Low-Voltage CMOS Quad 2-Input Multiplexer

With 5 V-Tolerant Inputs and Outputs (3-State, Inverting)

The MC74LCX258 is a high performance, quad 2–input inverting 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 $V_{\rm I}$ specification of 5.5 V allows MC74LCX258 inputs to be safely driven from 5 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 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

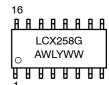
- Designed for 2.3 to 3.6 V V_{CC} Operation
- 5 V Tolerant Interface Capability With 5 V TTL Logic
- Supports Live Insertion and Withdrawal
- I_{OFF} Specification Guarantees High Impedance When $V_{CC} = 0 \text{ V}$
- TTL Compatible
- CMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- 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 are Pb-Free Devices*



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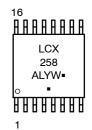




MARKING

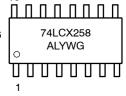
DIAGRAMS











A = Assembly Location

WL, L = Wafer Lot Y = Year WW, 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 4 of this data sheet.

1

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

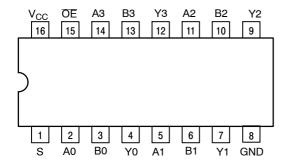


Figure 1. Pinout: 16-Lead Plastic Package (Top View)

PIN NAMES

Pins	Function
An	Source 0 Data Inputs
Bn	Source B Data Inputs
ŌĒ	Enable Input
S	Select Input
Yn	Outputs

TRUTH TABLE

Inp	Inputs		
Output Enable	Output Enable Select		
Н	Х	Z	
L	L	A0 – A3	
L	Н	<u>B0</u> − <u>B3</u>	

X = Don't Care

A0-A3, B0-B3 = The levels of the respective Data-Word Inputs

PIN DESCRIPTIONS

INPUTS

A0-A3 (Pins 2, 5, 11, 14)

Nibble A inputs. The data present on these pins is transferred to the outputs 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 inverted form for the LCX258.

B0-B3 (Pins 3, 6, 10, 13)

Nibble B inputs. The data present on these pins is transferred to the outputs 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 inverted form for the LCX258.

OUTPUTS

Y0-Y3 (Pins 4, 7, 9, 12)

Data outputs. The selected input nibble is presented at these outputs when the Output Enable input is at a low level. The data present on these pins is in its inverted form for the LCX258. For the Output Enable input at a high level, the outputs are at a high level for the LCX258.

Select (Pin 1)

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

CONTROL INPUTS

Output Enable (Pin 15)

Output Enable input. A low level on this input allows the selected data to be presented at the outputs. A high level on this input sets all of the outputs to 3-state off.

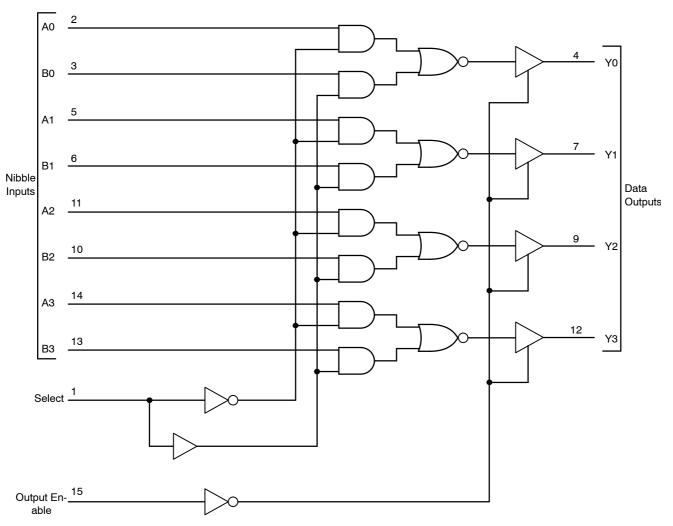


Figure 2. Expanded Logic Diagram

MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Unit
V _{CC}	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \leq V_I \leq +7.0$		٧
Vo	DC Output Voltage	$-0.5 \le V_O \le V_{CC} + 0.5$	Note 1	V
I _{IK}	DC Input Diode Current	-50	V _I < GND	mA
lok	DC Output Diode Current	-50	V _O < GND	mA
		+50	V _O > V _{CC}	mA
I _O	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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Тур	Max	Unit
V _{CC}	Supply Voltage	Operating Data Retention Only	2.0 1.5	2.3 to 3.3	3.6 3.6	٧
VI	Input Voltage		0		5.5	V
Vo	Output Voltage	(HIGH or LOW State)	0		V _{CC}	V
I _{OH}	HIGH Level Output Current	$V_{CC} = 3.0 \text{ V} - 3.6 \text{ V}$ $V_{CC} = 2.7 \text{ V} - 3.0 \text{ V}$ $V_{CC} = 2.3 \text{ V} - 2.7 \text{ V}$			-24 -12 -8	mA
I _{OL}	LOW Level Output Current	$V_{CC} = 3.0 \text{ V} - 3.6 \text{ V}$ $V_{CC} = 2.7 \text{ V} - 3.0 \text{ V}$ $V_{CC} = 2.3 \text{ V} - 2.7 \text{ V}$			+24 +12 +8	mA
T _A	Operating Free-Air Temperature		-40		+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate, V_{IN} $V_{CC} = 3.0 \text{ V}$	from 0.8 V to 2.0 V,	0		10	ns/V

ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCX258DR2G	SOIC-16 (Pb-Free)	2500 / Tape & Reel
MC74LCX258DTG	TSSOP-16* (Pb-Free)	96 Units / Rail
MC74LCX258DTR2G	TSSOP-16* (Pb-Free)	2500 / Tape & Reel
MC74LCX258MG	SOEIAJ-16 (Pb-Free)	48 Units / Rail

[†]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.
*This package is inherently Pb-Free.

^{1.} Output in HÍGH or LOW State. I_O absolute maximum rating must be observed.

DC ELECTRICAL CHARACTERISTICS

			$T_A = -40^{\circ}C$	c to +85°C	
Symbol	Characteristic	Condition	Min	Max	Unit
V_{IH}	Minimum HIGH Level Input Voltage	$2.3 \text{ V} \le \text{V}_{\text{CC}} \le 2.7 \text{ V}$	1.7		V
	(Note 2)	$2.7 \text{ V} \leq \text{V}_{\text{CC}} \leq 3.0 \text{ V}$	2.0		
		$3.0 \text{ V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{ V}$	2.0		
V_{IL}	Maximum LOW Level Input Voltage	$2.3 \text{ V} \leq \text{V}_{\text{CC}} \leq 2.7 \text{ V}$		0.7	V
	(Note 2)	$2.7 \text{ V} \leq \text{V}_{CC} \leq 3.0 \text{ V}$		8.0	
		$3.0 \text{ V} \leq \text{V}_{\text{CC}} \leq 3.6 \text{ V}$		8.0	
V _{OH}	Minimum HIGH Level Output Voltage	$2.3 \text{ V} \leq \text{V}_{CC} \leq 3.6 \text{ V}; \text{I}_{OH} = -100 \mu\text{A}$	V _{CC} - 0.2		V
		$V_{CC} = 2.3 \text{ V; } I_{OH} = -8 \text{ mA}$	1.7		
		$V_{CC} = 2.7 \text{ V; } I_{OH} = -12 \text{ mA}$	2.2		
		$V_{CC} = 3.0 \text{ V}; I_{OH} = -18 \text{ mA}$	2.4		
		$V_{CC} = 3.0 \text{ V}; I_{OH} = -24 \text{ mA}$	2.2		
V _{OL}	Maximum LOW Level Output Voltage	$2.3 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; \text{ I}_{OH} = 100 \mu\text{A}$		0.2	V
		$V_{CC} = 2.3 \text{ V; } I_{OH} = 8 \text{ mA}$		0.7	
		$V_{CC} = 2.7 \text{ V; } I_{OH} = 12 \text{ mA}$		0.4	
		$V_{CC} = 3.0 \text{ V}; I_{OH} = 16 \text{ mA}$		0.4	
		$V_{CC} = 3.0 \text{ V}; I_{OH} = 24 \text{ mA}$		0.55	
II	Input Leakage Current	$2.3 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; 0 \text{ V} \le \text{V}_{I} \le 5.5 \text{ V}$		±5.0	μΑ
I _{CC}	Quiescent Supply Current	$2.3 \text{ V} \leq \text{V}_{CC} \leq 3.6 \text{ V}; \text{V}_{I} = \text{V}_{CC} \text{ or GND}$		10	μΑ
		$2.3 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; 3.6 \text{ V} \le \text{V}_{I} \le 5.5 \text{ V}$		±10	
ΔI_{CC}	Increase in I _{CC} per Input	$2.3 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; \text{V}_{IH} = \text{V}_{CC} - 0.6 \text{ V}$		500	μΑ

^{2.} These values of V_I are used to test DC electrical characteristics only.

