2-Input Single-supply Translating AND gate

Features

- Wide Supply Voltage Range from 1.65 V to 5.5 V
- Overvoltage Tolerant Inputs to 5.5 V
- Low Threshold Inputs Support
- Translator at 1.8 V, 2.5 V, 3.3 V, and 5.0 V
- I_{OFF} Supports Partial Power-down Protection
- ESD Protection: ±4-kV HBM Model, ±1-kV CDM Model
- Latch-up Performance Exceeds 100 mA per JESD 78, Class II

Applications

- Computing
- Tablet PC
- Television
- Wearable Device
- Server
- Industrial Equipment

Description

The T74LV1T08 is a 2-input translating AND gate with V_{CC} supply from 1.65 V to 5.5 V. The low threshold inputs support the level-up translation and level-down by 5.5 V tolerant. I_{OFF} circuits can prevent backflow current during power-down, thus supporting partial power-down protection.

The T74LV1T08 is available in SOT353 and SOT23-5 packages and is characterized from –40°C to 125°C.

Device Table

Device	Package	Body Size
T74LV1T08-SC5R	SOT353	2 mm x 1.25 mm
T74LV1T08-S5TR	SOT23-5	2.9 mm x 1.6 mm

Typical Application Circuit

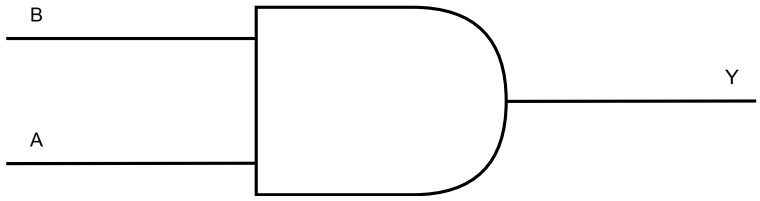


Table of Contents

Revision History

Date	Revision	Notes
2025-02-08	Rev.Pre.0	Initial version.
2026-01-08	Rev.A.0	Released version.

Pin Configuration and Functions

T74LV1T08
SOT353/SOT23-5
Top View

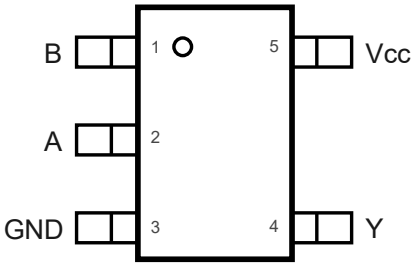


Table 1. Pin Functions

Pin No.	Name	I/O	Description
1	B	I	Input B
2	A	I	Input A
3	GND	Power	Ground
4	Y	O	Output Y
5	V_{CC}	Power	Supply pin

Function Table

Table 2. Truth Table

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

(1) H = High voltage level.
(2) L = Low voltage level.
(3) X = Don't care.

Specifications

Absolute Maximum Ratings (1)

Parameter		Min	Max	Unit
V_{CC}	Supply Voltage	–0.5	6.5	V
V_I	Input Voltage (2)	–0.5	6.5	V
V_O	Output Voltage, in Power-off Mode (2)	–0.5	6.5	V
V_O	Output Voltage, in Active Mode (2)	–0.5	V_{CC} + 0.5	V
I_O	Continuous Output Current	−25	25	mA
I_{IK}	Input Clamp Current, V_I < 0	−20		mA
I_{OK}	Output Clamp Current, V_O < 0	−20		mA
	Continuous Current through V_{CC} or GND	−50	50	mA
T_J	Junction Temperature		150	°C
T_{STG}	Storage Temperature	–65	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001, all pins (1)	±4,000	V
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002, all pins (2)	±1,000	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	1.65		5.5	V
V_I	Input Voltage	0		5.5	V
V_O	Output Voltage	0		V_{CC}	V
T_A	Ambient Temperature	−40		125	℃
Δt/ΔV	Input Transition Rise-and-Fall Rate			20	ns/V

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT353	246.6	68.2	°C/W
SOT23-5	185	93.4	°C/W

