MC74HC257

Quad 2-Input Data Selector/Multiplexer with 3-State Outputs

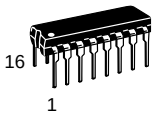
High–Performance Silicon–Gate CMOS

The MC74HC257 is identical in pinout to the LS257. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LSTTL outputs.

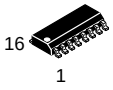
This device selects a (4–bit) nibble from either the A or B inputs as determined by the Select input. The nibble is presented at the outputs in noninverted form when the Output Enable pin is at a low level. A high level on the Output Enable pin switches the outputs into the high–impedance state.

The HC257 is similar in function to the HC157 which do not have 3–state outputs.

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 108 FETs or 27 Equivalent Gates



N SUFFIX
PLASTIC PACKAGE
CASE 648–08

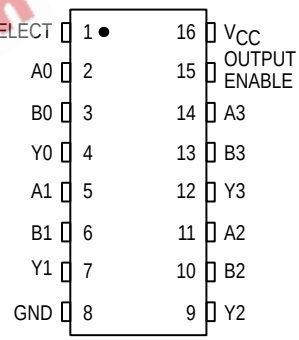


D SUFFIX
SOIC PACKAGE
CASE 751B–05

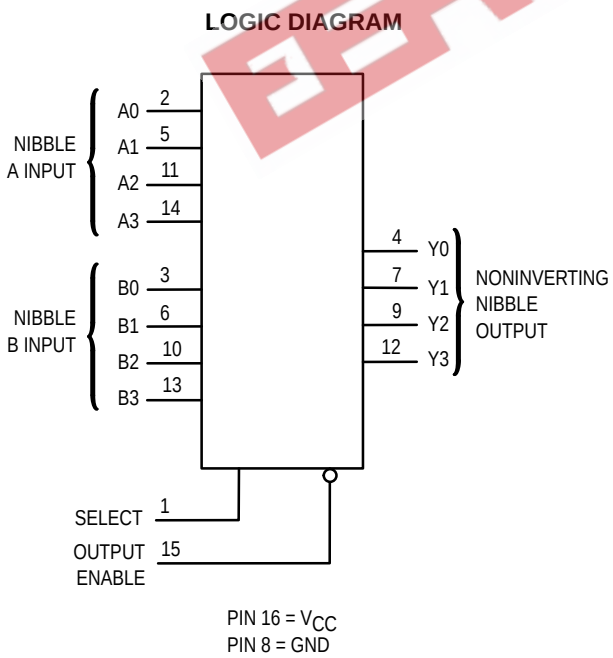
ORDERING INFORMATION

MC74HCXXXN	Plastic
MC74HCXXXD	SOIC

PIN ASSIGNMENT



LOGIC DIAGRAM



FUNCTION TABLE

Inputs		Outputs
Output Enable	**Select**	**Y0 – Y3**
H	X	Z
L	L	A0 – A3
L	H	B0 – B3

X = don't care
Z = high impedance
A0 – A3, B0 – B3 = the levels of the respective Nibble Inputs.

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	– 0.5 to + 7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	– 1.5 to V_{CC} + 1.5	V
V_{out}	DC Output Voltage (Referenced to GND)	– 0.5 to V_{CC} + 0.5	V
I_{in}	DC Input Current, per Pin	± 20	mA
I_{out}	DC Output Current, per Pin	± 35	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air Plastic DIP†	750	mW
	SOIC Package†	500	
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high–impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND ≤ (V_{in} or V_{out}) ≤ V_{CC}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

* Maximum Ratings are those values beyond which damage to the device may occur.
Functional operation should be restricted to the Recommended Operating Conditions.

†Derating — Plastic DIP: – 10 mW/°C from 65° to 125°C
SOIC Package: – 7 mW/°C from 65° to 125°C

For high frequency or heavy load considerations, see Chapter 2 of the Motorola High–Speed CMOS Data Book (DL129/D).

