1. General Description

The EM74LV1T00 is a single, level translating 2-input NAND gate. The low threshold inputs support 1.8 V input logic at V_{CC} = 3.3 V and can be used in 1.8 V to 3.3 V level up translation. In addition, the 5 V tolerant input pins enable level down translation (3.3 V to 2.5 V output at V_{CC} = 2.5 V). The output level is referenced to the supply voltage and supports 1.8 V, 2.5 V, 3.3 V and 5.0 V CMOS levels. The wide V_{CC} range permits the generation of output levels to connect to controllers or processors.

2. Features and Benefits

■ Single supply voltage translator at 1.8 V, 2.5 V, 3.3 V and 5.0 V

■ Up translation

- 1.2 V to 1.8 V at V_{CC} = 1.8 V
- 1.5 V to 2.5 V at V_{CC} = 2.5 V
- 1.8 V to 3.3 V at V_{CC} = 3.3 V
- 3.3 V to 5.0 V at V_{CC} = 5.0 V

■ Down translation

- 3.3 V to 1.8 V at V_{CC} = 1.8 V
- 3.3 V to 2.5 V at V_{CC} = 2.5 V
- 5.0 V to 3.3 V at V_{CC} = 3.3 V

■ 5 V tolerant inputs

■ Latch-up performance exceeds 200 mA

■ ESD protection:

- HBM ANSI/ESDA/JEDEC JS-001 Class 3A exceeds 6000 V
- CDM ANSI/ESDA/JEDEC JS-002 Class C3 exceeds 2000 V

■ Multiple package options

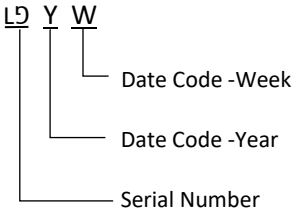
3.Ordering Information

Table 1. Ordering information

Type number	Topside marking	Package		
		Name	Description	Quantity
EM74LV1T00GV	LƉYW	SOT23-5L	SOT23 package, 5 pins 2.92 mm × 1.6 mm; 1.25 mm (Max) height	3000
EM74LV1T00GW	LƉYW	SOT353	SOT353 package, 5 pins 2.1 mm × 1.25 mm; 1.1 mm (Max) height	3000
EM74LV1T00GX	LƉ	DFN0.8x0.8-5L	DFN0.8×0.8 package, 5pins 0.8 mm × 0.8 mm; 0.4 mm (Max) height	3000

MARKING INFORMATION

NOTE: YW = Date Code.



4.Function Diagram

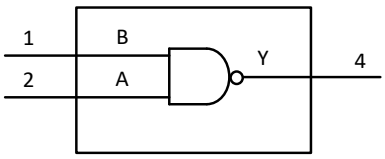


Fig. 1. Logic symbol

Fig. 2. IEC logic symbol

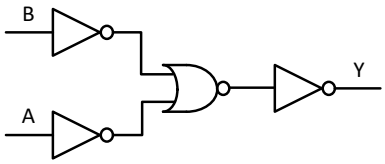


Fig. 3. Logic diagram

5. Pinning Information

5.1. Pinning

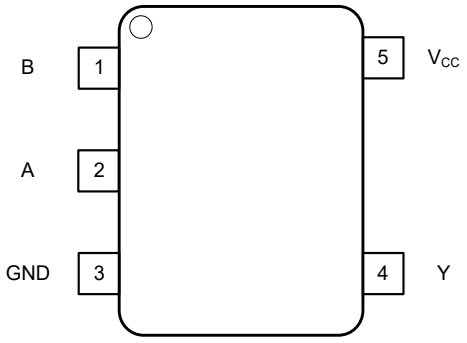


Fig. 4. Top view pin configuration SOT23-5 and SOT353

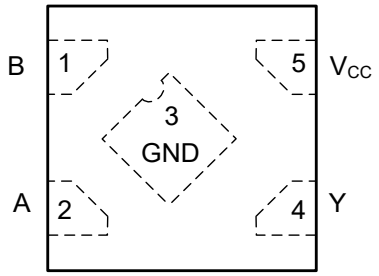


Fig. 5. Top view pin configuration DFN5L

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
B	1	Data input
A	2	Data input
GND	3	Ground (0V)
Y	4	Data output
V_{CC}	5	Supply voltage

6. Functional Description

Table 3. Function table

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

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

7. Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Table 4. Absolute Maximum Ratings

