Low-Voltage CMOS Quad 2-Input Multiplexer

With 5.0 V–Tolerant Inputs and Outputs (3–State, Non–Inverting)

The MC74LCX257 is a high performance, quad 2-input multiplexer with 3-state outputs operating from a 2.3 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5 V allows MC74LCX257 inputs to be safely driven from 5.0 V devices.

Four bits of data from two sources can be selected using the Select input. The four outputs present the selected data in the true (non-inverted) form. The outputs may be switched to a high impedance state by placing a logic HIGH on the Output Enable (\overline{OE}) input. Current drive capability is 24 mA at the outputs.

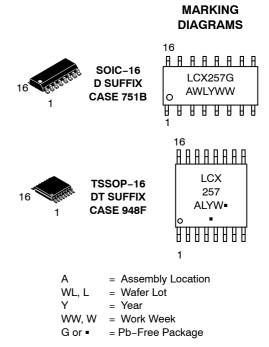
Features

- Designed for 2.3 to 3.6 V V_{CC} Operation
- 5.0 V Tolerant Interface Capability with 5.0 V TTL Logic
- Supports Live Insertion and Withdrawal
- I_{OFF} Specification Guarantees High Impedance When $V_{CC} = 0 V$
- LVTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (10 μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance:
 - Human Body Model >2000 V
 - Machine Model >200 V
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



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(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

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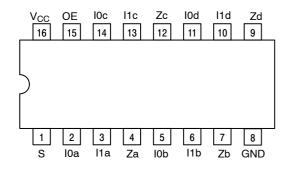
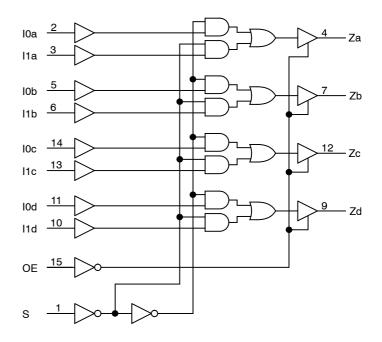


Figure 1. Pinout: 16-Lead Plastic Package (Top View)





PIN NAMES

Pins	Function	
l0n	Source 0 Data Inputs	
l1n	Source 1 Data Inputs	
ŌĒ	Output Enable Input	
S	Select Input	
Zn	Outputs	

TRUTH TABLE

	Inp	Outputs		
ŌE	S	l0n	l1n	Zn
н	Х	Х	Х	Z
L	Н	Х	L	L
L	Н	Х	Н	Н
L	L	L	Х	L
L	L	Н	Х	Н

H = High Voltage Level

L = Low Voltage Level

X = High or Low Voltage Level and Transitions are Acceptable
Z = High Impedance State

For ICC reasons, DO NOT FLOAT Inputs

MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Units
V _{CC}	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \leq V_I \leq +7.0$		V
Vo	DC Output Voltage	$-0.5 \leq V_I \leq +7.0$	Output in 3-State	V
		$-0.5 \le V_O \le V_{CC} + 0.5$	Output in HIGH or LOW State (Note 1)	V
Ι _{ΙΚ}	DC Input Diode Current	-50	V _I < GND	mA
I _{OK}	DC Output Diode Current	-50	V _O < GND	mA
		+50	V _O > V _{CC}	mA
Ι _Ο	DC Output Source/Sink Current	±50		mA
I _{CC}	DC Supply Current Per Supply Pin	±100		mA
I _{GND}	DC Ground Current Per Ground Pin	±100		mA
T _{STG}	Storage Temperature Range	-65 to +150		°C
MSL	Moisture Sensitivity		Level 1	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Туре	Max	Units
V _{CC}	Supply Voltage Operating Data Retention Only	2.0 1.5	2.5, 3.3 2.5, 3.3	3.6 3.6	V
VI	Input Voltage	0		5.5	V
V _O	Output Voltage (HIGH or LOW State) (3-State)	0 0		V _{CC} 5.5	V
I _{OH}				-24 -12 -8	mA
I _{OL}				+24 +12 +8	mA
T _A	Operating Free-Air Temperature	-40		+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate, V _{IN} from 0.8 V to 2.0 V, V _{CC} = 3.0 V	0		10	ns/V

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCX257DR2G	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74LCX257DTG	TSSOP-16 (Pb-Free)	96 Units / Rail
MC74LCX257DTR2G	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.

