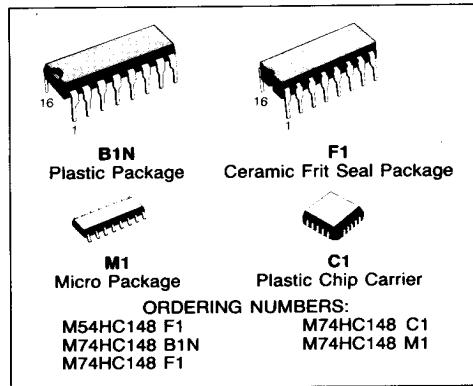




## 8-TO-3 LINE PRIORITY ENCODER

- HIGH SPEED  
 $t_{PD} = 16 \text{ ns (TYP.)}$  at  $V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION  
 $I_{CC} = 4 \mu\text{A}$  (MAX.) at  $T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28\%$   $V_{CC}$  (MIN.)
- OUTPUT DRIVE CAPABILITY  
10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE  
 $|I_{OH}| = |I_{OL}| = 4 \text{ mA}$  (MIN.)
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE  
WITH 54/74LS148

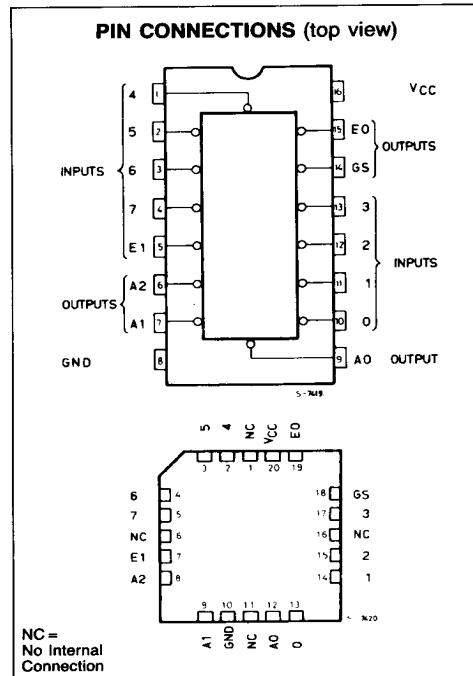


### DESCRIPTION

The M54/74HC148 is a high speed CMOS 8-TO-3 LINE PRIORITY ENCODER fabricated in silicon gate C<sub>2</sub>MOS technology.

It has the same high speed performance of LSTTL combined with true CMOS low power consumption. The M54/74HC148 encodes eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input E1 and enable output EO) has been provided to allow octal expansion without the need for external circuitry. Data inputs and outputs are active at the low logic level.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

