

MM54HCT147/MM74HCT147 10-to-4 Line Priority Encoder

General Description

This priority encoder utilizes advanced silicon-gate CMOS technology. It has the high noise immunity and low power consumption typical of CMOS circuits, as well as the speeds and output drive similar to LS-TTL.

This priority encoder accepts 9 input request lines 1-9 and outputs 4 line BCD. The priority encoding ensures that only the highest order data line is encoded. The implied decimal zero condition requires no input condition as zero is encoded when all nine data lines are at a high logic level. All data inputs and outputs are active at low logic level.

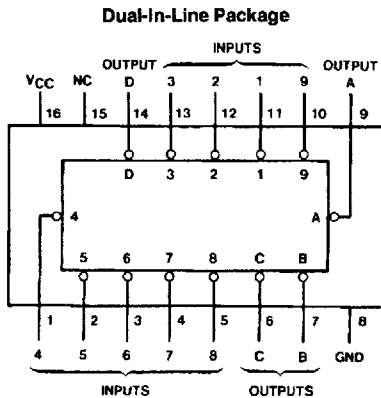
All inputs are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

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

- Low quiescent power consumption: 40 μ W maximum at 25°C
- High speed: 13 ns propagation delay (typical)
- Very low input current: 10^{-5} μ A typical

Connection and Logic Diagrams

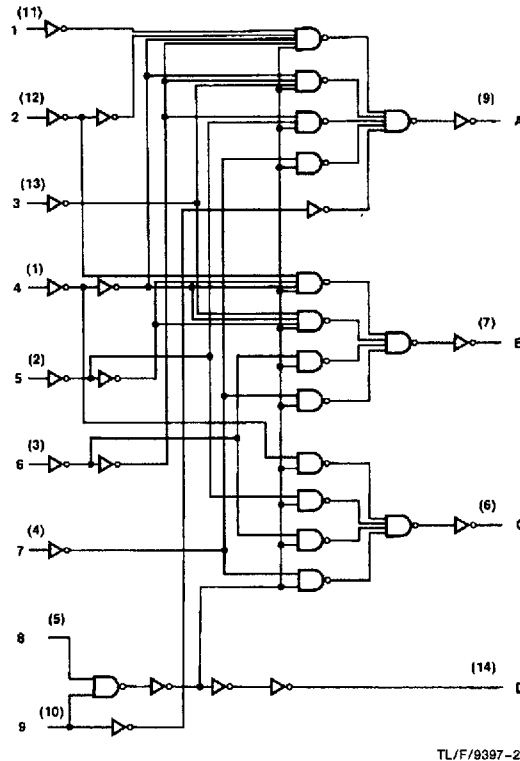


Order Number MM54HCT147 or MM74HCT147

Truth Table

Inputs									Outputs			
1	2	3	4	5	6	7	8	9	D	C	B	A
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	X	L	H	H	H	H	L	L	H
X	X	X	L	H	H	H	H	H	H	L	H	L
X	X	L	H	H	H	H	H	H	H	L	H	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

H = High Logic Level, L = Low Logic Level, X = Irrelevant



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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})	-0.5V to +7.0V
DC Input Voltage (V_{IN})	-1.5V to $V_{CC} + 1.5V$
DC Output Voltage (V_{OUT})	-0.5V to $V_{CC} + 0.5V$
Clamp Diode Current (I_{IK}, I_{OK})	± 20 mA
DC Output Current, per pin (I_{OUT})	± 35 mA
DC V_{CC} or GND Current, per pin (I_{CC})	± 75 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

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 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	$T_A = 25^\circ\text{C}$			Units	
			Typ	74HCT $T_A = -40^\circ\text{C to } +85^\circ\text{C}$	54HCT $T_A = -55^\circ\text{C to } +125^\circ\text{C}$		
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	$V_{IN} = V_{IH}$ or V_{IL} $I_{OUT} = 20 \mu\text{A}$ $I_{OUT} = 4.0 \text{ mA}, V_{CC} = 4.5\text{V}$ $I_{OUT} = 4.8 \text{ mA}, V_{CC} = 5.5\text{V}$	V_{CC}	$V_{CC} - 0.1$	$V_{CC} - 0.1$	$V_{CC} - 0.1$	V
			4.2	3.98	3.84	3.7	V
			5.7	4.98	4.84	4.7	V
V_{OL}	Maximum Low Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $I_{OUT} = 20 \mu\text{A}$ $I_{OUT} = 4.0 \text{ mA}, V_{CC} = 4.5\text{V}$ $I_{OUT} = 4.8 \text{ mA}, V_{CC} = 5.5\text{V}$	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 $I_{OUT} = 0 \mu\text{A}$		8.0	80	160	μA
			$V_{IN} = 2.4\text{V}$ or 0.5V (Note 4)	2.0	2.9	3.0	mA

