

## Hex Inverters

### General Description

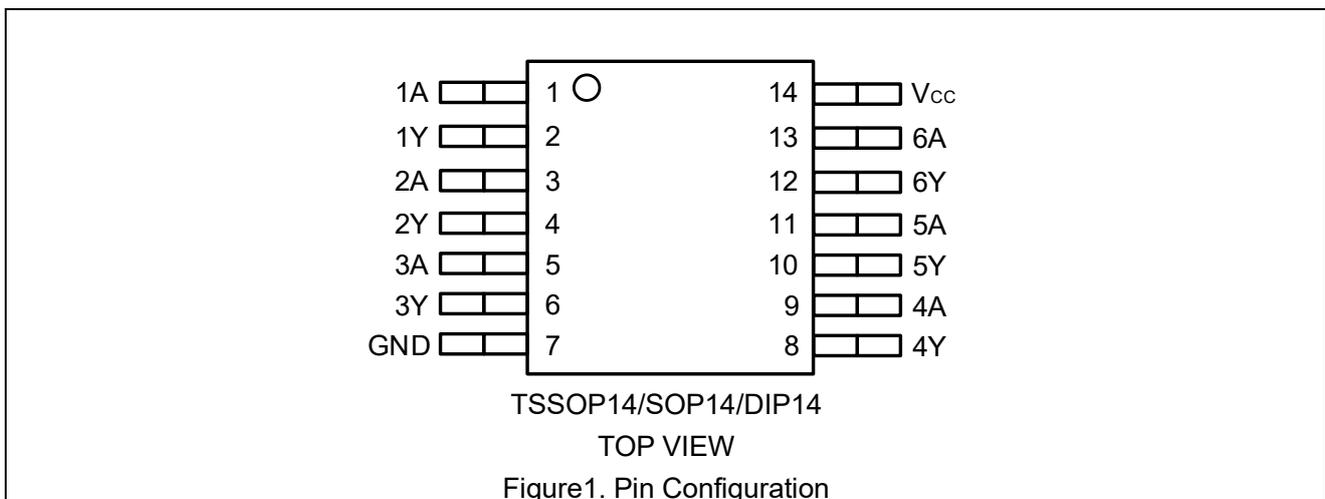
The ET74HC04 contains six independent inverters operating from a 1.65V to 5.5V supply. They perform the Boolean function  $Y = \bar{A}$  in positive logic.

### Features

- Designed for 1.65V to 5.5V  $V_{CC}$  Operation
- Over-voltage Tolerant Inputs
- Outputs Can Drive up to 10 LSTTL Loads
- Low Power Consumption  $I_{CC} = 20\mu A$  Max
- Typical  $t_{pd} = 8ns$  at 5V
- $\pm 32mA$  Output Drive at 5V
- 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

Product Name	Package	MSL
ET74LVC04AM	SOP14 (8.65mm × 3.90mm)	Level 3
ET74LVC04AV	TSSOP14 (4.96mm × 4.40mm)	Level 3
ET74LVC04AP	DIP14 (19.10mm × 6.35mm)	Level 3

