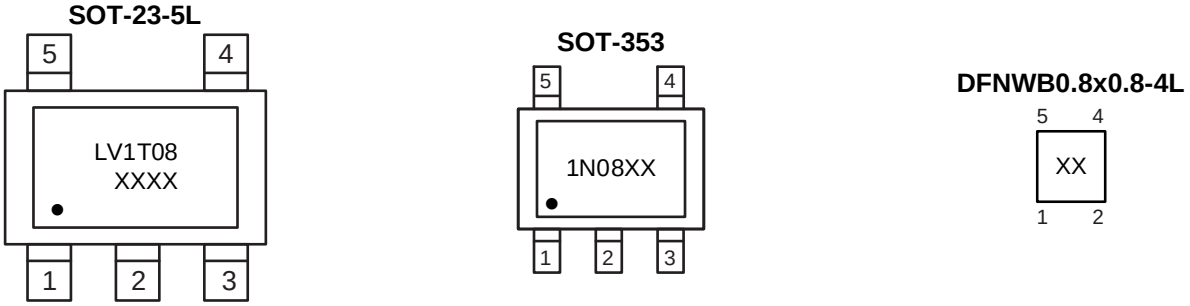
Figure 6-1 Pin configuration

6.2 Pin Function

PIN		I/O(1)	DESCRIPTION
No.	NAME		
1	B	I	Data input
2	A	I	Data input
3	GND	G	Ground (0V)
4	Y	O	Data output
5	VCC	P	Supply voltage

(1) I-Input, O-Output, P-Power, G-Ground

6.3 Marking Information



XXXX or XX: Code, indicates weekly record information.

7 Specifications

7.1 Absolute Maximum Ratings

T_{amb}=25°C, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	Supply voltage	-	-0.5	+7.0	V
V_I	Input voltage	-[1]	-0.5	+7.0	V
V_O	Output voltage	Output HIGH or LOW state[2][3]	-0.5	V_{CC}+0.5	V
		Output in power-off state[2]	-0.5	+4.6	V
I_{IK}	Input clamping current	V_I<0V	-20	-	mA
I_{OK}	Output clamping current	V_O<0V or V_O>V_{CC}	-	±20	mA
I_O	Output current	V_O=0V to V_{CC}	-	±25	mA
I_{CC}	Supply current	-	-	100	mA
I_{GND}	Ground current	-	-50	-	mA
T_{stg}	Storage temperature	-	-65	+150	°C
P_{tot}	Total power dissipation	T_{amb}=-40°C to +125°C	-	250	mW
T_L	Soldering temperature	10s	-	260	°C

(1) If the input current ratings are observed, the minimum input voltage ratings may be exceeded.

(2) If the output current ratings are observed, the output voltage ratings may be exceeded.

(3) This value is limited to 7V maximum.

7.2 Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	Supply voltage	-	1.6	5.0	5.5	V
V_I	Input voltage	-	0	-	5.5	V
V_O	Output voltage	Output HIGH or LOW state	0	-	V_{CC}	V
T_{amb}	Ambient temperature	-	-40	-	+125	°C
Δt/ΔV	Input transition rise and fall rate	V_{CC}=1.8V to 5.0V	-	-	20	ns/V

