

# Hex Schmitt-Trigger Inverter

## High-Performance Silicon-Gate CMOS

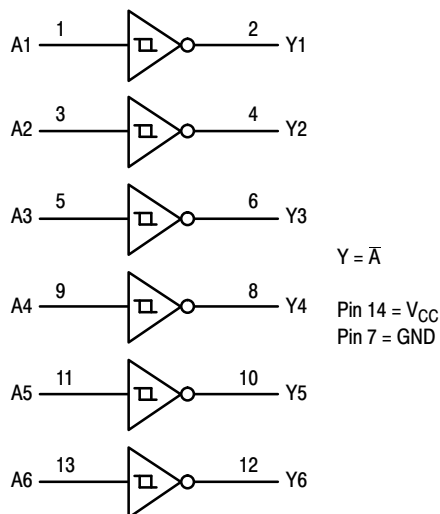
### MC74HC14A, MC74HCT14A

The MC74HC14A/MC74HCT14A is useful to “square up” slow input rise and fall times. Due to hysteresis voltage of the Schmitt trigger, the device finds applications in noisy environments. The MC74HC14A has CMOS-level input thresholds while the MC74HCT14A has TTL-level input thresholds.

#### Features

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0  $\mu$ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7.0 A Requirements
- Chip Complexity: 72 FETs or 18 Equivalent Gates
- -Q Suffix 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

#### LOGIC DIAGRAM

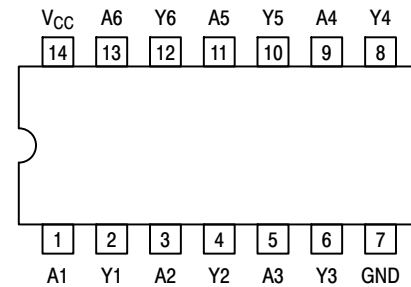


SOIC-14 NB  
D SUFFIX  
CASE 751A



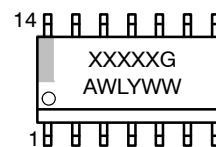
TSSOP-14  
DT SUFFIX  
CASE 948G

#### PIN ASSIGNMENT

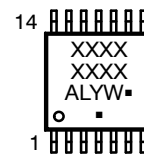


14-Lead (Top View)

#### MARKING DIAGRAMS



SOIC-14 NB



TSSOP-14

- XXXX = Specific Device Code
- A = Assembly Location
- L, WL = Wafer Lot
- Y, YY = Year
- W, WW = Work Week
- G or  $\blacksquare$  = Pb-Free Package

(Note: Microdot may be in either location)

#### FUNCTION TABLE

| Inputs | Outputs |
|--------|---------|
| A      | Y       |
| L      | H       |
| H      | L       |

#### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# MC74HC14A, MC74HCT14A

## MAXIMUM RATINGS

| Symbol        | Parameter  | Value                                    | Unit                    |      |
|---------------|--|--|-------------------------|------|
| $V_{CC}$      | DC Supply Voltage  | -0.5 to +6.5                             | V                       |      |
| $V_{IN}$      | DC Input Voltage   | -0.5 to $V_{CC} + 0.5$                   | V                       |      |
| $V_{OUT}$     | DC Output Voltage  | -0.5 to $V_{CC} + 0.5$                   | V                       |      |
| $I_{IN}$      | DC Input Current, per Pin                                    | $\pm 20$                                 | mA                      |      |
| $I_{OUT}$     | DC Output Current, per Pin                                   | $\pm 25$                                 | mA                      |      |
| $I_{CC}$      | DC Supply Current, $V_{CC}$ and GND Pins                     | $\pm 50$                                 | mA                      |      |
| $I_{IK}$      | Input Clamp Current ( $V_{IN} < 0$ or $V_{IN} > V_{CC}$ )    | $\pm 20$                                 | mA                      |      |
| $I_{OK}$      | Output Clamp Current ( $V_{OUT} < 0$ or $V_{OUT} > V_{CC}$ ) | $\pm 20$                                 | mA                      |      |
| $T_{STG}$     | Storage Temperature  | -65 to +150                              | °C                      |      |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds              | 260                                      | °C                      |      |
| $T_J$         | Junction Temperature Under Bias                              | $\pm 150$                                | °C                      |      |
| $\theta_{JA}$ | Thermal Resistance (Note 1)                                  | SOIC-14<br>TSSOP-14                      | 116<br>150              | °C/W |
| $P_D$         | Power Dissipation in Still Air at 25°C                       | SOIC-14<br>TSSOP-14                      | 1077<br>833             | mW   |
| MSL           | Moisture Sensitivity   | Level 1                                  | -                       |      |
| $F_R$         | Flammability Rating  | Oxygen Index: 28 to 34                   | UL 94 V-0 @<br>0.125 in | -    |
| $V_{ESD}$     | ESD Withstand Voltage (Note 2)                               | Human Body Model<br>Charged Device Model | 4000<br>1000            | V    |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 76mm-by-114mm, 2-ounce copper trace no air flow per JESD51-7.
2. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|--------|-----------|-----|-----|------|
|--------|-----------|-----|-----|------|

