

Hex Inverters

General Description

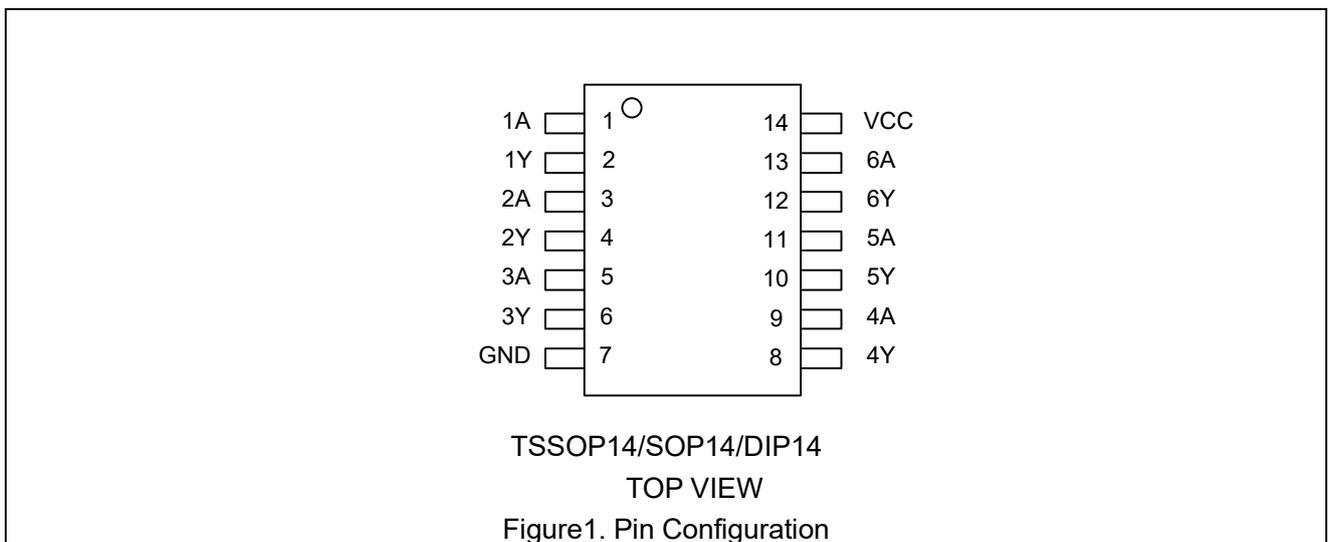
The ET74HC04 contains six independent inverters operating from a 2V to 6V supply. They perform the Boolean function $Y = \bar{A}$ in positive logic.

Features

- Designed for 2V to 6V 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
- $\pm 4mA$ 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
ET74HC04M	SOP14 (8.65mm × 3.90mm)	Level 3
ET74HC04V	TSSOP14 (4.96mm × 4.40mm)	Level 3
ET74HC04P	DIP14 (19.10mm × 6.35mm)	Level 3

Pin Configuration

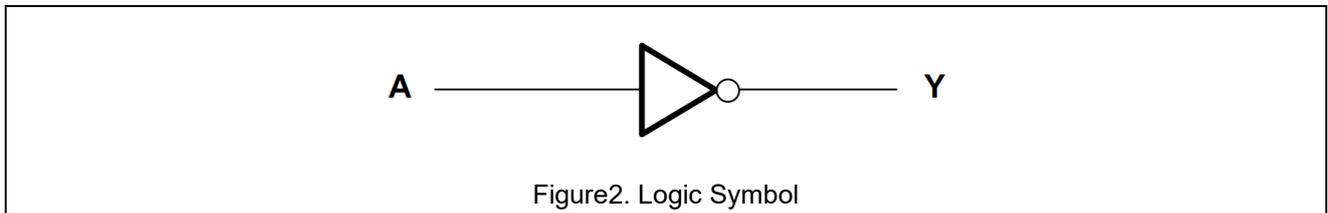


ET74HC04

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

ET74HC04

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
I _{IK}	DC Input Diode Current V _I < GND		±20	mA
I _{OK}	DC Output Diode Current V _O < GND, V _O > V _{CC}		±20	mA
I _O	DC Output Sink Current		±25	mA
I _{CC}	DC Supply Current per Supply Pin		+50	mA
I _{GND}	DC Supply Current GND Pin		-50	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(VCC Pin)	2	6	V
V _I	Input Voltage	0	V _{CC}	V
V _O	Output Voltage (High or Low State)	0	V _{CC}	V
T _A	Operating Temperature Range	-40	125	°C

