

Hex Inverters

General Description

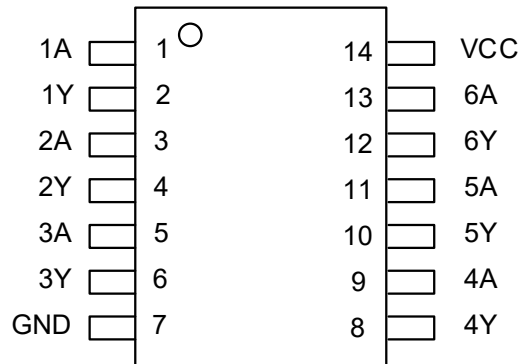
The ET74LVC04A contains six independent inverters operating from a 1.65V to 5.5V supply. They perform the Boolean function $Y = \bar{A}$ in positive logic.

Features

- Designed for 1.65V to 5.5V V_{CC} Operation
- Over-voltage Tolerant Inputs Accept Voltages to 5.5V
- Outputs Can Drive up to 10 LSTTL Loads
- Low Power Consumption $I_{CC} = 20\mu A$ Max
- Typical $t_{pd} = 8ns$ at 5V
- $\pm 32mA$ Balanced Output Sink and Source Capability
- Low Input Current of $1\mu A$ MAX
- ESD Protection Complies with JESD22 Standard
 - HBM: $\pm 4000V$ Pass (JEDEC JS-001)
 - CDM: $\pm 1000V$ Pass (JEDEC JS-002)
- Latch-up Performance Exceeds $\pm 100mA$ per JEDEC JESD78F
- Part No. and Package Information

Part No.	Package	MSL
ET74LVC04AM14	SOP14 (8.65mm × 3.90mm)	3
ET74LVC04AV	TSSOP14 (4.96mm × 4.40mm)	3
ET74LVC04AP	DIP14 (19.10mm × 6.35mm)	3

Pin Configuration



SOP14/TSSOP14/DIP14

Figure1. Pin Configuration

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Pin Function

No.	Name	Function
1	1A	Channel 1 Input.
2	1Y	Channel 1 Output.
3	2A	Channel 2 Input.
4	2Y	Channel 2 Output.
5	3A	Channel 3 Input.
6	3Y	Channel 3 Output.
7	GND	Ground.
8	4Y	Channel 4 Output.
9	4A	Channel 4 Input.
10	5Y	Channel 5 Output.
11	5A	Channel 5 Input.
12	6Y	Channel 6 Output.
13	6A	Channel 6 Input.
14	VCC	Positive Voltage Supply.

Logic Diagram

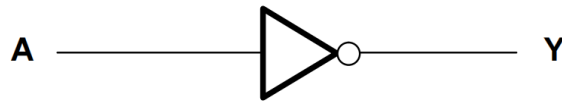


Figure2. Logic Symbol

Function Table

Input	Output
A	Y
H	L
L	H

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Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V _{CC}	DC Supply Voltage (V _{CC} Pin)		-0.5 to 6.5	V
V _I	DC Input Voltage ⁽¹⁾		$-0.5 \leq V_I \leq 6.5$	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 Supply Current Per GND Pin		-100	mA
T _{STG}	Storage Temperature Range		-65 to 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 the Maximum Ratings 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}	SOP14	Thermal Characteristics, Thermal Resistance, Junction-to-Air	80	°C/W
	TSSOP14		80	
	DIP14		86	

Recommended operating conditions

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage Operating	1.65	5.5	V
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