AC Electrical Characteristics $V_{CC} = 5V \pm 10\%$, $C_L = 50 \text{ pF}$, $t_r = t_f = 6 \text{ ns}$ (unless otherwise specified)

Symbol	Parameter	$T_A = 25^\circ\text{C}$			Units	
		Typ	74HCT $-40^\circ\text{C to } +85^\circ\text{C}$	54HCT $-55^\circ\text{C to } +125^\circ\text{C}$		
t_{PD}	Maximum Propagation Delay		22	28	33	ns
t_r, t_f	Maximum Output Rise and Fall Time	7	11	14	17	ns
C_{PD}	Power Dissipation Capacitance (Note 5)	TBD				pF
C_{IN}	Maximum Input Capacitance	5	10	10	10	pF

AC Electrical Characteristics $V_{CC} = 5V$, $T_A = 25^\circ\text{C}$, $C_L = 15 \text{ pF}$, $t_r = t_f = 6 \text{ ns}$

Symbol	Parameter	$T_A = 25^\circ\text{C}$			Units
		Typ	74HCT $-40^\circ\text{C to } +85^\circ\text{C}$	54HCT $-55^\circ\text{C to } +125^\circ\text{C}$	
t_{PD}	Maximum Propagation Delay	11			ns

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

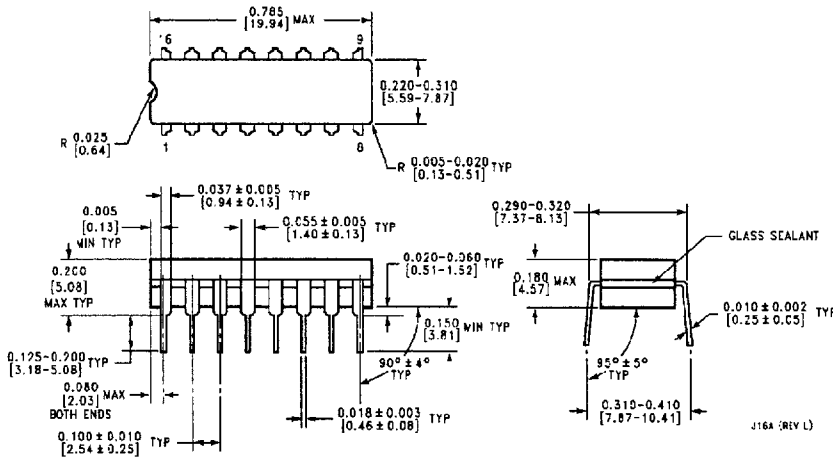
Note 2: Unless otherwise specified all voltages are referenced to ground.

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.

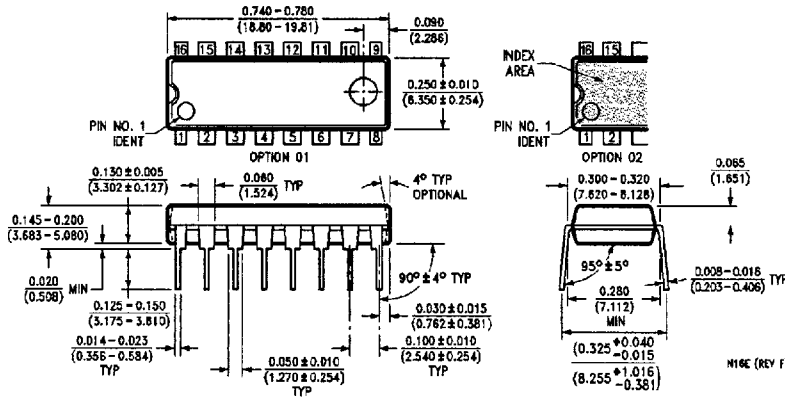
Note 4: Measured per input, other inputs held at V_{CC} or GND.

Note 5: C_{PD} determines the no load dynamic power consumption, and the no load dynamic current consumption.

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number MM54HCT147J or MM74HCT147J
NS Package Number J16A



Molded Dual-In-Line Package (N)
Order Number MM74HC147N
NS Package Number N16E

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