### Pin Configuration

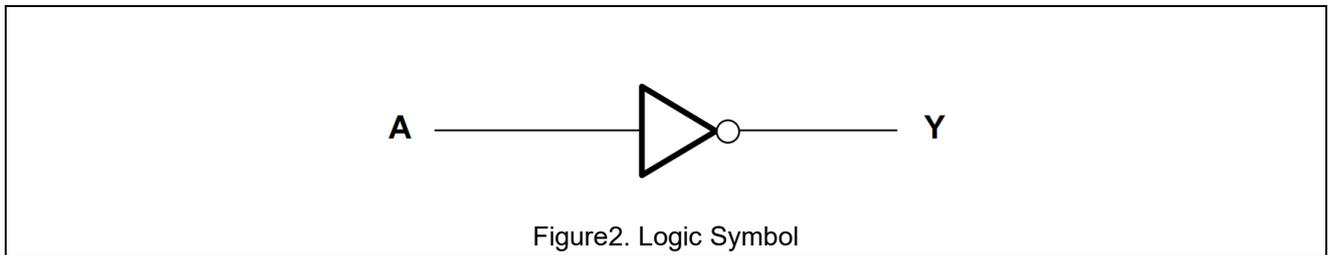


# ET74LVC04A

## 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



## Functional Description

Input	Output
A	Y
H	L
L	H

# ET74LVC04A

## Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V <sub>CC</sub>	DC Supply Voltage (V <sub>CC</sub> Pin)		-0.5 to 7.0	V
V <sub>I</sub>	DC Input Voltage <sup>(1)</sup>		-0.5 ≤ V <sub>I</sub> ≤ 7.0	V
I <sub>IK</sub>	DC Input Diode Current V <sub>I</sub> < GND		-50	mA
I <sub>OK</sub>	DC Output Diode Current V <sub>O</sub> < GND, V <sub>O</sub> > V <sub>CC</sub>		-50	mA
I <sub>O</sub>	DC Output Sink Current		±50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin		+100	mA
I <sub>GND</sub>	DC Supply Current GND Pin		-100	mA
T <sub>STG</sub>	Storage Temperature Range		-65 to 150	°C
V <sub>ESD</sub>	ESD Classification	Human Body Model <sup>(2)</sup>	±4000	V
		Charged Device Model <sup>(3)</sup>	±1000	
I <sub>LU</sub>	Max Latch Up Current Above V <sub>CC</sub> and GND at 125°C <sup>(4)</sup>		±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<sub>O</sub> 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 <sub>θJA</sub>	SOP14	Thermal Characteristics, Thermal Resistance, Junction-to-Air	80	°C/W
	TSSOP14		80	
	DIP14		86	

## Recommended operating conditions

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage Operating	1.65	5.5	V
V <sub>I</sub>	DC Input Voltage	0	V <sub>CC</sub>	V
V <sub>O</sub>	DC Output Voltage (High or Low State)	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature Range	-40	125	°C

# ET74LVC04A

## Electrical Characteristics

Symbol	Parameter	Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		1.65 to 1.95	0.65 * V <sub>CC</sub>			0.65 * V <sub>CC</sub>		V
			2.3 to 3.0	1.7			1.7		V
			3.6	2			2		V
			4.5 to 5.5	0.7 * V <sub>CC</sub>			0.7 * V <sub>CC</sub>		V
V <sub>IL</sub>	Low-Level Input Voltage		1.65 to 1.95			0.35 * V <sub>CC</sub>		0.35 * V <sub>CC</sub>	V
			2.3 to 3.0			0.7		0.7	V
			3.6			0.8		0.8	V
			4.5 to 5.5			0.3 * V <sub>CC</sub>		0.3 * V <sub>CC</sub>	V
V <sub>OH</sub>	High-Level Output Voltage	I <sub>OH</sub> = -100μA	1.65 to 5.5	V <sub>CC</sub> - 0.1			V <sub>CC</sub> - 0.1		V
		I <sub>OH</sub> = -4mA	1.65	1.2			1.2		
		I <sub>OH</sub> = -8mA	2.3	1.9			1.9		
		I <sub>OH</sub> = -12mA	2.7	2.2			2.2		
		I <sub>OH</sub> = -16mA	3.0	2.4			2.4		
		I <sub>OH</sub> = -24mA	3.0	2.3			2.3		
		I <sub>OH</sub> = -32mA	4.5	3.8			3.8		
		I <sub>OH</sub> = -32mA	5.5	4.8			4.8		
V <sub>OL</sub>	Low-Level Output Voltage	I <sub>OH</sub> = 100μA	1.65 to 5.5			0.1		0.1	V
		I <sub>OH</sub> = 4mA	1.65			0.45		0.45	
		I <sub>OH</sub> = 8mA	2.3			0.3		0.3	
		I <sub>OH</sub> = 12mA	2.7			0.4		0.4	
		I <sub>OH</sub> = 16mA	3.0			0.4		0.4	
		I <sub>OH</sub> = 24mA	3.0			0.55		0.55	
		I <sub>OH</sub> = 32mA	4.5			0.55		0.55	
		I <sub>OH</sub> = 32mA	5.5			0.55		0.55	
I <sub>I</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5V or GND	5.5V		±1	±20		±20	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 5.5V or GND	5.5V			10		10	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>IN</sub> = 5.5V or V <sub>OUT</sub> = 5.5V	0			±10		±10	uA

# ET74LVC04A

## Switching 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	

## Operating Characteristics ( $T_A = 25^\circ\text{C}$ )

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 <sup>(5)</sup>	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  $\mu\text{W}$ ).

