Hex Inverters

Features

- Wide Operating Voltage Range of 2V to 6V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption I_{CC} = 20μA Max
- Typical t_{PD} = 8ns @5V
- ±4mA Output Drive @ 5V
- Low Input Current of 1μA Max

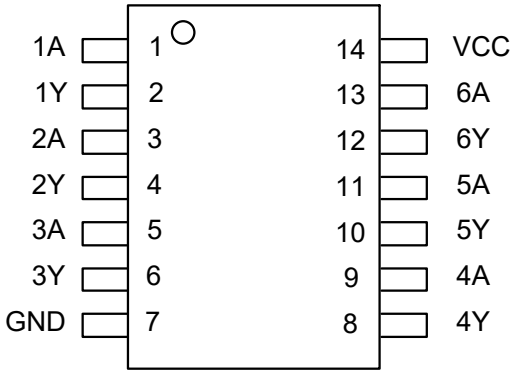
Applications

- Memory chip select decoding
- Data transmission system

Device Information

Product Name	Package
74HC04M	SOP14
74HC04V	TSSOP14
74HC04P	DIP14

Pin Configuration

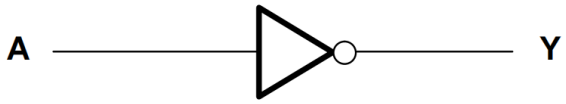


TOP VIEW

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 A	Output Y
H	L
L	H

Absolute Maximum Ratings

Parameter	Symbol	Range		Unit
Supply voltage	V_{CC}	-0.5～7		V
Input clamp current	I_{IK}	±20		mA
Output clamp current	I_{OK}	±20		mA
Continuous output current	I_O	±25		mA
Continuous current through VCC or GND	I_{CC}	±50		mA
Package thermal impedance	θ_{JA}	SOP14	80	°C/W
		TSSOP14	80	
		DIP14	86	
Storage temperature	T_{STG}	-65～150		°C

***Note**:* The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Recommended operating conditions

Characteristic	Symbol	Conditions	Range			Unit
			Min.	Typ.	Max.	
Supply voltage	V_{CC}		2	5	6	V
High-level input voltage	V_{IH}	V_{CC} =2V	1.5			V
		V_{CC} =4.5V	3.15			
		V_{CC} =6V	4.2			
Low-level input voltage	V_{IL}	V_{CC} =2V			0.5	V
		V_{CC} =4.5V			1.35	
		V_{CC} =6V			1.8	
Input voltage	V_I		0		V_{CC}	V
Output voltage	V_O		0		V_{CC}	V
Input transition rise/fall time	$\Delta t/\Delta v$	V_{CC} =2V			1000	ns
		V_{CC} =4.5V			500	
		V_{CC} =6V			400	
Operating free-air temperature	T_A		-40		85	°C

Electrical Characteristics

Symbol	Test Conditions		V_{CC}	T_A=25°C			−40°C≤T_A≤85°C		Unit
				Min.	Typ.	Max.	Min.	Max.	
V_{OH}	V_I = V_{IH} or V_{IL}	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}	V_I = V_{IH} or V_{IL}	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	V_I = V_{CC} or 0		6V		±0.1	±100		±1000	nA
I_{CC}	V_I = V_{CC} or 0, I_O =0		6V			2		20	μA
C_I			2V to 6V		3	10		10	pF

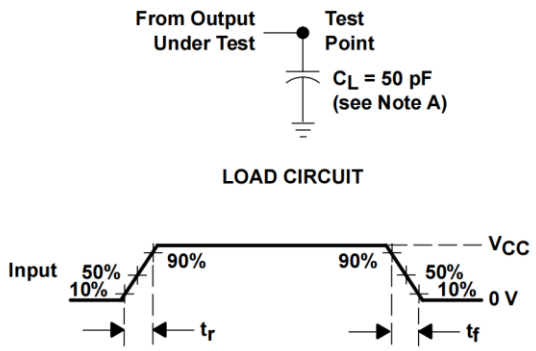
Switching Characteristics (C_L = 50pF)