### MC74HC

|                   |   |   |             |                                  |    |
|-------------------|---|---|-------------|----------------------------------|----|
| $V_{CC}$          | DC Supply Voltage (Referenced to GND)                         | 2.0   | 6.0         | V                                |    |
| $V_{IN}, V_{OUT}$ | DC Input Voltage, Output Voltage (Referenced to GND) (Note 4) | 0   | $V_{CC}$    | V                                |    |
| $T_A$             | Operating Free-Air Temperature                                | -55   | +125        | °C                               |    |
| $t_r, t_f$        | Input Rise or Fall Time (Note 3)                              | $V_{CC} = 2.0\text{ V}$<br>$V_{CC} = 4.5\text{ V}$<br>$V_{CC} = 6.0\text{ V}$ | 0<br>0<br>0 | No Limit<br>No Limit<br>No Limit | ns |

### MC74HCT

|                   |  |     |          |    |
|-------------------|--|-----|----------|----|
| $V_{CC}$          | DC Supply Voltage (Referenced to GND)                            | 4.5 | 5.5      | V  |
| $V_{IN}, V_{OUT}$ | DC Input Voltage, DC Output Voltage (Referenced to GND) (Note 4) | 0   | $V_{CC}$ | V  |
| $T_A$             | Operating Free-Air Temperature                                   | -55 | +125     | °C |
| $t_r, t_f$        | Input Rise or Fall Time (Note 3)                                 | 0   | No Limit | ns |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

3. No Limit when  $V_{IN} \sim 50\% \times V_{CC}$ ,  $I_{CC} > 1\text{ mA}$ .
4. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or  $V_{CC}$ ). Unused outputs must be left open.