7.3 Electrical Characteristics

7.3.1 DC Characteristics 1

T_{amb}=25°C, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{IH}	HIGH-level input voltage	V_{CC}=1.65V to 1.8V		0.94	-	-	V
		V_{CC}=2.0V		0.99	-	-	V
		V_{CC}=2.25V to 2.5V		1.25	-	-	V
		V_{CC}=2.75V		1.33	-	-	V
		V_{CC}=3.0V to 3.3V		1.49	-	-	V
		V_{CC}=3.6V		1.62	-	-	V
		V_{CC}=4.5V to 5.0V		2.40	-	-	V
		V_{CC}=5.5V		3.00	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=1.65V to 2.0V		-	-	0.58	V
		V_{CC}=2.25V to 2.75V		-	-	0.75	V
		V_{CC}=3.0V to 3.6V		-	-	0.80	V
		V_{CC}=4.5V to 5.5V		-	-	0.80	V
V_{OH}	HIGH-level output voltage	V_I=V_{IH} or V_{IL}	V_{CC}=1.65V to 5.5V; I_O=-20uA	V_{CC}-0.1	-	-	V
			V_{CC}=1.65V; I_O=-2mA	1.25	-	-	V
			V_{CC}=1.8V; I_O=-2mA	1.5	-	-	V
			V_{CC}=2.3V; I_O=-2.3mA	2.0	-	-	V
			V_{CC}=2.3V; I_O=-3mA	2.0	-	-	V
			V_{CC}=2.5V; I_O=-3mA	2.25	-	-	V
			V_{CC}=3.0V; I_O=-3mA	2.78	-	-	V
			V_{CC}=3.0V; I_O=-5.5mA	2.6	-	-	V
			V_{CC}=3.3V; I_O=-5.5mA	2.9	-	-	V
			V_{CC}=4.5V; I_O=-4mA	4.2	-	-	V
			V_{CC}=4.5V; I_O=-8mA	4.1	-	-	V
			V_{CC}=5.0V; I_O=-8mA	4.6	-	-	V
V_{OL}	LOW-level output voltage	V_I=V_{IH} or V_{IL}	V_{CC}=1.65V to 5.5V; I_O=20uA	-	-	0.1	V
			V_{CC}=1.65V; I_O=2mA	-	-	0.2	V
			V_{CC}=2.3V; I_O=2.3mA	-	-	0.1	V
			V_{CC}=2.3V; I_O=3mA	-	-	0.15	V
			V_{CC}=3.0V; I_O=3mA	-	-	0.1	V
			V_{CC}=3.0V; I_O=5.5mA	-	-	0.2	V
			V_{CC}=4.5V; I_O=4mA	-	-	0.15	V
			V_{CC}=4.5V; I_O=8mA	-	-	0.3	V
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=0V to 5.5V		-	-	±0.1	uA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=1.8V, 2.5V, 3.3V, 5.0V	-	-	1	uA
ΔI_{CC}	Additional supply current	Per input pin; V_{CC}=1.8V; V_I=0.3V or 1.1V; I_O=0A; Other pins at V_{CC} or GND	-	-	10	uA
		Per input pin; V_{CC}=5.5V; V_I=0.3V or 3.4V; I_O=0A; Other pins at V_{CC} or GND	-	-	1.35	mA

7.3.2 DC Characteristics 2

T_{amb}=-40°C to +85°C, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{IH}	HIGH-level input voltage	V_{CC}=1.65V to 1.8V		1.00	-	-	V
		V_{CC}=2.0V		1.04	-	-	V
		V_{CC}=2.25V to 2.5V		1.30	-	-	V
		V_{CC}=2.75V		1.38	-	-	V
		V_{CC}=3.0V to 3.3V		1.54	-	-	V
		V_{CC}=3.6V		1.67	-	-	V
		V_{CC}=4.5V to 5.0V		2.45	-	-	V
		V_{CC}=5.5V		3.05	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=1.65V to 2.0V		-	-	0.55	V
		V_{CC}=2.25V to 2.75V		-	-	0.71	V
		V_{CC}=3.0V to 3.6V		-	-	0.65	V
		V_{CC}=4.5V to 5.5V		-	-	0.80	V
V_{OH}	HIGH-level output voltage	V_I=V_{IH} or V_{IL}	V_{CC}=1.65V to 5.5V; I_O=-20uA	V_{CC}-0.1	-	-	V
			V_{CC}=1.65V; I_O=-2mA	1.21	-	-	V
			V_{CC}=1.8V; I_O=-2mA	1.45	-	-	V
			V_{CC}=2.3V; I_O=-2.3mA	2.0	-	-	V
			V_{CC}=2.3V; I_O=-3mA	1.93	-	-	V
			V_{CC}=2.5V; I_O=-3mA	2.15	-	-	V
			V_{CC}=3.0V; I_O=-3mA	2.7	-	-	V
			V_{CC}=3.0V; I_O=-5.5mA	2.49	-	-	V
			V_{CC}=3.3V; I_O=-5.5mA	2.8	-	-	V
			V_{CC}=4.5V; I_O=-4mA	4.1	-	-	V
			V_{CC}=4.5V; I_O=-8mA	3.95	-	-	V
			V_{CC}=5.0V; I_O=-8mA	4.5	-	-	V

