MC74LCX258

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_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.

- 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 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

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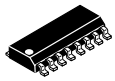
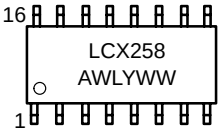
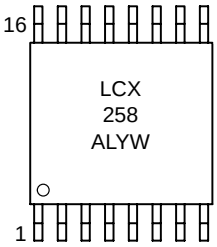
MARKING DIAGRAMS



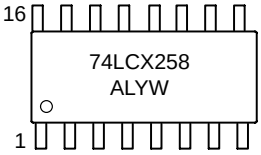
SO–16
D SUFFIX
CASE 751B



TSSOP–16
DT SUFFIX
CASE 948F



EIAJ SO–16
M SUFFIX
CASE 966



A = Assembly Location
L, WL = Wafer Lot
Y = Year
W, WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
MC74LCX258D	SO–16	48 Units/Rail
MC74LCX258DR2	SO–16	2400 Units/Reel
MC74LCX258DTEL	TSSOP–16	2000 Units/Reel
MC74LCX258DTR2	TSSOP–16	2500 Units/Reel
MC74LCX258M	EIAJ SO–16	48 Units/Rail
MC74LCX258MEL	EIAJ SO–16	2400 Units/Reel

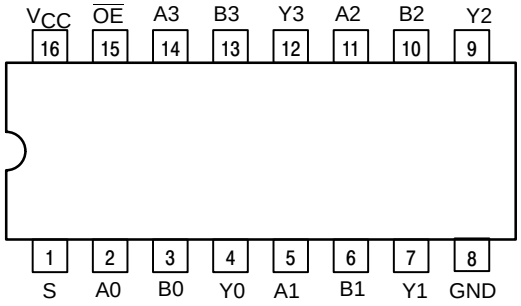


Figure 1. Pinout: 16–Lead Plastic Package
(Top View)

PIN NAMES

Pins	Function
An	Source 0 Data Inputs
Bn	Source B Data Inputs
$\overline{OE}$	Enable Input
S	Select Input
Yn	Outputs

TRUTH TABLE

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

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.

