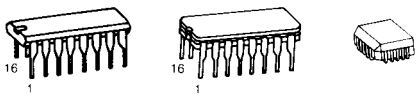
HS-C²MOS™ INTEGRATED CIRCUITS

PRELIMINARY DATA

M54/74HC157 QUAD 2-CHANNEL MULTIPLEXER
M54/74HC158 QUAD 2-CHANNEL MULTIPLEXER (INV.)



B1 Plastic Package | **F1** Ceramic Package | **C1** Chip Carrier

ORDERING NUMBERS: M54HCXXX F1
M74HCXXX B1
M74HCXXX F1
M74HCXXX C1

DESCRIPTION

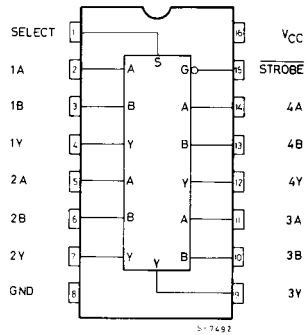
The M54/74HC157 and the M54/74HC158 are high speed CMOS QUAD 2-CHANNEL MULTIPLEXER's fabricated with silicon gate C²MOS technology. They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.
These devices consist of four 2-input digital multiplexers with common select and strobe inputs. The HC158 is an inverting multiplexer while the HC157 is a non-inverting multiplexer. When the $\overline{\text{STROBE}}$ input is held "H" level, selection of data in inhibited and all the outputs become "L" level in case of 157 and all the outputs become "H" level in case of 158. 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 or transient excess voltage.

FEATURES

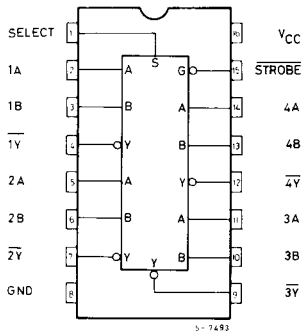
- High Speed
  t_{PD} = 12 ns (Typ.) at V_{CC} = 5V
- Low Power Dissipation
  I_{CC} = 4 μA (Max.) at T_A = 25°C
- High Noise Immunity
  $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Output Drive Capability
  10 LSTTL Loads
- Symmetrical Output Impedance
  $|I_{OH}| = I_{OL}$ = 4 mA (Min.)
- Balanced Propagation Delays
  $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range
  V_{CC} (opr) = 2V to 6V
- Pin and Function compatible with 54/74LS157/158

PIN CONNECTIONS
(top view)

