

MC74LCX08

Low-Voltage CMOS Quad 2-Input AND Gate

With 5 V-Tolerant Inputs

The MC74LCX08 is a high performance, quad 2-input AND gate 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 MC74LCX08 inputs to be safely driven from 5.0 V devices.

Current drive capability is 24 mA at the outputs.

Features

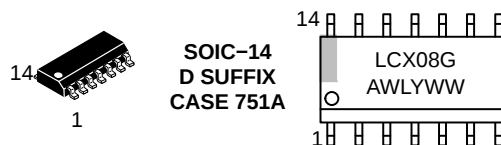
- Designed for 2.3 V to 3.6 V V_{CC} Operation
- 5.0 V Tolerant Inputs – Interface Capability With 5.0 V TTL Logic
- LVTTTL Compatible
- LVC MOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10 μ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance: Human Body Model >2000 V
Machine Model >200 V
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



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MARKING DIAGRAMS



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

MC74LCX08

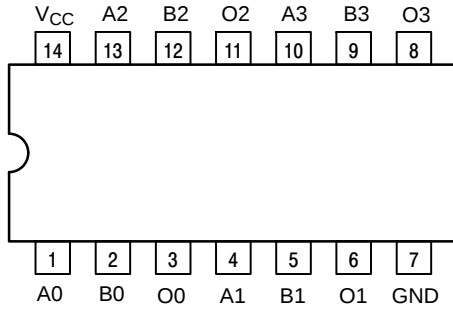


Figure 1. Pinout: 14-Lead (Top View)

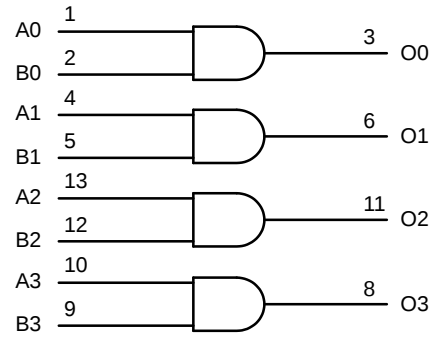


Figure 2. Logic Diagram

PIN NAMES

Pins	Function
An, Bn	Data Inputs
On	Outputs

TRUTH TABLE

Inputs		Outputs
An	Bn	On
L	L	L
L	H	L
H	L	L
H	H	H

H = High Voltage Level
L = Low Voltage Level

For I_{CC} reasons, DO NOT FLOAT Inputs

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 ≤ V _I ≤ +7.0		V
V _O	DC Output Voltage	-0.5 ≤ V _O ≤ V _{CC} + 0.5	Output in HIGH or LOW State (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
MSL	Moisture Sensitivity		Level 1	

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.

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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Type	Max	Unit
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
V _I	Input Voltage	0		5.5	V
V _O	Output Voltage (HIGH or LOW State) (3-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
Δt/ΔV	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

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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	T _A = –40°C to +85°C		Unit
			Min	Max	
V _{IH}	HIGH Level Input Voltage (Note 2)	2.3 V ≤ V _{CC} ≤ 2.7 V	1.7		V
		2.7 V ≤ V _{CC} ≤ 3.6 V	2.0		
V _{IL}	LOW Level Input Voltage (Note 2)	2.3 V ≤ V _{CC} ≤ 2.7 V		0.7	V
		2.7 V ≤ V _{CC} ≤ 3.6 V		0.8	
V _{OH}	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	1.8		
		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}	LOW Level Output Voltage	2.3 V ≤ V _{CC} ≤ 3.6 V; I _{OL} = 100 μA		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 _{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 ≤ V _{CC} ≤ 3.6 V; V _{IH} = V _{CC} – 0.6 V		500	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

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

Symbol	Parameter	Waveform	Limits						Unit
			T _A = -40°C to +85°C						
			V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 2.7 V		V _{CC} = 2.5 V ± 0.2 V		
			C _L = 50 pF		C _L = 50 pF		C _L = 30 pF		
			Min	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time	1	1.5	5.5	1.5	6.2	1.5	6.6	ns
t _{PHL}	Input to Output		1.5	5.5	1.5	6.2	1.5	6.6	
t _{OSHL}	Output-to-Output Skew			1.0					ns
t _{OSLH}	(Note 3)			1.0					