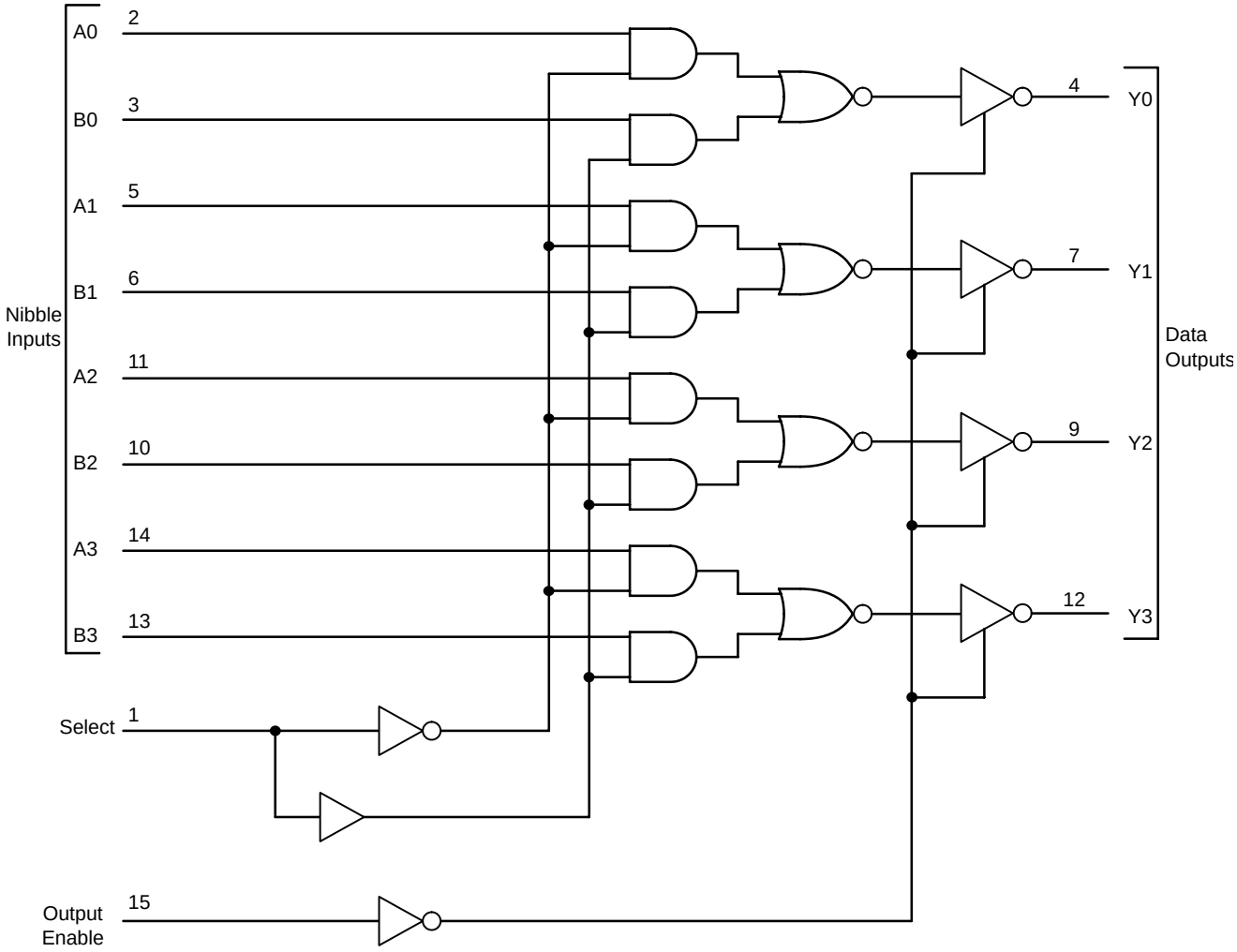


Figure 2. Expanded Logic Diagram

MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Unit
V_{CC}	DC Supply Voltage	–0.5 to +7.0		V
V_I	DC Input Voltage	$–0.5 \le V_I \le +7.0$		V
V_O	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
I_{OK}	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

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum–rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1. Output in HIGH or LOW State. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating Data Retention Only	2.0 1.5	2.3 to 3.3	3.6 3.6	V
V_I	Input Voltage		0		5.5	V
V_O	Output Voltage	(HIGH or LOW State)	0		V_{CC}	V
I_{OH}	HIGH Level Output Current	V_{CC} = 3.0 V – 3.6 V V_{CC} = 2.7 V – 3.0 V V_{CC} = 2.3 V – 2.7 V			–24 –12 –8	mA
I_{OL}	LOW Level Output Current	V_{CC} = 3.0 V – 3.6 V V_{CC} = 2.7 V – 3.0 V V_{CC} = 2.3 V – 2.7 V			+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

DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	$T_A = -40°C$ to $+85°C$ Min	Max	Unit
V_{IH}	Minimum HIGH Level Input Voltage	2.3 V ≤ V_{CC} ≤ 2.7 V	1.7		V
	(Note 2.)	2.7 V ≤ V_{CC} ≤ 3.0 V	2.0		
		3.0 V ≤ V_{CC} ≤ 3.6 V	2.0		
V_{IL}	Maximum LOW Level Input Voltage	2.3 V ≤ V_{CC} ≤ 2.7 V		0.7	V
	(Note 2.)	2.7 V ≤ V_{CC} ≤ 3.0 V		0.8	
		3.0 V ≤ V_{CC} ≤ 3.6 V		0.8	
V_{OH}	Minimum HIGH Level Output Voltage	2.3 V ≤ V_{CC} ≤ 3.6 V; I_{OH} = –100 μA	V_{CC} – 0.2		V
		V_{CC} = 2.3 V; I_{OH} = –8 mA	1.7		
		V_{CC} = 2.7 V; I_{OH} = –12 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}	Maximum LOW Level Output Voltage	2.3 V ≤ V_{CC} ≤ 3.6 V; I_{OH} = 100 μA		0.2	V
		V_{CC} = 2.3 V; I_{OH} = 8 mA		0.7	
		V_{CC} = 2.7 V; I_{OH} = 12 mA		0.4	
		V_{CC} = 3.0 V; I_{OH} = 16 mA		0.4	
		V_{CC} = 3.0 V; I_{OH} = 24 mA		0.55	
I_I	Input Leakage Current	2.3 V ≤ V_{CC} ≤ 3.6 V; 0 V ≤ V_I ≤ 5.5 V		±5.0	μA
I_{CC}	Quiescent Supply Current	2.3 V ≤ V_{CC} ≤ 3.6 V; V_I = V_{CC} or GND		10	μA
		2.3 V ≤ V_{CC} ≤ 3.6 V; 3.6 V ≤ V_I ≤ 5.5 V		±10	
ΔI_{CC}	Increase in I_{CC} per Input	2.3 V ≤ V_{CC} ≤ 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 ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Limits T_A = –40°C to +85°C						Unit
		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		
		Min	Max	Min	Max	Min	Max	
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
t_{OSHL}	Output–to–Output Skew		1.0					ns
t_{OSLH}			1.0					ns