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	7.0	V
I_{IK}	input clamping current	$V_I < 0$ V	-20		mA
V_I	input voltage	[1]	-0.5	7.0	V
I_{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V		±20	mA
V_O	output voltage	output HIGH or LOW [2][3]	-0.5	V_{CC} + 0.5	V
		output in power-off state [2]	-0.5	4.6	V
I_O	output current	V_O = 0 V to V_{CC}		±25	mA
I_{CC}	supply current			50	mA
I_{GND}	ground current		-50		mA
P_{tot}	total power dissipation	T_{amb} = -40 °C to + 125 °C		250	mW
T_{stg}	storage temperature		-65	150	°C

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] If the output current ratings are observed, the output voltage ratings may be exceeded.
[3] This value is limited to 7 V maximum.

8. Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. EnergyMath does not recommend exceeding them or designing to Absolute Maximum Ratings.

Table 5. 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	25	125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 1.8 V to 5.0 V			20	ns/V

9.Static Characteristics

Table 6. Static characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
V_{IH}	HIGH-level input voltage	V_{CC} = 1.65 V to 1.8 V	1.0			1.0		V
		V_{CC} = 2.0 V	1.03			1.03		V
		V_{CC} = 2.25 V to 2.5 V	1.18			1.18		V
		V_{CC} = 2.75 V	1.25			1.25		V
		V_{CC} = 3.0 V to 3.3 V	1.41			1.41		V
		V_{CC} = 3.6 V	1.49			1.49		V
		V_{CC} = 4.5 V to 5.0 V	2.03			2.03		V
		V_{CC} = 5.5 V	2.11			2.11		V
V_{IL}	LOW-level input voltage	V_{CC} = 1.65 V to 1.8 V			0.49		0.49	V
		V_{CC} = 2.0 V			0.55		0.55	V
		V_{CC} = 2.25 V to 2.5 V			0.67		0.67	V
		V_{CC} = 2.75 V			0.71		0.71	V
		V_{CC} = 3.0 V to 3.6 V			0.75		0.75	V
		V_{CC} = 4.5 V to 5.5 V			0.80		0.80	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}						
		V_{CC} = 1.65 V to 5.5V; I_O = -20 µA;	V_{CC}-0.1			V_{CC}-0.1		V
		V_{CC} = 1.65 V; I_O = -2 mA	1.21			1.21		V
		V_{CC} = 1.8 V; I_O = -2 mA	1.45			1.45		V
		V_{CC} = 2.3 V; I_O = -2.3 mA	2.0			2.0		V
		V_{CC} = 2.3 V; I_O = -3 mA	1.93			1.93		V
		V_{CC} = 2.5 V; I_O = -3 mA	2.15			2.15		V
		V_{CC} = 3.0 V; I_O = -3 mA	2.7			2.7		V
		V_{CC} = 3.0 V; I_O = -5.5 mA	2.49			2.49		V
		V_{CC} = 3.3 V; I_O = -5.5 mA	2.8			2.8		V
		V_{CC} = 4.5 V; I_O = -4 mA	4.1			4.1		V
		V_{CC} = 4.5 V; I_O = -8 mA	3.95			3.95		V
		V_{CC} = 5.0 V; I_O = -8 mA	4.5			4.5		V

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		V_{CC} = 1.65 V to 5.5V; I_O = 20 µA;			0.1		0.1	V
		V_{CC} = 1.65 V; I_O = 2 mA			0.25		0.25	V
		V_{CC} = 2.3 V; I_O = 2.3 mA			0.15		0.15	V
		V_{CC} = 2.3 V; I_O = 3 mA			0.2		0.2	V
		V_{CC} = 3.0 V; I_O = 3 mA			0.15		0.15	V
		V_{CC} = 3.0 V; I_O = 5.5 mA			0.252		0.252	V
		V_{CC} = 4.5 V; I_O = 4 mA			0.2		0.2	V
		V_{CC} = 4.5 V; I_O = 8 mA			0.35		0.35	V
I_I	input leakage current	$V_I = V_{CC}$ or GND ; V_{CC} = 0 V to 5.5 V			±1.0		±1.0	µA
I_{CC}	supply current	$V_I = V_{CC}$ or GND ; I_O = 0 A ; V_{CC} = 1.8 V, 2.5 V, 3.3 V, 5.0 V			10		10	µA
ΔI_{CC}	additional supply current	per input pin; V_{CC} = 1.8 V; V_I = 0.3 V or 1.1 V; I_O = 0 A; other pins at V_{CC} or GND			10		10	µA
		per input pin; V_{CC} = 5.5 V; V_I = 0.3 V or 3.4 V; I_O = 0 A; other pins at V_{CC} or GND			1.5		1.5	mA
C_I	input capacitance	$V_I = V_{CC}$ or GND; V_{CC} = 3.3 V		2.5				pF
C_O	output capacitance	$V_O = V_{CC}$ or GND; V_{CC} = 3.3 V		3.2				pF

[1]All typical values are measured at T_{amb} = 25°C.