# MC74HC14A, MC74HCT14A

## DC CHARACTERISTICS (MC74HC14A)

| Symbol                      | Parameter   | Condition   | V <sub>CC</sub><br>V                  | Guaranteed Limit           |       |        | Unit |
|-----------------------------|---|---|---------------------------------------|----------------------------|-------|--------|------|
|                             |   |   |                                       | -55 to 25°C                | ≤85°C | ≤125°C |      |
| V <sub>T+</sub> max         | Maximum Positive-Going Input Threshold Voltage (Figure 3) | V <sub>out</sub> = 0.1V<br> I <sub>out</sub>   ≤ 20μA                           | 2.0                                   | 1.50                       | 1.50  | 1.50   | V    |
|                             |   |   | 3.0                                   | 2.15                       | 2.15  | 2.15   |      |
|                             |   |   | 4.5                                   | 3.15                       | 3.15  | 3.15   |      |
|                             |   |   | 6.0                                   | 4.20                       | 4.20  | 4.20   |      |
| V <sub>T+</sub> min         | Minimum Positive-Going Input Threshold Voltage (Figure 3) | V <sub>out</sub> = 0.1V<br> I <sub>out</sub>   ≤ 20μA                           | 2.0                                   | 1.0                        | 0.95  | 0.95   | V    |
|                             |   |   | 3.0                                   | 1.5                        | 1.45  | 1.45   |      |
|                             |   |   | 4.5                                   | 2.3                        | 2.25  | 2.25   |      |
|                             |   |   | 6.0                                   | 3.0                        | 2.95  | 2.95   |      |
| V <sub>T-</sub> max         | Maximum Negative-Going Input Threshold Voltage (Figure 3) | V <sub>out</sub> = V <sub>CC</sub> - 0.1V<br> I <sub>out</sub>   ≤ 20μA         | 2.0                                   | 0.9                        | 0.95  | 0.95   | V    |
|                             |   |   | 3.0                                   | 1.4                        | 1.45  | 1.45   |      |
|                             |   |   | 4.5                                   | 2.0                        | 2.05  | 2.05   |      |
|                             |   |   | 6.0                                   | 2.6                        | 2.65  | 2.65   |      |
| V <sub>T-</sub> min         | Minimum Negative-Going Input Threshold Voltage (Figure 3) | V <sub>out</sub> = V <sub>CC</sub> - 0.1V<br> I <sub>out</sub>   ≤ 20μA         | 2.0                                   | 0.3                        | 0.3   | 0.3    | V    |
|                             |   |   | 3.0                                   | 0.5                        | 0.5   | 0.5    |      |
|                             |   |   | 4.5                                   | 0.9                        | 0.9   | 0.9    |      |
|                             |   |   | 6.0                                   | 1.2                        | 1.2   | 1.2    |      |
| V <sub>H</sub> max (Note 5) | Maximum Hysteresis Voltage (Figure 3)                     | V <sub>out</sub> = 0.1V or V <sub>CC</sub> - 0.1V<br> I <sub>out</sub>   ≤ 20μA | 2.0                                   | 1.20                       | 1.20  | 1.20   | V    |
|                             |   |   | 3.0                                   | 1.65                       | 1.65  | 1.65   |      |
|                             |   |   | 4.5                                   | 2.25                       | 2.25  | 2.25   |      |
|                             |   |   | 6.0                                   | 3.00                       | 3.00  | 3.00   |      |
| V <sub>H</sub> min (Note 5) | Minimum Hysteresis Voltage (Figure 3)                     | V <sub>out</sub> = 0.1V or V <sub>CC</sub> - 0.1V<br> I <sub>out</sub>   ≤ 20μA | 2.0                                   | 0.20                       | 0.20  | 0.20   | V    |
|                             |   |   | 3.0                                   | 0.25                       | 0.25  | 0.25   |      |
|                             |   |   | 4.5                                   | 0.40                       | 0.40  | 0.40   |      |
|                             |   |   | 6.0                                   | 0.50                       | 0.50  | 0.50   |      |
| V <sub>OH</sub>             | Minimum High-Level Output Voltage                         | V <sub>in</sub> ≤ V <sub>T-</sub> min<br> I <sub>out</sub>   ≤ 20μA             | 2.0                                   | 1.9                        | 1.9   | 1.9    | V    |
|                             |   |   | 4.5                                   | 4.4                        | 4.4   | 4.4    |      |
|                             |   |   | 6.0                                   | 5.9                        | 5.9   | 5.9    |      |
|                             |   |   | V <sub>in</sub> ≤ V <sub>T-</sub> min | I <sub>out</sub>   ≤ 2.4mA | 3.0   | 2.48   |      |
|                             | I <sub>out</sub>   ≤ 4.0mA                                | 4.5   | 3.98                                  | 3.84                       | 3.70  |        |      |
|                             | I <sub>out</sub>   ≤ 5.2mA                                | 6.0   | 5.48                                  | 5.34                       | 5.20  |        |      |
| V <sub>OL</sub>             | Maximum Low-Level Output Voltage                          | V <sub>in</sub> ≥ V <sub>T+</sub> max<br> I <sub>out</sub>   ≤ 20μA             | 2.0                                   | 0.1                        | 0.1   | 0.1    | V    |
|                             |   |   | 4.5                                   | 0.1                        | 0.1   | 0.1    |      |
|                             |   |   | 6.0                                   | 0.1                        | 0.1   | 0.1    |      |
|                             |   |   | V <sub>in</sub> ≥ V <sub>T+</sub> max | I <sub>out</sub>   ≤ 2.4mA | 3.0   | 0.26   |      |
|                             | I <sub>out</sub>   ≤ 4.0mA                                | 4.5   | 0.26                                  | 0.33                       | 0.40  |        |      |
|                             | I <sub>out</sub>   ≤ 5.2mA                                | 6.0   | 0.26                                  | 0.33                       | 0.40  |        |      |
| I <sub>in</sub>             | Maximum Input Leakage Current                             | V <sub>in</sub> = V <sub>CC</sub> or GND  | 6.0                                   | ±0.1                       | ±1.0  | ±1.0   | μA   |
| I <sub>CC</sub>             | Maximum Quiescent Supply Current (per Package)            | V <sub>in</sub> = V <sub>CC</sub> or GND<br>I <sub>out</sub> = 0μA              | 6.0                                   | 1.0                        | 10    | 40     | μA   |

