

MM54HCT04/MM74HCT04 Hex Inverter

General Description

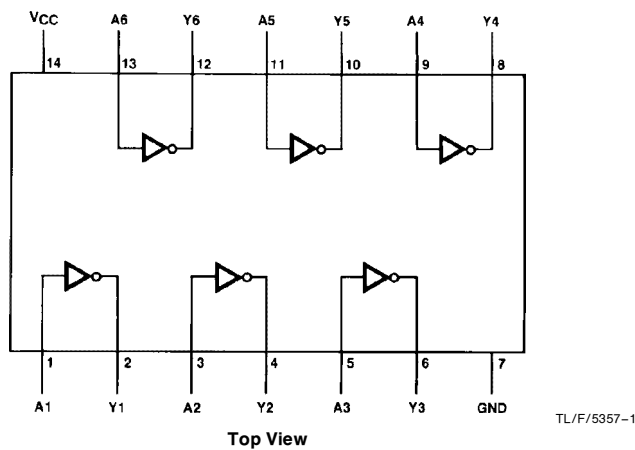
The MM54HCT04/MM74HCT04 are logic functions fabricated by using advanced silicon-gate CMOS technology which provides the inherent benefits of CMOS - low quiescent power and wide power supply range. These devices are input and output characteristic as well as pin-out compatible with standard DM54LS/74LS logic families. The MM54HCT04/MM74HCT04, triple buffered, hex inverters, feature low power dissipation and fast switching times. All inputs are protected from static discharge by internal diodes to V_{CC} and ground.

MM54HCT/MM74HCT devices are intended to interface between TTL and NMOS components and standard CMOS devices. These parts are also plug-in replacements for LS-TTL devices and can be used to reduce power consumption in existing designs.

Features

- TTL, LS pin-out and threshold compatible
- Fast switching: $t_{PLH}, t_{PHL} = 12$ ns (typ)
- Low power: $10 \mu\text{W}$ at DC, 3.7 mW at 5 MHz
- High fanout: ≥ 10 LS loads
- Inverting, triple buffered

Connection Diagram



Order Number MM54HCT04 or MM74HCT04

Absolute Maximum Ratings (Notes 1 & 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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 Temp. (T_L) (Soldering 10 seconds)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	4.5	5.5	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temp. Range (T_A)			
MM74HCT	-40	+85	°C
MM54HCT	-55	+125	°C
Input Rise or Fall Times (t_r, t_f)		500	ns

DC Electrical Characteristics $V_{CC} = 5V \pm 10\%$ (unless otherwise specified)

Symbol	Parameter	Conditions	$T_A = 25^\circ C$			Units	
			Typ	74HCT $T_A = -40$ to $85^\circ C$	54HCT $T_A = -55$ to $125^\circ C$		Guaranteed Limits
V_{IH}	Minimum High Level Input Voltage			2.0	2.0	2.0	V
V_{IL}	Maximum Low Level Input Voltage			0.8	0.8	0.8	V
V_{OH}	Minimum High Level Output Voltage	$V_{IN} = V_{IL}$ $I_{OUT} = 20 \mu A$ $I_{OUT} = 4.0$ mA, $V_{CC} = 4.5V$ $I_{OUT} = 4.8$ mA, $V_{CC} = 5.5V$	V_{CC}	$V_{CC} - 0.1$	$V_{CC} - 0.1$	$V_{CC} - 0.1$	V
			4.2	3.98	3.84	3.7	V
			5.2	4.98	4.84	4.7	V
V_{OL}	Maximum Low Level Output Voltage	$V_{IN} = V_{IH}$ $I_{OUT} = 20 \mu A$ $I_{OUT} = 4.0$ mA, $V_{CC} = 4.5V$ $I_{OUT} = 4.8$ mA, $V_{CC} = 5.5V$	0	0.1	0.1	0.1	V
			0.2	0.26	0.33	0.4	V
			0.2	0.26	0.33	0.4	V
I_{IN}	Maximum Input Current	$V_{IN} = V_{CC}$ or GND, V_{IH} or V_{IL}		± 0.1	± 1.0	± 1.0	μA
I_{CC}	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$		2.0	20	40	μA
		$V_{IN} = 2.4V$ or 0.5V (Note 4)		0.3	0.4	0.5	mA

AC Electrical Characteristics $V_{CC} = 5.0V, t_r = t_f = 6$ ns, $C_L = 15$ pF, $T_A = 25^\circ C$ (unless otherwise noted)

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PLH}, t_{PHL}	Maximum Propagation Delay		10	18	ns

AC Electrical Characteristics $V_{CC} = 5.0V \pm 10\%, t_r = t_f = 6$ ns, $C_L = 50$ pF (unless otherwise noted)

Symbol	Parameter	Conditions	$T_A = 25^\circ C$			Units	
			Typ	74HCT $T_A = -40$ to $85^\circ C$	54HCT $T_A = -55$ to $125^\circ C$		Guaranteed Limits
t_{PLH}, t_{PHL}	Maximum Propagation Delay		14	20	25	30	ns
t_{THL}, t_{TLH}	Maximum Output Rise & Fall Time		8	15	19	22	ns
C_{PD}	Power Dissipation Capacitance	(Note 5)	20				pF
C_{IN}	Input Capacitance		5	10	10	10	pF