10. Dynamic Characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); Typical values are measured at T_{amb} = 25 °C; for test circuit see Fig. 7.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t_{pd}	propagation delay	A, B to Y; see Fig. 6 [2]						
		V_{CC} = 1.8 V, C_L = 15 pF		13.1	19.5		20.5	ns
		V_{CC} = 2.5 V, C_L = 15 pF		5.5	11.5		12.2	ns
		V_{CC} = 3.3 V, C_L = 15 pF		3.6	7.7		8.3	ns
		V_{CC} = 5.0 V, C_L = 15 pF		3.0	7.1		7.5	ns
C_{PD}	power dissipation capacitance	per buffer; V_I = GND to V_{CC} ; C_L = 15 pF ; f =10MHz ; [3]						
		V_{CC} = 1.8 V		10.6				pF
		V_{CC} = 2.5 V		11.7				pF
		V_{CC} = 3.3 V		12.7				pF
		V_{CC} = 5.0 V		15.2				pF

[1] Typical values are measured at Tamb = 25 °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 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;

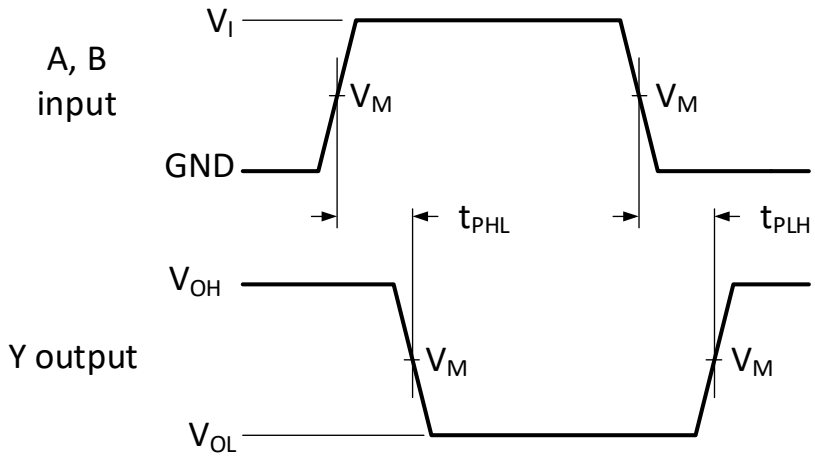
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

10.1. Waveforms and test circuit

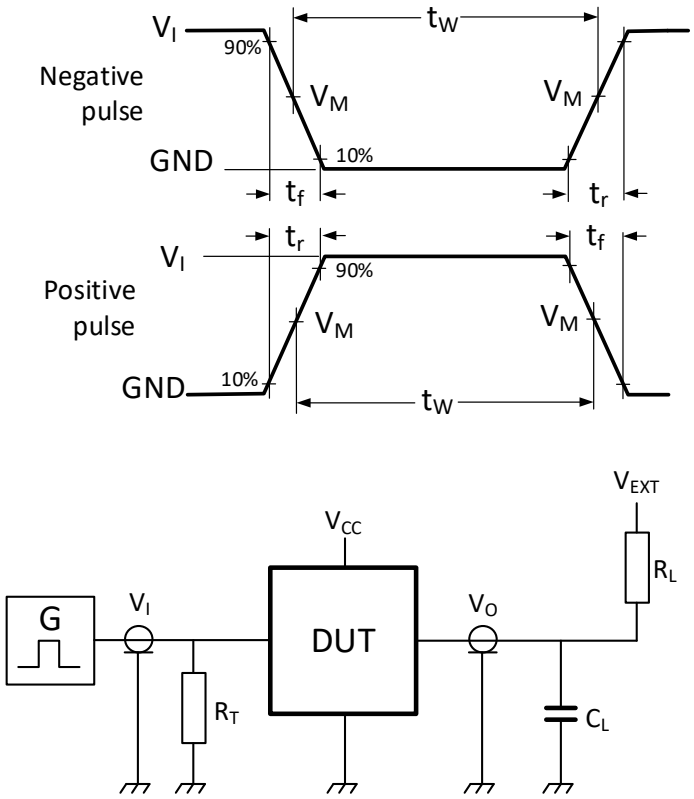


Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 6. The input A, B to output Y propagation delays

Table 8. Measurement points

Input	Output
V_M	V_M
0.5 x V_I	0.5 x V_{CC}



Test data is given in Table 9.
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.

