National Semiconductor

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MM54HC148/MM74HC148
8-3 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 LB-TTL.

This priority encoder accepts 8 input request lines 0–7 and outputs 3 lines A0–A2. The priority encoding ensures that only the highest order data line is encoded. Cascading circuitry (enable input EI and enable output EO) has been provided to allow octal expansion without the need for external circuitry. All data inputs and outputs are active at the low logic level.

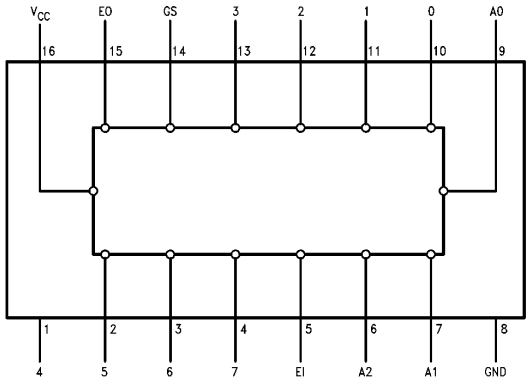
All inputs are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

Features

- Typical propagation delay: 13 ns
- Wide supply voltage range: 2V–6V

Connection Diagram

Dual-In-Line Package



TL/F/9390–1

Order Number MM54HC148 or MM74HC148

Truth Table

Inputs									Outputs				
EI	0	1	2	3	4	5	6	7	A2	A1	A0	GS	EO
H	X	X	X	X	X	X	X	X	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	X	L	H	L	L	H	L	H
L	X	X	X	X	X	L	H	H	L	H	L	L	H
L	X	X	X	X	L	H	H	H	L	H	H	L	H
L	X	X	X	L	H	H	H	H	H	L	L	L	H
L	X	X	L	H	H	H	H	H	H	L	H	L	H
L	X	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

H = High, L = Low, 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})	−0.5 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 sec.)	260°C

Operation 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)			
MM74HC	−40	+85	°C
MM54HC	−55	+125	°C
Input Rise or Fall Times (t_r, t_f) V_{CC} = 2.0V		1000	ns
V_{CC} = 4.5V		500	ns
V_{CC} = 6.0V		400	ns

DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	V_{CC}	T_A = 25°C	74HC T_A = −40 to 85°C	54HC T_A = −55 to 125°C	Units
				Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage		2.0V		1.5	1.5	1.5	V
			4.5V		3.15	3.15	3.15	V
			6.0V		4.2	4.2	4.2	V
V_{IL}	Maximum Low Level Input Voltage**		2.0V		0.5	0.5	0.5	V
			4.5V		1.35	1.35	1.35	V
			6.0V		1.8	1.8	1.8	V
V_{OH}	Minimum High Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 20\ \mu A$	2.0V	2.0	1.9	1.9	1.9	V
			4.5V	4.5	4.4	4.4	4.4	V
			6.0V	6.0	5.9	5.9	5.9	V
		V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 4.0$ mA	4.5V	4.7	3.96	3.84	3.7	V
		$\|I_{OUT}\| \leq 5.2$ mA	6.0V	5.2	5.48	5.34	5.2	V
V_{OL}	Maximum Low Level Output Voltage	V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 20\ \mu A$	2.0V	0	0.1	0.1	0.1	V
			4.5V	0	0.1	0.1	0.1	V
			6.0V	0	0.1	0.1	0.1	V
		V_{IN} = V_{IH} or V_{IL} $\|I_{OUT}\| \leq 4.0$ mA	4.5V	0.2	0.26	0.33	0.4	V
		$\|I_{OUT}\| \leq 5.2$ mA	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 μA	6.0V		8.0	80	160	μA

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: For a power supply of 5V ±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.

**V_{IL} limits are currently tested at 20% of V_{CC}. The above V_{IL} specification (30% of V_{CC}) will be implemented no later than Q1, CY'89.

