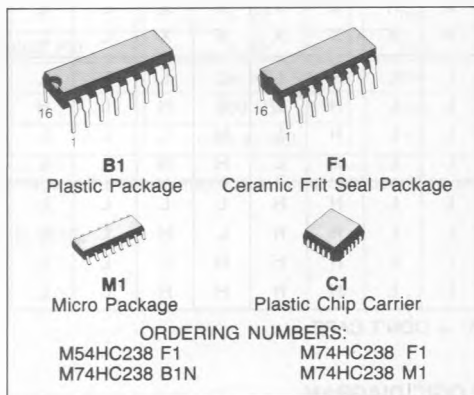
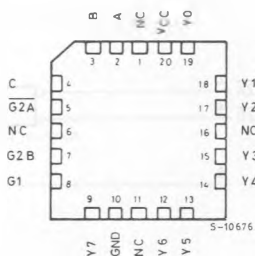
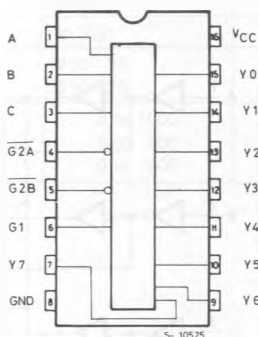


3 TO 8 LINE DECODER

- **HIGH SPEED**
 $t_{PD} = 18 \text{ ns (TYP.) at } V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu A \text{ (MAX.) at } T_A = 25^\circ C$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- **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**
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS238



PIN CONNECTIONS (top view)



DESCRIPTION

The M54/74HC238 is a high speed CMOS 3 to 8 line decoder fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. If the device is enabled, 3 binary select inputs (A, B and C) determine which one of outputs will go high. Enable input G1 is held "Low" or either G2A or G2B is held "High" decoding function is inhibited and all the 8 outputs go low. Three enable inputs are provided to ease cascade connection and application of this address decoder in memory systems.

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

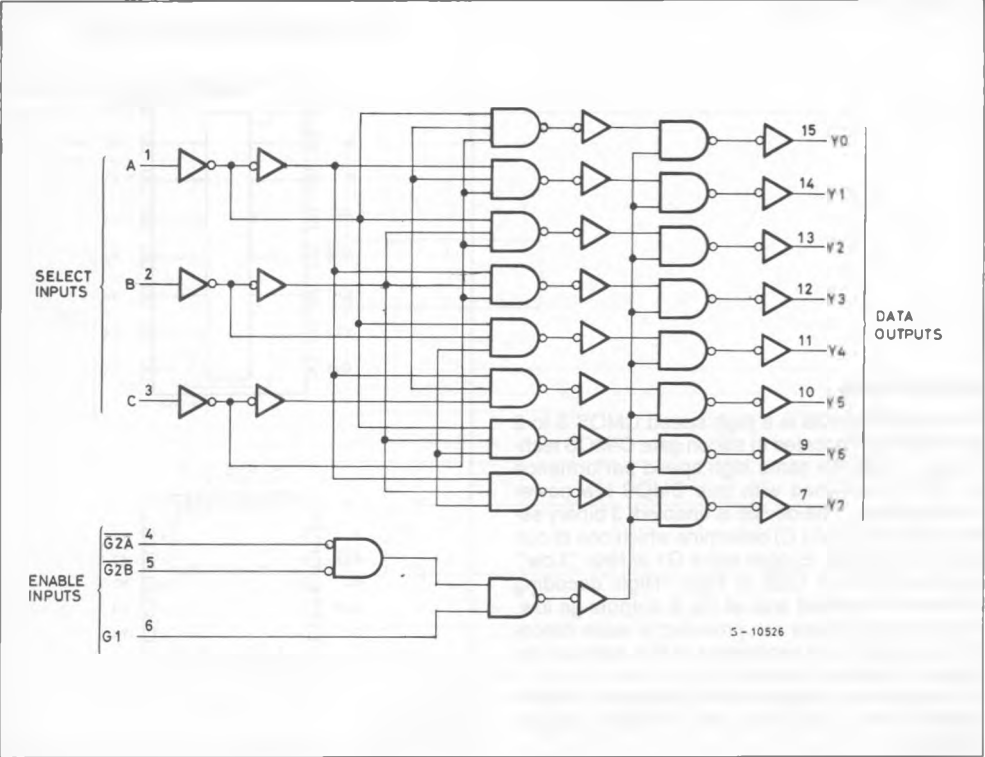
NC =
No Internal
Connection

TRUTH TABLE

INPUTS						OUTPUTS								SELECTED OUTPUT
ENABLE			SELECT			Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	
G2B	G2A	G1	C	B	A									
X	X	L	X	X	X	L	L	L	L	L	L	L	L	NONE
X	H	X	X	X	X	L	L	L	L	L	L	L	L	NONE
H	X	X	X	X	X	L	L	L	L	L	L	L	L	NONE
L	L	H	L	L	L	H	L	L	L	L	L	L	L	Y0
L	L	H	L	L	H	L	H	L	L	L	L	L	L	Y1
L	L	H	L	H	L	L	L	H	L	L	L	L	L	Y2
L	L	H	L	H	H	L	L	L	H	L	L	L	L	Y3
L	L	H	H	L	L	L	L	L	L	H	L	L	L	Y4
L	L	H	H	L	H	L	L	L	L	L	H	L	L	Y5
L	L	H	H	H	L	L	L	L	L	L	L	H	L	Y6
L	L	H	H	H	H	L	L	L	L	L	L	L	H	Y7