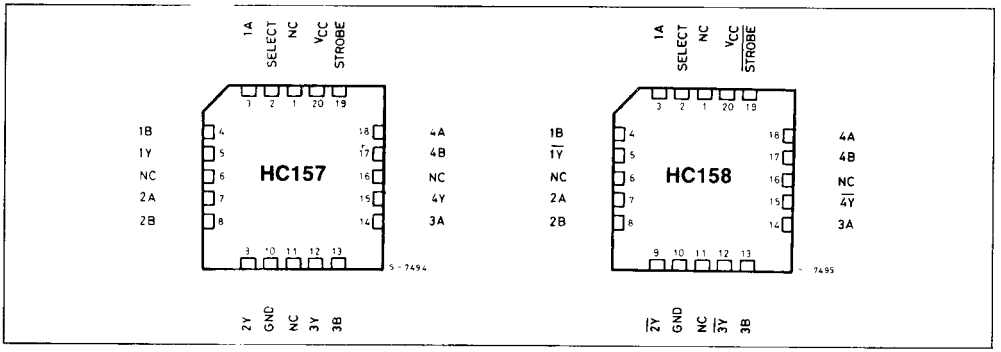
HC157



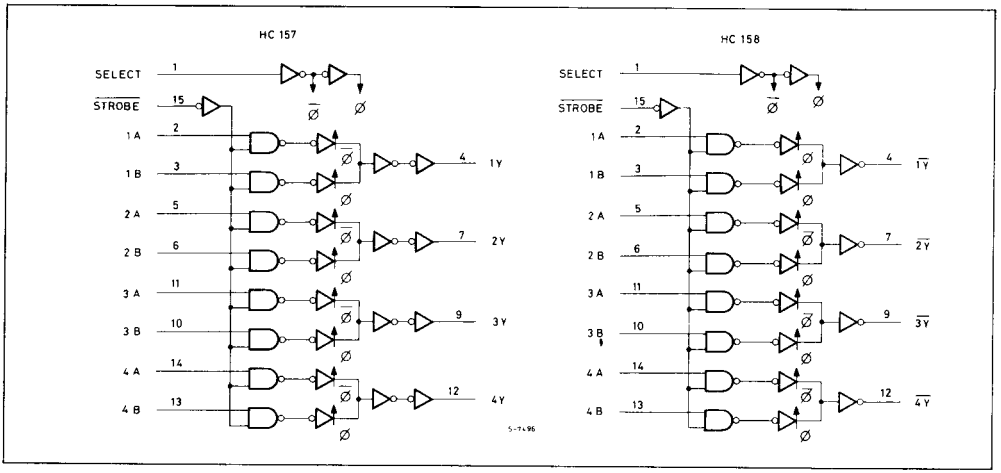
HC158



CHIP CARRIER



LOGIC DIAGRAM



TRUTH TABLE

INPUTS				OUTPUTS	
$\overline{\text{STROBE}}$	SELECT	A	B	Y (157)	$\overline{\text{Y}}$ (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	°C

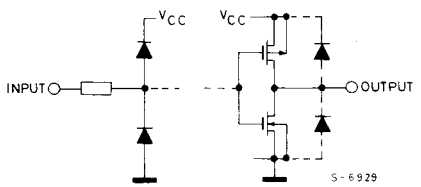
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: ≅ 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°C.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Limit		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} = 2 V	0 to 1000		ns
		V_{CC} = 4.5V	0 to 500		
		V_{CC} = 6 V	0 to 400		

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	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		-4.0 mA	4.18	4.31	—	4.13	—	4.10		
		6.0		-5.2 mA	5.68	5.8	—	5.63	—	5.60		
V_{OL}	Low Level Output Voltage	2.0			—	0	0.1	—	0.1		0.1	V
		4.5	V_{IH} or V_{IL}	20 μA	—	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 = 0		—	—	4	—	40		80	μA

* Applicable only to DIR, G, $\overline{G}$ input

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 - $\overline{Y}$) HC158		11	18	ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT - $\overline{Y}$) HC158		15	24	ns
t_{PLH} t_{PHL}	Propagation Delay Time ($\overline{STROBE}$ - $\overline{Y}$) HC158		14	23	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B - Y) HC157		12	20	ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT - Y) HC157		17	27	ns
t_{PLH} t_{PHL}	Propagation Delay Time ($\overline{STROBE}$ - Y) HC157		16	26	ns

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, Input $t_r = t_f$ = 6ns)

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.	
t_{TLH} t_{THL}	Output Transition Time	2.0 4.5 6.0		— — —	28 8 7	75 15 13	— — —	90 18 16			ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B - Y) HC 157	2.0 4.5 6.0		— — —	49 15 13	125 25 21	— — —	150 30 26			ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT - Y) HC157	2.0 4.5 6.0		— — —	70 20 17	150 30 26	— — —	180 36 32			ns
t_{PLH} t_{PHL}	Propagatin Delay Time ($\overline{STROBE}$-Y) HC 158	2.0 4.5 6.0		— — —	62 19 16	145 29 25	— — —	175 35 33			ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B - $\overline{Y}$) HC 158	2.0 4.5 6.0		— — —	42 13 11	110 22 19	— — —	135 27 23			ns
t_{PLH} t_{PHL}	Propagation Delay Time (SELECT - $\overline{Y}$) HC158	2.0 4.5 6.0		— — —	58 18 16	140 28 25	— — —	170 34 30			ns
t_{PLH} t_{PHL}	Propagation Delay Time ($\overline{STROBE}$-$\overline{Y}$) HC158	2.0 4.5 6.0		— — —	56 17 15	135 27 24	— — —	165 33 31	— —		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.
$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4$ (per Channel).