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)		2.0	6.0	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Referenced to GND)		0	V_{CC}	V
T_A	Operating Temperature, All Package Types		– 55	+ 125	°C
t_r, t_f	Input Rise and Fall Time (Figure 1)	V_{CC} = 2.0 V	0	1000	ns
		V_{CC} = 4.5 V	0	500	
		V_{CC} = 6.0 V	0	400	

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V_{CC} V	Guaranteed Limit – 55 to 25°C	Guaranteed Limit ≤ 85°C	Guaranteed Limit ≤ 125°C	Unit
V_{IH}	Minimum High–Level Input Voltage	V_{out} = 0.1 V or V_{CC} – 0.1 V $\|I_{out}\|$ ≤ 20 μA	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}	Maximum Low–Level Input Voltage	V_{out} = 0.1 V or V_{CC} – 0.1 V $\|I_{out}\|$ ≤ 20 μA	2.0	0.3	0.3	0.3	V
			4.5	0.9	0.9	0.9	
			6.0	1.2	1.2	1.2	
V_{OH}	Minimum High–Level Output Voltage	V_{in} = V_{IH} or V_{IL} $\|I_{out}\|$ ≤ 20 μA	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
		V_{in} = V_{IH} or V_{IL} $\|I_{out}\|$ ≤ 6.0 mA	4.5	3.98	3.84	3.70	
		$\|I_{out}\|$ ≤ 7.8 mA	6.0	5.48	5.34	5.20	
V_{OL}	Maximum Low–Level Output Voltage	V_{in} = V_{IH} or V_{IL} $\|I_{out}\|$ ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
		V_{in} = V_{IH} or V_{IL} $\|I_{out}\|$ ≤ 6.0 mA	4.5	0.26	0.33	0.40	
		$\|I_{out}\|$ ≤ 7.8 mA	6.0	0.26	0.33	0.40	
I_{in}	Maximum Input Leakage Current	V_{in} = V_{CC} or GND	6.0	± 0.1	± 1.0	± 1.0	μA
I_{OZ}	Maximum Three–State Leakage Current	Output in High–Impedance State V_{in} = V_{IL} or V_{IH} V_{out} = V_{CC} or GND	6.0	± 0.5	± 5.0	± 10	μA
I_{CC}	Maximum Quiescent Supply Current (per Package)	V_{in} = V_{CC} or GND I_{out} = 0 μA	6.0	8	80	160	μA

NOTE: Information on typical parametric values can be found in Chapter 2 of the Motorola High–Speed CMOS Data Book (DL129/D).

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

Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			– 55 to 25°C	≤ 85°C	≤ 125°C	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Nibble A or B to Output Y (Figures 1 and 4)	2.0 4.5 6.0	100 20 17	125 25 21	150 30 26	ns
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Select to Output Y (Figures 2 and 4)	2.0 4.5 6.0	100 20 17	125 25 21	150 30 26	ns
t_{PLZ}, t_{PHZ}	Maximum Propagation Delay, Output Enable to Output Y (Figures 3 and 5)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t_{PZL}, t_{PZH}	Maximum Propagation Delay, Output Enable to Output Y (Figures 3 and 5)	2.0 4.5 6.0	150 30 26	190 38 33	225 45 38	ns
t_{TLH}, t_{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 4)	2.0 4.5 6.0	60 12 10	75 15 13	90 18 15	ns
C_{in}	Maximum Input Capacitance	—	10	10	10	pF
C_{out}	Maximum Three–State Output Capacitance (Output in High–Impedance State)	—	15	15	15	pF

NOTES:
1. For propagation delays with loads other than 50 pF, see Chapter 2 of the Motorola High–Speed CMOS Data Book (DL129/D).
2. Information on typical parametric values can be found in Chapter 2 of the Motorola High–Speed CMOS Data Book (DL129/D).

		Typical @ 25°C, V_{CC} = 5.0 V	
C_{PD}	Power Dissipation Capacitance (Per Package)*	39	pF

* Used to determine the no–load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$. For load considerations, see Chapter 2 of the Motorola High–Speed CMOS Data Book (DL129/D).

PIN DESCRIPTIONS

INPUTS

A0, A1, A2, A3 (Pins 2, 5, 11, 14)

Nibble A input. The data present on these pins is transferred to the output when the Select input is at a low level and the Output Enable input is at a low level. The data is presented to the outputs in noninverted form.

B0, B1, B2, B3 (Pins 3, 6, 10, 13)

Nibble B input. The logic data present on these pins is transferred to the output when the Select input is at a high level and the Output Enable input is at a low level. The data is presented to the outputs in noninverted form.