Electrical Characteristics – DC Parameter

All test conditions: T_A = −40℃ to 125℃, all typical values are measured at T_A = 25℃, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	High-Level Input Voltage	V_{CC} = 1.65 V to 1.8 V	1			V
		V_{CC} = 2 V	1.03			V
		V_{CC} = 2.25 V to 2.5 V	1.18			V
		V_{CC} = 2.75 V	1.23			V
		V_{CC} = 3 V to 3.3 V	1.37			V
		V_{CC} = 3.6 V	1.48			V
		V_{CC} = 4.5 to 5 V	2.03			V
		V_{CC} = 5.5 V	2.11			V
V_{IL}	Low-Level Input Voltage	V_{CC} = 1.65 V to 2 V			0.45	V
		V_{CC} = 2.25 V to 2.75 V			0.71	V
		V_{CC} = 3 V to 3.6 V			0.65	V
		V_{CC} = 4.5 V to 5.5 V			0.8	V
V_{OH}	High-Level Output Voltage	I_{OH} = −20 μA; V_{CC} = 1.65 V to 5.5 V	V_{CC} − 0.1			V
		I_{OH} = −2 mA; V_{CC} = 1.65 V	1.2			V
		I_{OH} = −2 mA; V_{CC} = 1.8 V	1.4			V
		I_{OH} = −2.3 mA; V_{CC} = 2.3 V	2			V
		I_{OH} = −3 mA; V_{CC} = 2.3 V	1.93			V
		I_{OH} = −3 mA; V_{CC} = 2.5 V	2.15			V
		I_{OH} = −3 mA; V_{CC} = 3 V	2.7			V
		I_{OH} = −5.5 mA; V_{CC} = 3 V	2.49			V
		I_{OH} = −5.5 mA; V_{CC} = 3.3 V	2.8			V
		I_{OH} = −4 mA; V_{CC} = 4.5 V	4.1			V
		I_{OH} = −8mA; V_{CC} = 4.5 V	3.9			V
		I_{OH} = −8mA; V_{CC} = 5 V	4.4			V
V_{OL}	Low-Level Output Voltage	I_{OL} = 20 μA; V_{CC} = 1.65 V to 5.5 V			0.1	V
		I_{OL} = 2 mA; V_{CC} = 1.65 V			0.25	V
		I_{OL} = 2.3 mA; V_{CC} = 2.3 V			0.15	V
		I_{OL} = 3 mA; V_{CC} = 2.3 V			0.2	V
		I_{OL} = 3 mA; V_{CC} = 3 V			0.15	V
		I_{OL} = 5.5 mA; V_{CC} = 3 V			0.25	V
		I_{OL} = 4 mA; V_{CC} = 4.5 V			0.2	V
		I_{OL} = 8 mA; V_{CC} = 4.5 V			0.35	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_I	Input Leakage Current	V_I = GND or V_{CC} ; V_{CC}= 0 V to 5.5 V	−1	±0.1	1	μA
I_{OFF}	Power-off Leakage Current	V_I or V_O = 0 V to 5.5 V; V_{CC} = 0 V	−1	±0.1	1	μA
I_{CC}	Supply Current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 1.65 V to 5.5 V		0.1	2	μA
ΔI_{CC}	Additional Supply Current	V_I = 0.3 V or 1.1 V; I_O = 0 A; V_{CC} = 1.8 V		0.5	10	μA
		V_I = 0.3 V or 3.4 V; I_O = 0 A; V_{CC} = 5.5 V		0.1	1	mA
C_I (1)	Input Capacitance	V_I = V_{CC} or GND		2.3		pF
C_O (1)	Output Capacitance	V_O = V_{CC} or GND		2.5		pF

(1) Spec limit is based on bench characterization and design simulation, not tested in production.

Electrical Characteristics – AC Parameter

All test conditions: T_A = −40℃ to 125℃, all typical values are measured at T_A = 25℃, unless otherwise noted.

