MC74LCX06

Advance Information
Low-Voltage CMOS Hex Inverter with Open Drain Outputs and 5V-Tolerant Inputs

The MC74LCX06 is a high performance hex inverter operating from a 2.3 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers. All 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 MC74LCX04 inputs to be safely driven from 5 V devices.

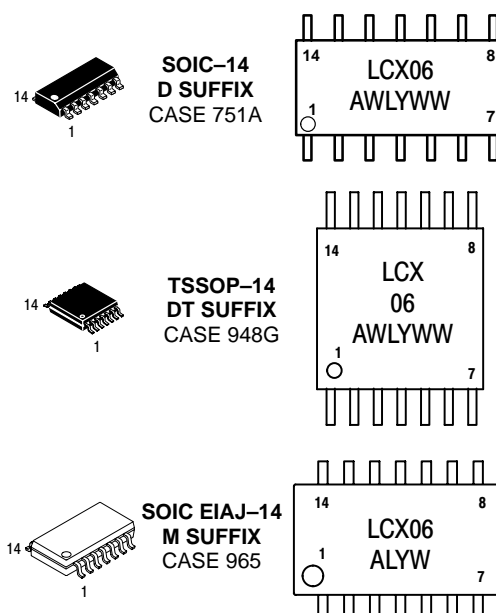Current drive capability is 24mA at the outputs.

- Designed for 2.3 to 3.6 V V_{CC} Operation
- 5 V Tolerant Inputs — Interface Capability With 5 V TTL Logic
- LVTTL Compatible
- LVCMOS Compatible
- 24mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500mA
- ESD Performance: Human Body Model >2000V; Machine Model >200V

ON Semiconductor

http://onsemi.com

MARKING DIAGRAMS

SOIC–14
D SUFFIX
CASE 751A

```
14        8
   LCX06
  AWLYWW
1         7
```

TSSOP–14
DT SUFFIX
CASE 948G

```
14        8
   LCX
    06
  AWLYWW
1         7
```

SOIC EIAJ–14
M SUFFIX
CASE 965

```
14        8
   LCX06
   ALYW
1         7
```

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

ORDERING INFORMATION

Device	Package	Shipping
MC74LCX06D	SOIC–14	55 Units/Rail
MC74LCX06DR2	SOIC–14	2500 Units/Reel
MC74LCX06DT	TSSOP–14	96 Untis/Rail
MC74LCX06DTR2	TSSOP–14	2500 Units/Reel
MC74LCX06M	SOIC EIAJ–14	50 Units/Rail
MC74LCX06MEL	SOIC EIAJ–14	2000 Units/Reel

This document contains information on a new product. Specifications and information herein are subject to change without notice.
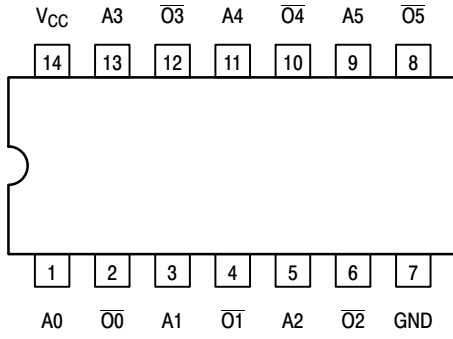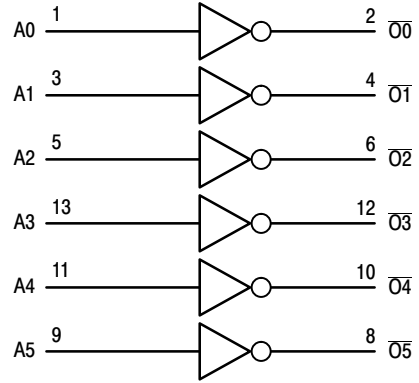
MC74LCX06

Pinout: 14–Lead (Top View)

V_{CC}	A3	$\overline{O3}$	A4	$\overline{O4}$	A5	$\overline{O5}$
14	13	12	11	10	9	8

1	2	3	4	5	6	7
A0	$\overline{O0}$	A1	$\overline{O1}$	A2	$\overline{O2}$	GND

Figure 1. LOGIC DIAGRAM

A0	1		2	$\overline{O0}$
A1	3		4	$\overline{O1}$
A2	5		6	$\overline{O2}$
A3	13		12	$\overline{O3}$
A4	11		10	$\overline{O4}$
A5	9		8	$\overline{O5}$

PIN NAMES

Pins	Function
An	Data Inputs
$\overline{On}$	Outputs

FUNCTION TABLE

An	$\overline{On}$
L	Z
H	L

MC74LCX06

ABSOLUTE 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	$−0.5 \leq V_O \leq V_{CC} + 0.5$	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

* Absolute maximum continuous 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.