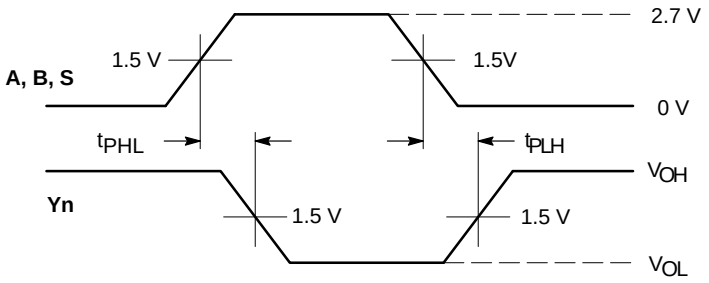
DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	T_A = +25°C Min	Typ	Max	Unit
V_{OLP}	Dynamic LOW Peak Voltage (Note 3.)	V_{CC} = 3.3 V, C_L = 50 pF, V_{IH} = 3.3 V, V_{IL} = 0 V		0.8		V
V_{OLV}	Dynamic LOW Valley Voltage (Note 3.)	V_{CC} = 3.3 V, C_L = 50 pF, V_{IH} = 3.3 V, V_{IL} = 0 V		0.8		V

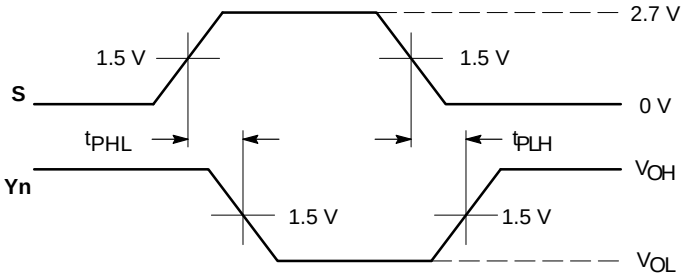
3. Number of outputs defined as “n”. Measured with “n–1” outputs switching from HIGH–to–LOW or LOW–to–HIGH. The remaining output is measured in the LOW state.

CAPACITIVE CHARACTERISTICS

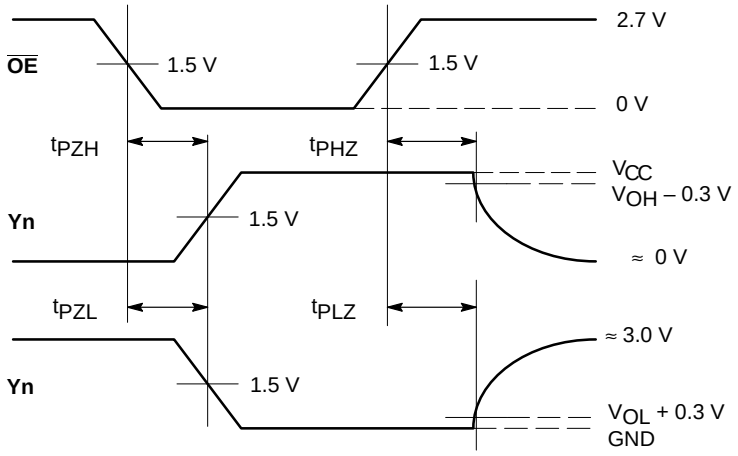
Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	7	pF
C_{OUT}	Output Capacitance	V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	10 MHz, V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	25	pF



WAVEFORM 1 – NONINVERTING PROPAGATION DELAYS
$t_R = t_F$ = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

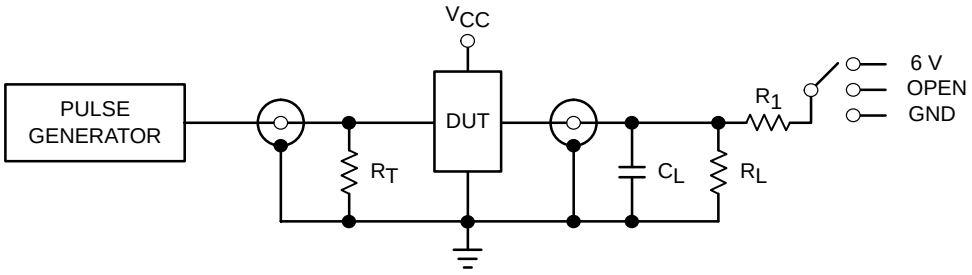


WAVEFORM 2 – INVERTING PROPAGATION DELAYS
$t_R = t_F$ = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns



WAVEFORM 3 – OUTPUT ENABLE AND DISABLE TIMES
$t_R = t_F$ = 2.5 ns, 10% to 90%; f = 1 MHz; t_W = 500 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