

Single Inverter

General Description

The ET74LV1T04 is an inverter operating from a 1.65V to 5.5V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

Features

- $\pm 32\text{mA}$ Balanced Output Sink and Source Capability
- Over-Voltage Tolerant Inputs and Outputs
- Designed for 1.65V to 5.5V V_{CC} Operation
- These Devices are Pb-Free and RoHS Compliant
- ESD Protection Complies with JESD22 Standard
 - HBM: $\pm 4000\text{V}$ Pass (JEDEC JS-001)
 - CDM: $\pm 1000\text{V}$ Pass (JEDEC JS-002)
- Latch-up Performance Exceeds $\pm 100\text{mA}$ per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET74LV1T04	SC70-5 (1.3mm $\times$ 2.1mm)	Tape and Reel, 3K/Reel	1
ET74LV1T04T	SOT23-5 (1.6mm $\times$ 2.9mm)	Tape and Reel, 3K/Reel	3
ET74LV1T04Y	DFN6 (1.0mm $\times$ 1.5mm)	Tape and Reel, 3K/Reel	1

Pin Configuration

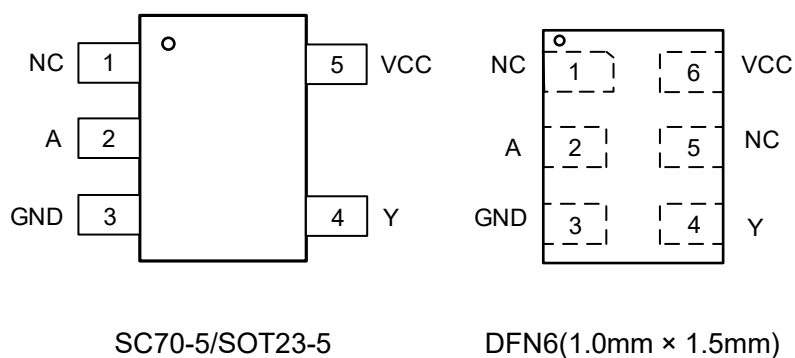


Figure1. Pin Configuration

ET74LV1T04

Pin Function

SC70-5/ SOT23-5

Pin No.	Pin Name	Function
1	NC	No Connect
2	A	Input
3	GND	Ground
4	Y	Output
5	VCC	Supply Voltage

DFN6

Pin No.	Pin Name	Function
1	NC	No Connect
2	A	Input
3	GND	Ground
4	Y	Output
5	NC	No Connect
6	VCC	Supply Voltage

Block Diagram

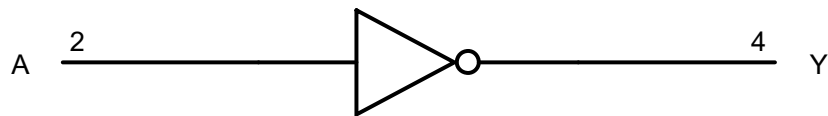


Figure2. Logic Symbol

Function Table

Input A	Output Y
L	H
H	L

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Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V _{CC}	DC Supply Voltage (VCC Pin)		-0.5 to 7.0	V
V _I	DC Input Voltage ⁽¹⁾		-0.5 ≤ V _I ≤ 7.0	V
V _O	DC Output Voltage Output in Higher or Low State		-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current, V _I < GND		-50	mA
I _{OK}	DC Output Diode Current, V _O < GND, V _O > V _{CC}		±50	mA
I _O	DC Output Sink Current		±50	mA
I _{CC}	DC Supply Current Per Supply Pin		±100	mA
I _{GND}	DC Ground Current Per Supply Pin		±100	mA
T _{STG}	Storage Temperature Range		-65 to 150	°C
T _L	Lead Temperature, Soldering 10 Seconds		260	°C
T _J	Max Junction Temperature		150	°C
V _{ESD}	ESD Classification	Human Body Model ⁽²⁾	±4000	V
		Charged Device Model ⁽³⁾	±1000	
I _{LU}	Max Latch Up Current Above V _{CC} and GND at 125°C ⁽⁴⁾		±100	mA

Stresses exceeding those listed in this table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Note1: I_O absolute maximum rating must be observed.

