

# 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
- Pb-Free Packages are Available\*

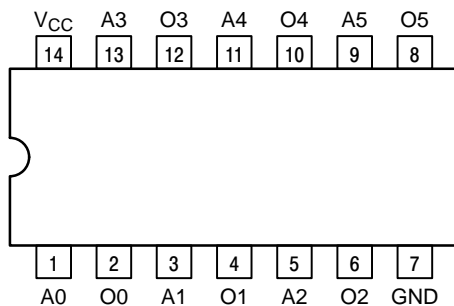


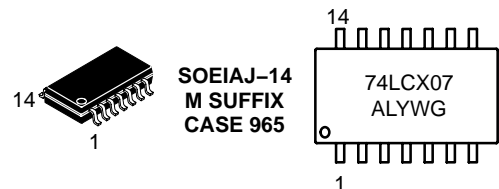
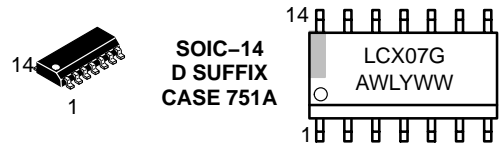
Figure 1. Pinout: 14-Lead (Top View)



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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.

\*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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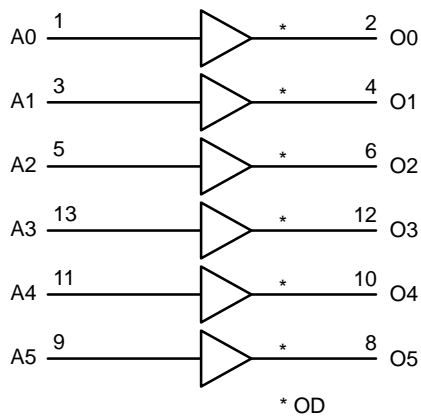


Figure 2. Logic Diagram

## PIN NAMES

Pins	Function
An	Data Inputs
On	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		$^{\circ}C$

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.

## ORDERING INFORMATION

Device	Package	Shipping†
MC74LCX07D	SOIC-14	55 Units / Rail
MC74LCX07DG	SOIC-14 (Pb-Free)	55 Units / Rail
MC74LCX07DR2	SOIC-14	2500 Tape & Reel
MC74LCX07DR2G	SOIC-14 (Pb-Free)	2500 Tape & Reel
MC74LCX07DT	TSSOP-14*	96 Units / Rail
MC74LCX07DTG	TSSOP-14*	96 Units / Rail
MC74LCX07DTR2	TSSOP-14*	2500 Tape & Reel
MC74LCX07DTR2G	TSSOP-14*	2500 Tape & Reel
MC74LCX07M	SOEIAJ-14	50 Units / Rail
MC74LCX07MG	SOEIAJ-14 (Pb-Free)	50 Units / Rail
MC74LCX07MEL	SOEIAJ-14	2000 Tape & Reel
MC74LCX07MELG	SOEIAJ-14 (Pb-Free)	2000 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.

\*This package is inherently Pb-Free.

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## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating Data Retention Only	2.0 1.5	2.3 to 3.3	5.5 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 V <sub>CC</sub> = 3.0 V–3.6 V V <sub>CC</sub> = 2.7 V–3.0 V V <sub>CC</sub> = 2.3 V–2.7 V			–24 –12 –8	mA
I <sub>OL</sub>	LOW Level Output Current V <sub>CC</sub> = 3.0 V–3.6 V V <sub>CC</sub> = 2.7 V–3.0 V V <sub>CC</sub> = 2.3 V–2.7 V			+24 +12 +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		
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	
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>I</sub>	Maximum Input Leakage Current	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V, 0 V ≤ V <sub>I</sub> ≤ 5.5 V		±5	μA
I <sub>OFF</sub>	Power–Off Leakage Current	V <sub>CC</sub> = 0V, V <sub>O</sub> or V <sub>I</sub> = 5.5V		10	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V, V <sub>I</sub> = V <sub>CC</sub> or GND 2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V, 3.6 V ≤ V <sub>I</sub> ≤ 5.5 V		10 ±10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	2.3 V ≤ V <sub>CC</sub> ≤ 3.6 V		500	μA
		4.5 V ≤ V <sub>CC</sub> ≤ 5.5 V		1.0	

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

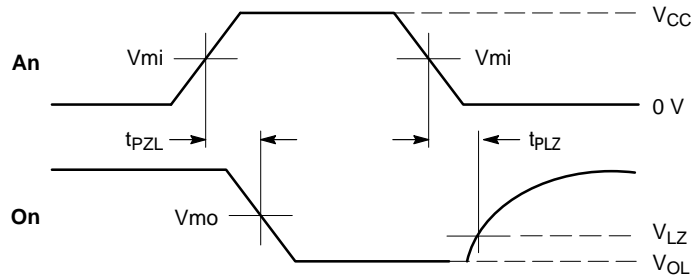
Symbol	Characteristic	Condition	T <sub>A</sub> = +25°C			Unit
			Min	Typ	Max	
V <sub>OLP</sub>	Dynamic LOW Peak Voltage (Note 3)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V		0.9 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 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 –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.