Symbol	From (Input)	To (Output)	V_{CC}	T_A=25°C		−40°C≤T_A≤85°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_T		Y	2V	38	75		95	ns
			4.5V	8	15		19	
			6V	6	13		16	

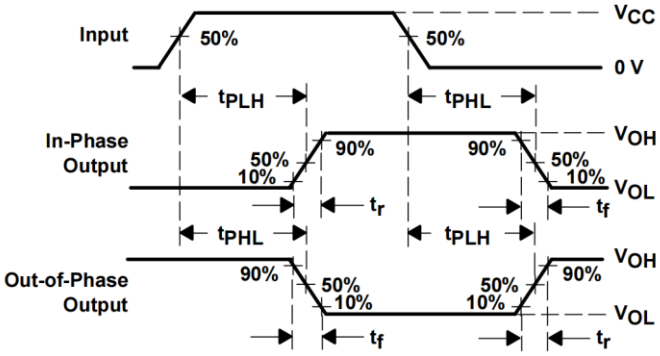
Operating Characteristics (T_A = 25°C)

Symbol	Parameter	Test Conditions	Typ.	Unit
C_{PD}	Power dissipation capacitance per inverter	No load	20	pF

Parameter Measurement Information



VOLTAGE WAVEFORM
INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

Notes:

A. C_L includes probe and test-fixture capacitance.

B. Phase relationships between waveforms were chosen arbitrarily.

All input pulses are supplied by generators having the following characteristics:

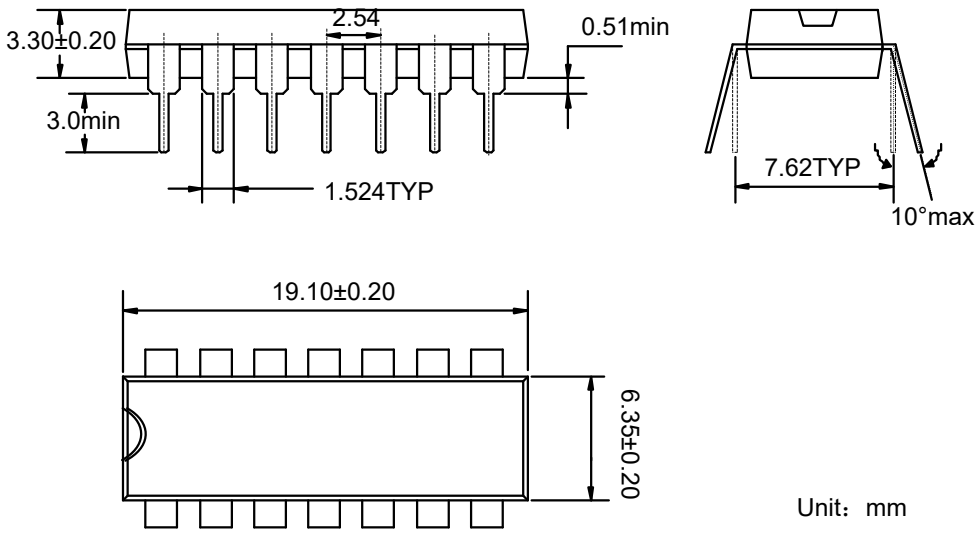
P_{RR}≤1MHz, Z_O = 50Ω, t_r = 6ns, t_f = 6ns.