Symbol (1)	Parameter	Conditions	Min	Typ	Max	Unit
t_{PD} (2)	Propagation Delay at 15-pF C_{LOAD}	V_{CC} = 1.8 V	3.7	8.2	12.4	ns
		V_{CC} = 2.5 V	2.3	5.1	8.1	ns
		V_{CC} = 3.3 V	1.7	4.2	6.5	ns
		V_{CC} = 5 V	1.2	3.5	5	ns
	Propagation Delay at 30-pF C_{LOAD}	V_{CC} = 1.8 V	4.4	9.2	14.1	ns
		V_{CC} = 2.5 V	2.8	5.7	9.3	ns
		V_{CC} = 3.3 V	2.2	4.6	7.3	ns
		V_{CC} = 5 V	1.6	3.8	5.8	ns
C_{PD} (3)	Power Dissipation Capacitance	f = 10 MHz; V_{CC} = 1.8 V		4.8		pF
		f = 10 MHz; V_{CC} = 2.5 V		5.2		pF
		f = 10 MHz; V_{CC} = 3.3 V		5.7		pF
		f = 10 MHz; V_{CC} = 5 V		6.9		pF

(1) Spec limit is based on bench characterization and design simulation, not tested in production.
(2) t_{PD} is the same as t_{PLH} and t_{PHL}.
(3) C_{PD} is used to determine the dynamic power dissipation (PD in μW).

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

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 Volts;

N = Number of inputs switching;

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

Parameter Measurement Waveforms

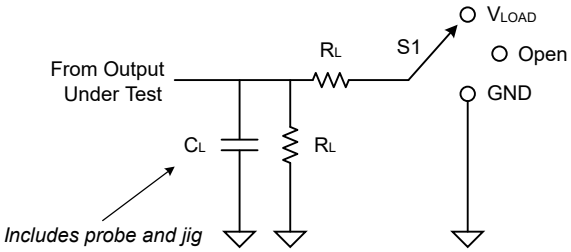


Figure 1. Timing Measurement Load Circuit

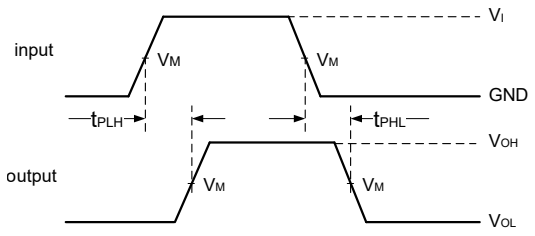


Figure 2. Propagation Delay Times

Table 3. Test Data

V_{CC}	Inputs		C_L	R_L	V_M		S1
	V_I	t_r/t_f			Inputs	Outputs	t_{PHL}/t_{PLH}
1.8 V	V_{CC}	≤ 2 ns	15 pF, 30 pF	1 MΩ	$0.5V_I$	$0.5V_{CC}$	Open
2.5 V	V_{CC}	≤ 2 ns	15 pF, 30 pF	1 MΩ	$0.5V_I$	$0.5V_{CC}$	Open
3.3 V	3 V	≤ 2.5 ns	15 pF, 30 pF	1 MΩ	$0.5V_I$	$0.5V_{CC}$	Open
5 V	3 V	≤ 2.5 ns	15 pF, 30 pF	1 MΩ	$0.5V_I$	$0.5V_{CC}$	Open

Application and Implementation

> Note
>
> Information in the following application sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Typical Application

Figure 3 shows the typical application schematic.

