



**THE DATASHEET OF
MC74LCX32MEL**



MC74LCX32

Low-Voltage CMOS Quad 2-Input OR Gate

With 5 V-Tolerant Inputs

The MC74LCX32 is a high performance, quad 2-input OR 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 MC74LCX32 inputs to be safely driven from 5.0 V devices.

Current drive capability is 24 mA at the outputs.

Features

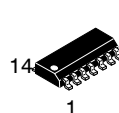
- Designed for 2.3 V to 3.6 V V_{CC} Operation
- 5.0 V Tolerant Inputs – Interface Capability With 5.0 V TTL Logic
- LVTTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10 μ A) Substantially Reduces System Power Requirements
- Latchup 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-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



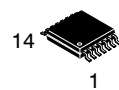
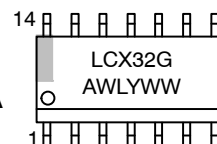
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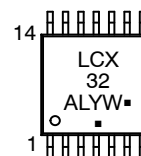
MARKING DIAGRAMS



SOIC-14
D SUFFIX
CASE 751A



TSSOP-14
DT SUFFIX
CASE 948G



A = Assembly Location
L, WL = Wafer Lot
Y, YY = 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.

MC74LCX32

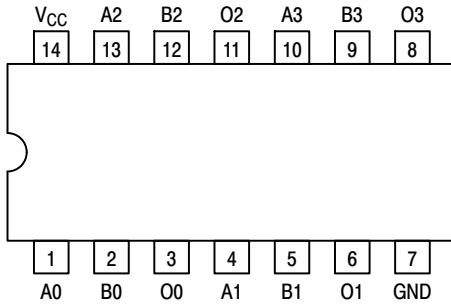


Figure 1. Pinout: 14-Lead (Top View)

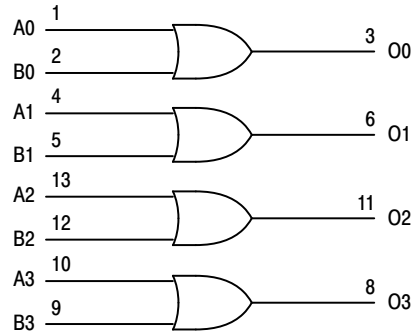


Figure 2. Logic Diagram

PIN NAMES

| Pins | Function |
|--------|-------------|
| An, Bn | Data Inputs |
| On | Outputs |

TRUTH TABLE

| Inputs | | Outputs |
|--------|----|---------|
| An | Bn | On |
| L | L | L |
| L | H | H |
| H | L | H |
| 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 | Units |
|------------------|----------------------------------|---|--------------------------------------|-------|
| 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 | |

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.

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RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Type | 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 |
| 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 $V_{CC} = 3.0\text{ V} - 3.6\text{ V}$ $V_{CC} = 2.7\text{ V} - 3.0\text{ V}$ $V_{CC} = 2.3\text{ V} - 2.7\text{ V}$ | | | -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 |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate, V_{IN} from 0.8 V to 2.0 V, $V_{CC} = 3.0\text{ V}$ | 0 | | 10 | ns/V |

