

# MC74LCX06

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

### With 5 V – Tolerant Inputs

The MC74LCX06 is a high performance hex inverter operating from a 2.3 V 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 MC74LCX06 inputs to be safely driven from 5.0 V devices.

#### Features

- Designed for 2.3 V to 3.6 V  $V_{CC}$  Operation
- 5.0 V Tolerant Inputs/Outputs
- LVTTL Compatible
- LVCMOS 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
- Functionally Compatible with LCX05
- ESD Performance: Human Body Model >1500 V;  
Machine Model >200 V
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

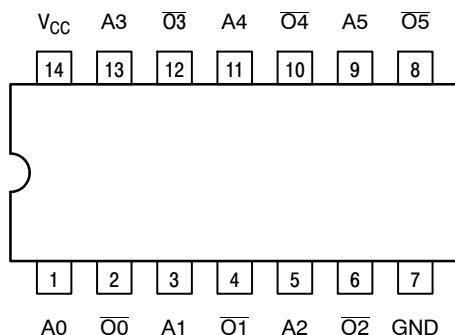


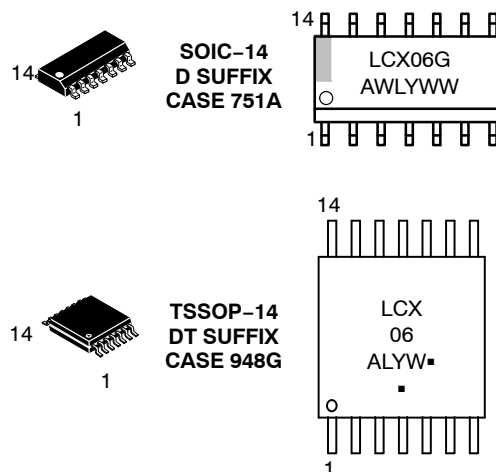
Figure 1. Pinout: 14-Lead (Top View)



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#### MARKING DIAGRAMS



A = Assembly Location  
WL, L = Wafer Lot  
Y = Year  
WW, W = 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 2 of this data sheet.

## MC74LCX06

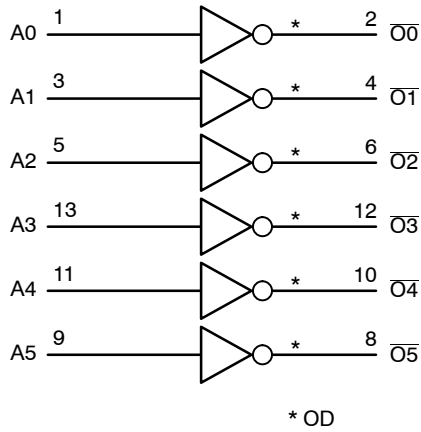


Figure 2. Logic Diagram

Table 1. PIN NAMES

| Pins                      | Function               |
|---------------------------|------------------------|
| $A_n$<br>$\overline{O_n}$ | Data Inputs<br>Outputs |

Table 2. TRUTH TABLE

| $A_n$  | $\overline{O_n}$ |
|--------|------------------|
| L<br>H | Z<br>L           |

### 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                              |      |

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 <sup>†</sup> |
|----------------|-----------------------|-----------------------|
| MC74LCX06DG    | SOIC-14<br>(Pb-Free)  | 55 Units / Rail       |
| MC74LCX06DR2G  | SOIC-14<br>(Pb-Free)  | 2500 / Tape & Reel    |
| MC74LCX06DTG   | TSSOP-14<br>(Pb-Free) | 96 Units / Rail       |
| MC74LCX06DTR2G | 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.

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## 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 | 2.5, 3.3<br>2.5, 3.3 | 3.6<br>3.6       | V    |
| V <sub>I</sub>  | Input Voltage                                                                                                                          | 0          |                      | 5.5              | V    |
| V <sub>O</sub>  | Output Voltage (HIGH or LOW State)                                                                                                     | 0          |                      | V <sub>CC</sub>  | V    |
| I <sub>OL</sub> | LOW Level Output Current Sink<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 (T<sub>A</sub> = –40°C to +85°C)

| Symbol           | Characteristic                        | Condition                                                                                                        | Min | Max  | Unit |
|------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------|-----|------|------|
| 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>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>One Input at V <sub>IH</sub> = V <sub>CC</sub> – 0.6 V                        |     | 500  | μA   |