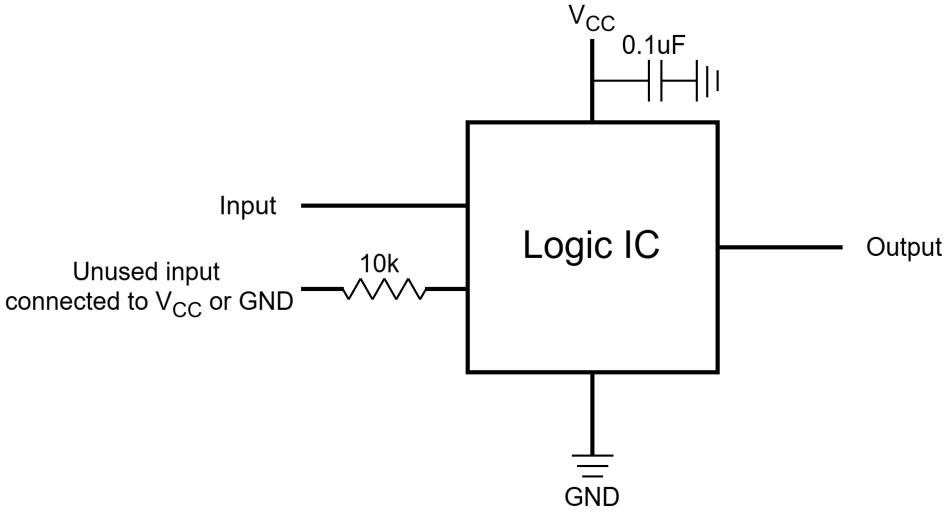
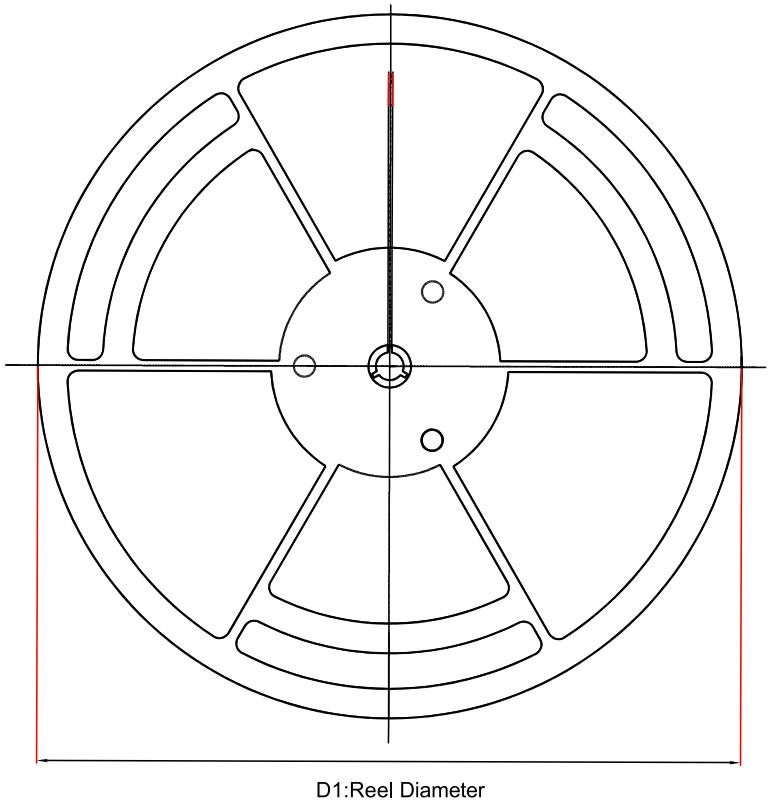
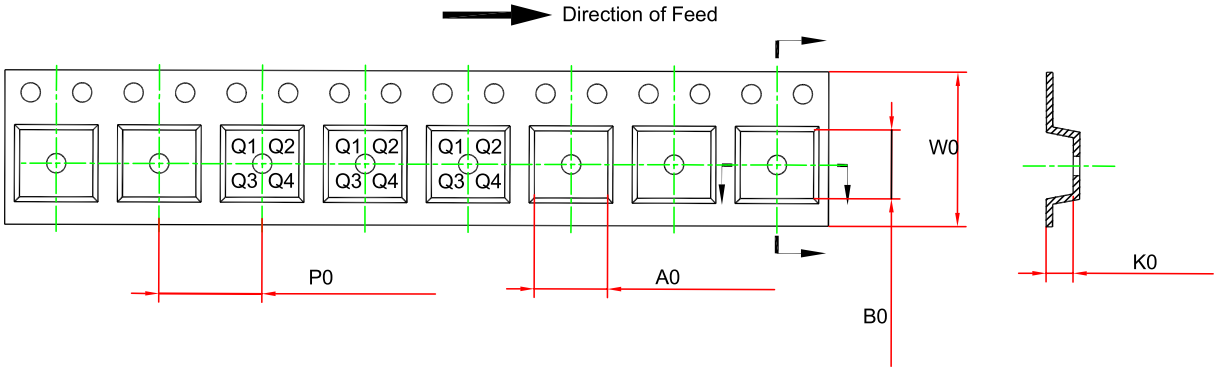


