

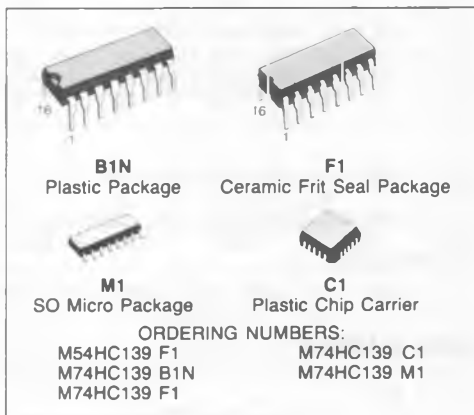
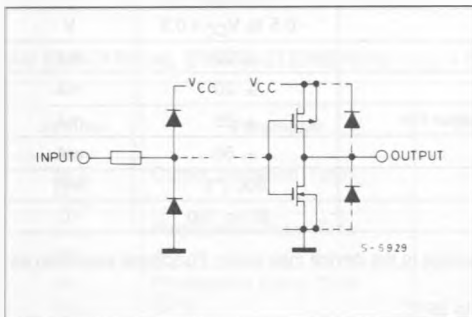
DUAL 2-TO-4 LINE DECODER/DEMULTIPLEXER

- **HIGH SPEED**
 $t_{PD} = 16 \text{ ns (TYP.)}$ at $V_{CC} = 5V$
- **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 54/74LS139

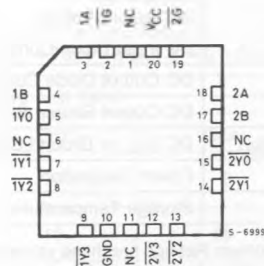
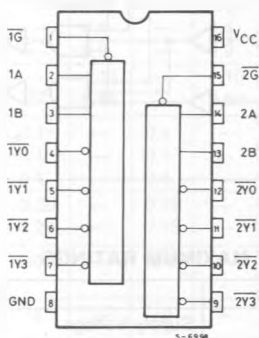
DESCRIPTION

The M54/74HC139 is a high speed CMOS DUAL TWO LINE TO FOUR LINE DECODER/DEMULTIPLEXER fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. The active low enable input can be used for gating or as a data input for demultiplexing applications. While the enable input is held high, all four outputs are high independently of the other inputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN CONNECTIONS (top view)



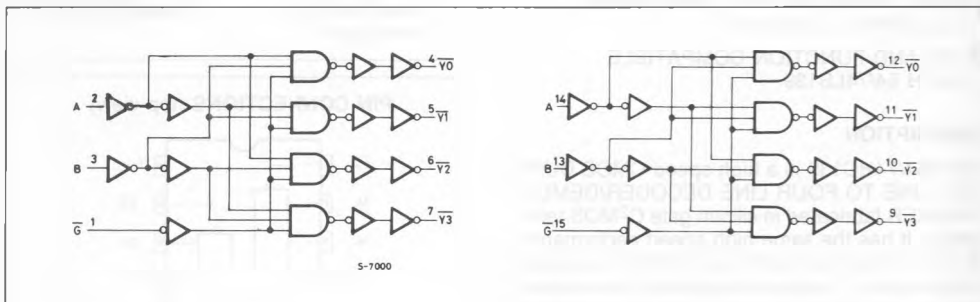
NC =
No Internal
Connection

TRUTH TABLE

INPUTS			OUTPUTS				SELECTED OUTPUT
ENABLE	SELECT		$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	
\overline{G}	B	A					
H	X	X	H	H	H	H	NONE
L	L	L	L	H	H	H	$\overline{Y0}$
L	L	H	H	L	H	H	$\overline{Y1}$
L	H	L	H	H	L	H	$\overline{Y2}$
L	H	H	H	H	H	L	$\overline{Y3}$

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	$^{\circ}C$

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

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

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

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 4.5 6.0	V _I	I _O	1.9	2.0	—	1.9	—	1.9	—	V		
			V _{IH} or V _{IL}	- 20 μA	4.4	4.5	—	4.4	—	4.4	—		4.4	—
				- 4.0 mA	4.18	4.31	—	4.13	—	4.10	—		—	—
				- 5.2 mA	5.68	5.8	—	5.63	—	5.60	—		—	—
V _{OL}	Low Level Output Voltage	2.0 4.5 6.0	V _{IH} or V _{IL}	20 μA	—	0	0.1	—	0.1	—	0.1	V		
				—	—	0	0.1	—	0.1	—	0.1		—	
				—	—	0	0.1	—	0.1	—	0.1		—	
				4.0 mA	—	0.17	0.26	—	0.33	—	0.40		—	
—	—	—	0.18	0.26	—	0.33	—	0.40	—	—				
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND	—	—	±0.1	—	±1	—	±1	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		16	26	ns
t _{PLH} t _{PHL}	Propagation Delay Time (G-Y)		14	23	ns

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

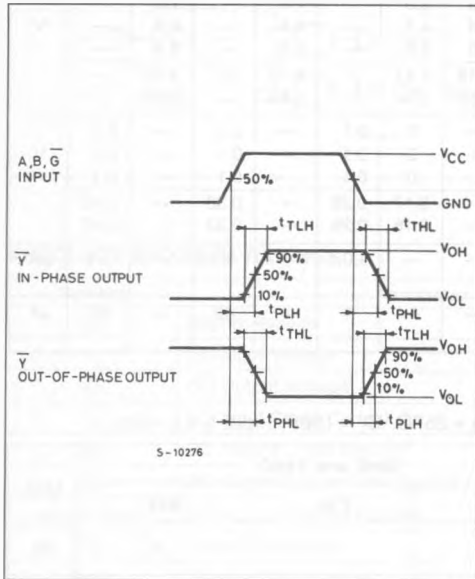
Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			-40 to 85°C 74HC		-55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} T_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	30 8 7	75 15 13	— — —	95 19 16	— — —	110 22 19	ns
t_{PLH} t_{PHL}	Propagation Delay Time A, B-Y	2.0 4.5 6.0		— — —	76 19 17	150 30 26	— — —	190 38 33	— — —	225 45 38	ns
t_{PLH} t_{PHL}	Propagation Delay Time G-Y	2.0 4.5 6.0		— — —	68 17 15	135 27 23	— — —	170 34 29	— — —	205 41 35	ns
C_{IN}	Input Capacitance			—	5	10	—	10	—		pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	49	—	—	—	—	—	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)

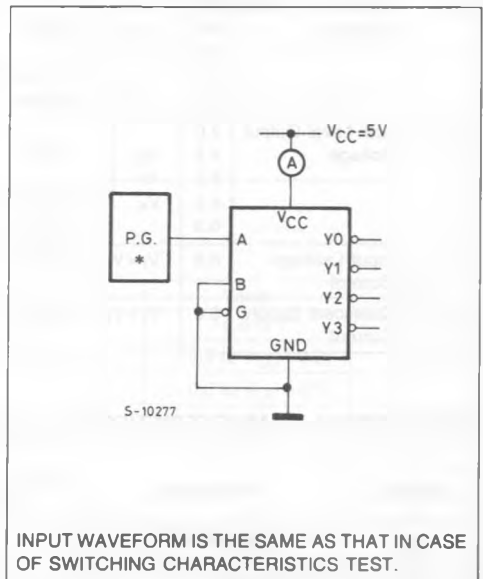
Average operating current can be obtained by the following equation.

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

SWITCHING CHARACTERISTICS TEST CIRCUIT



TEST CIRCUIT I_{CC} (Opr.)



INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST.