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Quad 2-Input Multiplexer with 3-State Outputs

The MC74AC257/74ACT257 is a quad 2–input multiplexer with 3–state outputs. Four bits of data from two sources can be selected using a Common Data Select input. The four outputs present the selected data in true (noninverted) form. The outputs may be switched to a high impedance state by placing a logic HIGH on the common Output Enable (\overline{OE}) input, allowing the outputs to interface directly with bus–oriented systems.

- Multiplexer Expansion by Tying Outputs Together
- Noninverting 3–State Outputs
- Outputs Source/Sink 24 mA
- 'ACT257 Has TTL Compatible Inputs
- These are Pb–Free Devices

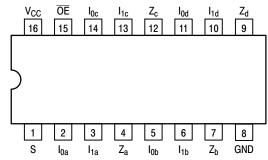


Figure 1. Pinout: 16-Lead Packages Conductors (Top View)



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MARKING DIAGRAMS



SOIC-16 D SUFFIX CASE 751B





TSSOP-16 DT SUFFIX CASE 948F



xxx = AC or ACT A = Assembly Location

WL or L = Wafer Lot Y = Year WW or W = Work Week G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

PIN NAME

PIN	FUNCTION				
S	Common Data Select Input				
ŌĒ	3-State Output Enable Input				
I _{0a} –I _{0d}	Data Inputs from Source 0				
I _{1a} -I _{1d} Data Inputs from Source 1					
Z _a –Z _d	3-State Multiplexer Outputs				

TRUTH TABLE

Output Enable	Select Input	Data Inputs				Outputs
ŌĒ	S	I ₀	I ₁	Z		
Н	Х	Χ	Х	Z		
L	Н	X	L	L		
L	Н	Χ	Н	Н		
L	L	L	Χ	L		
L	L	Н	Χ	Н		

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Z = High Impedance

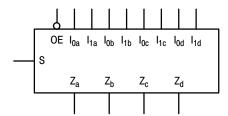


Figure 2. Logic Symbol

FUNCTIONAL DESCRIPTION

The MC74AC257/74ACT257 is a quad 2-input multiplexer with 3-state outputs. It selects four bits of data from two sources under control of a Common Data Select input. When the Select input is LOW, the I_{0x} inputs are selected and when Select is HIGH, the I_{1x} inputs are selected. The data on the selected inputs appears at the outputs in true (noninverted) form. The device is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select input. The logic equations for the outputs are shown below:

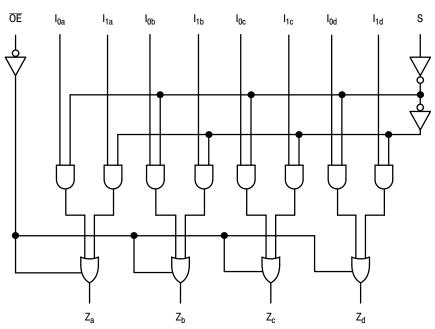
$$Z_a = \overline{OE} \bullet (I_{1a} \bullet S + I_{0a} \bullet \overline{S})$$

$$Z_b = \overline{OE} \cdot (I_{1b} \cdot S + I_{0b} \cdot \overline{S})$$

$$Z_c = \overline{OE} \cdot (I_{1c} \cdot S + I_{0c} \cdot \overline{S})$$

$$Z_d = \overline{OE} \bullet (I_{1d} \bullet S + I_{0d} \bullet \overline{S})$$

When the Output Enable input (\overline{OE}) is HIGH, the outputs are forced to a high impedance state. If the outputs are tied together, all but one device must be in the high impedance state to avoid high currents that would exceed the maximum ratings. Designers should ensure the Output Enable signals to 3–state devices whose outputs are tied together are designed so there is no overlap.