Figure 3. Typical Application Circuit

Tape and Reel Information



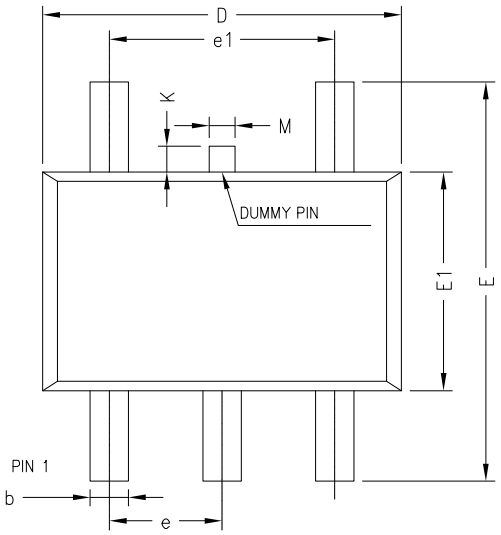


Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
T74LV1T08-SC5R	SOT353	178	12.1	2.4	2.5	1.2	4	8	Q3
T74LV1T08-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3

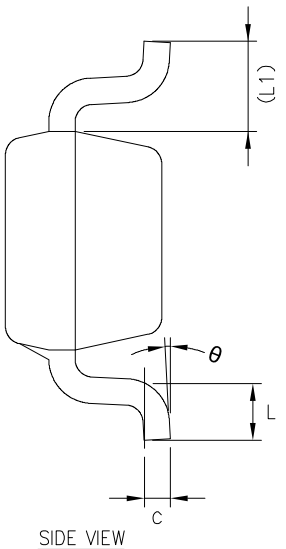
Package Outline Dimensions

SOT353

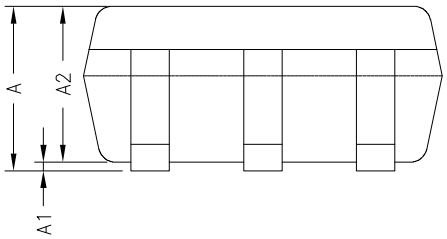
Package Outline Dimensions SC5(SOT353-5-B)



TOP VIEW



SIDE VIEW



SIDE VIEW

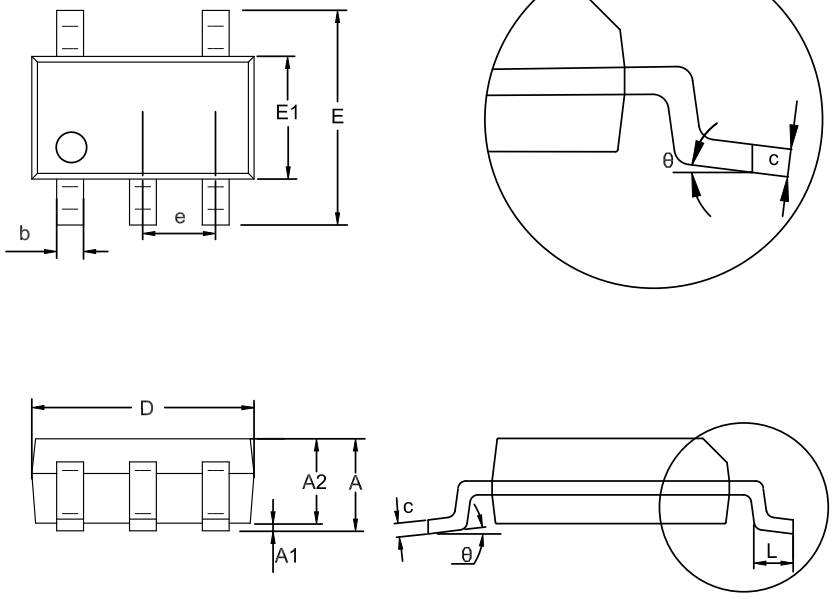
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.800	1.100	0.031	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.230	0.004	0.009
D	2.020	2.120	0.080	0.083
E	2.150	2.450	0.085	0.096
E1	1.210	1.310	0.048	0.052
e	0.650 BSC		0.026 BSC	
e1	1.200	1.400	0.047	0.055
L	0.260	0.460	0.010	0.018
L1	0.520 REF		0.020 REF	
K	0.000	0.200	0.000	0.008
M	0.100	0.200	0.004	0.008
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