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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	0.65V _{CC}			0.65V _{CC}		V
			2.3~3.0	1.7			1.7		V
			3.6	2			2		V
			4.5~5.5	0.7V _{CC}			0.7V _{CC}		V
V _{IL}	Low-Level Input Voltage		1.65~1.95			0.35V _{CC}		0.35V _{CC}	V
			2.3~3.0			0.7		0.7	V
			3.6			0.8		0.8	V
			4.5~5.5			0.3V _{CC}		0.3V _{CC}	V
V _{OH}	High-Level Output Voltage	I _{OH} = -100μA	1.65~5.5	V _{CC} - 0.1			V _{CC} - 0.1		V
		I _{OH} = -4mA	1.65	1.2			1.2		
		I _{OH} = -8mA	2.3	1.9			1.9		
		I _{OH} = -12mA	2.7	2.2			2.2		
		I _{OH} = -16mA	3.0	2.4			2.4		
		I _{OH} = -24mA	3.0	2.3			2.3		
		I _{OH} = -32mA	4.5	3.8			3.8		
		I _{OH} = -32mA	5.5	4.8			4.8		
V _{OL}	Low-Level Output Voltage	I _{OH} = 100μA	1.65~5.5			0.1		0.1	V
		I _{OH} = 4mA	1.65			0.45		0.45	
		I _{OH} = 8mA	2.3			0.3		0.3	
		I _{OH} = 12mA	2.7			0.4		0.4	
		I _{OH} = 16mA	3.0			0.4		0.4	
		I _{OH} = 24mA	3.0			0.55		0.55	
		I _{OH} = 32mA	4.5			0.55		0.55	
		I _{OH} = 32mA	5.5			0.55		0.55	
I _I	Input Leakage Current	V _I = 5.5V or GND	5.5V		±1	±20		±20	μA
I _{CC}	Quiescent Supply Current	V _I = 5.5V or GND	5.5V			10		10	μA
I _{OFF}	Power Off Leakage Current	V _I = 5.5V or V _O = 5.5V	0			±10		±10	uA

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AC Electrical Characteristics

Over operating free-air temperature range; typical values measured at $T_A = 25^\circ\text{C}$ (unless otherwise noted)

Symbol	Parameter	From	To	V_{CC}	$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$			$-40^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
					Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay	A	Y	$1.8\text{V} \pm 0.15\text{V}$	0.5	5	10.5	1	11	ns
				$2.5\text{V} \pm 0.2\text{V}$	0.5	3.8	6	1	6.5	
				2.7V	0.5	3.5	6.5	1	7	
				$3.3\text{V} \pm 0.3\text{V}$	0.5	2.6	5	1	5.5	
				$5\text{V} \pm 0.5\text{V}$	0.5	2.2	3.8	1	4.3	

Capacitance Characteristics

Symbol	Parameter	Test Conditions	Typ	Unit
C_{IN}	Input Capacitance	$V_{CC} = 5\text{V}$, $V_I = 0\text{V}$ or V_{CC}	5	pF
C_{PD}	Power Dissipation Capacitance Per Inverter ⁽⁵⁾	10MHz, $V_{CC} = 1.8\text{V}$, $V_I = 0\text{V}$ or V_{CC}	6	pF
		10MHz, $V_{CC} = 2.5\text{V}$, $V_I = 0\text{V}$ or V_{CC}	7	
		10MHz, $V_{CC} = 3.3\text{V}$, $V_I = 0\text{V}$ or V_{CC}	8	

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;

