

HC157 QUAD 2-CHANNEL MULTIPLEXER HC158 QUAD 2-CHANNEL MULTIPLEXER (INV.)

- **HIGH SPEED**
 $t_{PD} = 10 \text{ ns}$ (TYP.) at $V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu A$ (MAX.) at $T_A = 25^\circ C$
- **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 54/74LS157/158

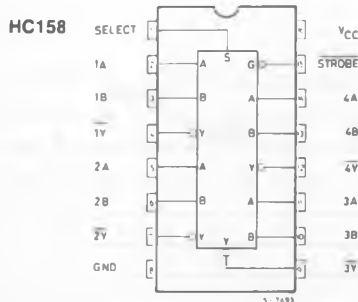
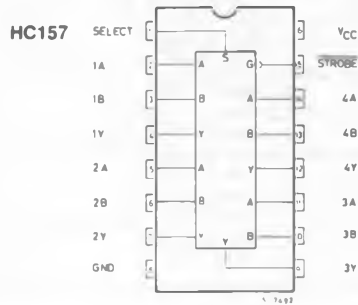


DESCRIPTION

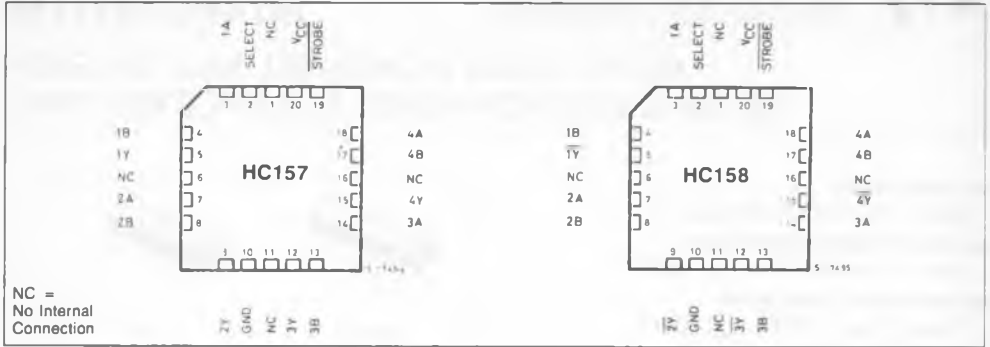
The M54/74HC157 and the M54/74HC158 are high speed CMOS QUAD 2-CHANNEL MULTIPLEXER's fabricated with silicon gate C²MOS technology. They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

These devices consist of four 2-input digital multiplexers with common select and strobe inputs. The HC158 is an inverting multiplexer while the HC157 is a non-inverting multiplexer. When the STROBE input is held High, selection of data is inhibited and all the outputs become Low in the M74HC157 and High in the M74HC158. The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

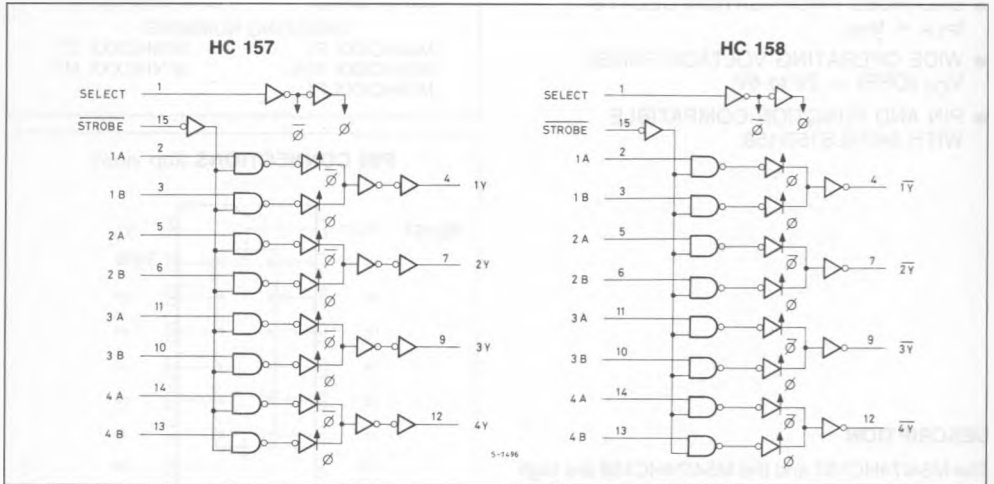
PIN CONNECTIONS (top view)



CHIP CARRIER



LOGIC DIAGRAM



TRUTH TABLE

INPUTS				OUTPUTS	
STROBE	SELECT	A	B	Y (157)	Y-bar (158)
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