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{OL}	LOW-level output voltage	$V_I=V_{IH}$ or V_{IL}	V_{CC}=1.65V to 5.5V; I_O=20uA	-	-	0.1	V
			V_{CC}=1.65V; I_O=2mA	-	-	0.25	V
			V_{CC}=2.3V; I_O=2.3mA	-	-	0.15	V
			V_{CC}=2.3V; I_O=3mA	-	-	0.2	V
			V_{CC}=3.0V; I_O=3mA	-	-	0.15	V
			V_{CC}=3.0V; I_O=5.5mA	-	-	0.252	V
			V_{CC}=4.5V; I_O=4mA	-	-	0.2	V
			V_{CC}=4.5V; I_O=8mA	-	-	0.35	V
I_I	Input leakage current	$V_I=V_{CC}$ or GND; V_{CC}=0V to 5.5V		-	-	±1	uA
I_{CC}	Supply current	$V_I=V_{CC}$ or GND; I_O=0A; V_{CC}=1.8V, 2.5V, 3.3V, 5.0V		-	-	10	uA
ΔI_{CC}	Additional supply current	Per input pin; V_{CC}=1.8V; V_I=0.3V or 1.1V; I_O=0A; Other pins at V_{CC} or GND		-	-	10	uA
		Per input pin; V_{CC}=5.5V; V_I=0.3V or 3.4V; I_O=0A; Other pins at V_{CC} or GND		-	-	1.5	mA

7.3.3 DC Characteristics 3

T_{amb}=-40°C to +125°C, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{IH}	HIGH-level input voltage	V_{CC}=1.65V to 1.8V	1.0	-	-	V
		V_{CC}=2.0V	1.04	-	-	V
		V_{CC}=2.25V to 2.5V	1.30	-	-	V
		V_{CC}=2.75V	1.38	-	-	V
		V_{CC}=3.0V to 3.3V	1.54	-	-	V
		V_{CC}=3.6V	1.67	-	-	V
		V_{CC}=4.5V to 5.0V	2.45	-	-	V
		V_{CC}=5.5V	3.05	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=1.65V to 2.0V	-	-	0.55	V
		V_{CC}=2.25V to 2.75V	-	-	0.71	V
		V_{CC}=3.0V to 3.6V	-	-	0.65	V
		V_{CC}=4.5V to 5.5V	-	-	0.80	V

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
V_{OH}	HIGH-level output voltage	$V_I=V_{IH}$ or V_{IL}	V_{CC}=1.65V to 5.5V; I_O=-20uA	V_{CC}-0.1	-	-	V
			V_{CC}=1.65V; I_O=-2mA	1.21	-	-	V
			V_{CC}=1.8V; I_O=-2mA	1.45	-	-	V
			V_{CC}=2.3V; I_O=-2.3mA	2.0	-	-	V
			V_{CC}=2.3V; I_O=-3mA	1.93	-	-	V
			V_{CC}=2.5V; I_O=-3mA	2.15	-	-	V
			V_{CC}=3.0V; I_O=-3mA	2.7	-	-	V
			V_{CC}=3.0V; I_O=-5.5mA	2.49	-	-	V
			V_{CC}=3.3V; I_O=-5.5mA	2.8	-	-	V
			V_{CC}=4.5V; I_O=-4mA	4.1	-	-	V
			V_{CC}=4.5V; I_O=-8mA	3.95	-	-	V
			V_{CC}=5.0V; I_O=-8mA	4.5	-	-	V
V_{OL}	LOW-level output voltage	$V_I=V_{IH}$ or V_{IL}	V_{CC}=1.65V to 5.5V; I_O=20uA	-	-	0.1	V
			V_{CC}=1.65V; I_O=2mA	-	-	0.25	V
			V_{CC}=2.3V; I_O=2.3mA	-	-	0.15	V
			V_{CC}=2.3V; I_O=3mA	-	-	0.2	V
			V_{CC}=3.0V; I_O=3mA	-	-	0.15	V
			V_{CC}=3.0V; I_O=5.5mA	-	-	0.252	V
			V_{CC}=4.5V; I_O=4mA	-	-	0.2	V
			V_{CC}=4.5V; I_O=8mA	-	-	0.35	V
I_I	Input leakage current	$V_I=V_{CC}$ or GND; V_{CC}=0V to 5.5V		-	-	±1	uA
I_{CC}	Supply current	$V_I=V_{CC}$ or GND; I_O=0A; V_{CC}=1.8V, 2.5V, 3.3V, 5.0V		-	-	10	uA
ΔI_{CC}	Additional supply current	Per input pin; V_{CC}=1.8V; V_I=0.3V or 1.1V; I_O=0A; Other pins at V_{CC} or GND		-	-	10	uA
		Per input pin; V_{CC}=5.5V; V_I=0.3V or 3.4V; I_O=0A; Other pins at V_{CC} or GND		-	-	1.5	mA