AC ELECTRICAL CHARACTERISTICS

			Limits					
			T _A = -40°C to +85°C					
		V _{CC} = 3.0	V to 3.6 V	V _{CC} =	2.7 V	V _{CC} = 2.3	V to 2.7 V	
		C _L =	50 pF	C _L =	50 pF	C _L =	30pF	
Symbol	Parameter	Min	Max	Min	Max	Min	Max	Unit
t _{PLH}	Propagation Delay	1.0	6.5	1.0	7.5	1.0	8.5	ns
t _{PHL}	A to B to Y	1.0	6.5	1.0	7.5	1.0	8.5	ns
t _{PLH}	Propagation Delay	1.0	7.0	1.0	8.0	1.0	9.0	ns
t_{PHL}	S to Y	1.0	7.0	1.0	8.0	1.0	9.0	ns
t _{PZL}	Propagation Delay	1.0	7.0	1.0	8.0	1.0	9.0	ns
t_{PZH}	OE to Y	1.0	7.0	1.0	8.0	1.0	9.0	ns
t_{PLZ}	Propagation Delay	1.0	6.0	1.0	7.0	1.0	8.0	ns
t_{PHZ}	OE to Y	1.0	6.0	1.0	7.0	1.0	8.0	ns
toshL	Output-to-Output Skew		1.0					ns
toslh			1.0					ns

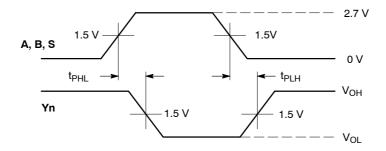
DYNAMIC SWITCHING CHARACTERISTICS

			$T_A = +25^{\circ}C$			
Symbol	Characteristic	Condition	Min	Тур	Max	Unit
V _{OLP}	Dynamic LOW Peak Voltage (Note 3)	$V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, V_{IH} = 3.3 \text{ V}, V_{IL} = 0 \text{ V}$		8.0		V
V _{OLV}	Dynamic LOW Valley Voltage (Note 3)	$V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, V_{IH} = 3.3 \text{ V}, V_{IL} = 0 \text{ V}$		0.8		V

^{3.} 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.

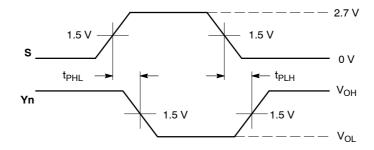
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C _{IN}	Input Capacitance	$V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	7	pF
C _{OUT}	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



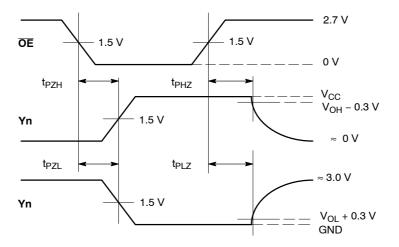
WAVEFORM 1 - NONINVERTING PROPAGATION DELAYS

 $t_R = t_F = 2.5 \text{ ns}, 10\% \text{ to } 90\%; f = 1 \text{ MHz}; t_W = 500 \text{ ns}$



WAVEFORM 2 - INVERTING PROPAGATION DELAYS

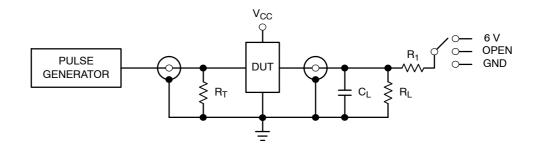
 $t_R = t_F = 2.5 \text{ ns}, 10\% \text{ to } 90\%; f = 1 \text{ MHz}; t_W = 500 \text{ ns}$



WAVEFORM 3 - OUTPUT ENABLE AND DISABLE TIMES

 $t_R = t_F = 2.5 \text{ ns}, 10\% \text{ to } 90\%; f = 1 \text{ MHz}; t_W = 500 \text{ ns}$

Figure 3. AC Waveforms



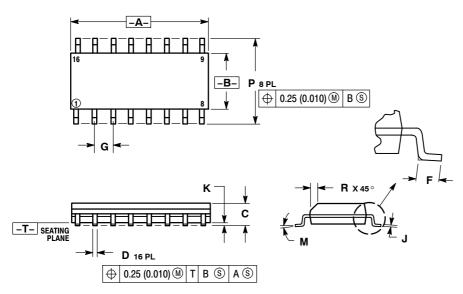
Test	Switch
t _{PLH} , t _{PHL}	Open
t _{PZL} , t _{PLZ}	6 V
Open Collector/Drain t _{PLH} and t _{PHL}	6 V
t _{PZH} , t _{PHZ}	GND

 C_L = 50 pF or equivalent (Includes jig and probe capacitance) R_L = R_1 = 500 Ω or equivalent R_T = Z_{OUT} of pulse generator (typically 50 Ω)

Figure 4. Test Circuit

PACKAGE DIMENSIONS

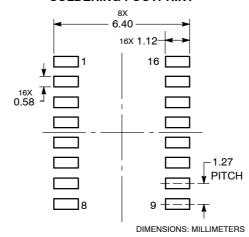
SOIC-16 **D SUFFIX** CASE 751B-05 **ISSUE K**



- 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. MAXIMUM MATERIAL CONDITION.