ET74HC04

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		2.0	1.5			1.5		
			4.5	3.15			3.15		
			6.0	4.2			4.2		
V _{IL}	Low-Level Input Voltage		2.0			0.5		0.5	
			4.5			1.35		1.35	
			6.0			1.8		1.8	
V _{OH}	High-Level Output Voltage	I _{OH} = -20μA	2V	1.9	1.998		1.9		V
			4.5V	4.4	4.499		4.4		
			6V	5.9	5.999		5.9		
		I _{OH} = -4mA	4.5V	3.98	4.3		3.84		
		I _{OH} = -5.2mA	6V	5.48	5.8		5.34		
V _{OL}	Low-Level Output Voltage	I _{OL} = 20μA	2V		0.002	0.1		0.1	V
			4.5V		0.001	0.1		0.1	
			6V		0.001	0.1		0.1	
		I _{OL} = 4mA	4.5V		0.17	0.26		0.33	
		I _{OL} = 5.2mA	6V		0.15	0.26		0.33	
I _I	Input Leakage Current	V _I = 6V or GND	6V		±0.1	±100		±1000	nA
I _{CC}	Quiescent Supply Current	V _I = 6V or GND	6V			2		20	μA

AC Electrical Characteristics(C_L = 50pF)

Symbol	From (Input)	To (Output)	V _{CC}	T _A = 25°C		-40°C ≤ T _A ≤ 125°C		Unit
				Typ	Max	Min	Max	
t _{pd}	A	Y	2V	45	95		120	ns
			4.5V	8	18		24	
			6V	7	15		20	
t _r /t _f		Y	2V	38	75		95	ns
			4.5V	8	15		19	
			6V	6	13		16	

ET74HC04

Operating Characteristics (T_A = 25°C)

Symbol	Parameter	Test Conditions	Typ	Unit
C _I	Input Capacitance	V _{CC} = 6V, V _I = 0V or V _{CC}	3	pF
C _{PD}	Power Dissipation Capacitance Per Inverter ⁽⁵⁾	No Load	20	pF

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.

