

# MC74LCX07

## Low-Voltage CMOS Hex Buffer with Open Drain Outputs

### With 5 V-Tolerant Inputs

The MC74LCX07 is a high performance hex buffer operating from a 2.3 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers. These LCX devices have open drain outputs which provide the ability to set output levels, or do active-HIGH AND or active-LOW OR functions. A  $V_I$  specification of 5.5 V allows MC74LCX07 inputs to be safely driven from 5.0 V devices.

#### Features

- Designed for 2.3 to 3.6 V  $V_{CC}$  Operation
- 5.0 V Tolerant Inputs/Outputs
- LVTTTL Compatible
- LVC MOS Compatible
- 24 mA Output Sink Capability
- Near Zero Static Supply Current (10  $\mu$ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- Wired-OR, Wired-AND
- Output Level Can Be Set Externally Without Affecting Speed of Device
- ESD Performance: Human Body Model >1500 V;  
Machine Model >200 V
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

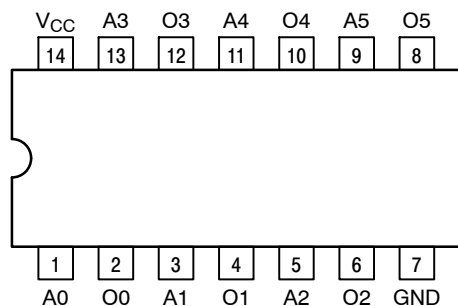


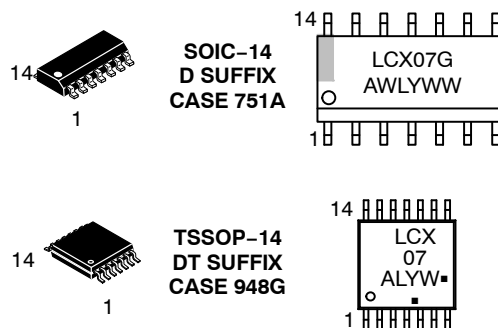
Figure 1. Pinout: 14-Lead (Top View)



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#### MARKING DIAGRAMS



A = Assembly Location  
L, WL = Wafer Lot  
Y, YY = Year  
W, WW = Work Week  
G = Pb-Free Package  
▪ = 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 2 of this data sheet.

## MC74LCX07

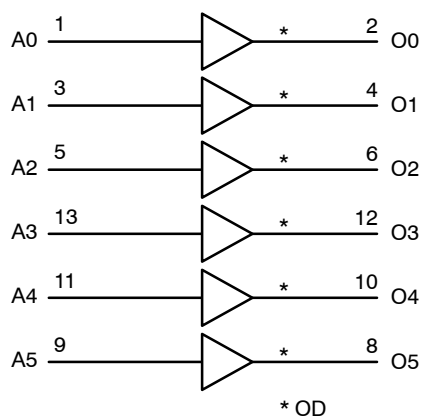


Figure 2. Logic Diagram

### PIN NAMES

| Pins     | Function               |
|----------|------------------------|
| An<br>On | Data Inputs<br>Outputs |

### TRUTH TABLE

| An | On |
|----|----|
| L  | L  |
| H  | Z  |

### MAXIMUM RATINGS

| Symbol    | Parameter                        | Value                     | Condition                            | Unit |
|-----------|----------------------------------|---------------------------|--------------------------------------|------|
| $V_{CC}$  | DC Supply Voltage                | -0.5 to +7.0              |                                      | V    |
| $V_I$     | DC Input Voltage                 | $-0.5 \leq V_I \leq +7.0$ |                                      | V    |
| $V_O$     | DC Output Voltage                | $-0.5 \leq V_O \leq +7.0$ | 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/Sink Current           | +50                       |                                      | mA   |
| $I_{CC}$  | DC Supply Current Per Supply Pin | $\pm 100$                 |                                      | mA   |
| $I_{GND}$ | DC Ground Current Per Ground Pin | $\pm 100$                 |                                      | mA   |
| $T_{STG}$ | Storage Temperature Range        | -65 to +150               |                                      | °C   |
| MSL       | Moisture Sensitivity             |                           | Level 1                              |      |

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.

1.  $I_O$  absolute maximum rating must be observed.

### ORDERING INFORMATION

| Device         | Package               | Shipping <sup>†</sup> |
|----------------|-----------------------|-----------------------|
| MC74LCX07DG    | SOIC-14<br>(Pb-Free)  | 55 Units / Rail       |
| MC74LCX07DR2G  | SOIC-14<br>(Pb-Free)  | 2500 Tape & Reel      |
| MC74LCX07DTG   | TSSOP-14<br>(Pb-Free) | 96 Units / Rail       |
| MC74LCX07DTR2G | TSSOP-14<br>(Pb-Free) | 2500 Tape & Reel      |

<sup>†</sup>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.

