

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
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FAIRCHILD
 SEMICONDUCTOR™

September 1983
 Revised February 1999

MM74HCU04 Hex Inverter

General Description

The MM74HCU04 inverters utilize advanced silicon-gate CMOS technology to achieve operating speeds similar to LS-TTL gates with the low power consumption of standard CMOS integrated circuits.

The MM74HCU04 is an unbuffered inverter. It has high noise immunity and the ability to drive 15 LS-TTL loads. The 74HCU logic family is functionally as well as pin-out compatible with the standard 74LS logic family. All inputs

are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

Features

- Typical propagation delay: 7 ns
- Fanout of 15 LS-TTL loads
- Quiescent power consumption: 10 μ A maximum at room temperature
- Low input current: 1 μ A maximum

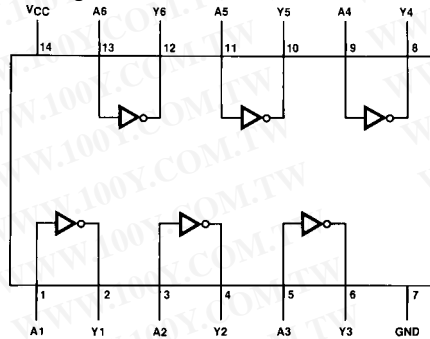
Ordering Code:

Order Number	Package Number	Package Description
MM74HCU04M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow
MM74HCU04SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HCU04MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HCU04N	N14A	14-Lead Plastic Dual-In-Lead Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

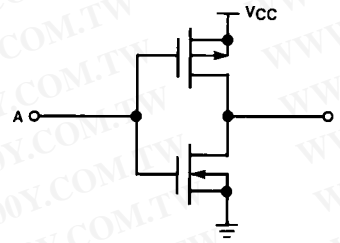
Connection Diagram

Pin Assignments for DIP, SOIC, SOP and TSSOP



Top View

Schematic Diagram



MM74HCU04 Hex Inverter

MM74HCJ04

Absolute Maximum Ratings (Note 1)

(Note 2)

Supply Voltage (V_{CC})	-0.5 to +7.0V
DC Input Voltage (V_{IN})	-1.5 to $V_{CC} + 1.5V$
DC Output Voltage (V_{OUT})	-0.5 to $V_{CC} + 0.5V$
Clamp Diode Current (I_{IK}, I_{OK})	± 20 mA
DC Output Current, per pin (I_{OUT})	± 25 mA
DC V_{CC} or GND Current, per pin (I_{CC})	± 50 mA
Storage Temperature Range (T_{STG})	-65°C to +150°C
Power Dissipation (P_D)	
(Note 3)	600 mW
S.O. Package only	500 mW
Lead Temperature (T_L)	
(Soldering 10 seconds)	260°C

Recommended Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	2	6	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temperature Range (T_A)	-40	+85	°C

Note 1: Absolute Maximum Ratings are those values beyond which damage to the device may occur.

Note 2: Unless otherwise specified all voltages are referenced to ground.

Note 3: Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C.

DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	V_{CC}	$T_A = 25^\circ\text{C}$			$T_A = -40 \text{ to } 85^\circ\text{C}$			Units
				Guaranteed Limits			Guaranteed Limits			
V_{IH}	Minimum HIGH Level Input Voltage		2.0V		1.7	1.7	1.7	V		
			4.5V		3.6	3.6	3.6	V		
			6.0V		4.8	4.8	4.8	V		
V_{IL}	Maximum LOW Level Input Voltage		2.0V		0.3	0.3	0.3	V		
			4.5V		0.8	0.8	0.8	V		
			6.0V		1.1	1.1	1.1	V		
V_{OH}	Minimum HIGH Level Output Voltage	$V_{IN} = V_{IL}$ $ I_{OUT} \leq 20 \mu\text{A}$	2.0V	2.0	1.8	1.8	1.8	V		
			4.5V	4.5	4.0	4.0	4.0	V		
			6.0V	6.0	5.5	5.5	5.5	V		
		$V_{IN} = \text{GND}$ $ I_{OUT} \leq 4.0 \text{ mA}$ $ I_{OUT} \leq 5.2 \text{ mA}$	4.5V	4.2	3.98	3.84	3.7	V		
			6.0V	5.7	5.48	5.34	5.2	V		
V_{OL}	Maximum LOW Level Output Voltage	$V_{IN} = V_{IH}$ $ I_{OUT} \leq 20 \mu\text{A}$	2.0V	0	0.2	0.2	0.2	V		
			4.5V	0	0.5	0.5	0.5	V		
			6.0V	0	0.5	0.5	0.5	V		
		$V_{IN} = V_{CC}$ $ I_{OUT} \leq 6.0 \text{ mA}$ $ I_{OUT} \leq 7.8 \text{ mA}$	4.5V	0.2	0.26	0.33	0.4	V		
			6.0V	0.2	0.26	0.33	0.4	V		
I_{IN}	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		± 0.1	± 1.0	± 1.0	μA		
I_{CC}	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu\text{A}$	6.0V		2.0	20	40	μA		

Note 4: For a power supply of $5V \pm 10\%$ the worst case output voltages (V_{OH} and V_{OL}) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at $V_{CC} = 5.5V$ and 4.5V respectively. (The V_{IH} value at 5.5V is 3.85V.) The worst case leakage current (I_{IN} , I_{CC} , and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0V values should be used.

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MM74HCU04

AC Electrical Characteristics					
$V_{CC} = 5V, T_A = 25^\circ C, C_L = 15 pF, t_r = t_f = 6 ns$					
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay		7	13	ns

AC Electrical Characteristics								
$V_{CC} = 2.0V \text{ to } 6.0V, C_L = 50 pF, t_r = t_f = 6 ns \text{ (unless otherwise specified)}$								
Symbol	Parameter	Conditions	V_{CC}	$T_A = 25^\circ C$		$T_A = -40 \text{ to } 85^\circ C$	$T_A = -55 \text{ to } 125^\circ C$	Units
				Typ	Guaranteed Limits			
t_{PHL}, t_{PLH}	Maximum Propagation Delay		2.0V	49	82	103	120	ns
			4.5V	9.9	16	21	24	ns
			6.0V	8.4	14	18	20	ns
t_{TLH}, t_{THL}	Maximum Output Rise and Fall Time		2.0V	30	75	95	110	ns
			4.5V	8	15	19	22	ns
			6.0V	7	13	16	19	ns
C_{PD}	Power Dissipation Capacitance (Note 5)	(per gate)		90				pF
C_{IN}	Maximum Input Capacitance			8	15	15	15	pF

Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Typical Applications

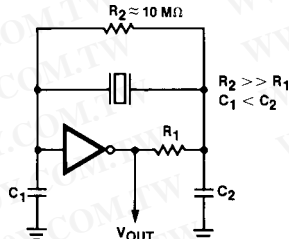


FIGURE 1. Crystal Oscillator

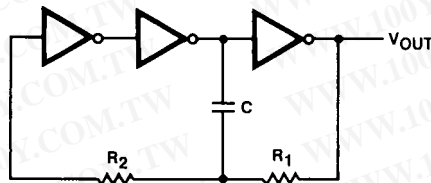


FIGURE 2. Stable RC Oscillator

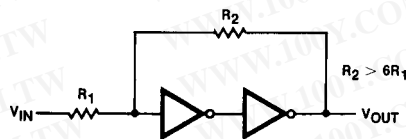
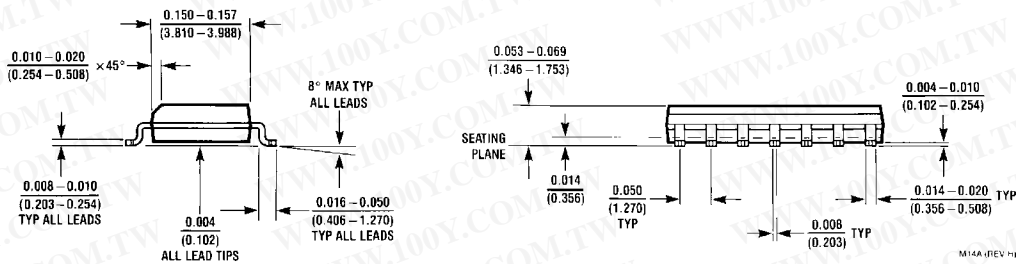
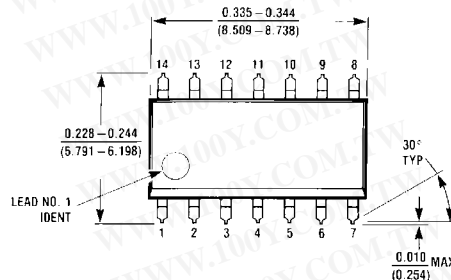


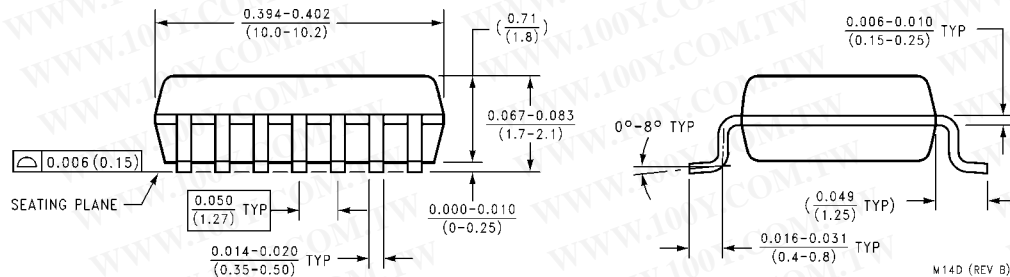
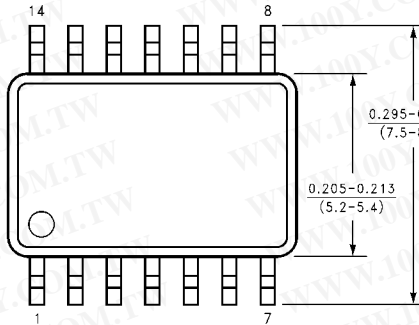
FIGURE 3. Schmitt Trigger