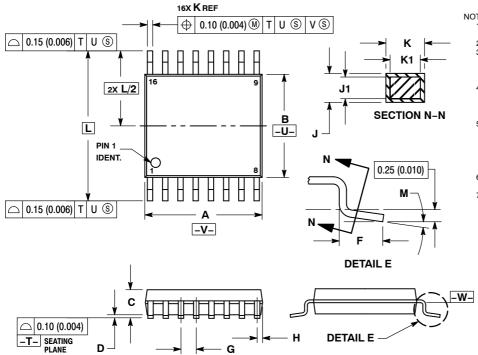
	MILLIN	IETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	9.80	10.00	0.386	0.393
В	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27	BSC	0.050	BSC
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7°	0°	7°
Р	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

SOLDERING FOOTPRINT



PACKAGE DIMENSIONS

TSSOP-16 **DT SUFFIX** CASE 948F-01 **ISSUE B**

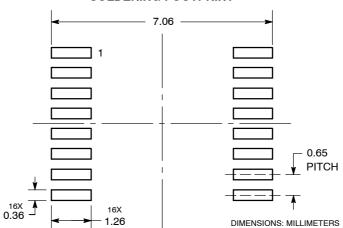


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 - 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 - DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION.
 - INTERLEAD FLASH OR PROTRUSION.
 INTERLEAD FLASH OR PROTRUSION SHALL
 NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE
 DAMBAR PROTRUSION. ALLOWABLE
 DAMBAR PROTRUSION SHALL BE 0.08
 (0.003) TOTAL IN EXCESS OF THE K
 DIMENSION AT MAXIMUM MATERIAL
 CONDITION. CONDITION. 6. TERMINAL NUMBERS ARE SHOWN FOR
 - REFERENCE ONLY.

 7. DIMENSION A AND B ARE TO BE

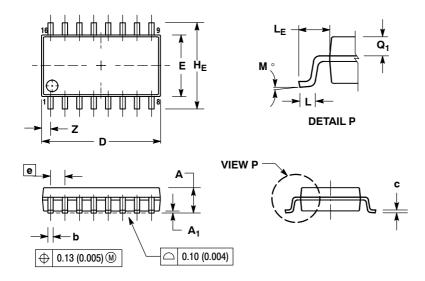
DETERMINED AT DATUM PLANE -W							
	MILLIN	IETERS	INC	HES			
DIM	MIN	MAX	MIN	MAX			
Α	4.90	5.10	0.193	0.200			
В	4.30	4.50	0.169	0.177			
C	-	1.20		0.047			
D	0.05	0.15	0.002	0.006			
F	0.50	0.75	0.020	0.030			
G	0.65	BSC	0.026	BSC			
Н	0.18	0.28	0.007	0.011			
J	0.09	0.20	0.004	0.008			
J1	0.09	0.16	0.004	0.006			
K	0.19	0.30	0.007	0.012			
K1	0.19	0.25	0.007	0.010			
L	6.40	BSC	0.252 BSC				
М	0°	8°	0 °	8°			

SOLDERING FOOTPRINT



PACKAGE DIMENSIONS

SOEIAJ-16 **M SUFFIX** CASE 966-01 **ISSUE A**



NOTES:

- 1. DIMENOIC Y14.5M, 1982 DIMENSIONING AND TOLERANCING PER ANSI
- Y14-3M, 1982.

 CONTROLLING DIMENSION: MILLIMETER.

 DIMENSIONS D AND E DO NOT INCLUDE
 MOLD FLASH OR PROTRUSIONS AND ARE
 MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
- (U.U.D) PER SIDE.

 4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

 5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

MILLIMETERS		INCHES	
MIN	MAX	MIN	MAX
	2.05		0.081
0.05	0.20	0.002	0.008
0.35	0.50	0.014	0.020
0.10	0.20	0.007	0.011
9.90	10.50	0.390	0.413
5.10	5.45	0.201	0.215
1.27 BSC		0.050 BSC	
7.40	8.20	0.291	0.323
0.50	0.85	0.020	0.033
1.10	1.50	0.043	0.059
0 °	10°	0 °	10 °
0.70	0.90	0.028	0.035
	0.78		0.031
	MIN 0.05 0.35 0.10 9.90 5.10 1.27 7.40 0.50 1.10 0 °	MIN MAX 2.05 0.05 0.20 0.35 0.50 0.10 0.20 9.90 10.50 5.10 5.45 1.27 BSC 7.40 8.20 0.50 0.85 1.10 1.50 0 ° 10 ° 0.70 0.90	MIN MAX MIN 2.05 0.05 0.20 0.002 0.35 0.50 0.014 0.10 0.20 0.007 9.90 10.50 0.390 5.10 5.45 0.201 1.27 BSC 0.050 7.40 8.20 0.291 0.50 0.85 0.020 1.10 1.50 0.043 0 ° 10 ° 0 ° 0.70 0.70 0.99 0.028

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