# MC74LCX07

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter                                                                                                                    | Min        | Typ        | Max              | Unit |
|-----------------|------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------------|------|
| V <sub>CC</sub> | Supply Voltage<br>Operating<br>Data Retention Only                                                                           | 2.0<br>1.5 | 2.3 to 3.3 | 5.5<br>5.5       | V    |
| V <sub>I</sub>  | Input Voltage                                                                                                                | 0          |            | 5.5              | V    |
| V <sub>O</sub>  | Output Voltage (HIGH or LOW State)                                                                                           | 0          |            | 5.5              | V    |
| I <sub>OH</sub> | HIGH Level Output Current<br>V <sub>CC</sub> = 3.0 V–3.6 V<br>V <sub>CC</sub> = 2.7 V–3.0 V<br>V <sub>CC</sub> = 2.3 V–2.7 V |            |            | –24<br>–12<br>–8 | mA   |
| I <sub>OL</sub> | LOW Level Output Current<br>V <sub>CC</sub> = 3.0 V–3.6 V<br>V <sub>CC</sub> = 2.7 V–3.0 V<br>V <sub>CC</sub> = 2.3 V–2.7 V  |            |            | +24<br>+12<br>+8 | mA   |
| T <sub>A</sub>  | Operating Free–Air Temperature                                                                                               | –40        |            | +85              | °C   |
| Δt/ΔV           | Input Transition Rise or Fall Rate, V <sub>IN</sub> from 0.8 V to 2.0 V, V <sub>CC</sub> = 3.0 V                             | 0          |            | 10               | ns/V |

## DC ELECTRICAL CHARACTERISTICS

| Symbol           | Characteristic                        | Condition                                                                                                                                                       | T <sub>A</sub> = –40°C to +85°C |                  | Unit           |
|------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------|----------------|
|                  |                                       |                                                                                                                                                                 | Min                             | Max              |                |
| V <sub>IH</sub>  | HIGH Level Input Voltage (Note 2)     | 2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V                                                                                                                                 | 1.7                             |                  | V              |
|                  |                                       | 2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V                                                                                                                                 | 2.0                             |                  |                |
|                  |                                       | 4.5 V ≤ V <sub>CC</sub> ≤ 5.25 V                                                                                                                                | 3.125                           |                  |                |
| V <sub>IL</sub>  | LOW Level Input Voltage (Note 2)      | 2.3 V ≤ V <sub>CC</sub> ≤ 2.7 V                                                                                                                                 |                                 | 0.7              | V              |
|                  |                                       | 2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V                                                                                                                                 |                                 | 0.8              |                |
|                  |                                       | 4.5 V ≤ V <sub>CC</sub> ≤ 5.25 V                                                                                                                                |                                 | 0.8              |                |
| V <sub>OL</sub>  | LOW Level Output Voltage              | 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OL</sub> = 100 μA                                                                                                       |                                 | 0.2              | V              |
|                  |                                       | V <sub>CC</sub> = 2.3 V; I <sub>OL</sub> = 8 mA                                                                                                                 |                                 | 0.3              |                |
|                  |                                       | V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 12 mA                                                                                                                |                                 | 0.4              |                |
|                  |                                       | V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 16 mA                                                                                                                |                                 | 0.4              |                |
|                  |                                       | V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 24 mA                                                                                                                |                                 | 0.55             |                |
| I <sub>OZ</sub>  | 3–State Output Current                | V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br>V <sub>OUT</sub> = 0 to 5.5 V                                                |                                 | ± 5              | μA             |
| I <sub>OFF</sub> | Power Off Leakage Current             | V <sub>CC</sub> = 0, V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V                                                                                        |                                 | 10               | μA             |
| I <sub>IN</sub>  | Input Leakage Current                 | V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = 5.5 V or GND                                                                                                         |                                 | ± 5              | μA             |
| I <sub>CC</sub>  | Quiescent Supply Current              | V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = 5.5 V or GND                                                                                                         |                                 | 10               | μA             |
| ΔI <sub>CC</sub> | Increase in I <sub>CC</sub> per Input | 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V<br>4.5 V ≤ V <sub>CC</sub> ≤ 5.5 V<br>V <sub>CC</sub> = 5.25 V, one input at 3.125 V, other<br>inputs at V <sub>CC</sub> or GND |                                 | 500<br>1.0<br>10 | μA<br>mA<br>mA |

2. These values of V<sub>I</sub> are used to test DC electrical characteristics only.

## AC ELECTRICAL CHARACTERISTICS

| Symbol           | Parameter         | Limits                          |     |                         |     |                                 |     | Unit |
|------------------|-------------------|---------------------------------|-----|-------------------------|-----|---------------------------------|-----|------|
|                  |                   | T <sub>A</sub> = -40°C to +85°C |     |                         |     |                                 |     |      |
|                  |                   | V <sub>CC</sub> = 3.3 V ± 0.3 V |     | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 2.5 V ± 0.2 V |     |      |
|                  |                   | C <sub>L</sub> = 50 pF          |     | C <sub>L</sub> = 50 pF  |     | C <sub>L</sub> = 30 pF          |     |      |
|                  |                   | Min                             | Max | Min                     | Max | Min                             | Max |      |
| t <sub>PLZ</sub> | Propagation Delay | 0.5                             | 3.0 | 0.8                     | 3.7 | 0.8                             | 3.8 | ns   |
| t <sub>pZL</sub> | Input to Output   | 0.5                             | 3.0 | 0.8                     | 3.7 | 0.8                             | 3.8 | ns   |