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## 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	$V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	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

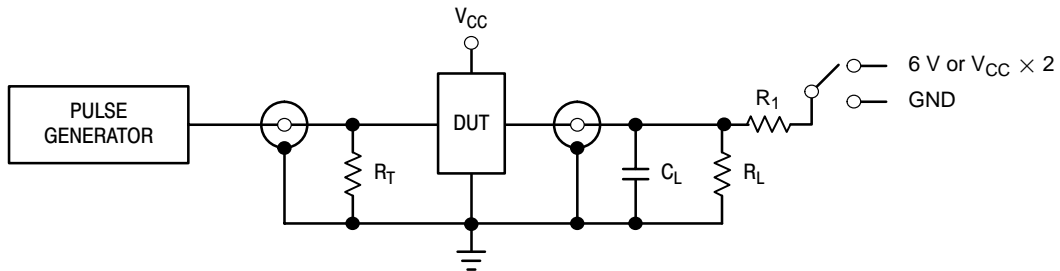


### PROPAGATION DELAYS

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

Symbol	$V_{CC}$		
	$3.3 \text{ V} \pm 0.3 \text{ V}$	$2.7 \text{ V}$	$2.5 \text{ V} \pm 0.2 \text{ V}$
$V_{mi}$	1.5 V	1.5 V	$V_{CC}/2$
$V_{mo}$	1.5 V	1.5 V	$V_{CC}/2$
$V_{LZ}$	$V_{OL} + 0.3 \text{ V}$	$V_{OL} + 0.3 \text{ V}$	$V_{OL} + 0.15 \text{ V}$

Figure 3. AC Waveforms



TEST	SWITCH
$t_{PZL}, t_{PLZ}$	6 V
Open Collector/Drain $t_{PLH}$ and $t_{PHL}$	6 V
$t_{PZH}, t_{PHZ}$	GND

$C_L = 50 \text{ pF}$  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  $50 \Omega$ )

Figure 4. Test Circuit

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## PACKAGE DIMENSIONS

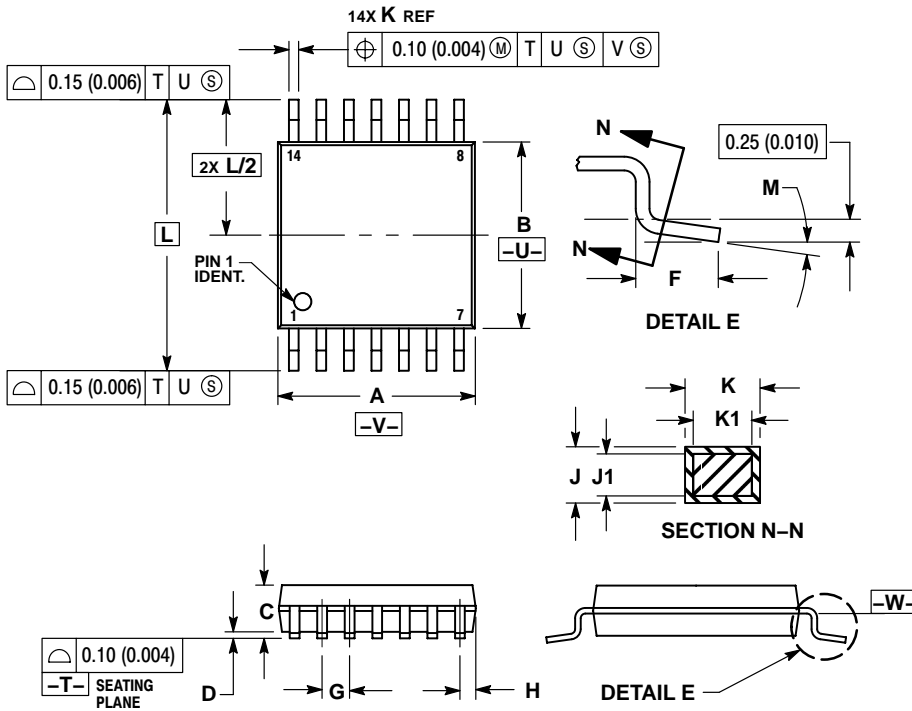
SOIC-14  
D SUFFIX  
CASE 751A-03  
ISSUE G



- 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.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	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°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

TSSOP-14  
DT SUFFIX  
CASE 948G-01  
ISSUE A



- 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.
  4. DIMENSION B DOES NOT INCLUDE 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.
  6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	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	
H	0.50	0.60	0.020	0.024
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	
M	0°	8°	0°	8°

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## PACKAGE DIMENSIONS

SOEIAJ-14  
M SUFFIX  
CASE 965-01  
ISSUE O



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. 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.
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).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A <sub>1</sub>	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H <sub>E</sub>	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L <sub>E</sub>	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q <sub>1</sub>	0.70	0.90	0.028	0.035
Z	---	1.42	---	0.056

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