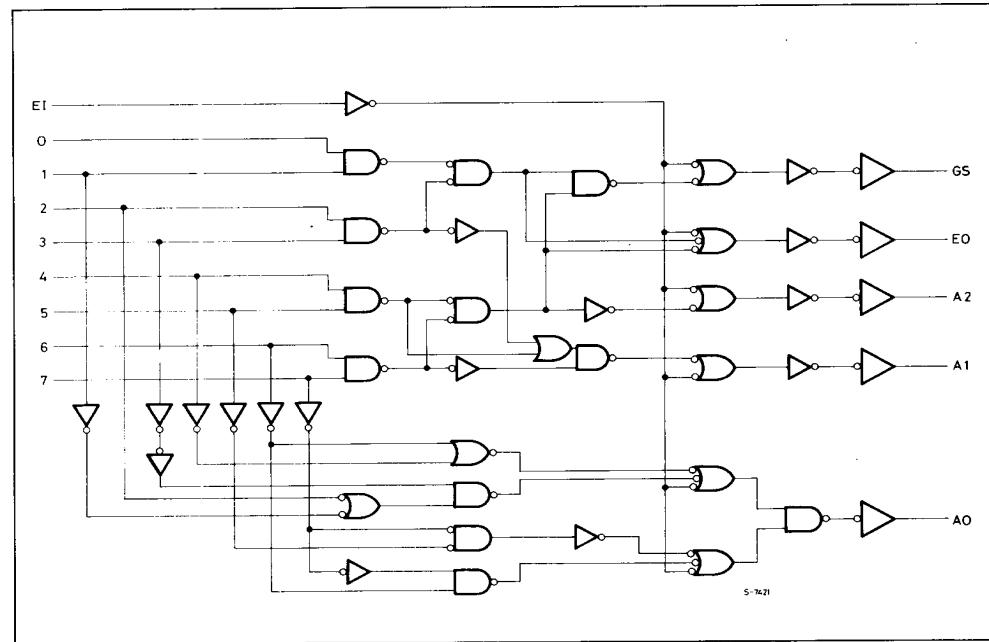


## TRUTH TABLE

INPUT									OUTPUT				
E1	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	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

X: DON'T CARE

## LOGIC DIAGRAM



**ABSOLUTE MAXIMUM RATINGS**

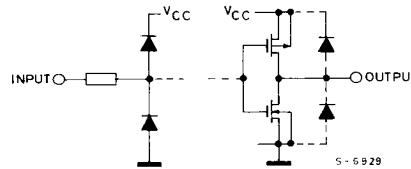
Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to 7	V
$V_I$	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
$V_O$	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Source Sink Current Per Output Pin	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	mA
$P_D$	Power Dissipation	500 (*)	mW
$T_{STG}$	Storage Temperature	-65 to 150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(\*) 500 mW:  $\equiv 65^{\circ}\text{C}$  derate to 300 mW by 10 mW/°C:  $65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	2 to 6	V
$V_I$	Input Voltage	0 to $V_{CC}$	V
$V_O$	Output Voltage	0 to $V_{CC}$	V
$T_A$	Operating Temperature 74HC Series 54HC Series	-40 to 85 -55 to 125	°C
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} \left\{ \begin{array}{ll} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5\text{V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{array} \right.$	ns

**INPUT AND OUTPUT EQUIVALENT CIRCUIT**

## DC SPECIFICATIONS

Symbol	Parameter	V <sub>CC</sub>	Test Condition	T <sub>A</sub> = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V <sub>IH</sub>	High Level Input Voltage	2.0 4.5 6.0		1.5 3.15 4.2	— — —	— — —	1.5 3.15 4.2	— — —	1.5 3.15 4.2	— — —	V
V <sub>IL</sub>	Low Level Input Voltage	2.0 4.5 6.0		— — —	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	V
V <sub>OH</sub>	High Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V <sub>I</sub>	I <sub>O</sub>	1.9 4.4 5.9	2.0 4.5 6.0	— — —	1.9 4.4 5.9	— — —	1.9 4.4 5.9	— — —
			V <sub>IH</sub> or V <sub>IL</sub>	- 20 μA - 4.0 mA - 5.2 mA	4.18 5.68	4.31 5.8	— —	4.13 5.63	— —	4.10 5.60	— —
V <sub>OL</sub>	Low Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V <sub>IH</sub> or V <sub>IL</sub>	20 μA	— — —	0 0 0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	— — —	0.1 0.1 0.1
				4.0 mA 5.2 mA	— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	— —	0.40 0.40
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND		— — —	— — —	± 0.1	— — —	± 1	— — —	± 1
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND		— —	— —	4	— —	40	— —	80
											μA

AC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C, C<sub>L</sub> = 15pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time		4	8	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (IN - A0, A1, A2)		16	25	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (IN - EO, GS)		18	28	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (E1 - EO)		12	20	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (E1 - GS)		12	19	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (E1 - A0, A1, A2)		13	21	ns

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$ )