5. V<sub>H</sub>min > (V<sub>T+</sub> min) - (V<sub>T-</sub> max); V<sub>H</sub>max = (V<sub>T+</sub> max) - (V<sub>T-</sub> min).

## AC CHARACTERISTICS (MC74HC14A)

| Symbol                                 | Parameter   | V <sub>CC</sub><br>V                    | Guaranteed Limit |       |        | Unit |
|--|---|---|------------------|-------|--------|------|
|  |   |   | -55 to 25°C      | ≤85°C | ≤125°C |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Input A or B to Output Y (Figures 1 and 2) | 2.0                                     | 75               | 95    | 110    | ns   |
|  |   | 3.0                                     | 30               | 40    | 55     |      |
|  |   | 4.5                                     | 15               | 19    | 22     |      |
|  |   | 6.0                                     | 13               | 16    | 19     |      |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output (Figures 1 and 2)          | 2.0                                     | 75               | 95    | 110    | ns   |
|  |   | 3.0                                     | 27               | 32    | 36     |      |
|  |   | 4.5                                     | 15               | 19    | 22     |      |
|  |   | 6.0                                     | 13               | 16    | 19     |      |
| C <sub>in</sub>                        | Maximum Input Capacitance   |   | 10               | 10    | 10     | pF   |
| C <sub>PD</sub>                        | Power Dissipation Capacitance (Per Inverter) (Note 6)                 | Typical @ 25°C, V <sub>CC</sub> = 5.0 V |                  |       | pF     |      |
|  |   | 22                                      |                  |       |        |      |

6. Used to determine the no-load dynamic power consumption: P<sub>D</sub> = C<sub>PD</sub> V<sub>CC</sub><sup>2</sup>f + I<sub>CC</sub> V<sub>CC</sub>.