3. 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

Symbol	Characteristic	Condition	$T_A = +25^\circ\text{C}$			Unit
			Min	Typ	Max	
V_{OLP}	Dynamic LOW Peak Voltage (Note 4)	$V_{CC} = 3.3 \text{ V}$, $C_L = 50 \text{ pF}$, $V_{IH} = 3.3 \text{ V}$, $V_{IL} = 0 \text{ V}$ $V_{CC} = 2.5 \text{ V}$, $C_L = 30 \text{ pF}$, $V_{IH} = 2.5 \text{ V}$, $V_{IL} = 0 \text{ V}$		0.8 0.6		V V
V_{OLV}	Dynamic LOW Valley Voltage (Note 4)	$V_{CC} = 3.3 \text{ V}$, $C_L = 50 \text{ pF}$, $V_{IH} = 3.3 \text{ V}$, $V_{IL} = 0 \text{ V}$ $V_{CC} = 2.5 \text{ V}$, $C_L = 30 \text{ pF}$, $V_{IH} = 2.5 \text{ V}$, $V_{IL} = 0 \text{ V}$		-0.8 -0.6		V 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	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	$V_{CC} = 3.3 \text{ V}$, $V_O = 0 \text{ V}$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	10 MHz, $V_{CC} = 3.3 \text{ V}$, $V_I = 0 \text{ V}$ or V_{CC}	25	pF

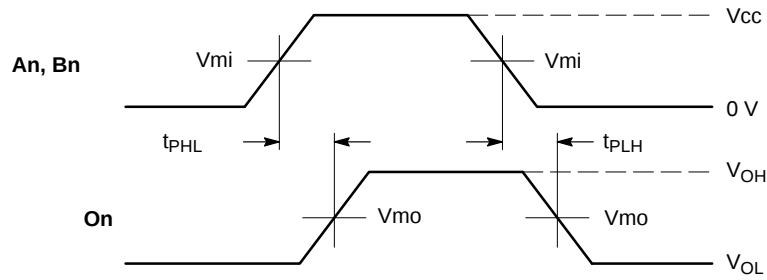
ORDERING INFORMATION

Device	Package	Shipping [†]
MC74LCX08DG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74LCX08DR2G	SOIC-14 (Pb-Free)	2500 Tape & Reel
MC74LCX08DTG	TSSOP-14 (Pb-Free)	96 Units / Rail
MC74LCX08DTR2G	TSSOP-14 (Pb-Free)	2500 Tape & Reel
NLVLCX08DTR2G*	TSSOP-14 (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.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

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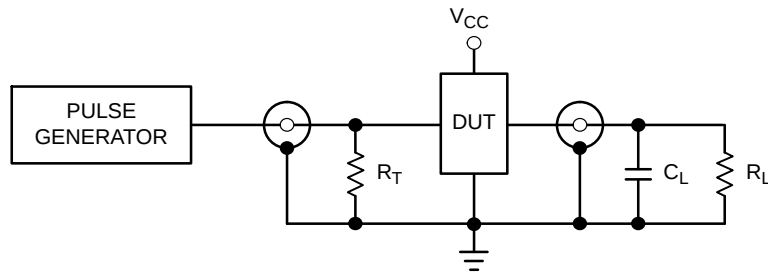


WAVEFORM 1 – PROPAGATION DELAYS

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

Symbol	V _{CC}		
	3.3 V ± 0.3 V	2.7 V	2.5 V ± 0.2 V
V _{mi}	1.5 V	1.5 V	V _{CC} /2
V _{mo}	1.5 V	1.5 V	V _{CC} /2