DC ELECTRICAL CHARACTERISTICS

| Symbol | Characteristic | Condition | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units |
|-----------------|------------------------------------|--|---|---------|---------------|
| | | | Min | Max | |
| V_{IH} | HIGH Level Input Voltage (Note 1.) | $2.3\text{ V} \leq V_{CC} \leq 2.7\text{ V}$ | 1.7 | | V |
| | | $2.7\text{ V} \leq V_{CC} \leq 3.6\text{ V}$ | 2.0 | | |
| V_{IL} | LOW Level Input Voltage (Note 1.) | $2.3\text{ V} \leq V_{CC} \leq 2.7\text{ V}$ | | 0.7 | V |
| | | $2.7\text{ V} \leq V_{CC} \leq 3.6\text{ V}$ | | 0.8 | |
| V_{OH} | HIGH Level Output Voltage | $2.3\text{ V} \leq V_{CC} \leq 3.6\text{ V}; I_{OH} = -100\ \mu\text{A}$ | $V_{CC} - 0.2$ | | V |
| | | $V_{CC} = 2.3\text{ V}; I_{OH} = -8\text{ mA}$ | 1.8 | | |
| | | $V_{CC} = 2.7\text{ V}; I_{OH} = -12\text{ mA}$ | 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} | LOW Level Output Voltage | $2.3\text{ V} \leq V_{CC} \leq 3.6\text{ V}; I_{OL} = 100\ \mu\text{A}$ | | 0.2 | V |
| | | $V_{CC} = 2.3\text{ V}; I_{OL} = 8\text{ mA}$ | | 0.6 | |
| | | $V_{CC} = 2.7\text{ V}; I_{OL} = 12\text{ mA}$ | | 0.4 | |
| | | $V_{CC} = 3.0\text{ V}; I_{OL} = 16\text{ mA}$ | | 0.4 | |
| | | $V_{CC} = 3.0\text{ V}; I_{OL} = 24\text{ mA}$ | | 0.55 | |
| I_{OFF} | Power Off Leakage Current | $V_{CC} = 0, V_{IN} = 5.5\text{ V or } V_{OUT} = 5.5\text{ V}$ | | 10 | μA |
| I_{IN} | Input Leakage Current | $V_{CC} = 3.6\text{ V}, V_{IN} = 5.5\text{ V or GND}$ | | ± 5 | μA |
| I_{CC} | Quiescent Supply Current | $V_{CC} = 3.6\text{ V}, V_{IN} = 5.5\text{ V or GND}$ | | 10 | μA |
| ΔI_{CC} | Increase in I_{CC} per Input | $2.3 \leq V_{CC} \leq 3.6\text{ V}; V_{IH} = V_{CC} - 0.6\text{ V}$ | | 500 | μA |

1. 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 | | | | | | Units |
|--------------------------|---|----------|---|------------|--------------------------|------------|--|------------|-------|
| | | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | | | | | |
| | | | $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ | | $V_{CC} = 2.7 \text{ V}$ | | $V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$ | | |
| | | | $C_L = 50 \text{ pF}$ | | $C_L = 50 \text{ pF}$ | | $C_L = 30 \text{ pF}$ | | |
| | | | Min | Max | Min | Max | Min | Max | |
| t_{PLH} t_{PHL} | Propagation Delay Time Input to Output | 1 | 1.5 1.5 | 5.5 5.5 | 1.5 1.5 | 6.2 6.2 | 1.5 1.5 | 6.6 6.6 | ns |
| t_{OSHL} t_{OSLH} | Output-to-Output Skew (Note 2) | | | 1.0 1.0 | | | | | ns |

2. 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 | $T_A = +25^\circ\text{C}$ | | | Units |
|-----------|--|--|---------------------------|--------------|-----|-------|
| | | | Min | Typ | Max | |
| V_{OLP} | Dynamic LOW Peak Voltage (Note 3) | $V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, V_{IH} = 3.3 \text{ V}, V_{IL} = 0 \text{ V}$ $V_{CC} = 2.5 \text{ V}, C_L = 30 \text{ pF}, V_{IH} = 2.5 \text{ V}, V_{IL} = 0 \text{ V}$ | | 0.8 0.6 | | V |
| V_{OLV} | Dynamic LOW Valley Voltage (Note 3) | $V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, V_{IH} = 3.3 \text{ V}, V_{IL} = 0 \text{ V}$ $V_{CC} = 2.5 \text{ V}, C_L = 30 \text{ pF}, V_{IH} = 2.5 \text{ V}, V_{IL} = 0 \text{ V}$ | | -0.8 -0.6 | | V |

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 | Units |
|-----------|-------------------------------|--|---------|-------|
| C_{IN} | Input Capacitance | $V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$ | 7 | pF |
| C_{OUT} | Output Capacitance | $V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$ | 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 |

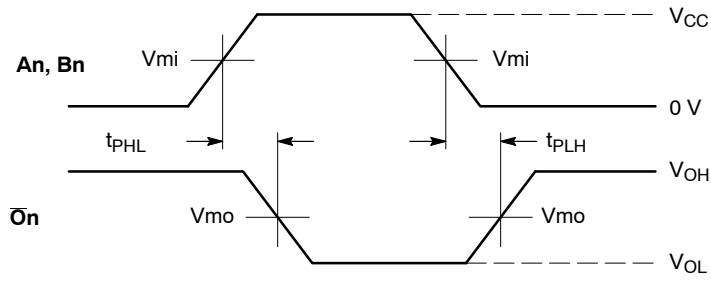
ORDERING INFORMATION

| Device | Package | Shipping [†] |
|------------------|-----------------------|-----------------------|
| MC74LCX32DR2G | SOIC-14 (Pb-Free) | 2500 Tape & Reel |
| MC74LCX32DTG | TSSOP-14 (Pb-Free) | 96 Units / Rail |
| MC74LCX32DTR2G | TSSOP-14 (Pb-Free) | 2500 Tape & Reel |
| NLV74LCX32DTR2G* | 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-Q100 Qualified and PPAP Capable.