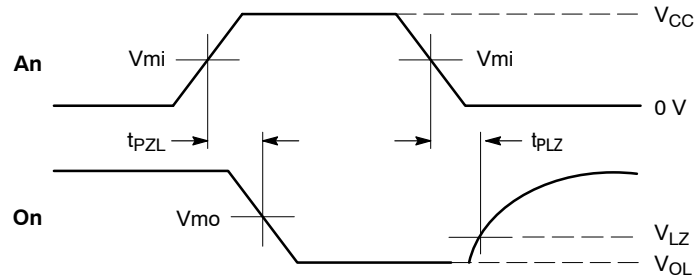
### DYNAMIC SWITCHING CHARACTERISTICS

| Symbol           | Characteristic                      | Condition                                                                                                                                                                                          | T <sub>A</sub> = +25°C |              |     | Unit |
|------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------|-----|------|
|                  |                                     |                                                                                                                                                                                                    | Min                    | Typ          | Max |      |
| V <sub>OLP</sub> | Dynamic LOW Peak Voltage (Note 3)   | V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V<br>V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V |                        | 0.9<br>0.7   |     | V    |
| V <sub>OLV</sub> | Dynamic LOW Valley Voltage (Note 3) | V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V<br>V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V |                        | -0.8<br>-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 | Unit |
|------------------|-------------------------------|--------------------------------------------------------------------------|---------|------|
| C <sub>IN</sub>  | Input Capacitance             | V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>         | 7       | pF   |
| C <sub>OUT</sub> | Output Capacitance            | V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>         | 8       | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance | 10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub> | 25      | pF   |

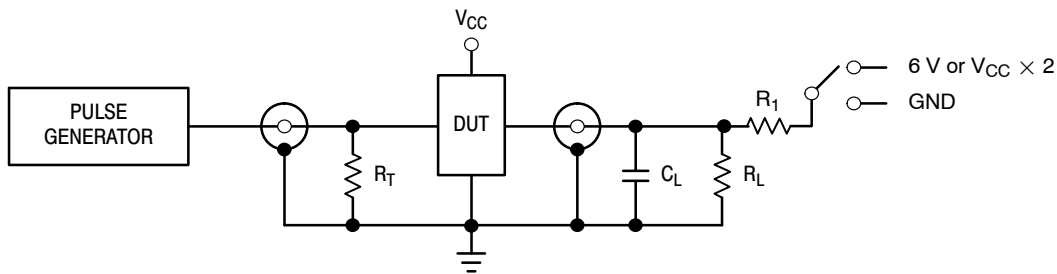


#### PROPAGATION DELAYS

t<sub>R</sub> = t<sub>F</sub> = 2.5 ns, 10% to 90%; f = 1MHz; t<sub>W</sub> = 500 ns

| Symbol          | V <sub>CC</sub>         |                         |                          |
|-----------------|-------------------------|-------------------------|--------------------------|
|                 | 3.3 V ± 0.3 V           | 2.7 V                   | 2.5 V ± 0.2 V            |
| V <sub>mi</sub> | 1.5 V                   | 1.5 V                   | V <sub>CC</sub> /2       |
| V <sub>mo</sub> | 1.5 V                   | 1.5 V                   | V <sub>CC</sub> /2       |
| V <sub>LV</sub> | V <sub>OL</sub> + 0.3 V | V <sub>OL</sub> + 0.3 V | V <sub>OL</sub> + 0.15 V |

Figure 3. AC Waveforms



| TEST                                                       | SWITCH |
|------------------------------------------------------------|--------|
| t <sub>PZL</sub> , t <sub>PLZ</sub>                        | 6 V    |
| Open Collector/Drain t <sub>PLH</sub> and t <sub>PHL</sub> | 6 V    |
| t <sub>PZH</sub> , t <sub>PHZ</sub>                        | GND    |

C<sub>L</sub> = 50 pF at V<sub>CC</sub> = 3.3 ± 0.3 V or equivalent (includes jig and probe capacitance)  
C<sub>L</sub> = 30 pF at V<sub>CC</sub> = 2.5 ± 0.2 V or equivalent (includes jig and probe capacitance)  
R<sub>L</sub> = R<sub>1</sub> = 500 Ω or equivalent  
R<sub>T</sub> = Z<sub>OUT</sub> of pulse generator (typically 50 Ω)

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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CASE 751A-03  
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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