DC ELECTRICAL CHARACTERISTICS

			T _A = −40°C		
Symbol	Characteristic	Condition	Min	Max	Units
VIH	HIGH Level Input Voltage (Note 2)	$2.3~\text{V} \leq \text{V}_{CC} \leq 2.7~\text{V}$	1.7		V
		$2.7 \text{ V} \leq \text{V}_{CC} \leq 3.6 \text{ V}$	2.0		
V _{IL}	LOW Level Input Voltage (Note 2)	$2.3~\text{V} \leq \text{V}_{CC} \leq 2.7~\text{V}$		0.7	V
		$2.7 \text{ V} \leq \text{V}_{CC} \leq 3.6 \text{ V}$		0.8	
V _{OH}	HIGH Level Output Voltage	$2.3~V \leq V_{CC} \leq 3.6~V;~I_{OH} = -100~\mu A$	V _{CC} – 0.2		V
		V _{CC} = 2.3 V; I _{OH} = -8 mA	1.8		
		$V_{CC} = 2.7 \text{ V}; I_{OH} = -12 \text{ mA}$	2.2		
		V _{CC} = 3.0 V; I _{OH} = -18 mA	2.4		
		V _{CC} = 3.0 V; I _{OH} = -24 mA	2.2		
V _{OL}	LOW Level Output Voltage	$2.3~V \leq V_{CC} \leq 3.6~V;~I_{OL} = 100~\mu A$		0.2	V
		V _{CC} = 2.3 V; I _{OL} = 8 mA		0.6	
		V _{CC} = 2.7 V; I _{OL} = 12 mA		0.4	
		V _{CC} = 3.0 V; I _{OL} = 16 mA		0.4	
		V _{CC} = 3.0 V; I _{OL} = 24 mA		0.55	
I _{OZ}	3-State Output Current	$V_{CC} = 3.6 \text{ V}, V_{IN} = V_{IH} \text{ or } V_{IL}, \\ V_{OUT} = 0 \text{ to } 5.5 \text{ V}$		±5	μΑ
I _{OFF}	Power Off Leakage Current	V_{CC} = 0, V_{IN} = 5.5 V or V_{OUT} = 5.5 V		10	μA
I _{IN}	Input Leakage Current	V_{CC} = 3.6 V, V_{IN} = 5.5 V or GND		±5	μA
I _{CC}	Quiescent Supply Current	V_{CC} = 3.6 V, V_{IN} = 5.5 V or GND		10	μA
ΔI_{CC}	Increase in I _{CC} per Input	$2.3 \le V_{CC} \le 3.6$ V; $V_{IH} = V_{CC} - 0.6$ V		500	μA

2. These values of V_{I} are used to test DC electrical characteristics only.

AC CHARACTERISTICS $t_R = t_F = 2.5 \text{ ns}; R_L = 500 \ \Omega$

				Limits					
				T _A = −40°C to +85°C					
			V _{CC} = 3.3	$V \pm 0.3 V$	V _{CC} =	2.7 V	V _{CC} = 2.5	$\textbf{V}\pm\textbf{0.2}~\textbf{V}$	
			C _L =	50 pF	C _L = 5	50 pF	C _L =	30 pF	
Symbol	Parameter	Waveform	Min	Max	Min	Max	Min	Max	Units
t _{PLH} t _{PHL}	Propagation Delay In to Zn	1	1.5 1.5	6.0 6.0	1.5 1.5	6.5 6.5	1.5 1.5	7.2 7.2	ns
t _{PLH} t _{PHL}	Propagation Delay S to Zn	1, 2	1.5 1.5	7.0 7.0	1.5 1.5	8.5 8.5	1.5 1.5	9.1 9.1	ns
t _{PZH} t _{PZL}	Output Enable Time to High and Low Level	3	1.5 1.5	7.0 7.0	1.5 1.5	8.5 8.5	1.5 1.5	9.1 9.1	ns
t _{PHZ} t _{PLZ}	Output Disable Time from High and Low Level	3	1.5 1.5	5.5 5.5	1.5 1.5	6.0 6.0	1.5 1.5	6.6 6.6	ns
t _{OSHL} t _{OSLH}	Output-to-Output Skew (Note 3)			1.0 1.0					ns

 Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

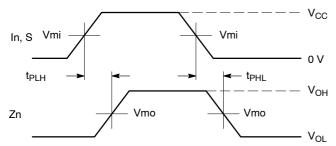
DYNAMIC SWITCHING CHARACTERISTICS

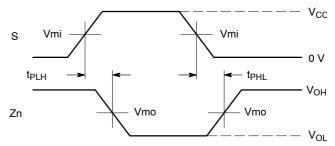
			T _A = +25°C			
Symbol	Characteristic	Condition	Min	Тур	Max	Units
V _{OLP}	Dynamic LOW Peak Voltage (Note 4)	$ \begin{array}{l} V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, \text{V}_{IH} = 3.3 \text{V}, \text{V}_{IL} = 0 \text{V} \\ \text{V}_{CC} = 2.5 \text{V}, \text{C}_L = 30 \text{pF}, \text{V}_{IH} = 2.5 \text{V}, \text{V}_{IL} = 0 \text{V} \end{array} $		0.8 0.6		V
V _{OLV}	Dynamic LOW Valley Voltage (Note 4)	$ \begin{array}{l} V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, \text{V}_{IH} = 3.3 \text{ V}, \text{V}_{IL} = 0 \text{ V} \\ \text{V}_{CC} = 2.5 \text{ V}, C_L = 30 \text{ pF}, \text{V}_{IH} = 2.5 \text{ V}, \text{V}_{IL} = 0 \text{ V} \end{array} $		-0.8 -0.6		V

4. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

CAPACITIVE CHARACTERISTICS

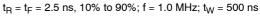
Symbol	Parameter	Condition	Typical	Units
C _{IN}	Input Capacitance	V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC}	7	pF
C _{I/O}	Input/Output Capacitance	V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC}	8	pF
C _{PD}	Power Dissipation Capacitance	10 MHz, V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	25	pF

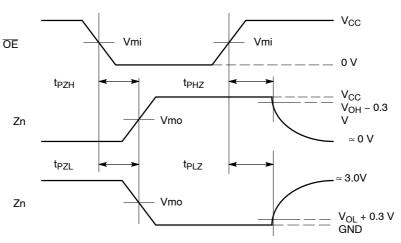




WAVEFORM 1 - NON-INVERTING PROPAGATION DELAYS t_{R} = t_{F} = 2.5 ns, 10% to 90%; f = 1.0 MHz; t_{W} = 500 ns

WAVEFORM 2 - INVERTING PROPAGATION DELAYS



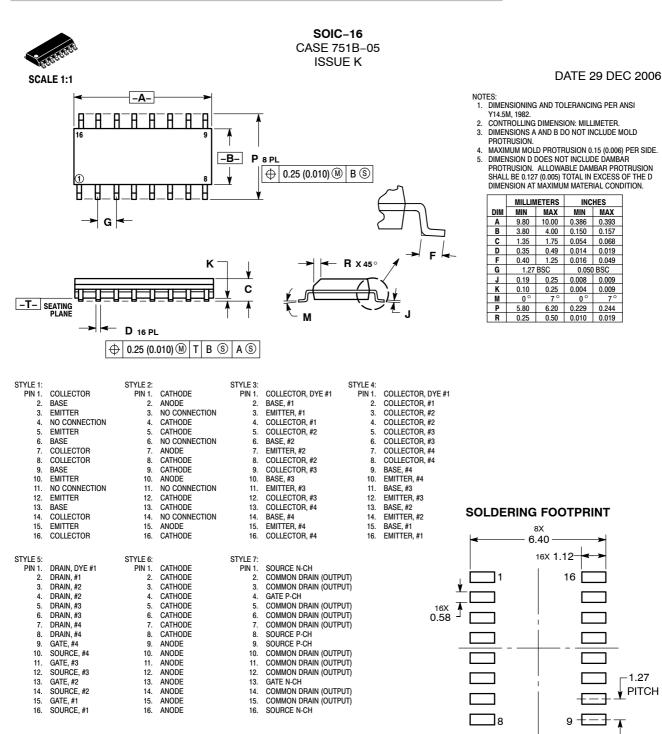


WAVEFORM 3 - OUTPUT ENABLE AND DISABLE TIMES t_{R} = t_{F} = 2.5 ns, 10% to 90%; f = 1.0 MHz; t_{W} = 500 ns

	Vcc				
Symbol	3.3 V \pm 0.3 V	2.7 V	2.5 V \pm 0.2 V		
Vmi	1.5 V	1.5 V	Vcc/2		
Vmo	1.5 V	1.5 V	Vcc/2		
V _{HZ}	V _{OL} + 0.3 V	V _{OL} + 0.3 V	V _{OL} + 0.15 V		
V _{LZ}	V _{OH} – 0.3 V	V _{OH} – 0.3 V	V _{OH} – 0.15 V		

Figure 3. AC Waveforms



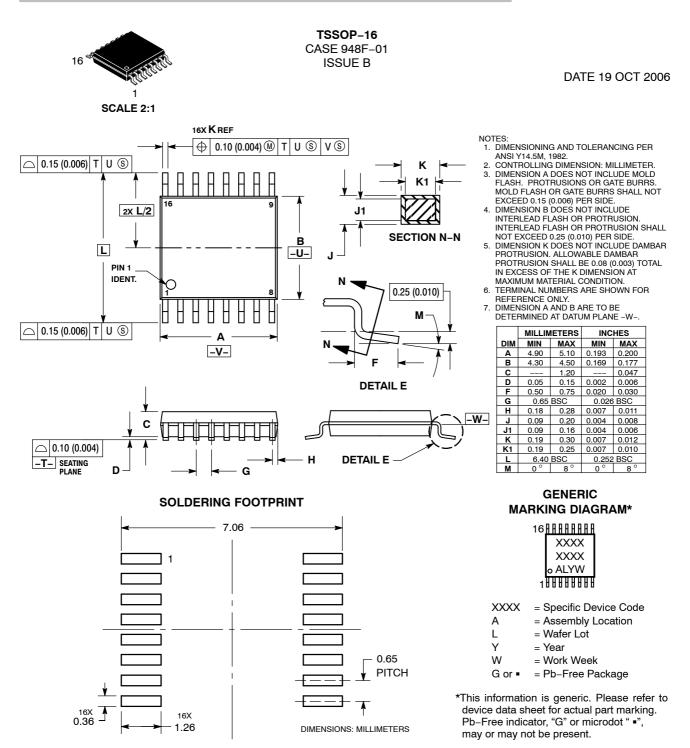


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