

# MM54HCT157/MM74HCT157 Quad 2-Input Multiplexer MM54HCT158/MM74HCT158 Quad 2-Input Multiplexer (Inverted Output)

## General Description

These high speed QUAD 2-to-1 line data selector/multiplexers utilize advanced silicon-gate CMOS technology. They possess the high noise immunity and low power consumption of standard CMOS integrated circuits, as well as the ability to drive 10 LS-TTL loads.

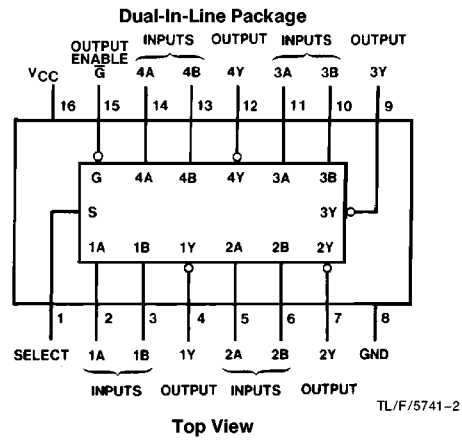
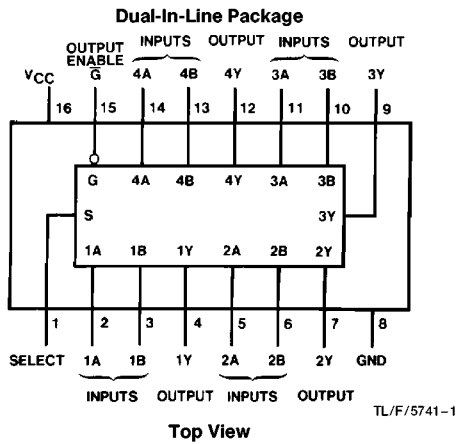
These devices each consist of four 2-input digital multiplexers with common select and OUTPUT ENABLE inputs. On the MM54HCT157/MM74HCT157, when the OUTPUT ENABLE input is at logical "0" the four outputs assume the values as selected from the inputs. When the OUTPUT ENABLE input is at a logical "1" the outputs assume logical "0". The MM54HCT158/MM74HCT158 operates in the same manner, except that its outputs are inverted. Select decoding is done internally resulting in a single select input only. If enabled, the select input determines whether the A or B inputs get routed to their corresponding Y outputs.

The 54HCT/74HCT logic family is functionally as well as pin-out compatible with the standard 54LS/74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

## Features

- Typical propagation delay: 14 ns data to any output
- Power supply range:  $5V \pm 10\%$
- Low power supply quiescent current: 80  $\mu A$  maximum (74HCT Series)
- Low input current: 1  $\mu A$  maximum
- Completely TTL compatible
- High output drive current: 60 mA minimum

## Connection Diagrams



Order Number MM54HCT157/158 or MM74HCT157/158

## Function Table

Strobe	Select	Inputs		Output Y	
		A	B	HCT157	HCT158
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

H = High Level, L = Low Level, X = Irrelevant

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## Absolute Maximum Ratings (Notes 1 & 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC}$ + 1.5V
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC}$ + 0.5V
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	±20 mA
DC Output Current, per pin ( $I_{OUT}$ )	±25 mA
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	±50 mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation ( $P_D$ )	
(Note 3)	600 mW
S.O. Package only	500 mW
Lead Temperature ( $T_L$ )	
(Soldering, 10 seconds)	260°C

## Operating Conditions

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	4.5	5.5	V
DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Operating Temp. Range ( $T_A$ )			
MM74HCT	-40	+85	°C
MM54HCT	-55	+125	°C
Input Rise or Fall Times ( $t_r, t_f$ )		500	ns

## DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ\text{C}$		74HCT	54HCT	Units
				Typ	Guaranteed Limits		$T_A = -40$ to $85^\circ\text{C}$	
$V_{IH}$	Minimum High Level Input Voltage				2.0	2.0	2.0	V
$V_{IL}$	Maximum Low Level Input Voltage				0.8	0.8	0.8	V
$V_{OH}$	Minimum High Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu\text{A}$	4.5V		4.4	4.4	4.4	V
			4.5V	4.2	3.98	3.84	3.7	V
			5.5V	5.2	4.98	4.84	4.7	V
$V_{OL}$	Maximum Low Level Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  = 20 \mu\text{A}$ $ I_{OUT}  = 6.0 \text{ mA}$ $ I_{OUT}  = 7.2 \text{ mA}$		0	0.1	0.1	0.1	V
			4.5V	0.2	0.26	0.33	0.4	V
			5.5V	0.2	0.26	0.33	0.4	V
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		±0.1	±1.0	±1.0	μA
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu\text{A}$			8.0	80	160	μA
		$V_{IN} = 2.4\text{V}$ or 0.5V (Note 4)			1.2	1.4	1.5	mA

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C; ceramic "J" package: -12 mW/°C from 100°C to 125°C.

**Note 4:** For a power supply of 5V ±10% the worst case output voltages ( $V_{OH}$  and  $V_{OL}$ ) occur for HCT at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case  $V_{IH}$  and  $V_{IL}$  occur at  $V_{CC} = 5.5\text{V}$  and 4.5V respectively. (The  $V_{IH}$  value at 5.5V is 3.85V.) The worst case leakage current ( $I_{IN}$ ,  $I_{CC}$ , and  $I_{OZ}$ ) occur for CMOS at the higher voltage and so the 6.0V values should be used.

**AC Electrical Characteristics**  $V_{CC}=5V$ ,  $T_A=25^\circ C$ ,  $C_L=15\text{ pF}$ ,  $t_r=t_f=6\text{ ns}$

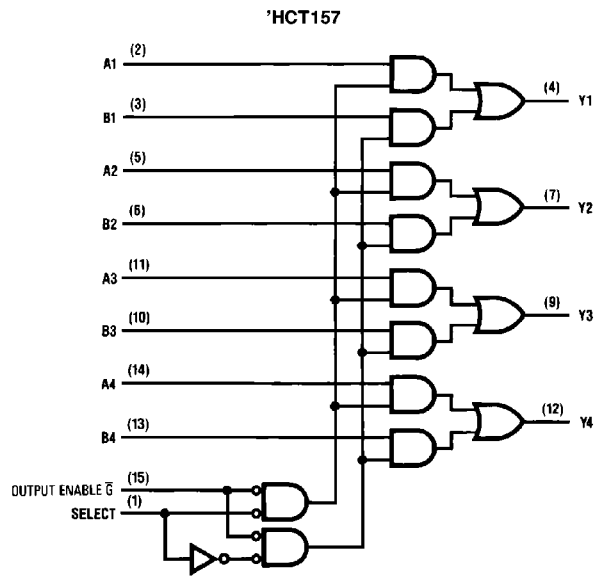
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Data to Output		14	20	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Select to Output		14	20	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Strobe to Output		12	18	ns

**AC Electrical Characteristics**  $V_{CC}=5V \pm 10\%$ ,  $C_L=50\text{ pF}$ ,  $t_r=t_f=6\text{ ns}$  (unless otherwise specified)

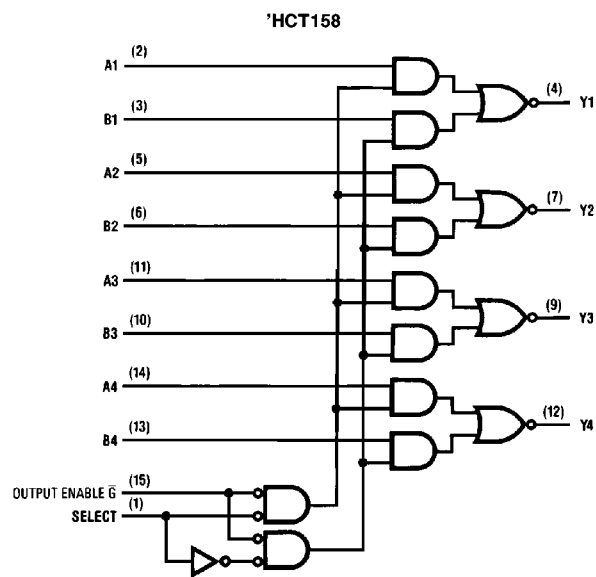
Symbol	Parameter	Conditions	$T_A=25^\circ C$		74HCT	54HCT	Units
			Typ	Guaranteed Limits		$T_A=-40\text{ to }85^\circ C$	
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Data to Output		13	22	28	33	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Select to Output		15	27	34	41	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, OUTPUT ENABLE to Output		14	25	31	38	ns
$t_{TLH}$ , $t_{THL}$	Maximum Output Rise and Fall Time		8	15	19	22	ns
$C_{IN}$	Maximum Input Capacitance		5	10	10	10	pF
$C_{PD}$	Power Dissipation Capacitance (Note 5)		48				pF

**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D=C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S=C_{PD} V_{CC} f + I_{CC}$ .

