

MM54HC149/MM74HC149 8 Line to 8 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.

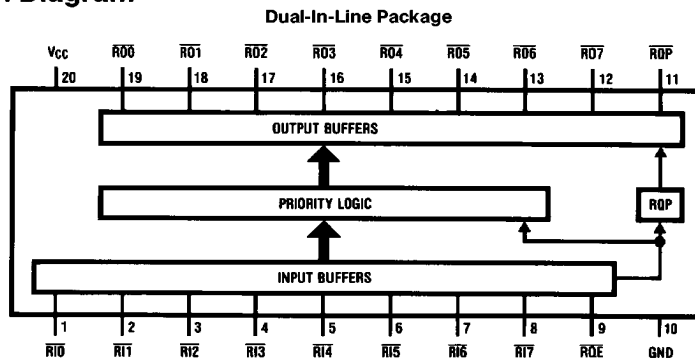
This priority encoder accepts 8 input request lines, $\overline{RI7}$ – $\overline{RI0}$, and outputs 8 lines, $\overline{RO7}$ – $\overline{RO0}$. Only one request output can be low at a time. The output that is low is dependent on the highest priority request that is low. The order of priority is $\overline{RI7}$ highest and $\overline{RI0}$ lowest. Also provided is an enable input, \overline{RQE} , which when high forces all outputs high. A request output is also provided, \overline{RQP} , which goes low when any $\overline{RI_n}$ is active.

All inputs to this device are protected from damage due to electrostatic discharge by diodes to V_{CC} and ground.

Features

- Propagation delay: 15 ns typical
- Wide power supply range: 2–6V
- Low quiescent current: 80 μ A max (74HC Series)
- Wide input noise immunity

Connection Diagram



TL/F/5312-1

Order Number MM54HC149 or MM74HC149

Truth Table

Inputs									Outputs								
0	1	2	3	4	5	6	7	RQE	0	1	2	3	4	5	6	7	RQP
X	X	X	X	X	X	X	X	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	L	L	H	H	H	H	H	H	H	L	L
X	X	X	X	X	X	L	H	L	H	H	H	H	H	H	L	H	L
X	X	X	X	L	H	H	H	L	H	H	H	H	L	H	H	H	L
X	X	X	L	H	H	H	H	L	H	H	H	L	H	H	H	H	L
X	X	L	H	H	H	H	H	L	H	H	L	H	H	H	H	H	L
X	L	H	H	H	H	H	H	L	H	L	H	H	H	H	H	H	L
L	H	H	H	H	H	H	H	L	L	H	H	H	H	H	H	H	L

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 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)			
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}	$T_A = 25^\circ C$			Units		
				Typ	74HC $T_A = -40$ to $85^\circ C$	54HC $T_A = -55$ to $125^\circ C$			
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	V		
			4.5V	4.5	4.4	4.4	V		
			6.0V	6.0	5.9	5.9	V		
		$V_{IN} = V_{IH}$ or V_{IL} $ I_{OUT} \leq 4.0$ mA $ I_{OUT} \leq 5.2$ 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	$V_{IN} = V_{IH}$ 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 $ I_{OUT} \leq 5.2$ mA	4.5V	0.2	0.26	0.33	0.4	0.4	V
			6.0V	0.2	0.26	0.33	0.4	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 $I_{OUT} = 0 \mu A$	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 $\pm 10\%$ 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.

** 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 $V_{CC} = 5V, T_A = 25^\circ C, C_L = 15$ pF, $t_r = t_f = 6$ ns (Note 6)