X: DON'T CARE

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	$^{\circ}C$

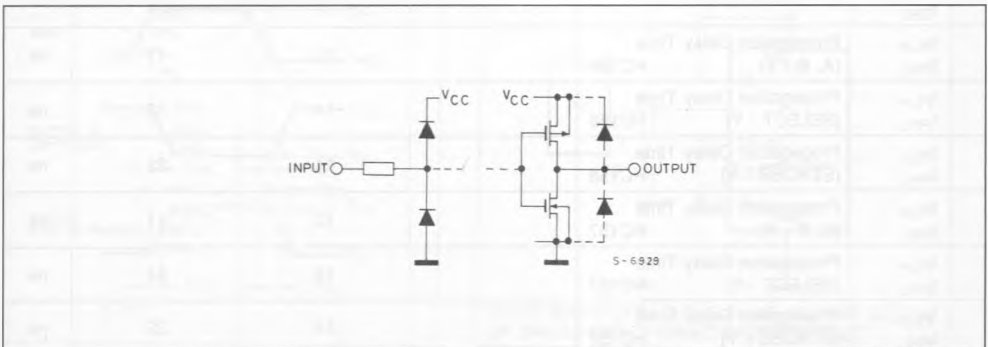
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 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	$^{\circ}C$
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		1.5	—	—	1.5	—	1.5	—	V							
		4.5		3.15	—	—	3.15	—	3.15	—								
		6.0		4.2	—	—	4.2	—	4.2	—								
V _{IL}	Low Level Input Voltage	2.0		—	—	0.5	—	0.5	—	0.5	V							
		4.5		—	—	1.35	—	1.35	—	1.35								
		6.0		—	—	1.8	—	1.8	—	1.8								
V _{OH}	High Level Output Voltage	2.0	V _I	I _O														
		4.5	V _{IH}	-20 μA								1.9	2.0	—	1.9	—	1.9	—
		6.0	or									4.4	4.5	—	4.4	—	4.4	—
		6.0	V _{IL}	-4.0 mA								5.9	6.0	—	5.9	—	5.9	—
4.5		-5.2 mA	4.18	4.31	—	4.13	—	4.10	—									
6.0			5.68	5.8	—	5.63	—	5.60	—									
V _{OL}	Low Level Output Voltage	2.0	V _{IH} or V _{IL}	20 μA														
		4.5										—	0	0.1	—	0.1	—	0.1
		6.0										—	0	0.1	—	0.1	—	0.1
		6.0										—	0	0.1	—	0.1	—	0.1
4.5		4.0 mA	—	0.17	0.26	—	0.33	—	0.40									
6.0		5.2 mA	—	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 I _O = C		—	—	4	—	40	—	80	μA						

* Applicable only to DIR, G, \bar{G} inputAC 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 - \bar{Y}) HC158		10	17	ns
t _{PLH} t _{PHL}	Propagation Delay Time (SELECT - \bar{Y}) HC158		14	22	ns
t _{PLH} t _{PHL}	Propagation Delay Time (STROBE - \bar{Y}) HC158		14	22	ns
t _{PLH} t _{PHL}	Propagation Delay Time (A, B - Y) HC157		10	17	ns
t _{PLH} t _{PHL}	Propagation Delay Time (SELECT - Y) HC157		15	24	ns
t _{PLH} t _{PHL}	Propagation Delay Time (STROBE - Y) HC157		14	22	ns

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

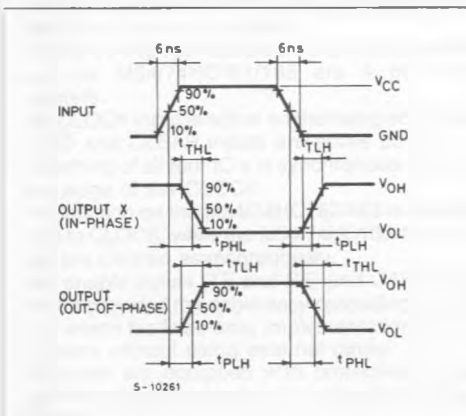
Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			-40 to 85°C 74HC		-55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} T_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	30 8 7	75 15 13	— — —	95 19 16	— — —	110 22 19	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B - Y) HC157	2.0 4.5 6.0		— — —	52 13 11	105 21 18	— — —	130 26 22	— — —	160 32 27	ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT-Y) HC157	2.0 4.5 6.0		— — —	72 18 15	140 28 24	— — —	175 35 30	— — —	210 42 36	ns
t_{PLH} t_{PHL}	Propagation Delay Time (STROBE-Y) HC157	2.0 4.5 6.0		— — —	68 17 14	135 27 23	— — —	170 34 29	— — —	205 41 35	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B - \bar{Y}) HC158	2.0 4.5 6.0		— — —	46 12 10	100 20 17	— — —	125 25 21	— — —	150 30 26	ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT- \bar{Y}) HC158	2.0 4.5 6.0		— — —	68 17 14	135 27 23	— — —	170 34 29	— — —	205 41 35	ns
t_{PLH} t_{PHL}	Propagation Delay Time (STROBE- \bar{Y}) HC158	2.0 4.5 6.0		— — —	64 16 14	130 26 22	— — —	165 33 28	— — —	195 39 33	ns
C_{IN}	Input Capacitance			—	6	10	—	10	—	—	pF
$C_{PD} (*)$	Power Dissipation Capacitance		HC157	—	53	—	—	—	—	—	pF
			HC158	—	51	—	—	—	—	—	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.

Average operating current can be obtained by the following equation hereunder.

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per Channel)}$$

SWITCHING CHARACTERISTICS TEST CIRCUIT

TEST CIRCUIT I_{CC} (Opr.)