C. The outputs are measured one at a time, with one input transition per measurement.

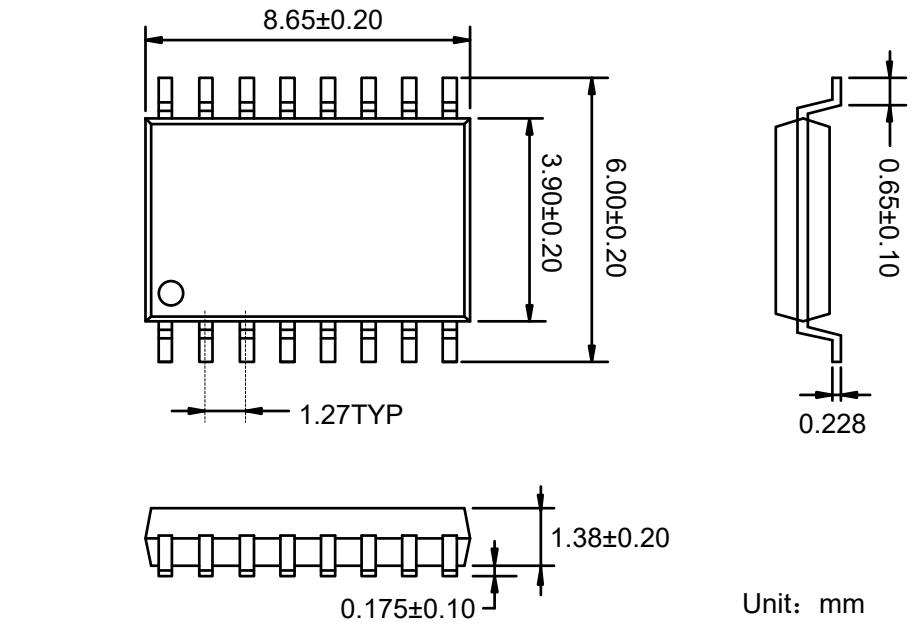
D. t_{PLH} and t_{PHL} are the same as t_{PD}.

Package Dimension

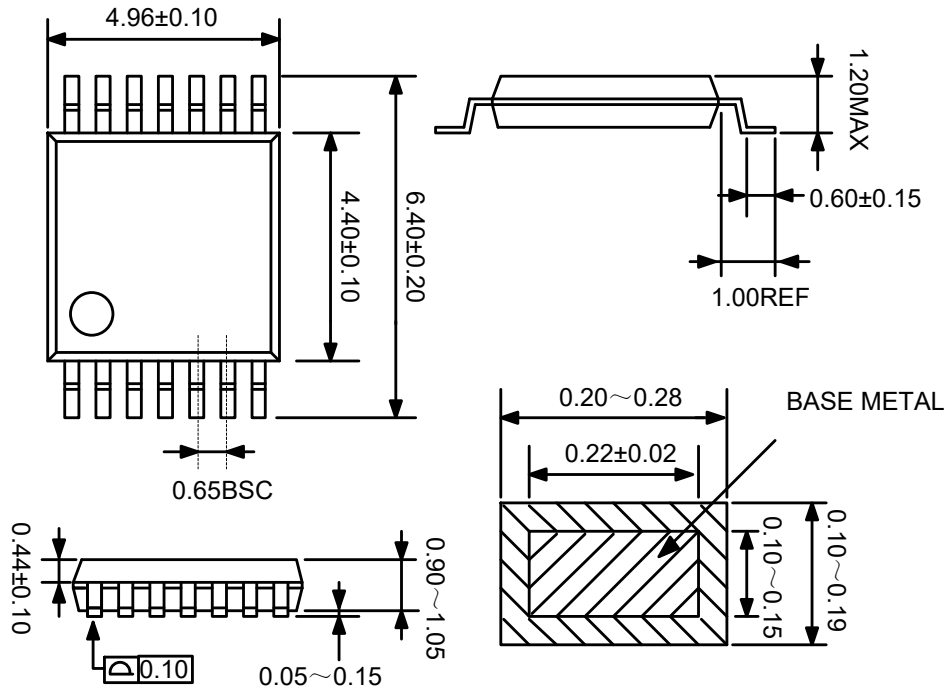
DIP14



SOP14



TSSOP14


4.96±0.10
4.40±0.10
6.40±0.20
0.65BSC
1.20MAX
0.60±0.15
1.00REF
0.20～0.28
BASE METAL
0.22±0.02
0.10～0.15
0.10～0.19
0.44±0.10
0.90～1.05
0.10
0.05～0.15
Unit：mm