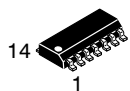
Figure 3. AC Waveforms



$C_L = 50 \text{ pF}$ at $V_{CC} = 3.3 \pm 0.3 \text{ V}$ or equivalent (includes jig and probe capacitance)
 $C_L = 30 \text{ pF}$ at $V_{CC} = 2.5 \pm 0.2 \text{ V}$ or equivalent (includes jig and probe capacitance)
 $R_L = R_1 = 500 \Omega$ or equivalent
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 4. Test Circuit

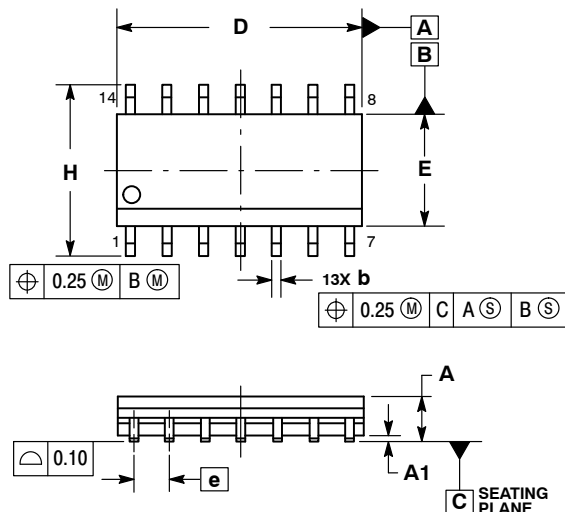
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-14 NB
CASE 751A-03
ISSUE L

DATE 03 FEB 2016



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

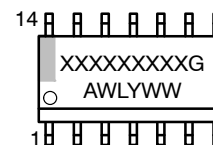
SOLDERING FOOTPRINT*



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.

GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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ISSUE L

DATE 03 FEB 2016

STYLE 1:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
5. ANODE/CATHODE
6. NO CONNECTION
7. ANODE/CATHODE
8. ANODE/CATHODE
9. ANODE/CATHODE
10. NO CONNECTION
11. ANODE/CATHODE
12. ANODE/CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 2:
CANCELLED

STYLE 3:
PIN 1. NO CONNECTION
2. ANODE
3. ANODE
4. NO CONNECTION
5. ANODE
6. NO CONNECTION
7. ANODE
8. ANODE
9. ANODE
10. NO CONNECTION
11. ANODE
12. ANODE
13. NO CONNECTION
14. COMMON CATHODE

STYLE 4:
PIN 1. NO CONNECTION
2. CATHODE
3. CATHODE
4. NO CONNECTION
5. CATHODE
6. NO CONNECTION
7. CATHODE
8. CATHODE
9. CATHODE
10. NO CONNECTION
11. CATHODE
12. CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 5:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. ANODE/CATHODE
5. ANODE/CATHODE
6. NO CONNECTION
7. COMMON ANODE
8. COMMON CATHODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. ANODE/CATHODE
12. ANODE/CATHODE
13. NO CONNECTION
14. COMMON ANODE

STYLE 6:
PIN 1. CATHODE
2. CATHODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE
7. CATHODE
8. ANODE
9. ANODE
10. ANODE
11. ANODE
12. ANODE
13. ANODE
14. ANODE

STYLE 7:
PIN 1. ANODE/CATHODE
2. COMMON ANODE
3. COMMON CATHODE
4. ANODE/CATHODE
5. ANODE/CATHODE
6. ANODE/CATHODE
7. ANODE/CATHODE
8. ANODE/CATHODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. COMMON CATHODE
12. COMMON ANODE
13. ANODE/CATHODE
14. ANODE/CATHODE

STYLE 8:
PIN 1. COMMON CATHODE
2. ANODE/CATHODE
3. ANODE/CATHODE
4. NO CONNECTION
5. ANODE/CATHODE
6. ANODE/CATHODE
7. COMMON ANODE
8. COMMON ANODE
9. ANODE/CATHODE
10. ANODE/CATHODE
11. NO CONNECTION
12. ANODE/CATHODE
13. ANODE/CATHODE
14. COMMON CATHODE

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