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

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AC Test Circuit

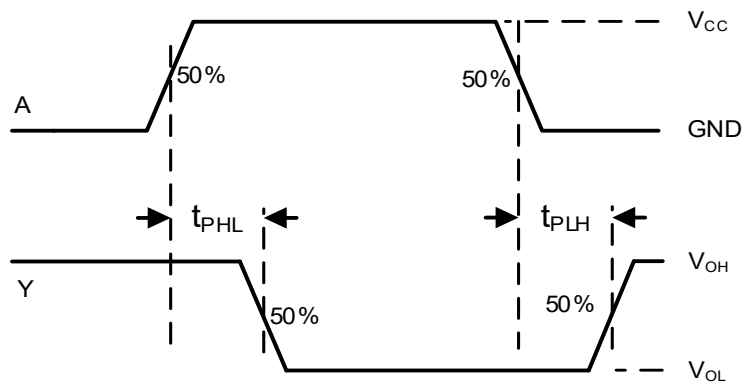


Figure3. Switching Waveform

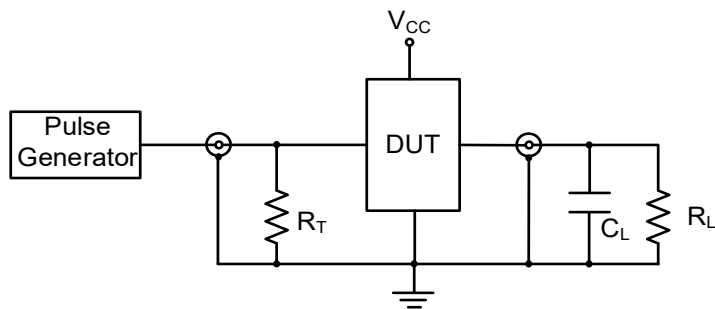


Figure4. Test Circuit

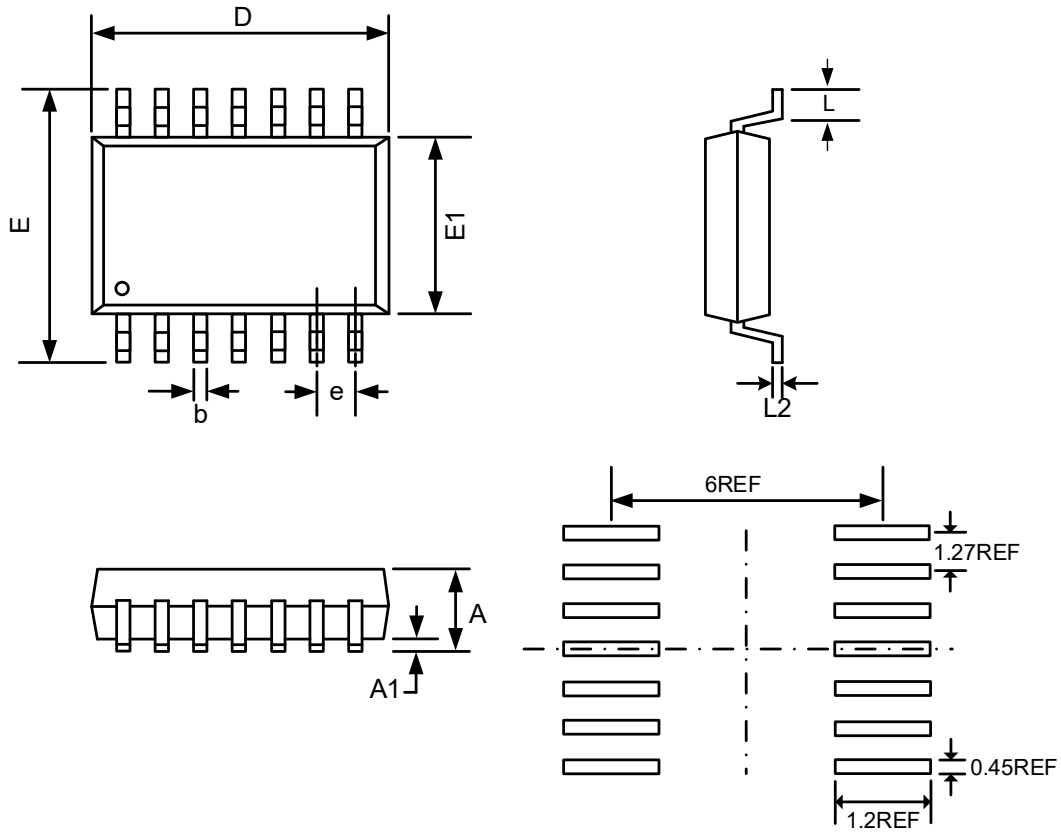
Table1.Measurement Points and Test Data

V _{CC}	Input		V _M	V _{LOAD}	C _L	R _L	V _Δ
	V _I	t _r /t _f					
1.8V ± 0.15V	V _{CC}	≤ 2ns	V _{CC} / 2	2 × V _{CC}	30pF	1kΩ	0.15V
2.5V ± 0.2V	V _{CC}	≤ 2ns	V _{CC} / 2	2 × V _{CC}	30pF	500Ω	0.15V
2.7V	3V	≤ 2.5ns	1.5V	6V	50pF	500Ω	0.3V
3.3V ± 0.3V	3V	≤ 2.5ns	1.5V	6V	50pF	500Ω	0.3V
5.5V ± 0.5V	V _{CC}	≤ 2.5ns	V _{CC} / 2	2 × V _{CC}	50pF	500Ω	0.3V

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Package Dimension

SOP14 (3.9mm × 8.65mm)