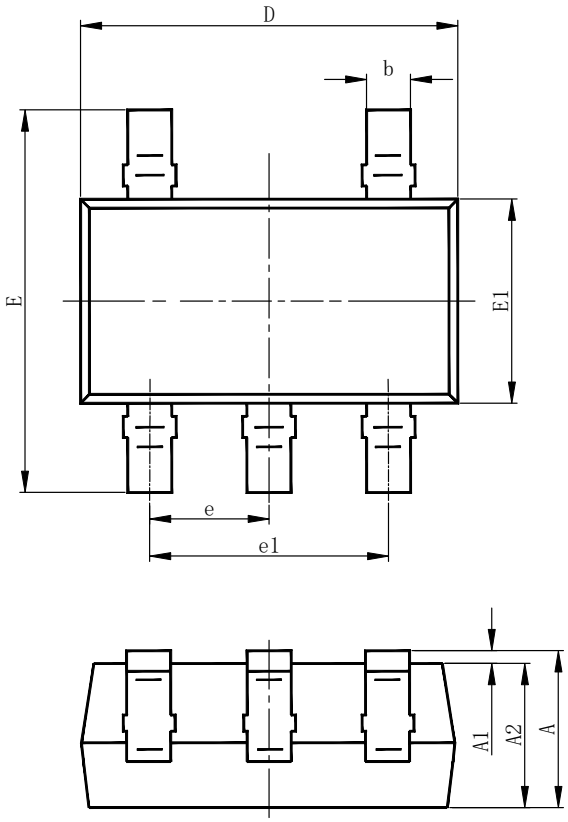
Fig. 7. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input			Load		V_{EXT}
V_{CC}	V_I	$t_r = t_f$	f_{max}	C_L	R_L	t_{PLH}, t_{PHL}
1.8 V	V_{CC}	≤ 2.5 ns	15MHz	15 pF	1 KΩ	open
2.5 V	V_{CC}	≤ 2.5 ns	25MHz	15 pF	1 kΩ	open
3.3 V	3 V	≤ 2.5 ns	50MHz	15 pF	1 kΩ	open
5.0 V	3 V	≤ 2.5 ns	50MHz	15 pF	1 kΩ	open

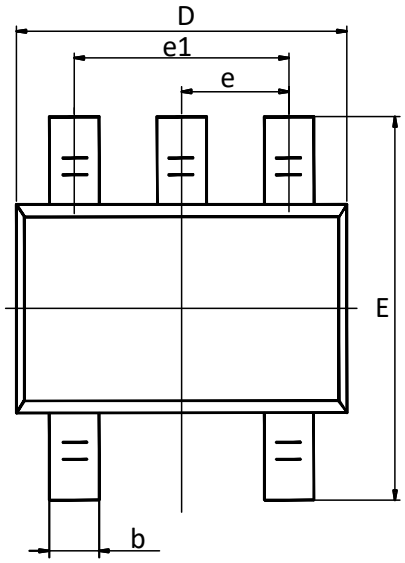
11. Package Outline

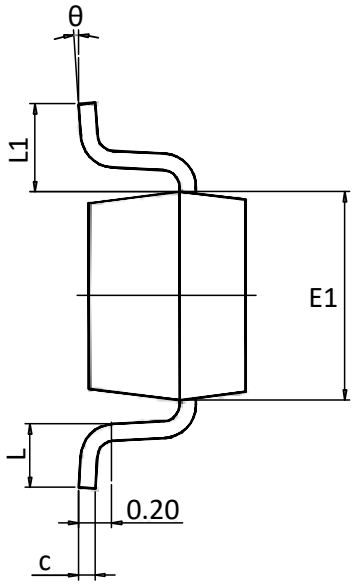
SOT23-5L

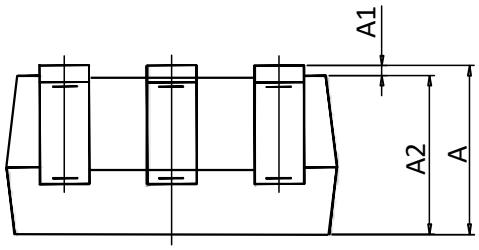


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
L1	0.600REF.		0.024REF.	
θ	0°	8°	0°	8°