Parameter Measurement Information

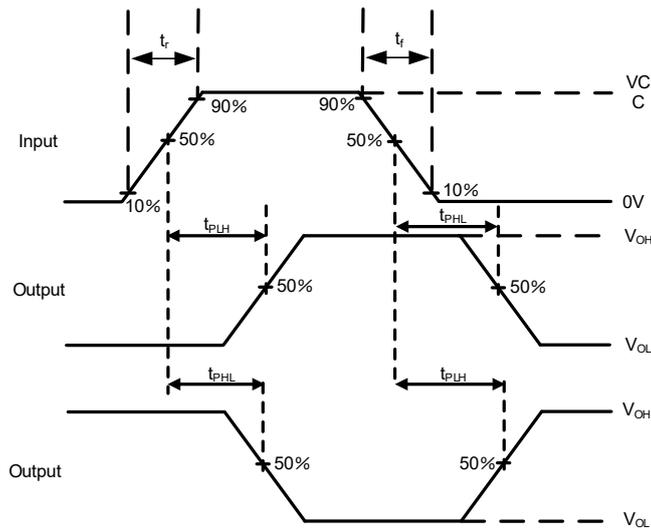


Figure3. Switching Waveform

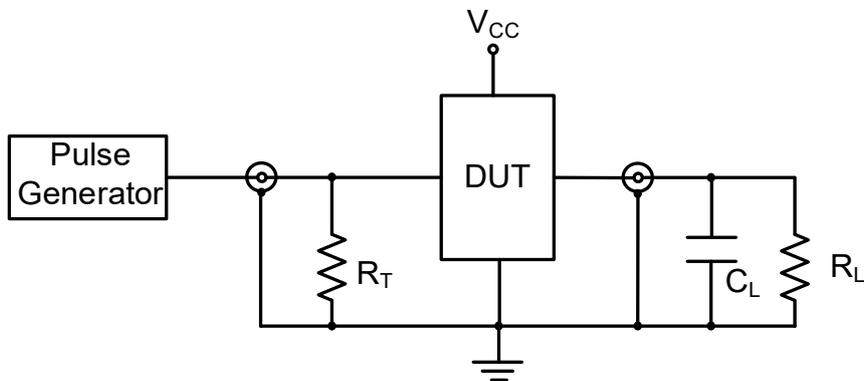
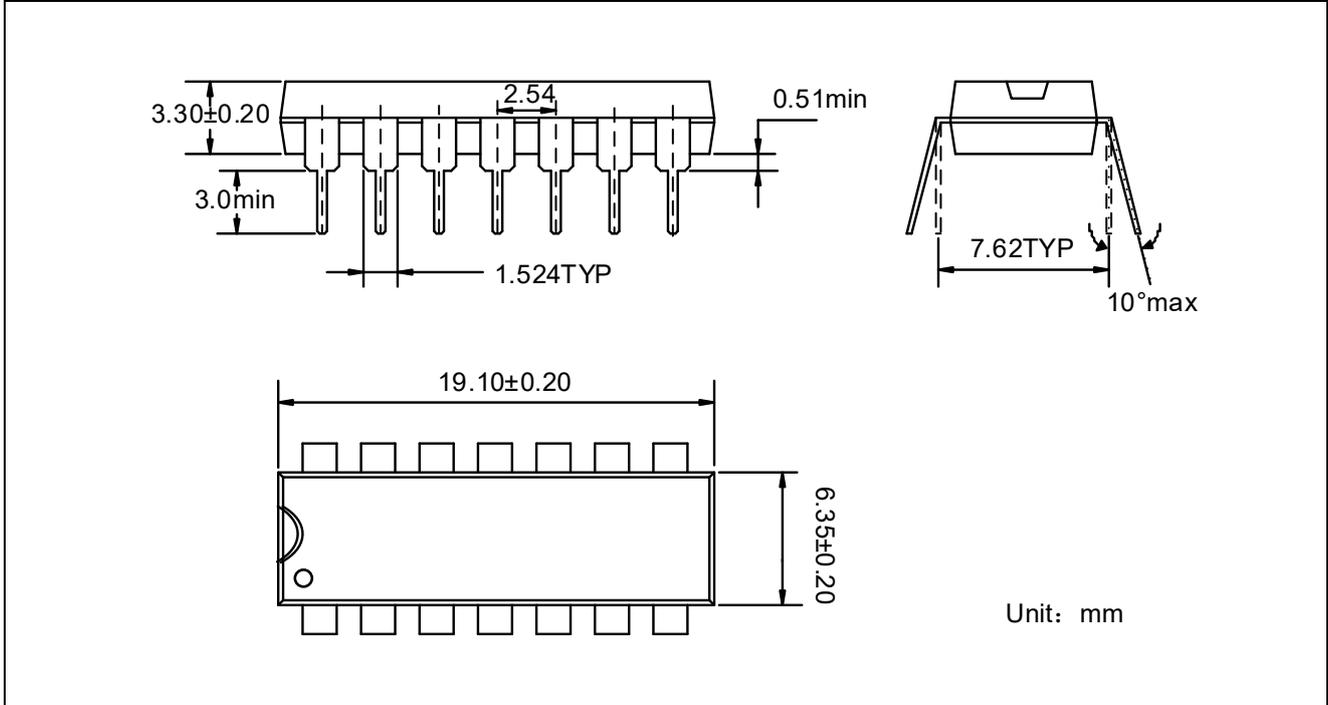