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

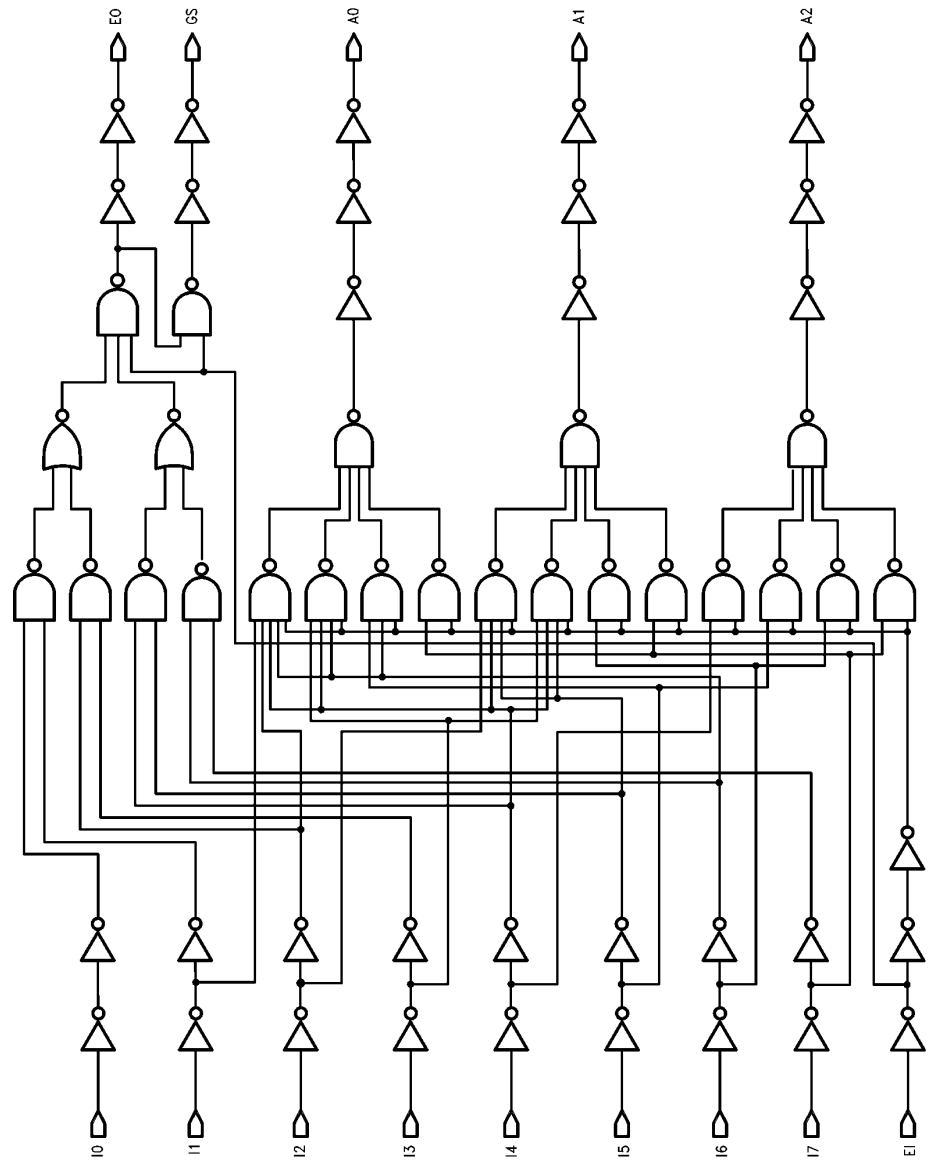
Symbol	Parameter	Conditions	Typ	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Any Input to Any Output		14	ns

AC Electrical Characteristics $V_{CC} = 2.0V$ to $6.0V$, $C_L = 50$ pF, $t_r = t_f = 6$ ns (unless otherwise specified)

Symbol	Parameter	V_{CC}	$T_A = 25°C$	74HC $-40°C$ to $+85°C$	54HC $-55°C$ to $+125°C$	Units
			Typ	Guaranteed Limits		
t_{PHL}, t_{PLH}	Inputs 0–7 to Outputs A0, A1, A2	2.0V	14	140	175	210	ns
		4.5V		28	35	42	ns
		6.0V		24	30	36	ns
t_{PHL}, t_{PLH}	Inputs 0–7 to Output EO	2.0V	15	140	175	210	ns
		4.5V		28	35	42	ns
		6.0V		24	30	36	ns
t_{PHL}, t_{PLH}	Inputs 0–7 to Output GS	2.0V	17	160	200	240	ns
		4.5V		32	40	48	ns
		6.0V		27	34	41	ns
t_{PHL}, t_{PLH}	Input EI to Outputs A0, A1, A2	2.0V	17	160	200	240	ns
		4.5V		32	40	48	ns
		6.0V		27	34	41	ns
t_{PHL}, t_{PLH}	Input EI to Output GS	2.0V	12	100	125	150	ns
		4.5V		20	25	30	ns
		6.0V		17	21	26	ns
t_{PHL}, t_{PLH}	Input EI to Output EO	2.0V	12	100	125	150	ns
		4.5V		20	25	30	ns
		6.0V		17	21	26	ns
t_f, t_r	Maximum Output Rise and Fall Time	2.0V	7	75	95	110	ns
		4.5V		15	19	22	ns
		6.0V		13	16	19	ns
C_{pd}	Power Dissipation Capacitance (Note 5)		52				pF
C_{in}	Maximum Input Capacitance		5	10	10	10	pF