Note2: HBM tested per JEDEC JS-001;

Note3: CDM tested per JEDEC JS-002;

Note4: Latch Up Current Maximum Rating tested per JEDEC JESD78F.

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
R _{θJA}	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	300	°C /W
	SOT23-5		250	
	DFN6 (1.0mm × 1.5mm)		440	
P _D	SC70-5	Power Dissipation in Still Air at 85°C	215	mW
	SOT23-5		260	
	DFN6 (1.0mm × 1.5mm)		150	

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Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V _{CC}	DC Supply Voltage		1.65	5.5	V
	Operating Data Retention		1.5	5.5	
V _I	DC Input Voltage		0	V _{CC}	V
V _O	DC Output Voltage(High or Low State)		0	V _{CC}	V
T _A	Operating Temperature Range		-40	125	°C
t _r , t _f	Input Rise and Fall Time	V _{CC} = 2.5V ± 0.2V	0	20	ns/V
		V _{CC} = 3.0V ± 0.3V	0	10	
		V _{CC} = 5.0V ± 0.5V	0	5	

Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-40°C ≤ T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65~1.95 2.3~5.5	0.75V _{CC} 0.7V _{CC}			0.75V _{CC} 0.7V _{CC}		V
V _{IL}	Low-Level Input Voltage		1.65~1.95 2.3~5.5			0.25V _{CC} 0.3V _{CC}		0.25V _{CC} 0.3V _{CC}	V
V _{OH}	High-Level Output Voltage	I _{OH} = -100uA	1.65~5.5	V _{CC} - 0.1	V _{CC}		V _{CC} - 0.1		V
		I _{OH} = -3mA	1.65	1.29	1.4		1.29		
		I _{OH} = -8mA	2.3	1.9	2.1		1.9		
		I _{OH} = -12mA	2.7	2.2	2.4		2.2		
		I _{OH} = -16mA	3.0	2.4	2.7		2.4		
		I _{OH} = -24mA	3.0	2.3	2.5		2.3		
		I _{OH} = -32mA	4.5	3.8	4.0		3.8		
V _{OL}	Low-Level Output Voltage	I _{OH} = 100uA	1.65~5.5		0.0	0.1		0.1	V
		I _{OL} = 3mA	1.65		0.08	0.24		0.24	
		I _{OL} = 8mA	2.3		0.20	0.3		0.3	
		I _{OL} = 12mA	2.7		0.22	0.4		0.4	
		I _{OL} = 16mA	3.0		0.28	0.4		0.4	
		I _{OL} = 24mA	3.0		0.38	0.55		0.55	
		I _{OL} = 32mA	4.5		0.42	0.55		0.55	

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DC Electrical Characteristics (Continued)

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-40°C ≤ T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
I _{IN}	Input Leakage Current	V _I = 5.5V or GND	0~5.5		±0.1			±1.0	μA
I _{OFF}	Power Off Leakage Current	V _I = 5.5 or V _O = 5.5V	0			1		10	μA
I _{CC}	Quiescent Supply Current	V _I = 5.5V or GND	5.5					10	μA

AC Electrical Characteristics

t_r = t_f = 3ns; C_L = 50pF; R_L = 500Ω

Symbol	Parameter	Condition	V _{CC} (V)	T _A = 25°C			-40°C ≤ T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation Delay (Figure3 and 4)	R _L = 1MΩ, C _L = 15pF	1.65	2.0	5.3	11.4	2.0	12.0	ns
			1.8	2.0	4.4	9.5	2.0	10.0	
		R _L = 1MΩ, C _L = 15pF	2.5 ± 0.2	0.8	3.0	6.5	0.8	7.0	
		R _L = 1MΩ, C _L = 15pF	3.3 ± 0.3	0.5	2.4	4.5	0.5	4.7	
		R _L = 500Ω, C _L = 50pF		1.5	2.5	5.5	1.5	5.2	
		R _L = 1MΩ, C _L = 15pF	5.0 ± 0.5	0.5	2.0	3.9	0.5	4.1	
		R _L = 500Ω, C _L = 50pF		0.8	2.4	4.3	0.8	4.5	

Capacitance Characteristics

Symbol	Parameter	Condition	Typ	Unit
C _{IN}	Input Capacitance	V _{CC} = 5.5V, V _I = 0V or V _{CC}	5	pF
C _{PD}	Power Dissipation Capacitance ⁽⁵⁾	10MHz, V _{CC} = 3.3V, V _I = 0V or V _{CC}	26	pF
		10MHz, V _{CC} = 5.5V, V _I = 0V or V _{CC}	30	

Note5: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

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;

Σ(C_L × V_{CC}² × f_o) = sum of outputs.