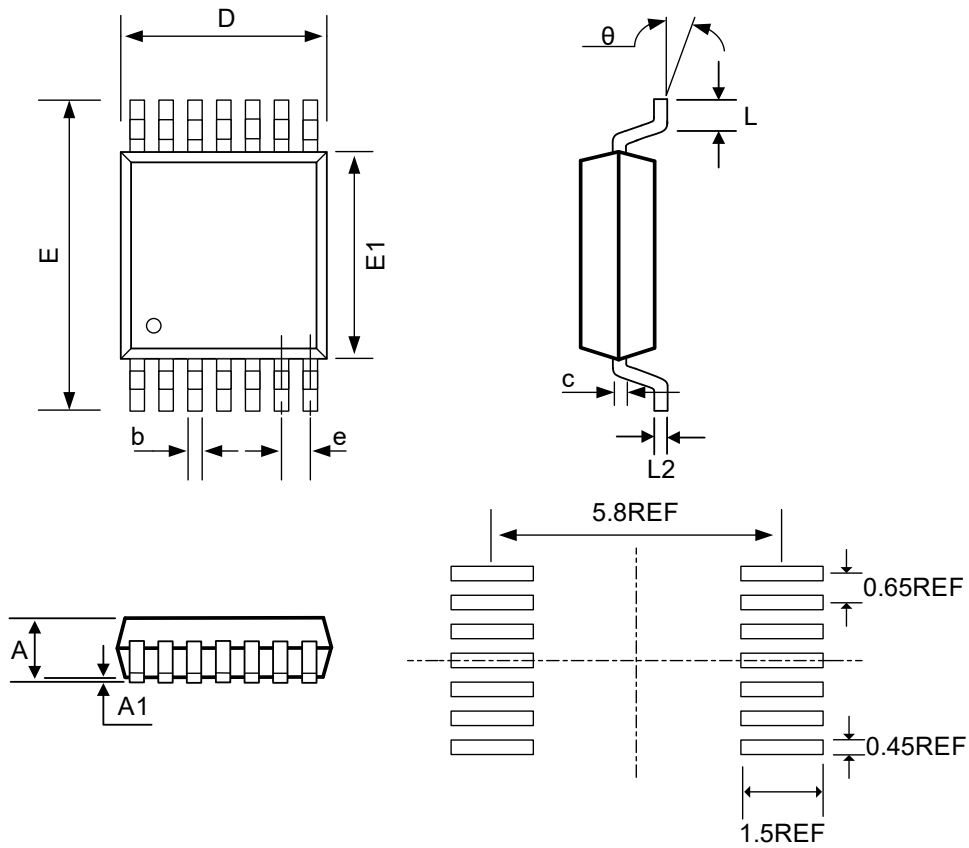
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	MAX
A	--	1.75
A1	0.10	0.25
b	0.36	0.51
D	8.55	8.75
E	5.80	6.20
E1	3.80	4.00
e	1.22	1.32
L	0.45	0.75
L2	0.25 BSC	

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TSSOP14 (4.4mm × 5.0mm)



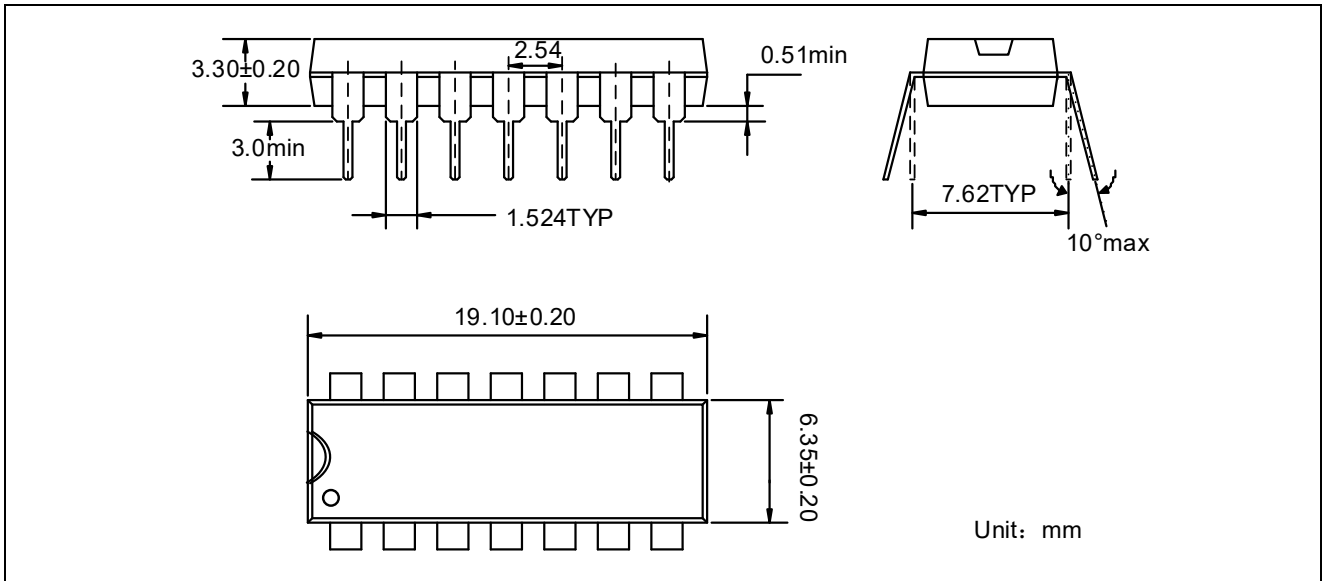
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	MAX
A	--	1.20
A1	0.05	0.15
b	0.19	0.30
c	0.15 REF	
D	4.86	5.10
E	6.20	6.60
E1	4.30	4.50
e	0.65BSC	
L	0.45	0.75
L2	0.25 REF	
θ	0°	8°