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

$f_i$  = 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.

## Parameter Measurement Information

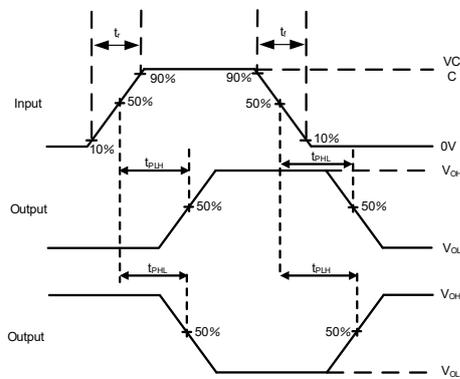


Figure3. Switching Waveform

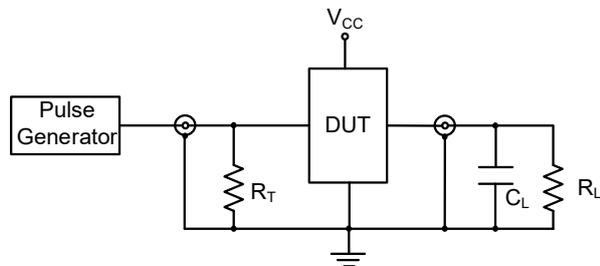


Figure4. Test Circuit

# ET74LVC04A

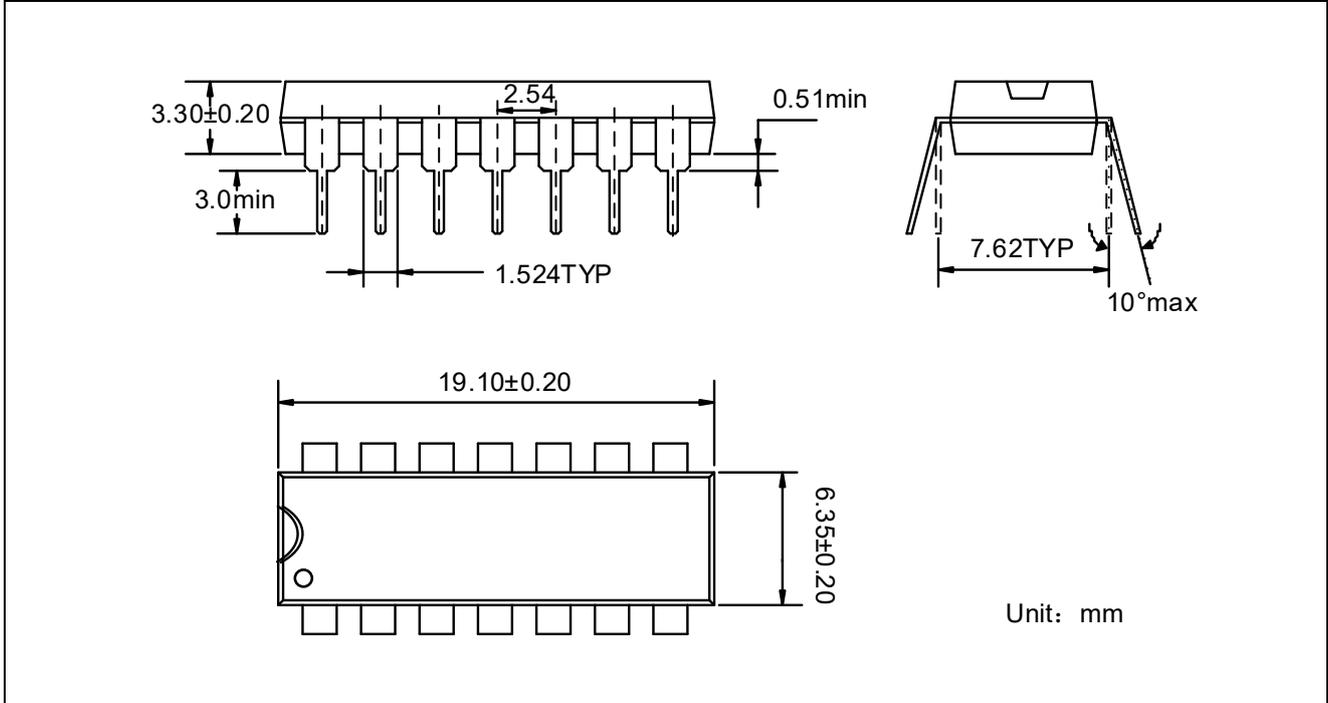
Table 1. Measurement Points and Test Data