SOT353

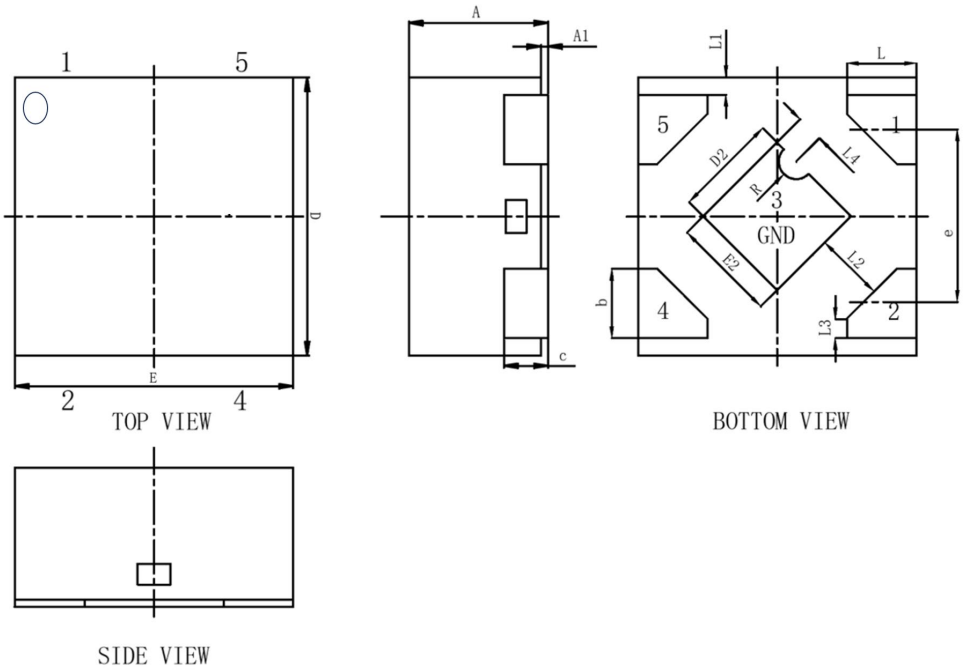






Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650 TYP.		0.026 TYP.	
e1	1.200	1.400	0.047	0.055
L	0.260	0.460	0.010	0.018
L1	0.525 REF.		0.021 REF.	
θ	0°	8°	0°	8°

DFN0.8x0.8-5L



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.35	—	0.40
A1	0.00	0.02	0.05
b	0.15	0.20	0.25
c	0.127REF		
D	0.75	0.80	0.85
D2	0.20	0.30	0.40
e	0.50BSC		
E	0.75	0.80	0.85
E2	0.20	0.30	0.40
L	0.15	0.20	0.25
L1	0.05REF		
L2	0.20REF		
L3	0.055REF		
L4	0.10REF		
R	0.05REF		