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	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	- 65 to 150	°C

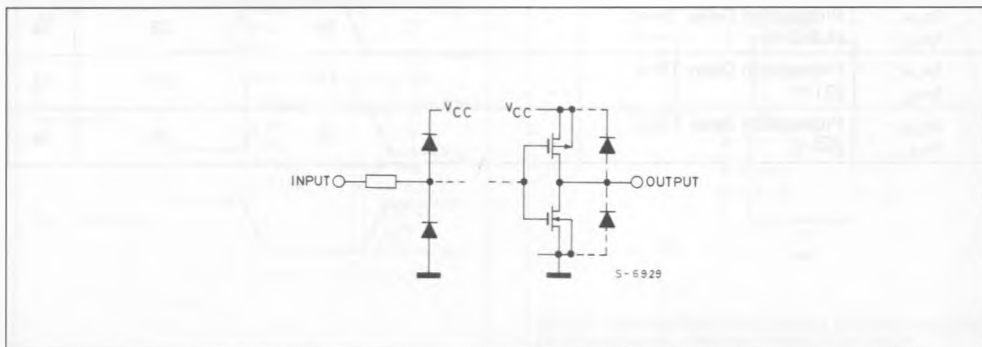
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW = 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°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	$V_{CC} \begin{cases} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5 \text{ V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{cases}$	ns

INPUT AND OUTPUT EQUIVALENT CIRCUIT



DC SPECIFICATIONS

Symbol	Parameter	V _{CC}	Test Condition	T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V _{IH}	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 _{IL}	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 _{OH}	High Level Output Voltage	2.0	V _I	I _O	1.9	2.0	—	1.9	—	1.9	V
		4.5	V _{IH} or V _{IL}	- 20 µA	4.4	4.5	—	4.4	—	4.4	
		6.0			5.9	6.0	—	5.9	—	5.9	
		4.5 6.0		- 4.0 mA - 5.2 mA	4.18 5.68	4.31 5.8	— —	4.13 5.63	— —	4.10 5.60	
V _{OL}	Low Level Output Voltage	2.0	V _{IH} or V _{IL}	20 µA	—	0.0	0.1	—	0.1	—	V
		4.5			—	0.0	0.1	—	0.1	—	
		6.0			—	0.0	0.1	—	0.1	—	
		4.5 6.0		4.0 mA 5.2 mA	— —	0.17 0.18	0.26 0.26	— —	0.33 0.33	— —	
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND		—	—	± 0.1	—	± 1.0	—	µA
I _{CC}	Quiescent Supply Current	6.0	V _I = V _{CC} or GND		—	—	4	—	40	—	80 µA

AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, T_A = 25°C, C_L = 15pF, Input t_r = t_f = 6ns)

Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t _{TLH} t _{THL}	Output Transition Time		4	8	ns
t _{PLH} t _{PHL}	Propagation Delay Time (A,B,C-Y)		18	28	ns
t _{PLH} t _{PHL}	Propagation Delay Time (G1-Y)		17	27	ns
t _{PLH} t _{PHL}	Propagation delay Time (G2-Y)		19	29	ns

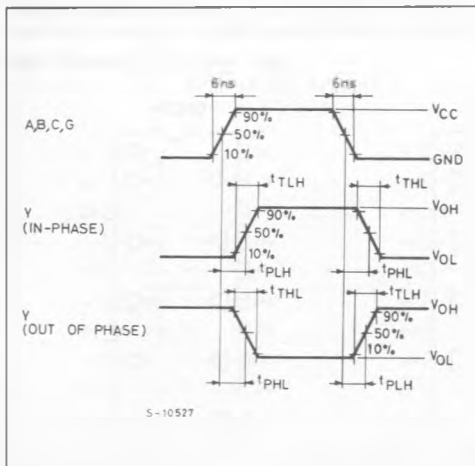
AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40\text{ to }85^\circ\text{C}$ 74HC		$-55\text{ to }125^\circ\text{C}$ 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	30 8 7	75 15 13	— — —	95 19 16	— — —	110 22 19	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A,B,C-Y)	2.0 4.5 6.0		— — —	84 21 18	165 33 28	— — —	205 41 35	— — —	250 50 43	ns
t_{PLH} t_{PHL}	Propagation Delay Time (G1-Y)	2.0 4.5 6.0		— — —	80 20 17	155 31 26	— — —	195 39 33	— — —	235 47 40	ns
t_{PLH} t_{PHL}	Propagation Delay Time (G2-Y)	2.0 4.5 6.0		— — —	88 22 19	170 34 29	— — —	215 43 37	— — —	255 51 43	ns
C_{IN}	Input Capacitance			—	5	10	—	10	—	10	pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	67	—	—	—	—	—	pF

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

Average operating current can be obtained from the equation: $I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

SWITCHING CHARACTERISTICS TEST WAVEFORM

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