7.3.4 AC Characteristics

T_{amb}=-40°C to +125°C, GND=0V, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS		-40°C to +125°C					UNIT
				MIN.	TYP. 25°C	MAX. 25°C	MAX. 85°C	MAX. 125°C	
t_{pd}	Propagation delay	A, B to Y; See Figure 8-5(1)	V_{CC}=1.8V; C_L=15pF	-	13	19.4	21.8	23.4	ns
			V_{CC}=1.8V; C_L=30pF	-	15.2	21.8	24.8	26.8	ns
			V_{CC}=2.5V; C_L=15pF	-	9.2	13.2	15.2	16.4	ns
			V_{CC}=2.5V; C_L=30pF	-	10.6	15	17.2	18.4	ns
			V_{CC}=3.3V; C_L=15pF	-	7.6	10.8	12.2	13	ns
			V_{CC}=3.3V; C_L=30pF	-	8.8	12.2	13.6	14.6	ns
			V_{CC}=5.0V; C_L=15pF	-	6.4	8.2	9	9.4	ns
			V_{CC}=5.0V; C_L=30pF	-	7.2	9.2	10.2	10.8	ns
C_I	Input capacitance	V_I=V_{CC} or GND; V_{CC}=3.3V		-	1.5	10	10	10	pF
C_O	Output capacitance	V_O=V_{CC} or GND; V_{CC}=3.3V		-	2.5	-	-	-	pF
C_{PD}	Power dissipation capacitance	Per buffer; V_I=GND to V_{CC}; C_L=30pF; f=10MHz(2)	V_{CC}=1.8V	-	4.2	-	-	-	pF
			V_{CC}=2.5V	-	5.3	-	-	-	pF
			V_{CC}=3.3V	-	7.2	-	-	-	pF
			V_{CC}=5.0V	-	11.1	-	-	-	pF

(1) t_{pd} is the same as t_{PLH} and t_{PHL}.

(2) C_{PD} is used to determine the dynamic power dissipation (P_D in uW).
$P_D=C_{PD}xV_{CC}^2xf_ixN+\sum(C_LxV_{CC}^2xf_o)$ 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;
$\sum(C_LxV_{CC}^2xf_o)$=sum of the outputs.

8 Detailed Description

8.1 Overview

The CJ74LV1T08 is a single, level translating 2-input AND gate. The low threshold inputs support 1.8V input logic at V_{CC}=3.3V and can be used in 1.8V to 3.3V level up translation. In addition, the 5V tolerant input pins enable level down translation (3.3V to 2.5V output at V_{CC}=2.5V). The output level is referenced to the supply voltage and supports 1.8V, 2.5V, 3.3V and 5.0V CMOS levels. The wide V_{CC} range permits the generation of output levels to connect to controllers or processors.