OUTPUTS

Y0, Y1, Y2, Y3 (Pins 4, 7, 9, 12)

Nibble output. The selected nibble input is presented at these outputs when the Output Enable input is at a low level. For the Output Enable input at a high level, the outputs are switched to the high impedance state.

CONTROL INPUTS

Select (Pin 1)

Nibble select. This input determines the nibble to be transferred to the outputs. A low level on this input selects the A inputs and a high level selects the B inputs.

Output Enable (Pin 15)

Output Enable. A low level on this input allows the selected input data to be presented at the outputs. A high level on this input forces the outputs into the high–impedance state.

SWITCHING WAVEFORMS

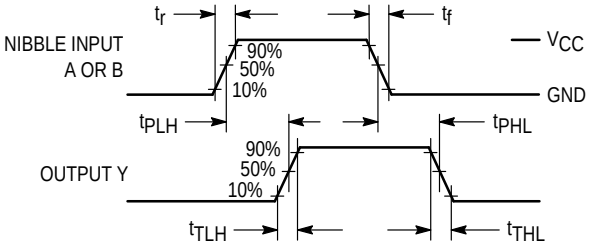


Figure 1.

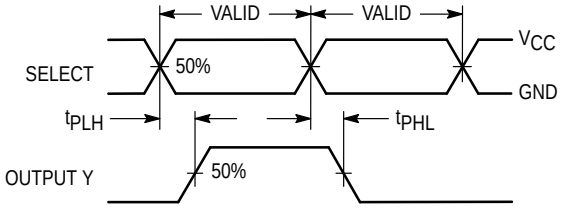


Figure 2.

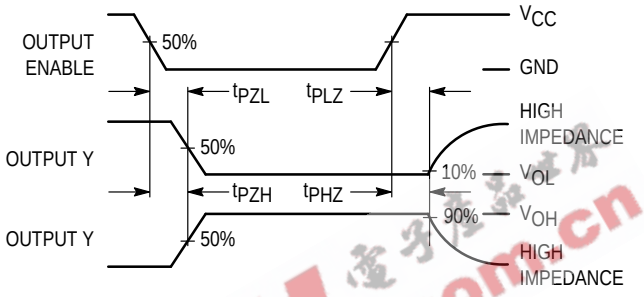
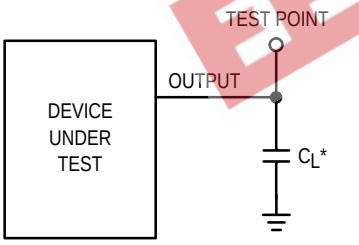


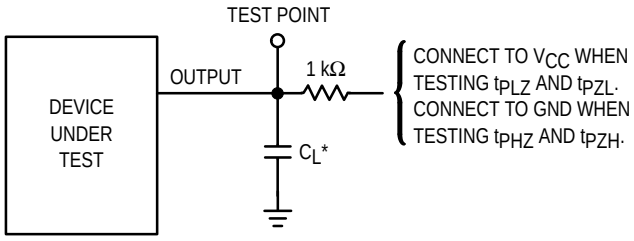
Figure 3.