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	$V_{CC}= 3.0V–3.6V$ $V_{CC}= 2.7V–3.0V$ $V_{CC}= 2.3V–2.7V$			−24 −12 −8	mA
I_{OL}	LOW Level Output Current	$V_{CC}= 3.0V–3.6V$ $V_{CC}= 2.7V–3.0V$ $V_{CC}= 2.3V–2.7V$			+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 0.8V to 2.0V, $V_{CC} = 3.0V$		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 (Note 1.)	$2.3V \leq V_{CC} < 2.7V$ $2.7V \leq V_{CC} < 3.0V$ $3.0V \leq V_{CC} < 3.6V$	1.7 2.0 2.0		V
V_{IL}	Maximum LOW Level Input Voltage (Note 1.)	$2.3V \leq V_{CC} < 2.7V$ $2.7V \leq V_{CC} < 3.0V$ $3.0V \leq V_{CC} < 3.6V$		0.7 0.8 0.8	V
V_{OL}	Maximum LOW Level Output Voltage	$2.3V \leq V_{CC} \leq 3.6V$, $I_{OL}= 100\mu A$ $V_{CC}= 2.3V$, $I_{OL}= 8mA$ $V_{CC}= 2.7V$, $I_{OL}= 12mA$ $V_{CC}= 3.0V$, $I_{OL}= 16mA$ $V_{CC}= 3.0V$, $I_{OL}= 24mA$		0.2 0.6 0.4 0.4 0.55	V
I_I	Maximum Input Leakage Current	$2.3V \leq V_{CC} \leq 3.6V$, $0V \leq V_I \leq 5.5V$		±5.0	μA
I_{OFF}	Power–Off Leakage Current	$V_{CC}= 0V$, V_O or $V_I= 5.5V$		10.0	μA
I_{CC}	Maximum Quiescent Supply Current	$2.3V \leq V_{CC} \leq 3.6V$, $V_I= V_{CC}$ or GND $2.3V \leq V_{CC} \leq 3.6V$, $3.6V \leq V_I \leq 5.5V$		10 ±10.0	μA
ΔI_{CC}	Increase in I_{CC} per Input	$2.3V \leq V_{CC} \leq 3.6V$, One Input at $V_{IH}= V_{CC}-0.6$		500	μA

1. 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
		$V_{CC}= 3.0V$ to 3.6V $C_L= 50pF$		$V_{CC}= 2.7V$ $C_L= 50pF$		$V_{CC}= 2.3V$ to 2.7V $C_L= 30pF$		
		Min	Max	Min	Max	Min	Max	
t_{PLZ}	Propagation Delay	1	3.7	1	4.1	0.8	3.5	ns
t_{PZL}	Input to Output	1	3.7	1	4.1	0.8	3.5	ns

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	$T_A = +25°C$ Min	Typ	Max	Unit
V_{OLP}	Dynamic LOW Peak Voltage (Note 1.)	$V_{CC} = 3.3V$, $C_L = 50pF$, $V_{IH} = 3.3V$, $V_{IL} = 0V$ $V_{CC} = 2.5V$, $C_L = 30pF$, $V_{IH} = 2.5V$, $V_{IL} = 0V$		0.9 0.7		V
V_{OLV}	Dynamic LOW Valley Voltage (Note 1.)	$V_{CC} = 3.3V$, $C_L = 50pF$, $V_{IH} = 3.3V$, $V_{IL} = 0V$ $V_{CC} = 2.5V$, $C_L = 30pF$, $V_{IH} = 2.5V$, $V_{IL} = 0V$		-0.8 -0.6		V

1. 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

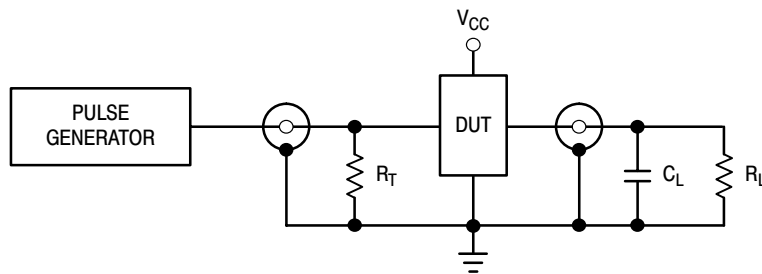| Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	10MHz, $V_{CC} = 3.3V$, $V_I = 0V$ or V_{CC}	25	pF

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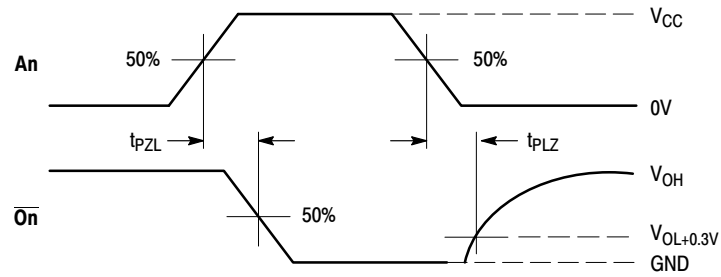
PROPAGATION DELAYS