NOTE: This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Figure 3. Logic Diagram

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V _{CC}	DC Supply Voltage		-0.5 to +7.0	V
VI	DC Input Voltage		$-0.5 \le V_{CC} + 0.5$	V
Vo	DC Output Voltage (Note 1)		$-0.5 \le V_{CC} + 0.5$	V
I _{IK}	DC Input Diode Current		±20	mA
I _{OK}	DC Output Diode Current		±50	mA
I _O	DC Output Sink/Source Current		±50	mA
I _{CC}	DC Supply Current per Output Pin		±50	mA
I _{GND}	DC Ground Current per Output Pin		±50	mA
T _{STG}	Storage Temperature Range		-65 to +150	°C
TL	Lead temperature, 1 mm from Case for 10 Seconds		260	°C
TJ	Junction temperature under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 2)	SOIC TSSOP	69.1 103.8	°C/W
P _D	Power Dissipation in Still Air at 65°C (Note 3)	SOIC TSSOP	500 500	mW
MSL	Moisture Sensitivity		Level 1	
F _R	Flammability Rating Oxygen Index:	30% – 35%	UL 94 V-0 @ 0.125 in	
V _{ESD}	ESD Withstand Voltage Human Body Mo Machine Mo Charged Device Mo	odel (Note 5)	> 2000 > 200 > 1000	V
I _{Latch-Up}	Latch-Up Performance Above V _{CC} and Below GND at 8	5°C (Note 7)	±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- 1. I_O absolute maximum rating must be observed.
- 2. The package thermal impedance is calculated in accordance with JESD51-7.
- 3. 500 mW at 65°C; derate to 300 mW by 10 mW/ from 65°C to 85°C.
- 4. Tested to EIA/JESD22-A114-A.
- 5. Tested to EIA/JESD22-A115-A.
- 6. Tested to JESD22-C101-A.
- 7. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Тур	Max	Unit	
.,	County Mallage	′AC	2.0	5.0	6.0	
V _{CC}	Supply Voltage	'ACT	4.5	5.0	5.5	V
V _{IN} , V _{OUT}	DC Input Voltage, Output Voltage (Ref. to GND)		0	-	V _{CC}	V
		V _{CC} @ 3.0 V	-	150	-	
t _r , t _f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V _{CC} @ 4.5 V	-	40	-	ns/V
		V _{CC} @ 5.5 V	-	25	-	
	Input Rise and Fall Time (Note 2)	V _{CC} @ 4.5 V	-	10	-	ns/V
t _r , t _f	'ACT Devices except Schmitt Inputs	V _{CC} @ 5.5 V	-	8.0	-	TIS/ V
T _A	Operating Ambient Temperature Range		-40	25	85	°C
I _{OH}	Output Current – High		-	_	-24	mA
I _{OL}	Output Current – Low		-	_	24	mA

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

- 1. V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
 2. V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

	Parameter		74AC T _A = +25°C		74AC	Unit		
Symbol		V _{CC} (V)			T _A = -40°C to +85°C		Conditions	
			Тур	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	2.1 3.15 3.85	2.1 3.15 3.85	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V	
V _{IL}	Maximum Low Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	0.9 1.35 1.65	0.9 1.35 1.65	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V	
V _{OH}	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 4.4 5.4	2.9 4.4 5.4	V	I _{OUT} = -50 μA	
		3.0 4.5 5.5	- - -	2.56 3.86 4.86	2.46 3.76 4.76	V	* V _{IN} = V _{IL} or V _{IH} -12 mA I_{OH} -24 mA -24 mA	
V _{OL}	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 0.1 0.1	0.1 0.1 0.1	V	Ι _{ΟυΤ} = 50 μΑ	
		3.0 4.5 5.5	- - -	0.36 0.36 0.36	0.44 0.44 0.44	V	* V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA	
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μΑ	$V_I = V_{CC}$, GND	
I _{OZ}	Maximum 3-State Current	5.5	-	±0.5	±5.0	μΑ	V_{I} (OE) = V_{IL} , V_{IH} V_{I} = V_{CC} , GND V_{O} = V_{CC} , GND	
I _{OLD}	†Minimum Dynamic	5.5	_	_	75	mA	V _{OLD} = 1.65 V Max	
I _{OHD}	Output Current	5.5	_	_	-75	mA	V _{OHD} = 3.85 V Min	
Icc	Maximum Quiescent Supply Current	5.5	-	8.0	80	μΑ	V _{IN} = V _{CC} or GND	

 $^{^\}star\text{All}$ outputs loaded; thresholds on input associated with output under test. †Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: I $_{\rm IN}$ and I $_{\rm CC}$ @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V $_{\rm CC}$.

AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

	Parameter		74AC			74AC		Unit	Fig. No.
Symbol		V _{CC} * (V)	T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Тур	Max	Min	Max		
t _{PLH}	Propagation Delay I_n to Z_n	3.3 5.0	1.5 1.5	5.0 4.0	8.5 6.0	1.0 1.0	9.0 7.0	ns	3–5
t _{PHL}	Propagation Delay I_n to Z_n	3.3 5.0	1.5 1.5	6.0 4.5	8.5 6.0	1.0 1.0	9.0 7.0	ns	3–5
t _{PLH}	Propagation Delay S to Z _n	3.3 5.0	1.5 1.5	7.0 5.0	10.5 7.5	1.5 1.0	11.5 8.5	ns	3–6
t _{PHL}	Propagation Delay S to Z _n	3.3 5.0	1.5 1.5	7.5 5.5	10.5 7.5	1.5 1.0	11.5 8.5	ns	3–6
t _{PZH}	Output Enable Time	3.3 5.0	1.5 1.5	6.5 5.0	9.5 7.5	1.0 1.0	10.5 8.5	ns	3–7
t _{PZL}	Output Enable Time	3.3 5.0	1.5 1.5	5.5 5.0	9.0 8.5	1.0 1.0	10.0 9.5	ns	3–8
t _{PHZ}	Output Disable Time	3.3 5.0	1.5 1.5	5.5 5.0	10.0 9.0	1.0 1.0	11.0 10.0	ns	3–7
t _{PLZ}	Output Disable Time	3.3 5.0	1.5 1.5	5.5 5.0	9.0 8.0	1.0 1.0	10.0 9.0	ns	3–8

^{*}Voltage Range 3.3 V is 3.3 V ± 0.3 V. *Voltage Range 5.0 V is 5.0 V ± 0.5 V.

DC CHARACTERISTICS

	Parameter		74 <i>A</i>	CT	74ACT		
Symbol		V _{CC} (V)	T _A = +25°C		T _A = -40°C to +85°C	Unit	Conditions
			Тур	Guar	anteed Limits		
V _{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
V _{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
V _{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	I _{OUT} = -50 μA
		4.5 5.5	- -	3.86 4.86	3.76 4.76	V	$^{*}V_{IN} = V_{IL} \text{ or } V_{IH}$ -24 mA I_{OH} -24 mA
V _{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	I _{OUT} = 50 μA
		4.5 5.5		0.36 0.36	0.44 0.44	V	$^{*}V_{IN} = V_{IL} \text{ or } V_{IH}$ $^{24} \text{ mA}$ ^{1}OL $^{24} \text{ mA}$
I _{IN}	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μΑ	V _I = V _{CC} , GND
ΔI_{CCT}	Additional Max. I _{CC} /Input	5.5	0.6	_	1.5	mA	$V_{I} = V_{CC} - 2.1 \text{ V}$
l _{OZ}	Maximum 3–State Current	5.5	_	±0.5	±5.0	μΑ	$\begin{aligned} &V_{I}\left(OE\right) = V_{IL}, V_{IH} \\ &V_{I} = V_{CC}, GND \\ &V_{O} = V_{CC}, GND \end{aligned}$
I _{OLD}	†Minimum Dynamic	5.5	-	_	75	mA	V _{OLD} = 1.65 V Max
I _{OHD}	Output Current	5.5	-	_	-75	mA	V _{OHD} = 3.85 V Min
Icc	Maximum Quiescent Supply Current	5.5	-	8.0	80	μΑ	V _{IN} = V _{CC} or GND

 $^{^\}star All$ outputs loaded; thresholds on input associated with output under test. †Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS (For Figures and Waveforms - See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