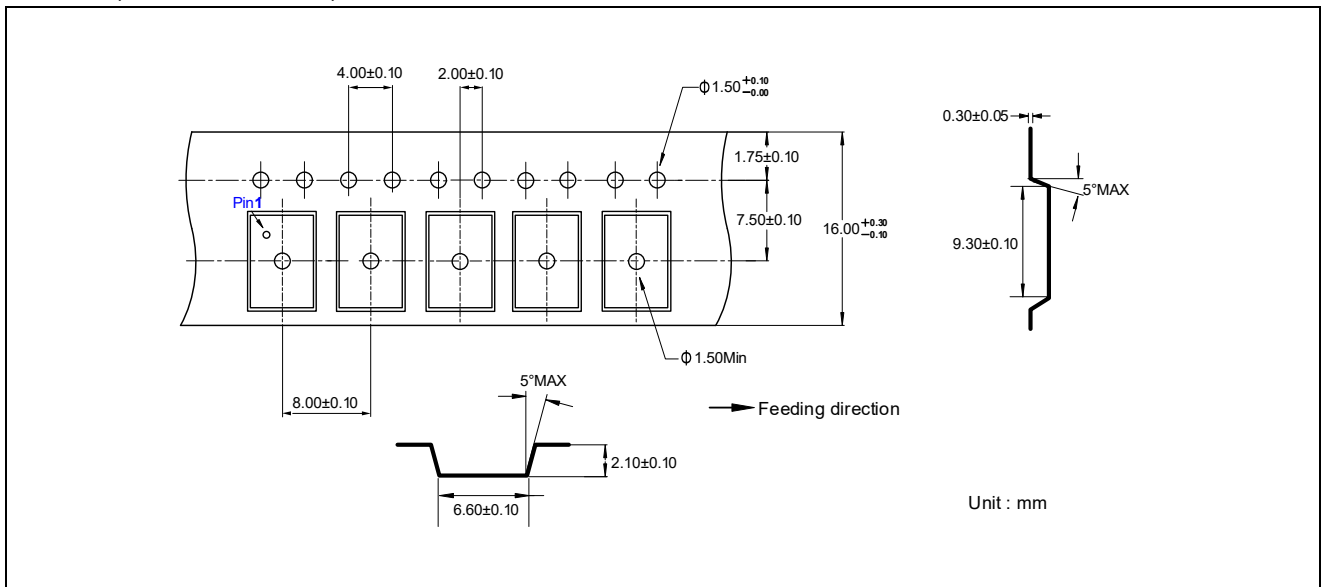
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DIP14 (19.10mm × 6.35mm)