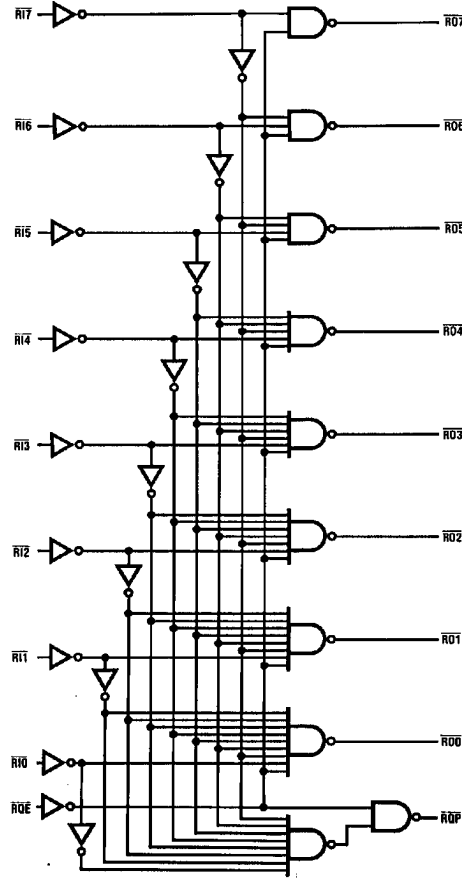
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Any Input To Any Output		20	33	ns

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	Conditions	V_{CC}	$T_A = 25^\circ C$		74HC	54HC	Units
						$T_A = -40$ to $85^\circ C$	$T_A = -55$ to $125^\circ C$	
				Typ	Guaranteed Limits			
t_{PHL}, t_{PLH}	Maximum Propagation Delay Any Input To Any Output		2.0V	73	205	255	310	ns
			4.5V	25	41	51	62	ns
			6.0V	21	35	43	53	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)			50				pF
C_{IN}	Maximum Input Capacitance			7	10	10	10	pF

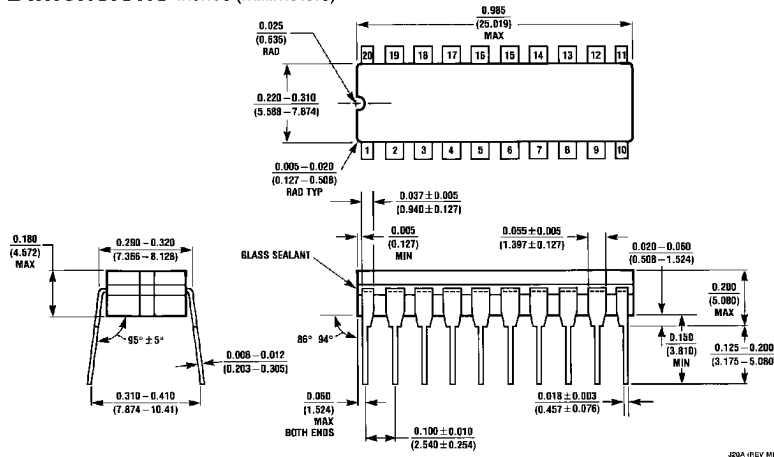
Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Simplified Logic Diagram

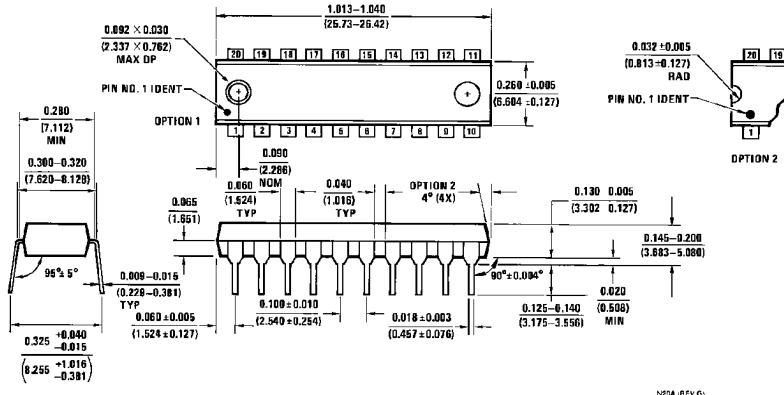


TL/F/5312-2

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number MM54HC149J or MM74HC149J
NS Package J20A



Molded Dual-In-Line Package (N)
Order Number MM74HC149N
NS Package N20A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: cnjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 13th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2406

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.