# Logic Diagrams

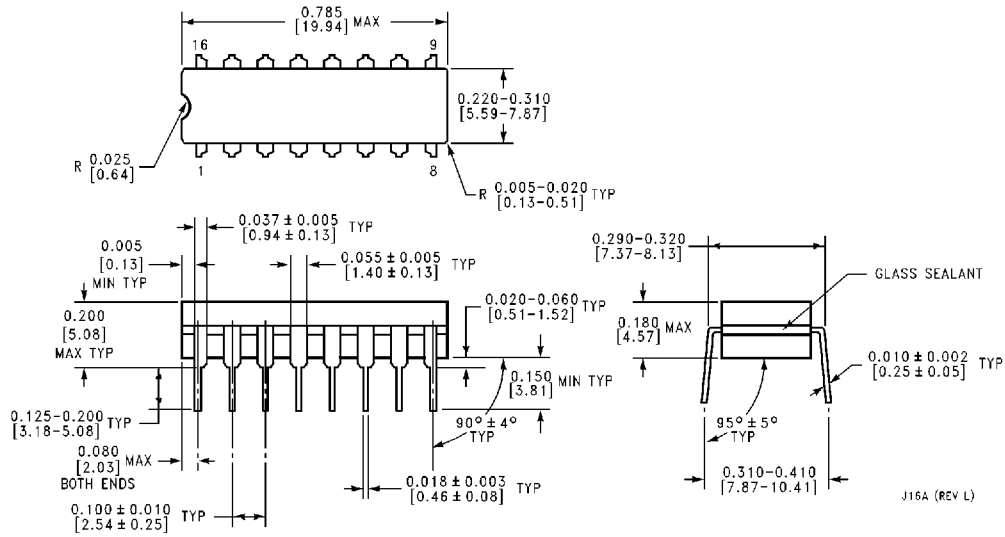


TL/F/5741-3



TL/F/5741-4

**Physical Dimensions** inches (millimeters)

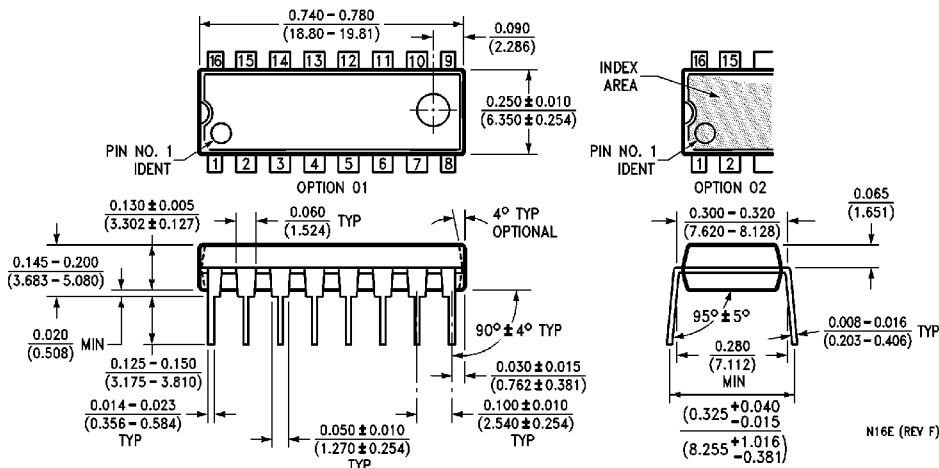


**Ceramic Dual-In-Line Package (J)**  
**Order Number MM54HCT157J, MM54HCT158J, MM74HCT157J or MM74HCT158J**  
**NS Package Number J16A**

J16A (REV L)

MM54HCT157 / MM74HCT157 Quad 2-Input Multiplexer  
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**Physical Dimensions** inches (millimeters) (Continued)



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