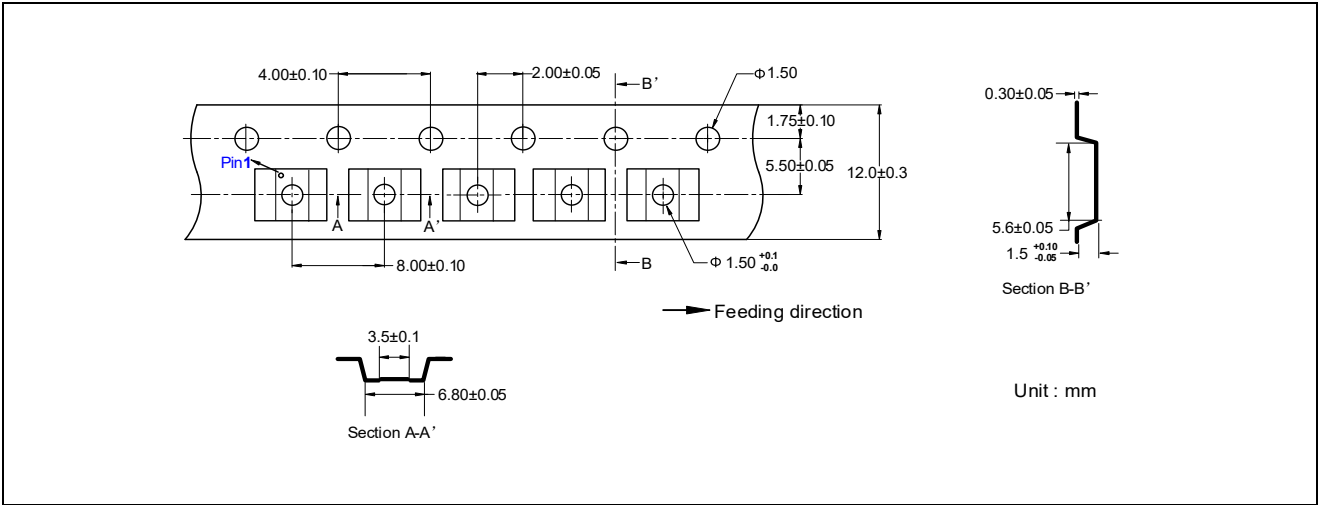
Tape Information

SOP14 (3.9mm × 8.65mm)

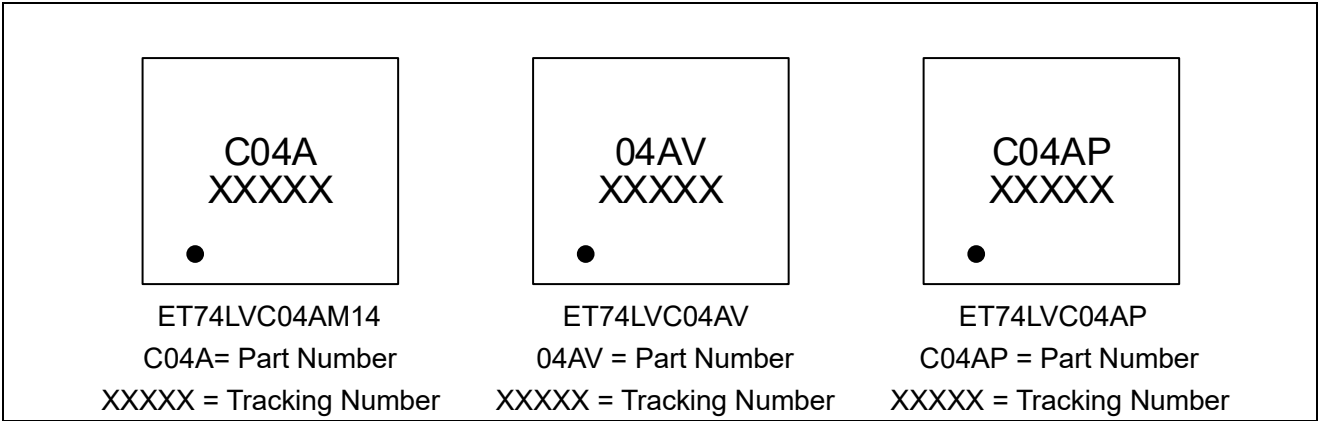


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TSSOP14 (4.4mm × 5.0mm)



Marking Information



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2025-11-04	Official Version	Zhang zixuan	Yang xiaoxu	Liu jiaying
1.0.a	2026-04-02	Update Format, Add Tape and Marking	Xu tao	Yang xiaoxu	Liu jiaying