8.2 Functional Block Diagram

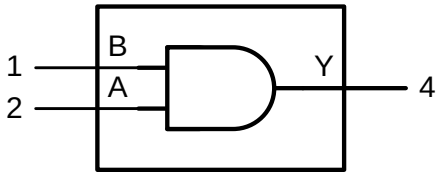


Figure 8-1 Logic symbol

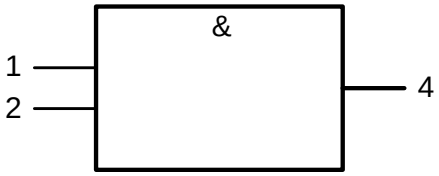


Figure 8-2 logic symbol

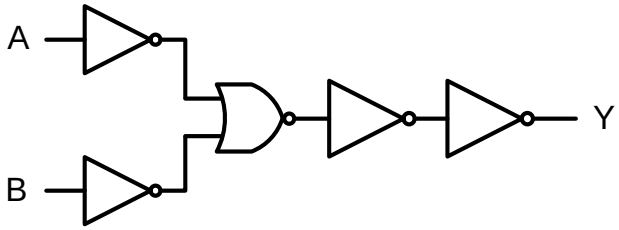


Figure 8-3 Logic diagram

8.3 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.

8.4 Testing Circuit

8.4.1 AC Testing Circuit

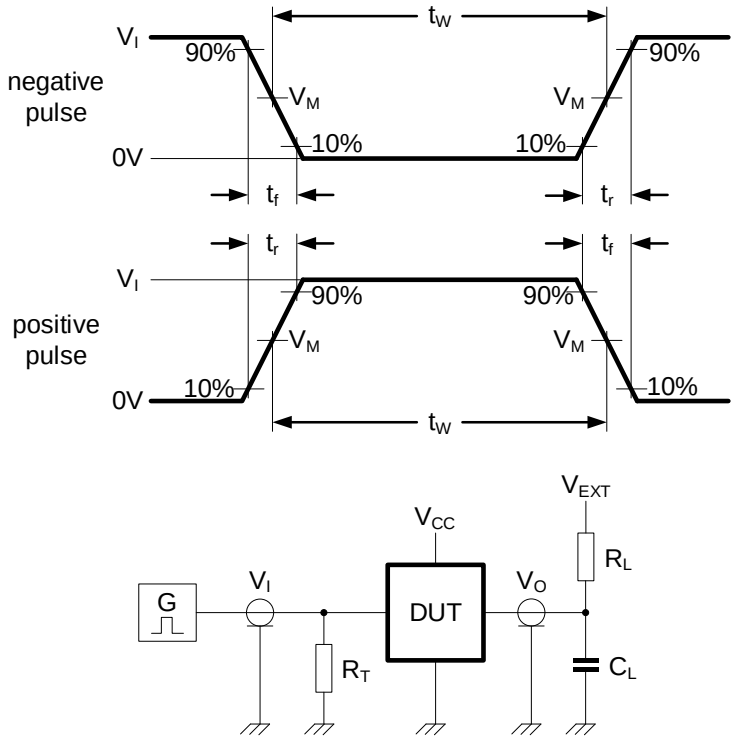


Figure 8-4 Test circuit for measuring switching times

Definitions test circuit:

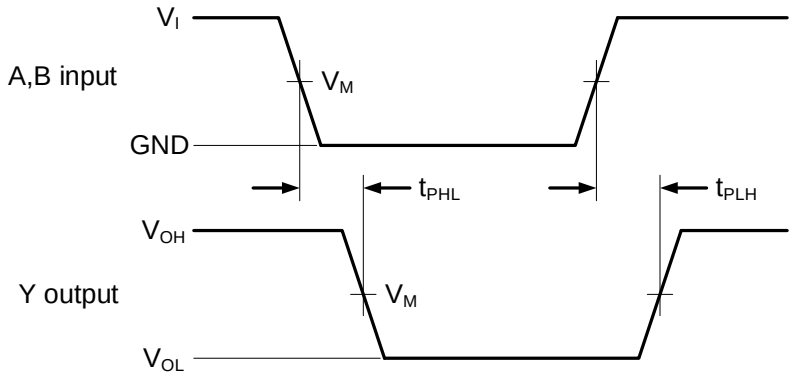
R_T=Termination resistance should be equal to output impedance Z_o of the pulse generator