Figure4. Test Circuit

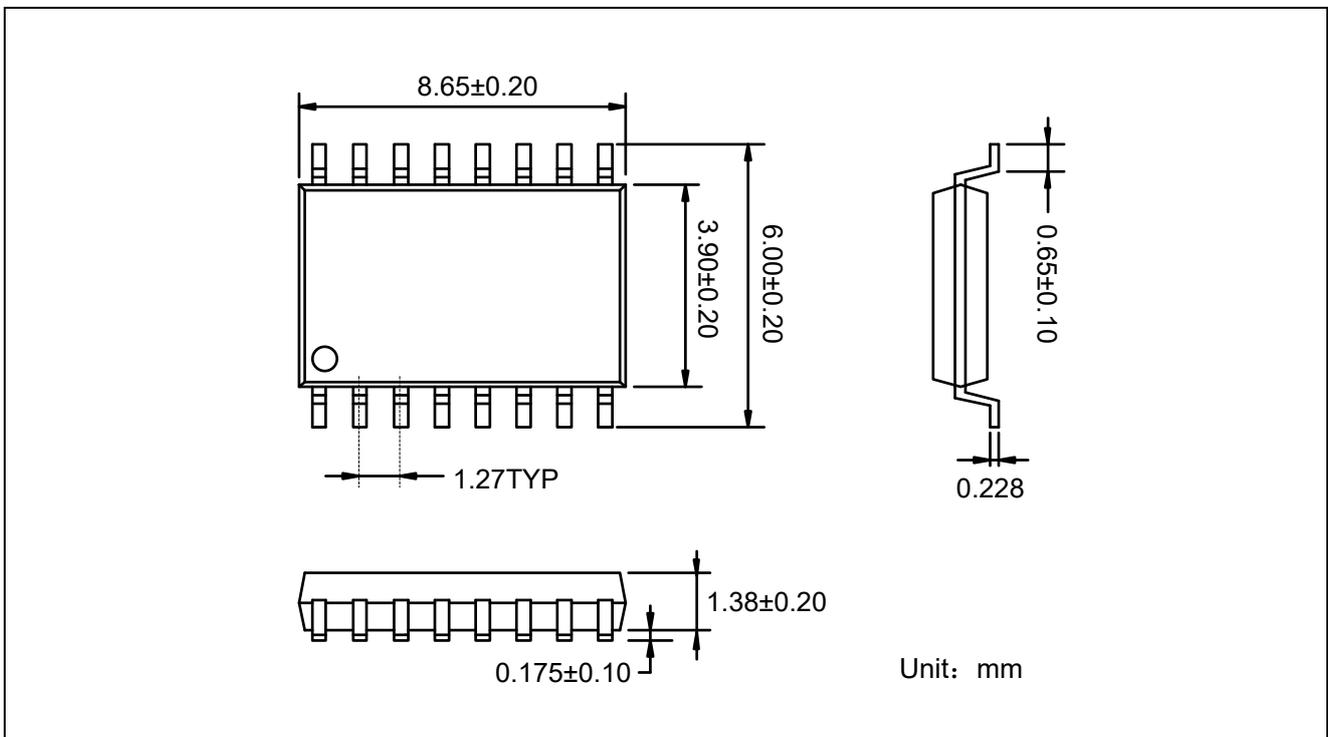
ET74HC04

Package Dimension

DIP14(19.10mm × 6.35mm)

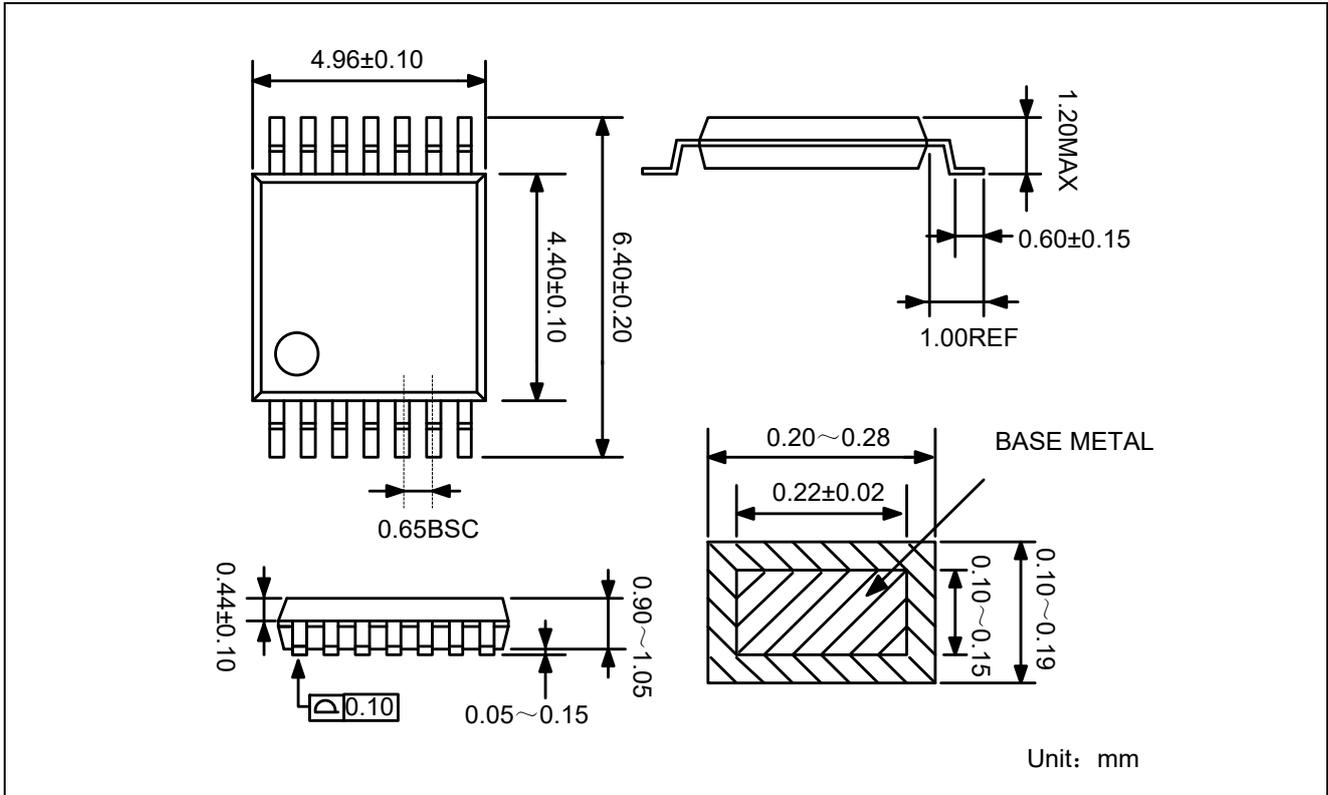


SOP14(8.65mm × 3.90mm)



ET74HC04

TSSOP14(4.96mm × 4.40mm)



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2025-11-03	Official Version	Zhang zixuan	Yang xiaoxu	Liu jiating