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

## AC ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = –40°C to +85°C)

| Symbol           | Parameter         | V <sub>CC</sub> = 3.3 V ± 0.3 V<br>C <sub>L</sub> = 50 pF |     | V <sub>CC</sub> = 2.7 V<br>C <sub>L</sub> = 50 pF |     | V <sub>CC</sub> = 2.5 V ± 0.2 V<br>C <sub>L</sub> = 30 pF |     | Unit |
|------------------|-------------------|-----------------------------------------------------------|-----|---------------------------------------------------|-----|-----------------------------------------------------------|-----|------|
|                  |                   | Min                                                       | Max | Min                                               | Max | Min                                                       | Max |      |
| t <sub>PLZ</sub> | Propagation Delay | 0.8                                                       | 3.7 | 1.0                                               | 4.1 | 0.8                                                       | 3.5 | ns   |
| t <sub>PZL</sub> | Input to Output   | 0.8                                                       | 3.7 | 1.0                                               | 4.1 | 0.8                                                       | 3.5 | ns   |

## DYNAMIC SWITCHING CHARACTERISTICS (T<sub>A</sub> = +25°C)

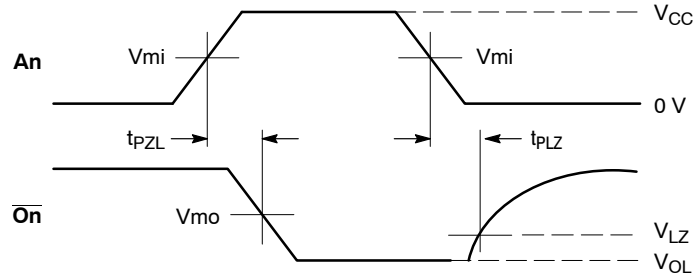
| Symbol           | Characteristic                      | Condition                                                                                                                                                                                          | Min | Typ          | Max | Unit |
|------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------|-----|------|
| 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.

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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%;  $f = 1 \text{ MHz}$ ;  $t_W = 500 \text{ ns}$

Table 3. AC WAVEFORMS

| 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                    | $V_{CC} / 2$                      |
| $V_{LZ}$ | $V_{OL} + 0.3 \text{ V}$          | $V_{OL} + 0.3 \text{ V}$ | $V_{OL} + 0.15 \text{ V}$         |

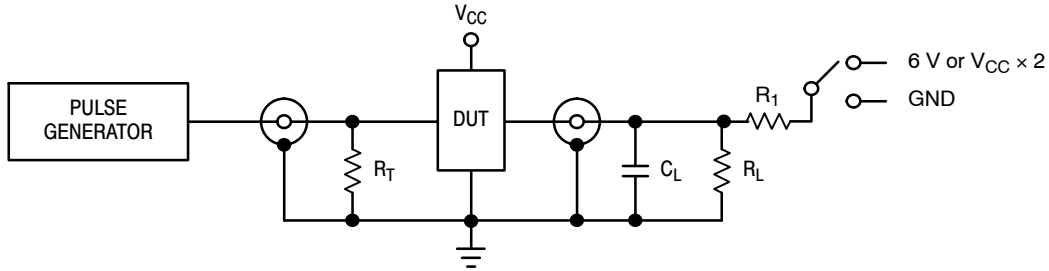


Table 4. TEST CIRCUIT

| 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)

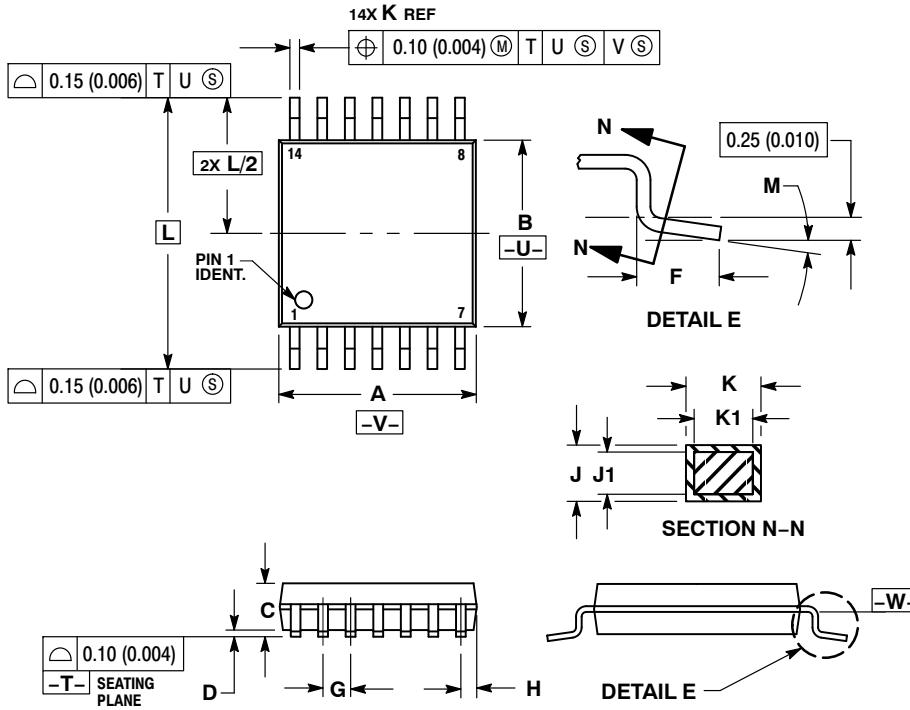
$R_L = R_1 = 500 \Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )

# MC74LCX06

## PACKAGE DIMENSIONS

TSSOP-14  
DT SUFFIX  
CASE 948G  
ISSUE B

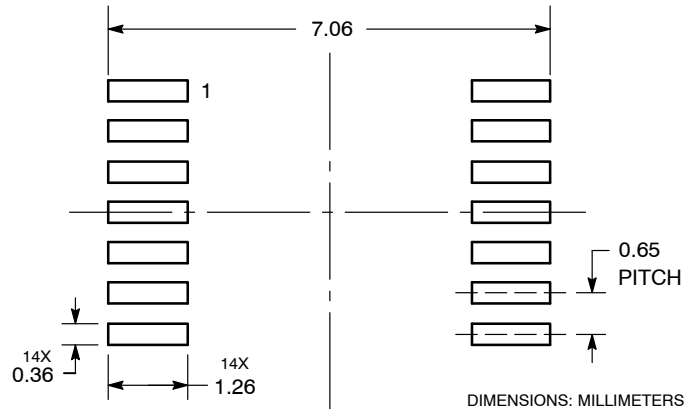


### NOTES:

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-.

|     | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
| DIM | 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°    |

### SOLDERING FOOTPRINT\*

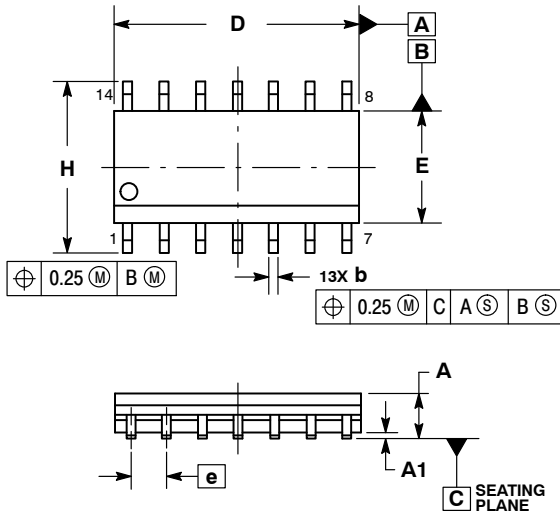


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC74LCX06

## PACKAGE DIMENSIONS

SOIC-14 NB  
CASE 751A-03  
ISSUE K

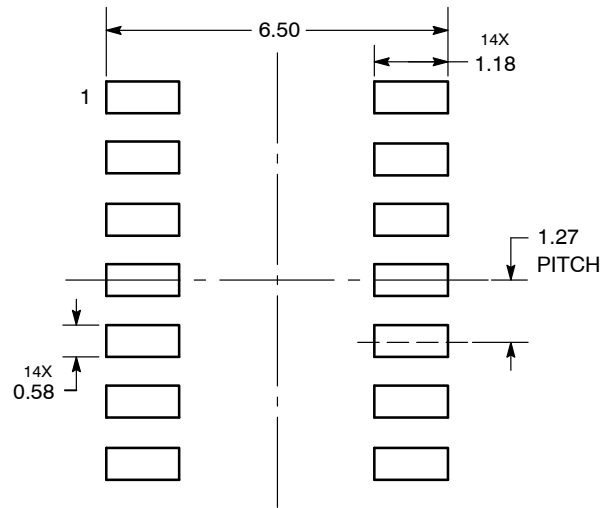


### NOTES:

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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MC74LCX06/D

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- Подбор аналогов.
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- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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