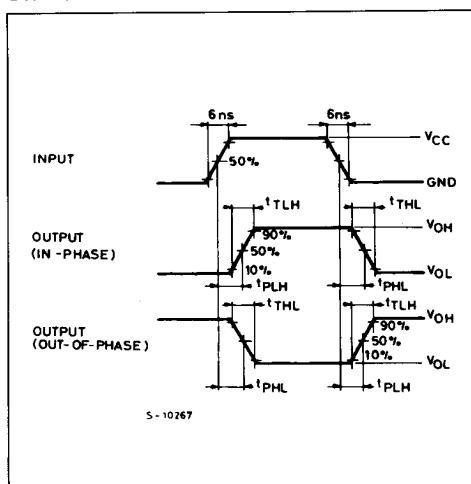
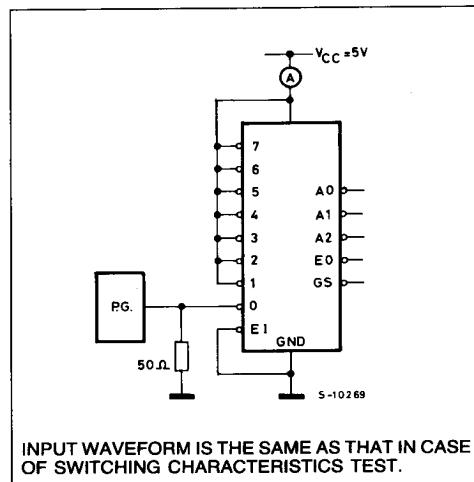
Symbol	Parameter	$V_{CC}$	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			- 40 to $85^\circ\text{C}$ 74HC		- 55 to $125^\circ\text{C}$ 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
$t_{TLH}$	Output Transition Time	2.0 4.5 6.0		—	30 8 7	75 15 13	—	95 19 16	—	110 22 19	ns
$t_{PLH}$	Propagation Delay Time (IN A0, A1, A2)	2.0 4.5 6.0		—	76 19 16	150 30 26	—	190 38 33	—	225 45 38	ns
$t_{PLH}$	Propagation Delay Time (IN, E0, GS)	2.0 4.5 6.0		—	84 21 18	165 33 28	—	205 41 35	—	250 50 43	ns
$t_{PL}$ $t_{PHL}$	Propagation Delay Time (IN, E1, E0)	2.0 4.5 6.0		—	60 15 13	120 24 20	—	150 30 26	—	180 36 31	ns
$t_{PLH}$	Propagation Delay Time (IN, E1, GS)	2.0 4.5 6.0		—	56 14 12	115 23 20	—	145 29 25	—	175 35 30	ns
$t_{PLH}$	Propagation Delay Time (IN E1, A0, A1, A2)	2.0 4.5 6.0		—	64 16 14	125 25 21	—	155 31 26	—	190 38 32	ns
$C_{IN}$	Input Capacitance			—	5	10	—	10	—	10	pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	57	—	—	—	—	—	pF

Note (\*)  $C_{PD}$  is defined as the value the IC's of internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit).

Average operating current can be obtained by the following equation.

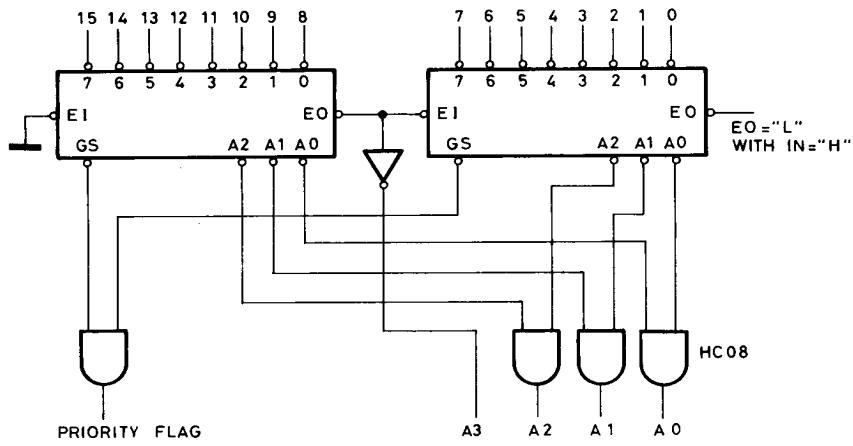
$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

## SWITCHING CHARACTERISTICS TEST CIRCUIT

TEST CIRCUIT  $I_{CC}$  (Opr.)

## TYPICAL APPLICATION

## 4-BIT CASCADE CONNECTION



S-10270