C_L=Load capacitance including jig and probe capacitance

R_L=Load resistance

V_{EXT}=External voltage for measuring switching times

8.4.2 AC Testing Waveforms



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

Figure 8-5 The input A,B to output Y propagation delays

8.4.3 Measurement Points

INPUT	OUTPUT
V_M	**V_M**
0.5xV_I	0.5xV_{CC}

8.4.4 Test Data

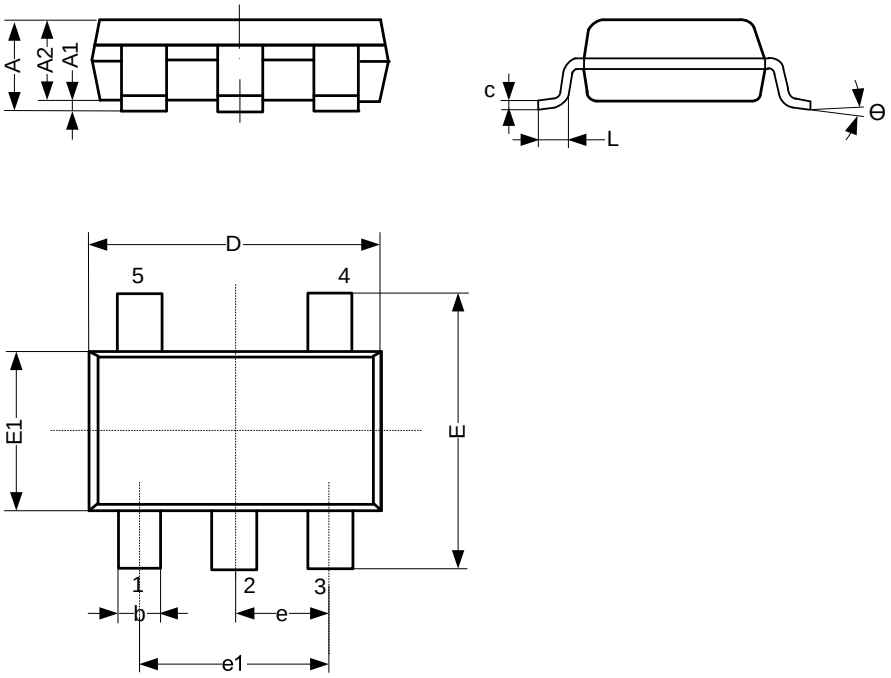
SUPPLY VOLTAGE	INPUT			LOAD		V_{EXT}		
V_{CC}	V_I	$\Delta t/\Delta V^{(1)}$	f_{max}	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.8V	V_{CC}	≤1.0ns/V	15MHz	15pF,30pF	1MΩ	GND	GND	V_{CC}
2.5V	V_{CC}	≤1.0ns/V	25MHz	15pF,30pF	1MΩ	GND	GND	V_{CC}
3.3V	3V	≤1.0ns/V	50MHz	15pF,30pF	1MΩ	GND	GND	V_{CC}
5.0V	3V	≤1.0ns/V	50MHz	15pF,30pF	1MΩ	GND	GND	V_{CC}

(1) dV/dt ≥1.0V/ns.