12. Tape and Reel Information

12.1. Carrier tape dimensions

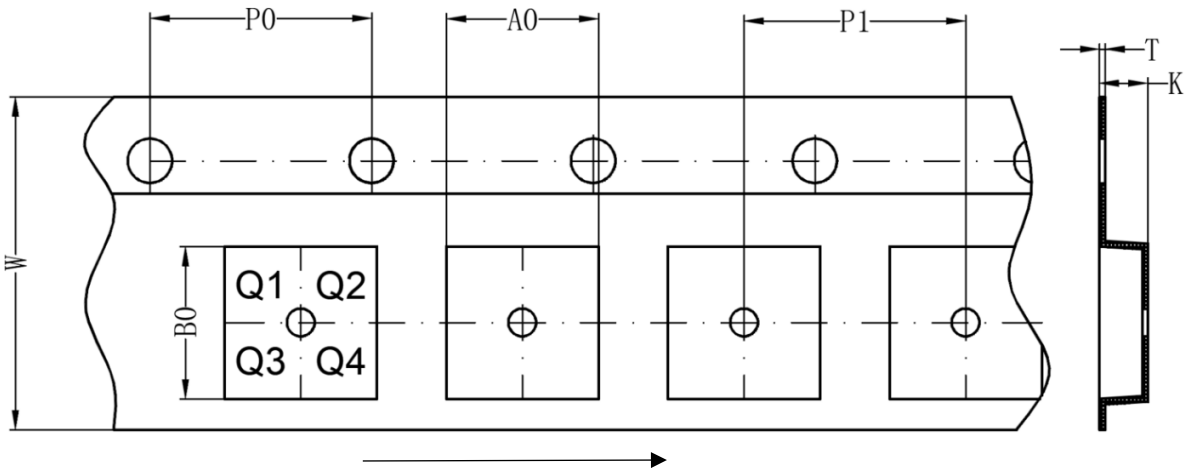


Table 10. Carrier tape dimensions

Package version	Type number ending	A0(mm)	B0(mm)	K(mm)	T(mm)	P1(mm)	W(mm)	P0(mm)	PIN 1
DFN0.8x0.8-5L	GX	0.91	0.91	0.5	0.2	2	8	4	Q1
SOT353	GW	2.55	2.55	1.2	0.2	4	8	4	Q3
SOT23-5L	GV	3.23	3.17	1.37	0.25	4	8	4	Q3

12.2. Reel and box dimensions

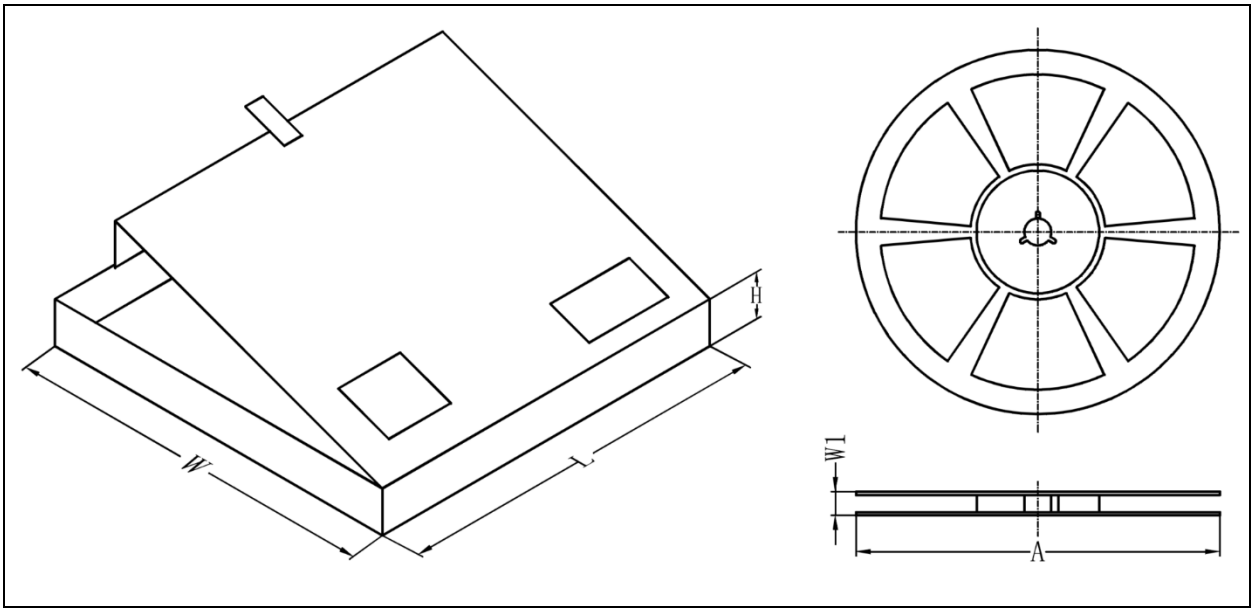


Table 11. Dimensions and quantities

Package version	Reel Dimension A (mm)	Max Reel Width W1 (mm)	SPQ (pcs)[1]	Reels per box	Outer box dimensions L×W×H(mm)[2]
DFN0.8x0.8-5L	180	13.2	3000	1	210x200x40
SOT353	180	13.2	3000	1	210x200x40
SOT23-5L	180	13.2	3000	1	210x200x40

[1] Packing quantity dependent on specific product type. Please contact your local Energymath representative for ordering.

[2] Dimensions for reference only.

13. Abbreviations

Table 12. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
CDM	Charged Device Model

14. Revision History

Table 13. Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
EM74LV1T00 Rev. 1.0	Mar 02, 2026	Product datasheet		