$V_{CC}$	Input		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 $\Omega$	0.15V
2.7V	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$5.5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 $\Omega$	0.3V

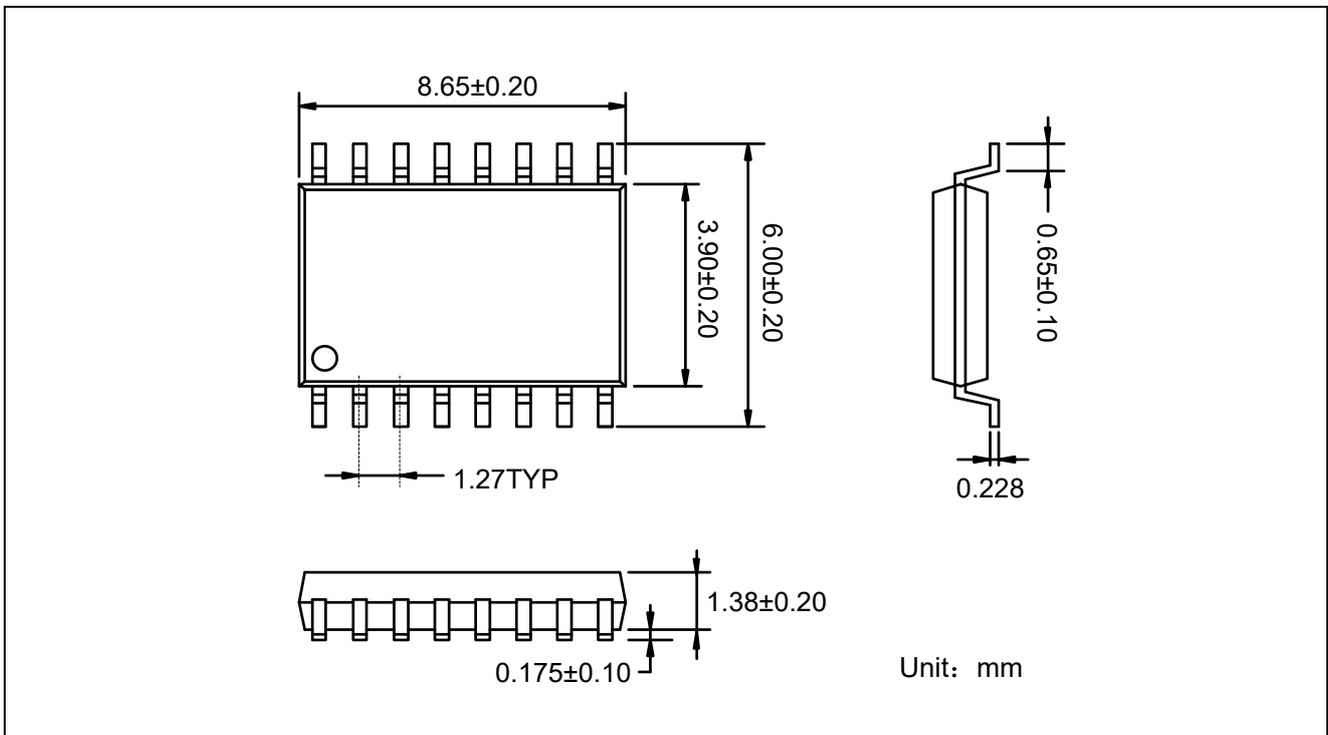
# ET74LVC04A

## Package Dimension

DIP14 (19.10mm × 6.35mm)