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AC Test Circuit

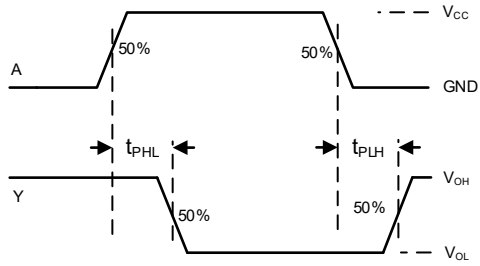


Figure3. Switching Waveform

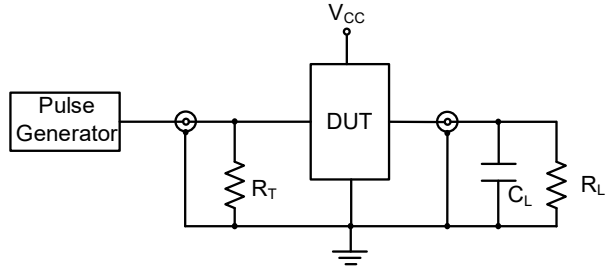
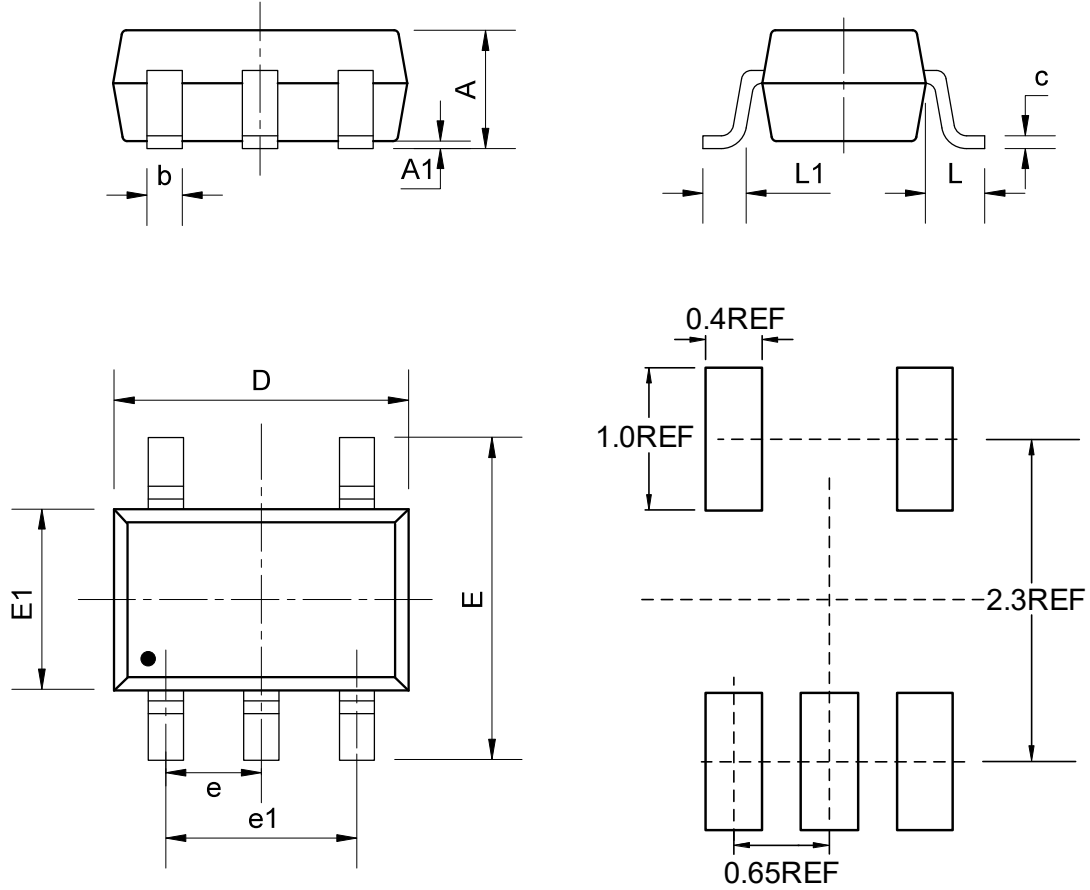