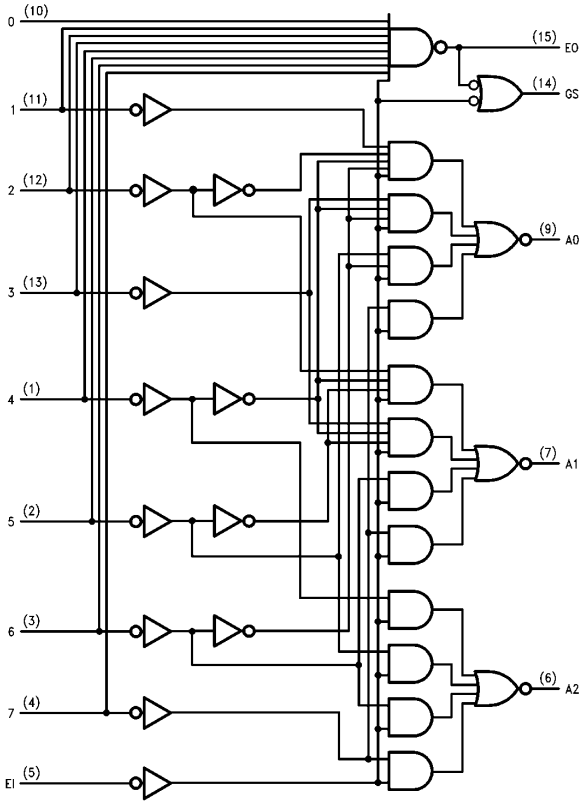
Note 5: C_{pd} determines the no load dynamic power consumption, and the no load dynamic current consumption.

HC148 Schematic for Datasheet



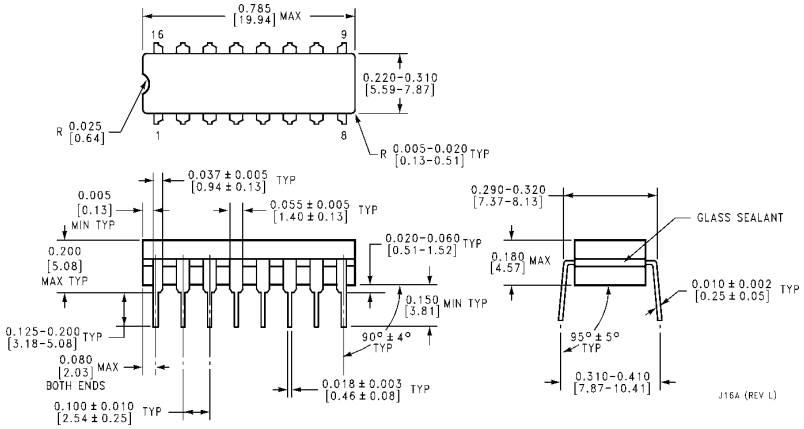
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Logic Diagram



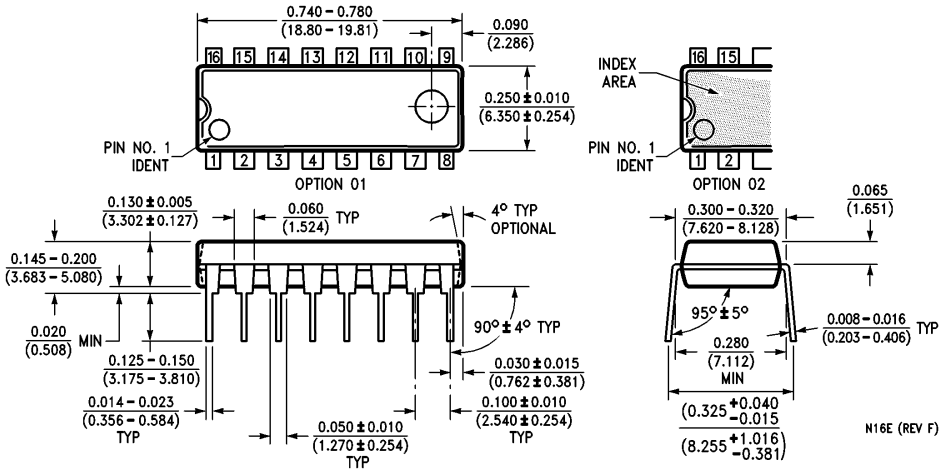
TL/F/9390–2

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number MM54HC148 or MM74HC148
NS Package Number J16A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number MM54HC148 or MM74HC148
NS Package Number N16E

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