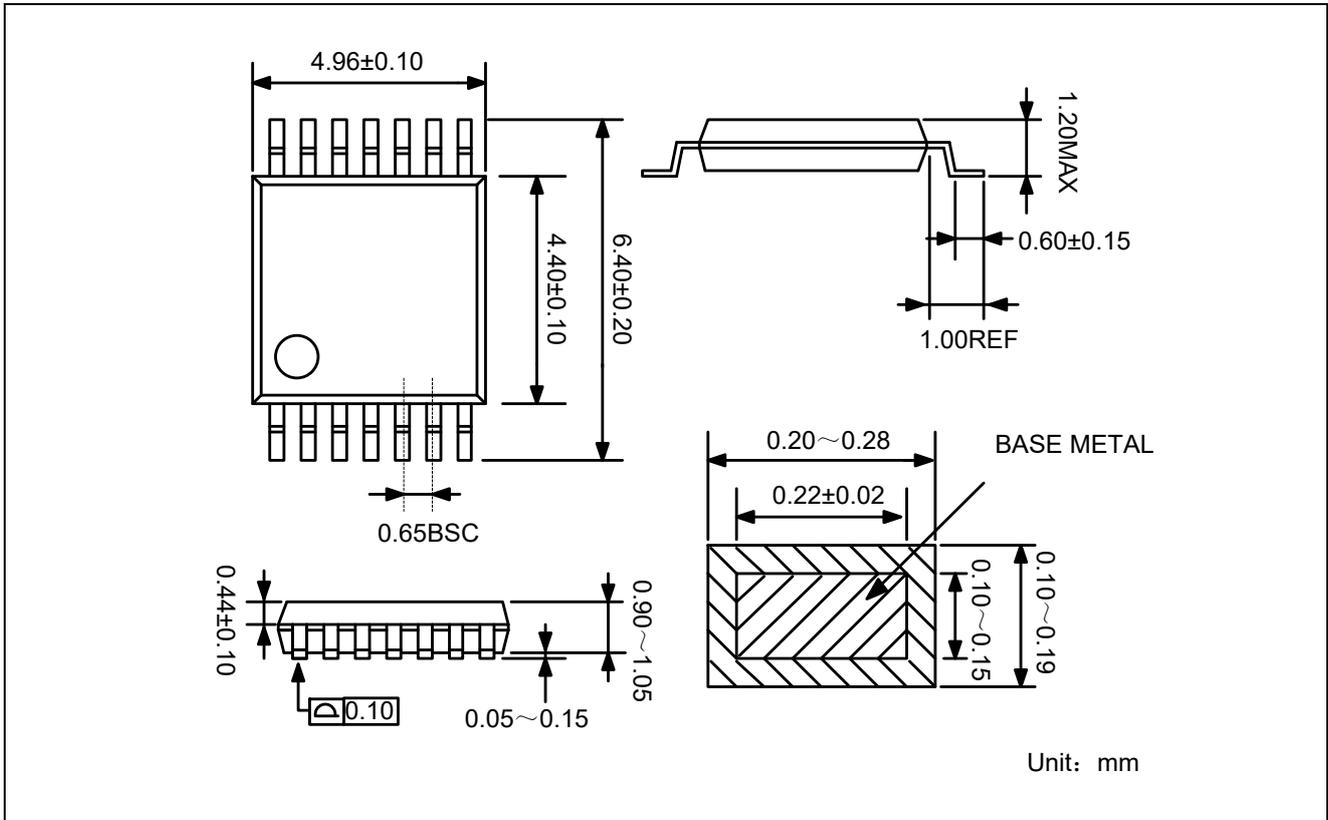


SOP14 (8.65mm × 3.90mm)



# ET74LVC04A

TSSOP14 (4.96mm × 4.40mm)



## Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-11-04	Official Version	Zhang zixuan	Yang xiaoxu	Liu jiaoying