SOT23-5

Package Outline Dimensions S5T(SOT23-5-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.280	0.500	0.011	0.020
c	0.100	0.230	0.004	0.009
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.720	0.059	0.068
e	0.950 BSC		0.037 BSC	
L	0.300	0.600	0.012	0.024
θ	0	8°	0	8°

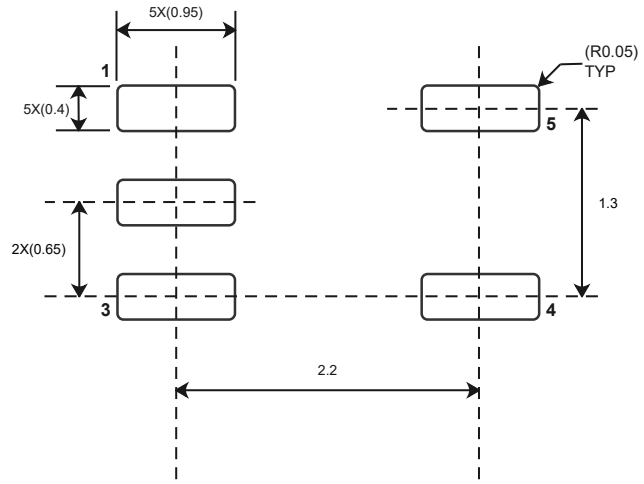
NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

Example Board Layout

SOT353

EXAMPLE BOARD LAYOUT **SOT353**

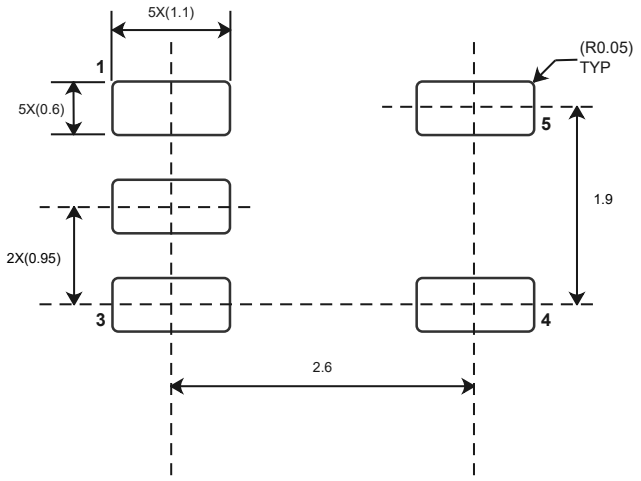


LAND PATTERN EXAMPLE

NOTES
1.All dimensions are in millimeters.
2.This drawing is for design reference only.
3.This drawing is subject to change without notice.

SOT23-5

EXAMPLE BOARD LAYOUT **SOT23-5**



LAND PATTERN EXAMPLE

NOTES
1.All dimensions are in millimeters.
2.This drawing is for design reference only.
3.This drawing is subject to change without notice.

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
T74LV1T08-SC5R	−40 to 125℃	SOT353	LT8	MSL3	Tape and Reel,3000	Green
T74LV1T08-S5TR	−40 to 125℃	SOT23-5	SJ	MSL3	Tape and Reel,3000	Green

Green: 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

IMPORTANT NOTICE AND DISCLAIMER

Performance Information. Performance tests or performance range contained in this document/material are either results of design simulation or actual tests conducted under designated testing environment. Any variation in testing environment or simulation environment, including but not limited to testing method, testing process or testing temperature, may affect actual performance of the product.

Disclaimer. 3PEAK provides technical and reliability data (including data sheets), design resources (including reference designs), application or other design recommendations, networking tools, security information and other resources "As Is". 3PEAK makes no warranty as to the absence of defects, and makes no warranties of any kind, express or implied, including without limitation, implied warranties as to merchantability, fitness for a particular purpose or non-infringement of any third-party's intellectual property rights. Unless otherwise specified in writing, products supplied by 3PEAK are not designed to be used in any life-threatening scenarios, including critical medical applications, automotive safety-critical systems, aviation, aerospace, or any situations where failure could result in bodily harm, loss of life, or significant property damage. 3PEAK disclaims all liability for any such unauthorized use.