Figure4. Test Circuit

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Package Dimension

SC70-5 (1.3mm × 2.1mm)



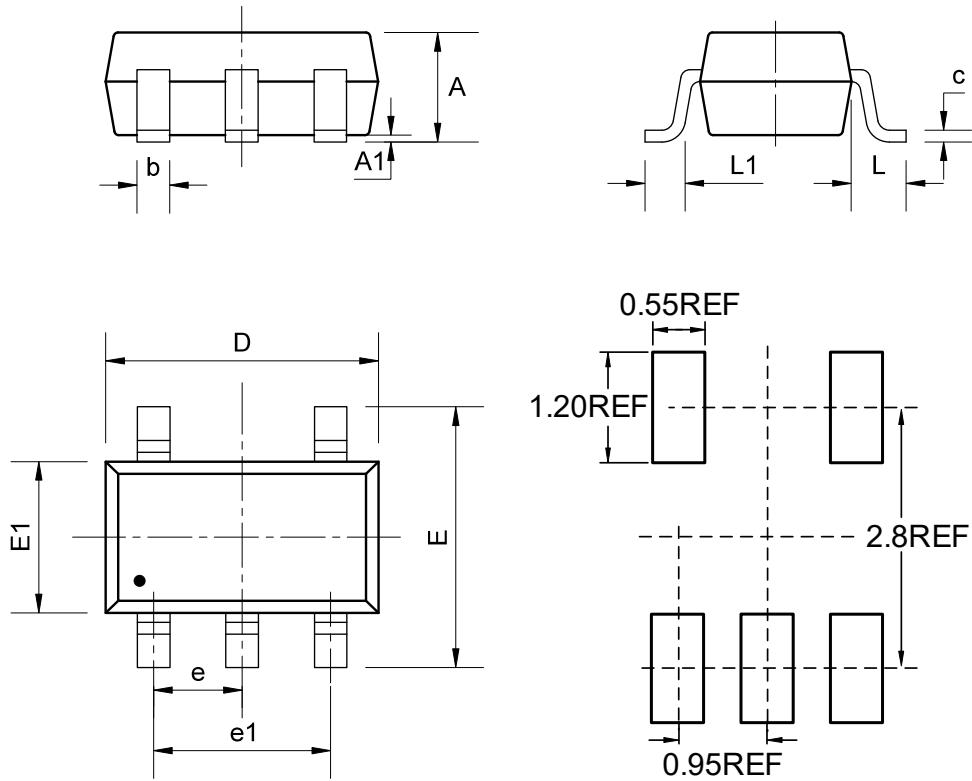
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	-	-	1.10
A1	0.00	-	0.15
b	0.15	-	0.35
c	0.08	-	0.20
D	2.00	2.10	2.30
e	0.65BSC		
e1	1.30BSC		
E	2.15	2.30	2.50
E1	1.15	1.30	1.45
L	0.50REF		
L1	0.33REF		

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SOT23-5 (1.6mm × 2.9mm)