MM74HCJ04

Physical Dimensions inches (millimeters) unless otherwise noted



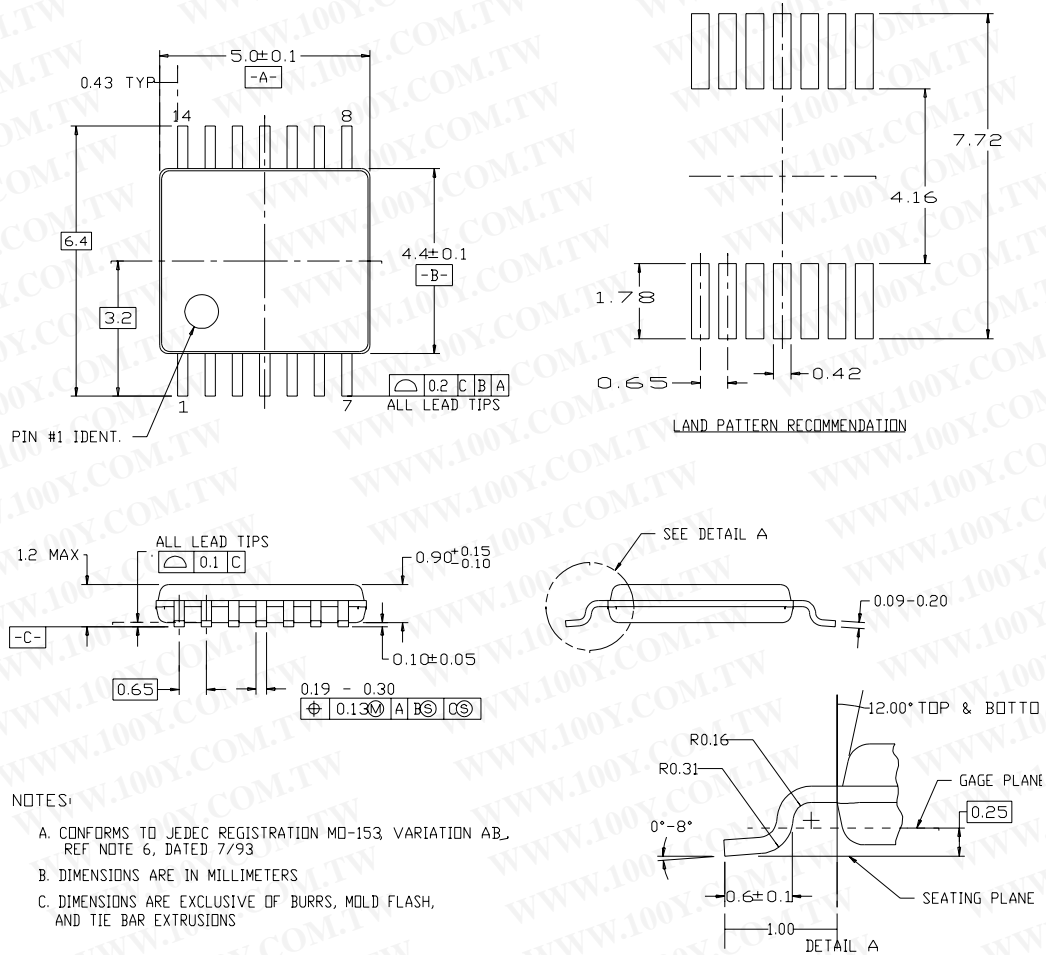
**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow
Package Number M14A**



**14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M14D**

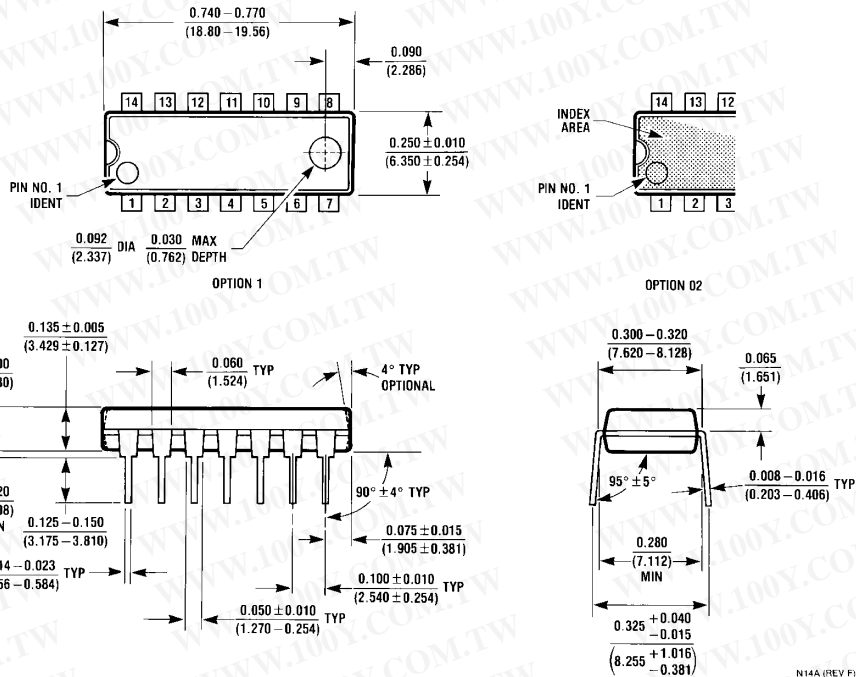
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

14LD, TSSOP, JEDEC MO-153, 4.4MM WIDE



**14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC14**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N14A

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