TEST CIRCUITS



* Includes all probe and jig capacitance

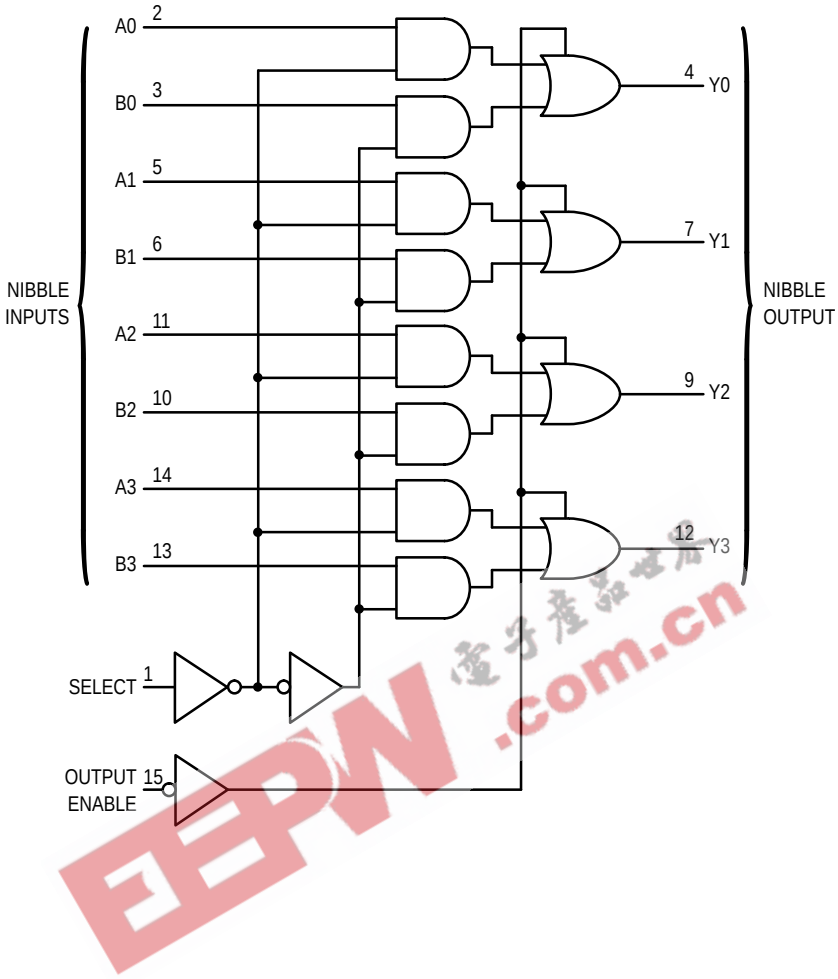
Figure 4.



* Includes all probe and jig capacitance

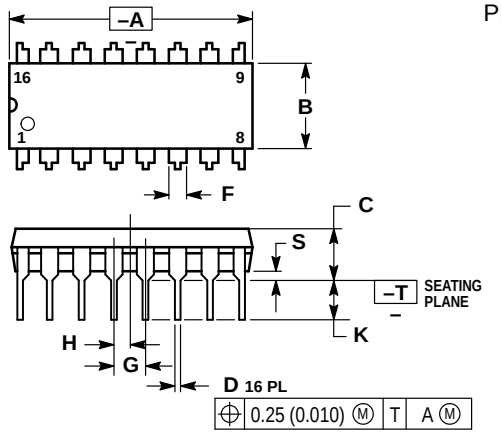
Figure 5.

EXPANDED LOGIC DIAGRAM



OUTLINE DIMENSIONS

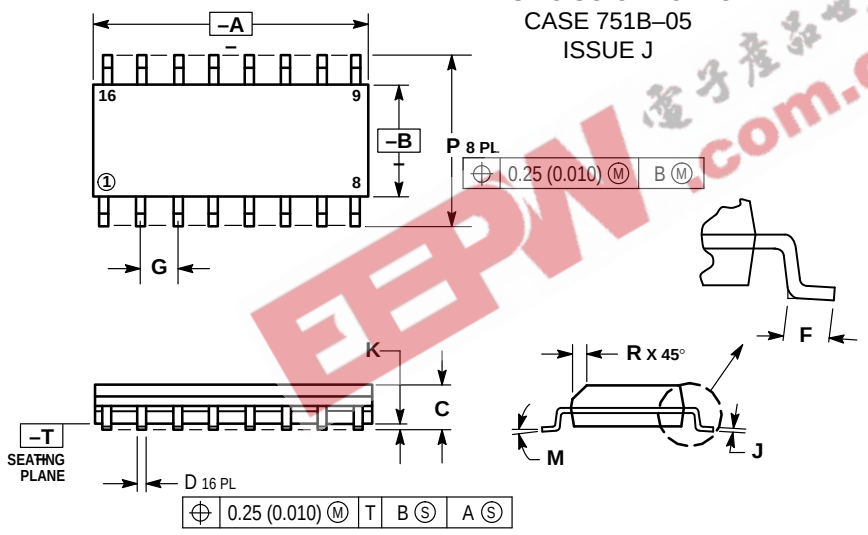
N SUFFIX
PLASTIC PACKAGE
CASE 648–08
ISSUE R



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.070	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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