			74ACT		74	CT			
Symbol	Parameter	V _{CC} * (V)	T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF		Unit	Fig. No.
			Min Typ Max	Min	Max				
t _{PLH}	Propagation Delay I_n to Z_n	5.0	1.5	5.0	7.0	1.0	7.5	ns	3–6
t _{PHL}	Propagation Delay I_n to Z_n	5.0	2.0	6.0	7.5	1.5	8.5	ns	3–6
t _{PLH}	Propagation Delay S to Z _n	5.0	2.0	7.0	9.5	1.5	10.5	ns	3–6
t _{PHL}	Propagation Delay S to Z _n	5.0	2.5	7.0	10.5	2.0	11.5	ns	3–6
t _{PZH}	Output Enable Time	5.0	2.0	6.0	8.0	1.5	9.0	ns	3–7
t _{PZL}	Output Enable Time	5.0	2.0	6.0	8.0	1.5	9.0	ns	3–8
t _{PHZ}	Output Disable Time	5.0	2.5	6.5	9.0	1.5	10.0	ns	3–7
t _{PLZ}	Output Disable Time	5.0	2.0	6.0	7.5	1.5	8.5	ns	3–8

^{*}Voltage Range 5.0 V is 5.0 V \pm 0.5 V.

CAPACITANCE

Symbol	Parameter		Unit	Test Conditions	
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V	
C _{PD}	Power Dissipation Capacitance	50	pF	V _{CC} = 5.0 V	

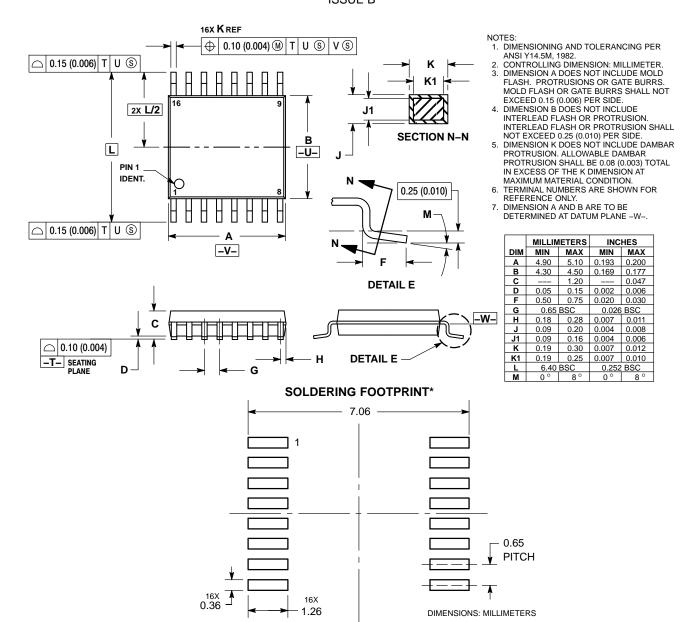
ORDERING INFORMATION

Device Order Number	Package	Shipping [†]
MC74AC257DG	SOIC-16 (Pb-Free)	48 Units / Rail
MC74AC257DR2G	SOIC-16 (Pb-Free)	2500 / Tape & Reel
MC74AC257DTR2G	TSSOP-16 (Pb-Free)	2500 / Tape & Reel
MC74ACT257DG	SOIC-16 (Pb-Free)	48 Units / Rail
MC74ACT257DR2G	SOIC-16 (Pb-Free)	2500 / Tape & Reel
MC74ACT257DTR2G	TSSOP-16 (Pb-Free)	2500 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

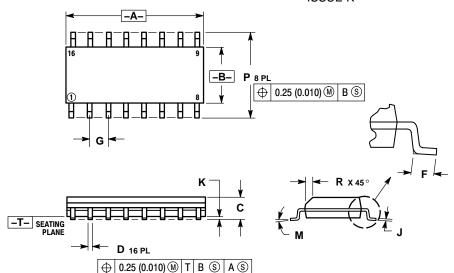
TSSOP-16 DT SUFFIX CASE 948F ISSUE B



*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

SOIC-16 **D SUFFIX** CASE 751B-05 ISSUE K

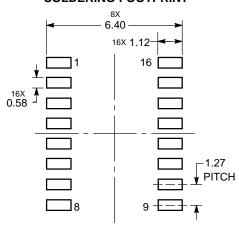


NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
 DIMENSIONS A AND B DO NOT INCLUDE MOLD
- PROTRUSION.
 MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
- 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.

	MILLIN	IETERS	INC	HES	
DIM	MIN	MAX	MIN	MAX	
Α	9.80	10.00	0.386	0.393	
В	3.80	4.00	0.150	0.157	
С	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	

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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MC74ACT257N MC74ACT257NG