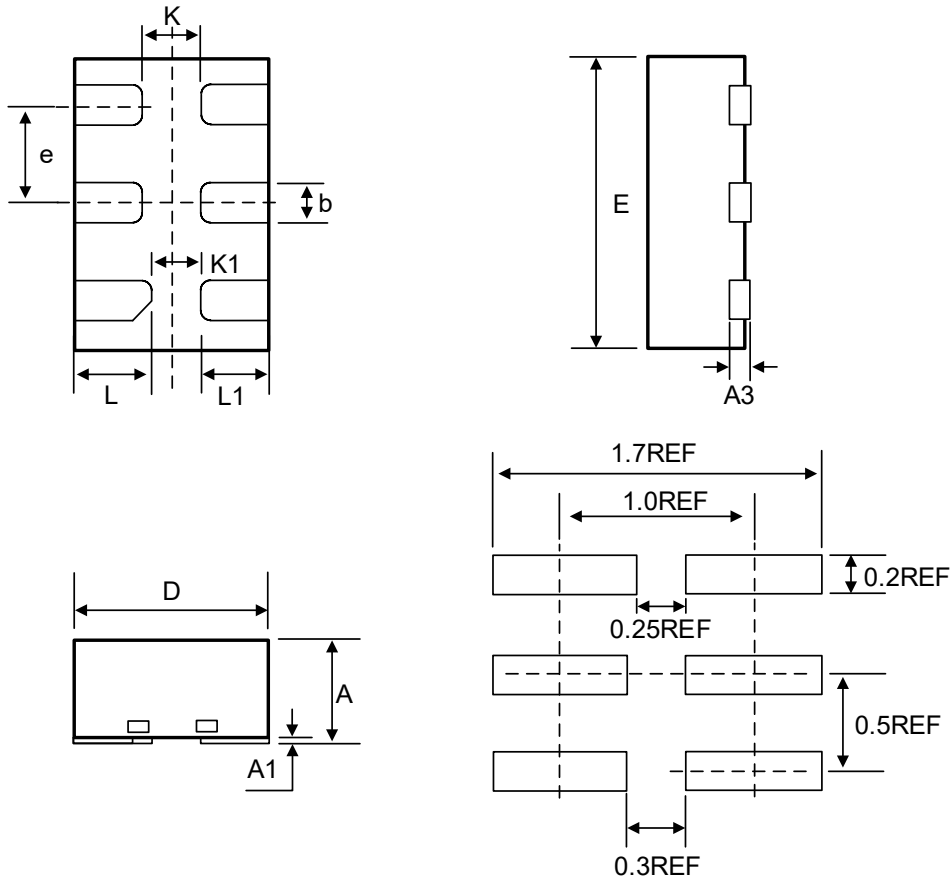
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	-	-	1.45
A1	0.00	-	0.15
b	0.28	0.35	0.50
c	0.08	0.15	0.22
D	2.75	2.9	3.05
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
E	2.60	2.80	3.00
E1	1.45	1.6	1.75
L	0.60REF		
L1	0.30	0.45	0.60

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DFN6 (1.0mm × 1.5mm)



COMMON DIMENSIONS

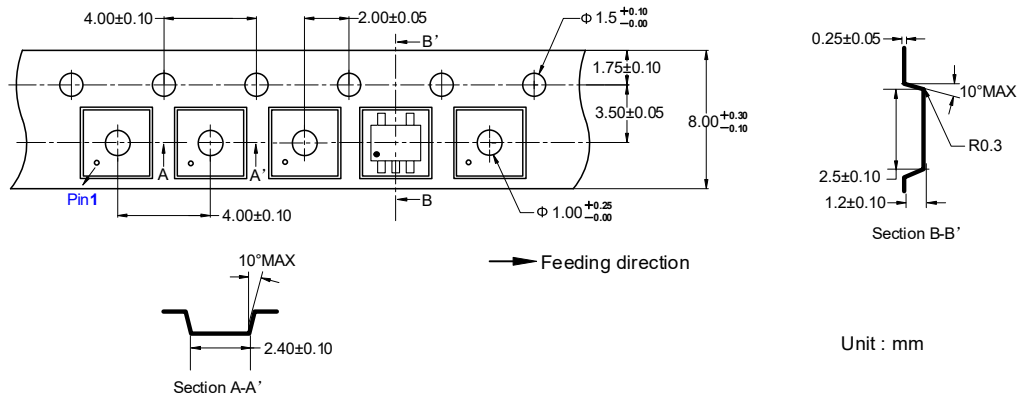
(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	0.50	--	0.60
A1	0.00	0.02	0.05
A3	0.10REF		
b	0.15	0.20	0.25
D	0.90	1.00	1.10
E	1.40	1.50	1.60
e	0.50BSC		
K	0.30REF		
K1	0.25REF		
L	0.35	0.40	0.45
L1	0.30	0.35	0.40