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

Figure 1. AC Waveforms

C_L = 50pF or equivalent (Includes jig and probe capacitance)
$R_L = R_1 = 500\Omega$ or equivalent
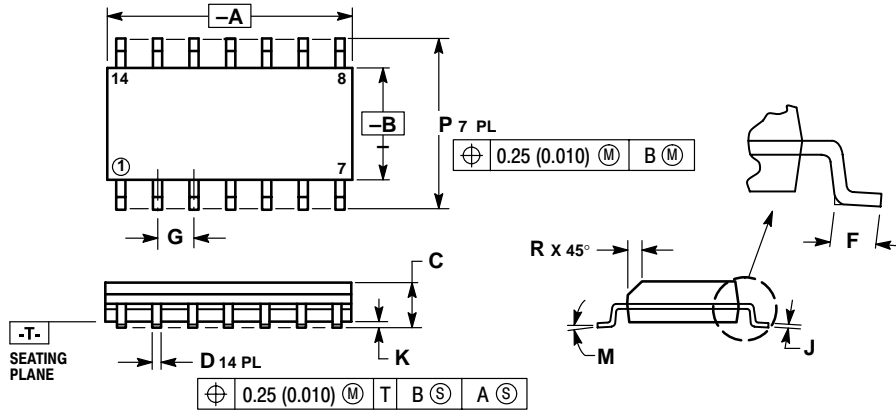$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 2. Test Circuit

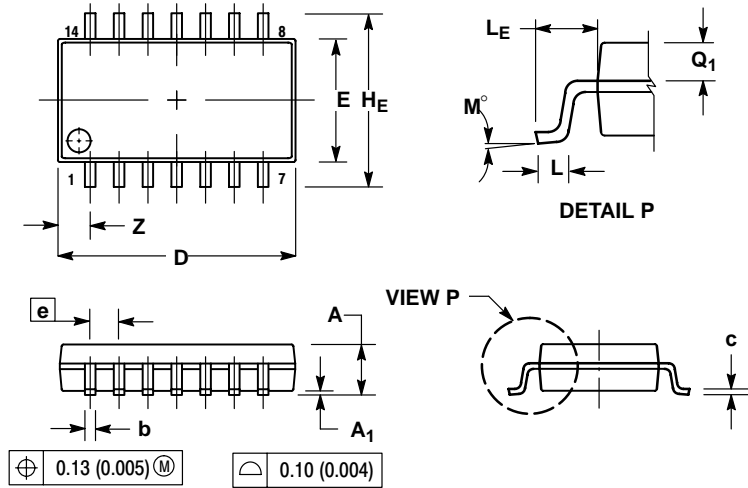## PACKAGE DIMENSIONS

SOIC–14
D SUFFIX
CASE 751A–03
ISSUE F

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 O
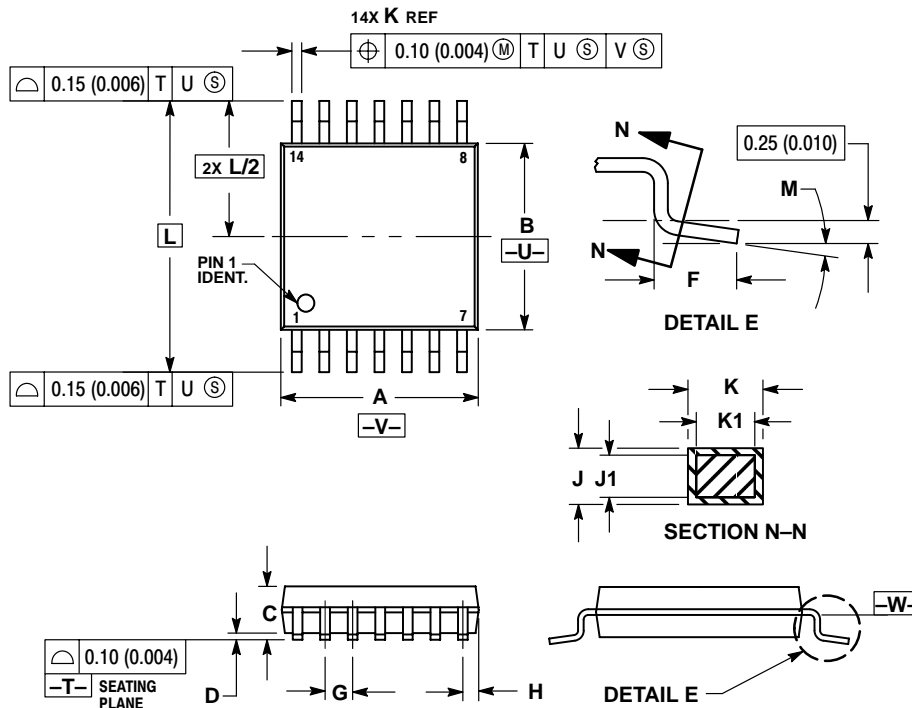
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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
SOIC EIAJ–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_1	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_E	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L_E	1.10	1.50	0.043	0.059
M	0 °	10 °	0 °	10 °
Q_1	0.70	0.90	0.028	0.035
Z	---	1.42	---	0.056