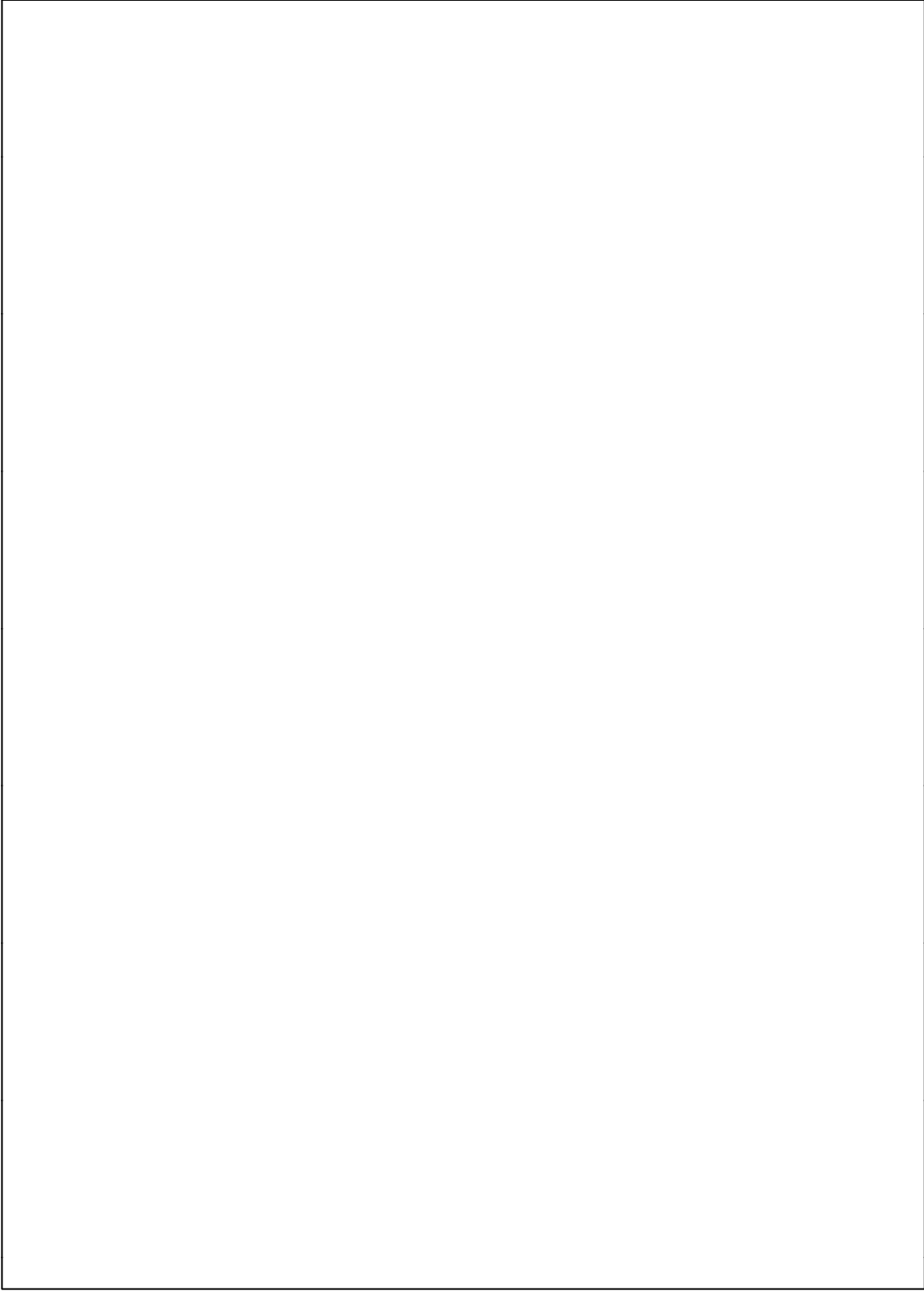
Note 1: Absolute Maximum Ratings are those values beyond which damage to the device may occur.

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

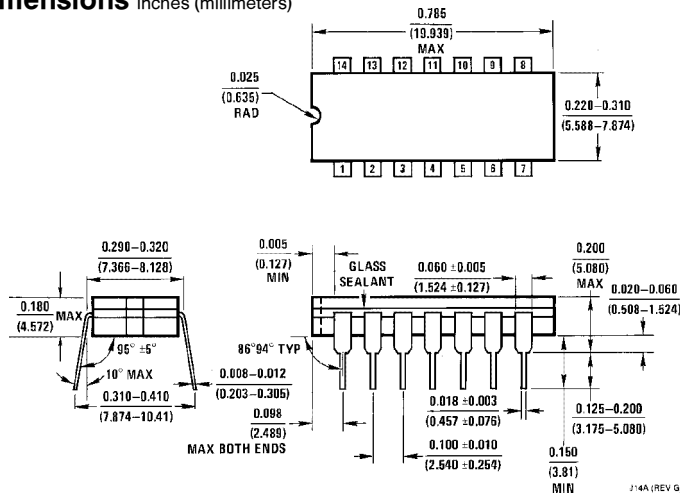
Note 3: Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C; ceramic "J" package: -12 mW/°C from 100°C to 125°C.

Note 4: This is measured per input with all other inputs held at V_{CC} or ground.

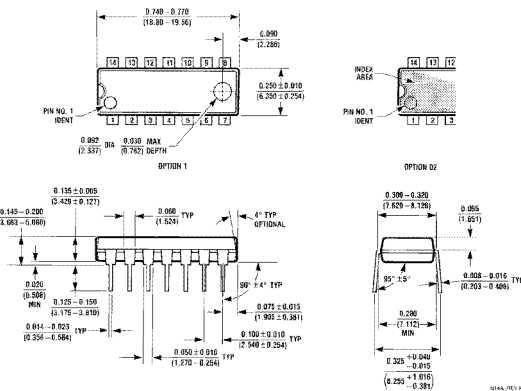
Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.



Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number MM54HCT04J or MM74HCT04J
NS Package J14A



Molded Dual-In-Line Package (N)
Order Number MM74HCT04N
NS Package N14A

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