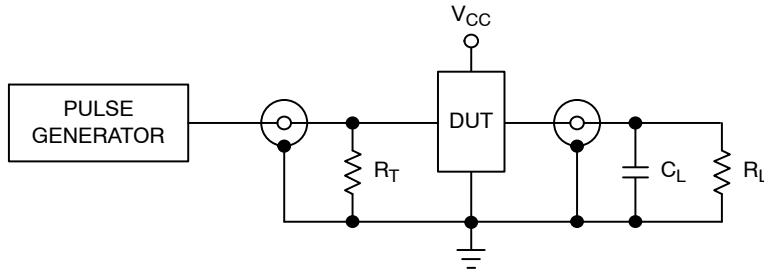
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WAVEFORM 1 - PROPAGATION DELAYS
 $t_R = t_F = 2.5 \text{ ns}$, 10% to 90%; $f = 1 \text{ MHz}$; $t_W = 500 \text{ ns}$

| Symbol | Vcc | | |
|--------|---------------|-------|---------------|
| | 3.3 V ± 0.3 V | 2.7 V | 2.5 V ± 0.2 V |
| Vmi | 1.5 V | 1.5 V | Vcc/2 |
| Vmo | 1.5 V | 1.5 V | Vcc/2 |

Figure 3. AC Waveforms



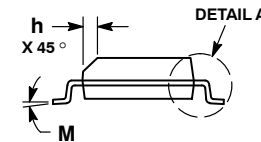
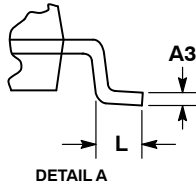
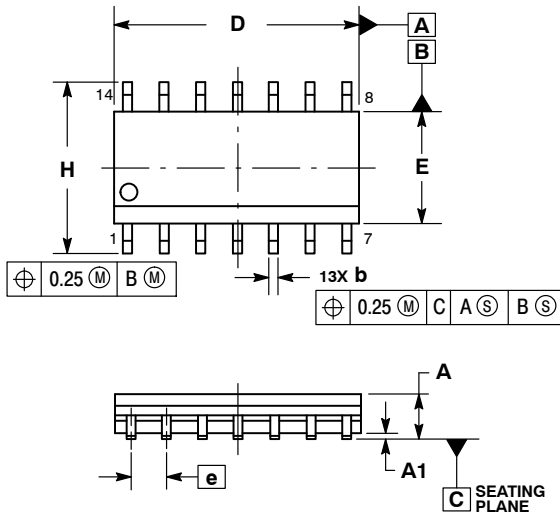
$C_L = 50 \text{ pF}$ at $V_{CC} = 3.3 \pm 0.3 \text{ V}$ or equivalent (includes jig and probe capacitance)
 $C_L = 30 \text{ pF}$ at $V_{CC} = 2.5 \pm 0.2 \text{ V}$ or equivalent (includes jig and probe capacitance)
 $R_L = R_1 = 500 \Omega$ or equivalent
 $R_T = Z_{OUT}$ of pulse generator (typically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

Figure 4. Test Circuit

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PACKAGE DIMENSIONS

SOIC-14 NB
CASE 751A-03
ISSUE K

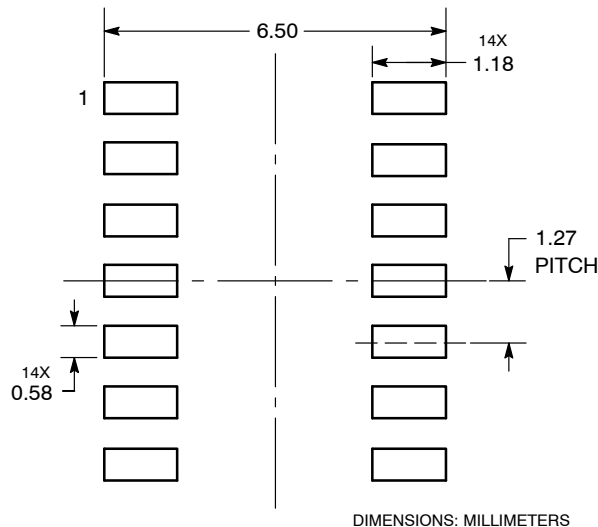


NOTES:

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.

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