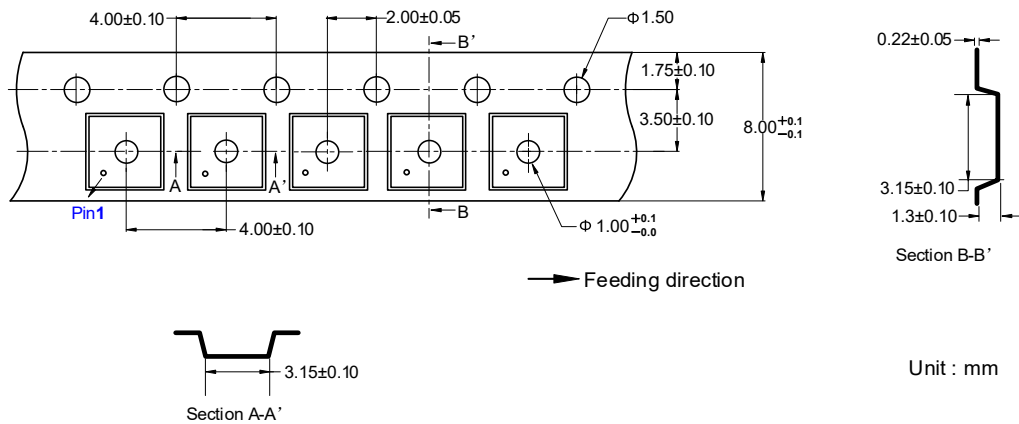
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Tape Information

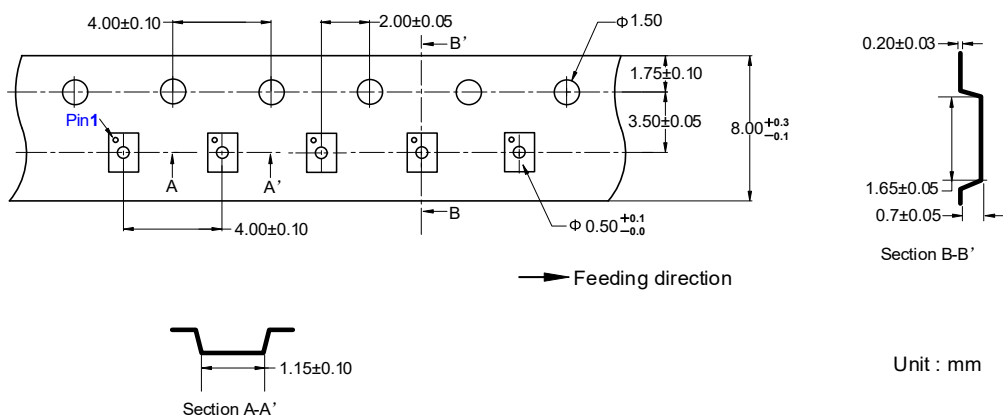
SC70-5 (1.3mm × 2.1mm)



SOT23-5 (1.6mm × 2.9mm)

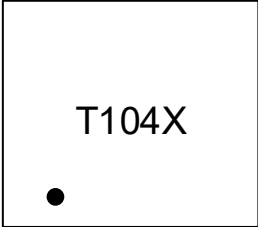
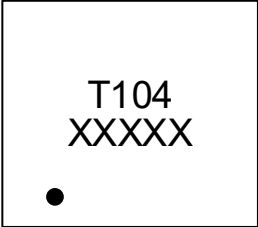


DFN6 (1.0mm × 1.5mm)



ET74LV1T04

Marking Information

	
ET74LV1T04	ET74LV1T04T
T104 = Part Number	T104 = Part Number
X = Tracking Number	XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-07-19	Original Version	Ma yongjian	Ma yongjian	Ma yongjian
1.1	2021-06-25	Update DC/AC Table	Ma yongjian	Ma yongjian	Ma yongjian
1.2	2022-05-18	Add DFN6 Package	Shi bo	Shi bo	Shi bo
1.3	2022-06-10	ESD Update	Shi bo	Shi bo	Shi bo
1.4	2022-08-03	Update DFN6 Package	Shi bo	Shi bo	Shi bo
1.5	2022-10-14	Update Format and Thermal Characteristics	Wu han	Shi bo	Shi bo
1.6	2023-11-30	Update Pin Table/ESD	Shi bo	Shi bo	Shi bo
1.7	2025-05-27	Update Format	Xu tao	Yang xiaoxu	Liu jiaying