9 Mechanical Information

9.1 SOT-23-5L Mechanical Information

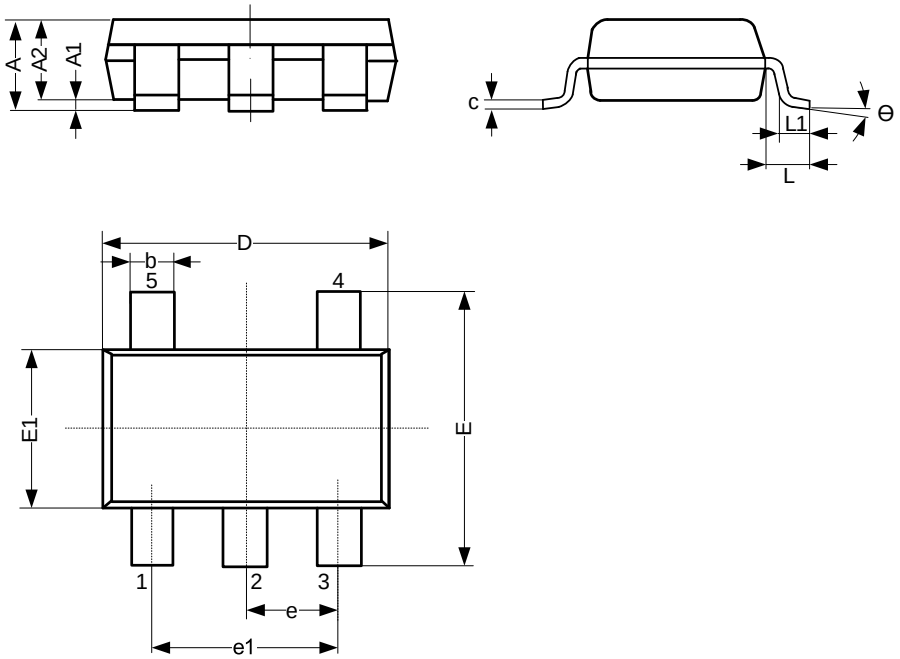
9.1.1 SOT-23-5L Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	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 BSC		
e1	1.80	-	2.00
L	0.30	-	0.60
θ	0°	-	8°
Unit: mm			

9.2 SOT-353 Mechanical Information

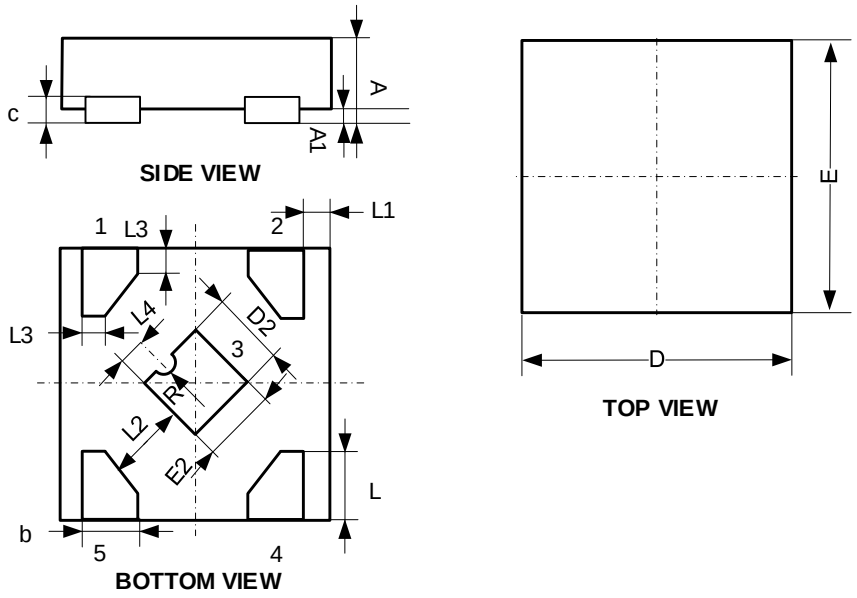
9.2.1 SOT-353 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	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	2.15	-	2.45
E1	1.15	-	1.35
e	0.65 BSC		
e1	1.20	-	1.40
L	-	0.525	-
L1	0.26	-	0.46
Θ	0°	-	8°
Unit: mm			

9.3 DFNWB0.8x0.8-4L Mechanical Information

9.3.1 DFNWB0.8x0.8-4L Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	0.37	-	0.43
A1	0.00	-	0.05
b	0.15	-	0.25
c	-	0.127	-
D	0.75	-	0.85
D2	0.20	-	0.40
E	0.75	-	0.85
E2	0.20	-	0.40
e	0.50 BSC		
L	0.15	-	0.25
L1	-	0.05	-
L2	-	0.20	-
L3	-	0.055	-
L4	-	0.10	-
R	-	0.05	-
Unit: mm			

10 Notes and Revision History

10.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- ***https:www.jscj-elec.com*** for more details.

10.2 Notes

Electrostatic Discharge Caution

This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. JSCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses JSCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. JSCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

Without the written consent of JSCJ, this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, military facilities and aerospace. JSCJ shall not be responsible for casualties or property losses caused by abnormal use or application of this product.

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