# MC74HC14A, MC74HCT14A

## DC ELECTRICAL CHARACTERISTICS (MC74HCT14A)

| Symbol              | Parameter                                      | Test Conditions   | V <sub>CC</sub><br>Volts | Temperature Limit |            |               |            |            |            | Unit |
|---------------------|--|---|--------------------------|-------------------|------------|---------------|------------|------------|------------|------|
|                     |  |   |                          | -55°C to 25°C     |            | ≤ 85°C        |            | ≤ 125°C    |            |      |
|                     |  |   |                          | Min               | Max        | Min           | Max        | Min        | Max        |      |
| V <sub>T+</sub> max | Maximum Positive-Going Input Threshold Voltage | V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 4.5<br>5.5               |                   | 1.9<br>2.1 |               | 1.9<br>2.1 |            | 1.9<br>2.1 | V    |
| V <sub>T+</sub> min | Minimum Positive-Going Input Threshold Voltage | V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 4.5<br>5.5               | 1.2<br>1.4        |            | 1.2<br>1.4    |            | 1.2<br>1.4 |            | V    |
| V <sub>T-</sub> max | Maximum Negative-Going Input Threshold Voltage | V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 4.5<br>5.5               |                   | 1.2<br>1.4 |               | 1.2<br>1.4 |            | 1.2<br>1.4 |      |
| V <sub>T-</sub> min | Minimum Negative-Going Input Threshold Voltage | V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 4.5<br>5.5               | 0.5<br>0.6        |            | 0.5<br>0.6    |            | 0.5<br>0.6 |            |      |
| V <sub>H</sub> max  | Maximum Hysteresis Voltage                     | V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 4.5<br>5.5               |                   | 1.4<br>1.5 |               | 1.4<br>1.5 |            | 1.4<br>1.5 |      |
| V <sub>H</sub> min  | Minimum Hysteresis Voltage                     | V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V<br> I <sub>out</sub>   ≤ 20 μA  | 4.5<br>5.5               | 0.4<br>0.4        |            | 0.4<br>0.4    |            | 0.4<br>0.4 |            |      |
| V <sub>OH</sub>     | Minimum High-Level Output Voltage              | V <sub>I</sub> < V <sub>T-</sub> min<br> I <sub>out</sub>   ≤ 20 μA   | 4.5<br>5.5               | 4.4<br>5.4        |            | 4.4<br>5.4    |            | 4.4<br>5.4 |            | V    |
|                     |  | V <sub>I</sub> < V <sub>T-</sub> min<br> I <sub>out</sub>   ≤ 4.0 mA  | 4.5                      | 3.98              |            | 3.84          |            | 3.7        |            |      |
| V <sub>OL</sub>     | Maximum Low-Level Output Voltage               | V <sub>I</sub> ≥ V <sub>T+</sub> max<br> I <sub>out</sub>   ≤ 20 μA   | 4.5<br>5.5               |                   | 0.1<br>0.1 |               | 0.1<br>0.1 |            | 0.1<br>0.1 | V    |
|                     |  | V <sub>I</sub> ≥ V <sub>T+</sub> max<br> I <sub>out</sub>   ≤ 4.0 mA  | 4.5                      |                   | 0.26       |               | 0.33       |            | 0.4        |      |
| I <sub>IK</sub>     | Maximum Input Leakage Current                  | V <sub>I</sub> = V <sub>CC</sub> or GND   | 5.5                      |                   | ±0.1       |               | ±1.0       |            | ±1.0       | μA   |
| I <sub>CC</sub>     | Maximum Quiescent Supply Current (per package) | V <sub>I</sub> = V <sub>CC</sub> or GND<br>I <sub>out</sub> = 0 μA  | 5.5                      |                   | 1.0        |               | 10         |            | 40         | μA   |
| ΔI <sub>CC</sub>    | Additional Quiescent Supply Current            | V <sub>I</sub> = 2.4 V, Any One Input<br>V <sub>I</sub> = V <sub>CC</sub> or GND, Other Inputs<br>I <sub>out</sub> = 0 μA | 5.5                      | ≥ -55°C           |            | 25°C to 125°C |            |            |            | mA   |
|                     |  |   |                          | 2.9               |            | 2.4           |            |            |            |      |

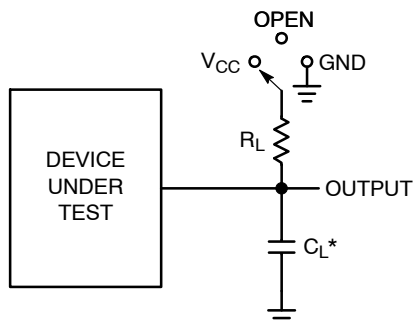
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## AC CHARACTERISTICS (MC74HCT14A)

| Symbol                                 | Parameter   | Test Conditions  | Figures | Guaranteed Limit |     |        |     |         |     | Unit |
|--|---|--|---------|------------------|-----|--------|-----|---------|-----|------|
|  |   |  |         | -55°C to 25°C    |     | ≤ 85°C |     | ≤ 125°C |     |      |
|  |   |  |         | Min              | Max | Min    | Max | Min     | Max |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Maximum Propagation Delay, Input A to Output Y (L to H) | V <sub>CC</sub> = 5.0 V ±10%<br>C <sub>L</sub> = 50 pF, Input t <sub>r</sub> = t <sub>f</sub> = 6.0 ns | 1 & 2   |                  | 32  |        | 40  |         | 48  | ns   |
| t <sub>TLH</sub> ,<br>t <sub>THL</sub> | Maximum Output Transition Time, Any Output              | V <sub>CC</sub> = 5.0 V ±10%<br>C <sub>L</sub> = 50 pF, Input t <sub>r</sub> = t <sub>f</sub> = 6.0 ns | 1 & 2   |                  | 15  |        | 19  |         | 22  | ns   |

| C <sub>PD</sub> | Power Dissipation Capacitance, per Inverter (Note 6) | Typical @ 25°C, V <sub>CC</sub> = 5.0 V |  | pF |
|-----------------|--|---|--|----|
|                 |  | 32                                      |  |    |
|                 |  |   |  |    |

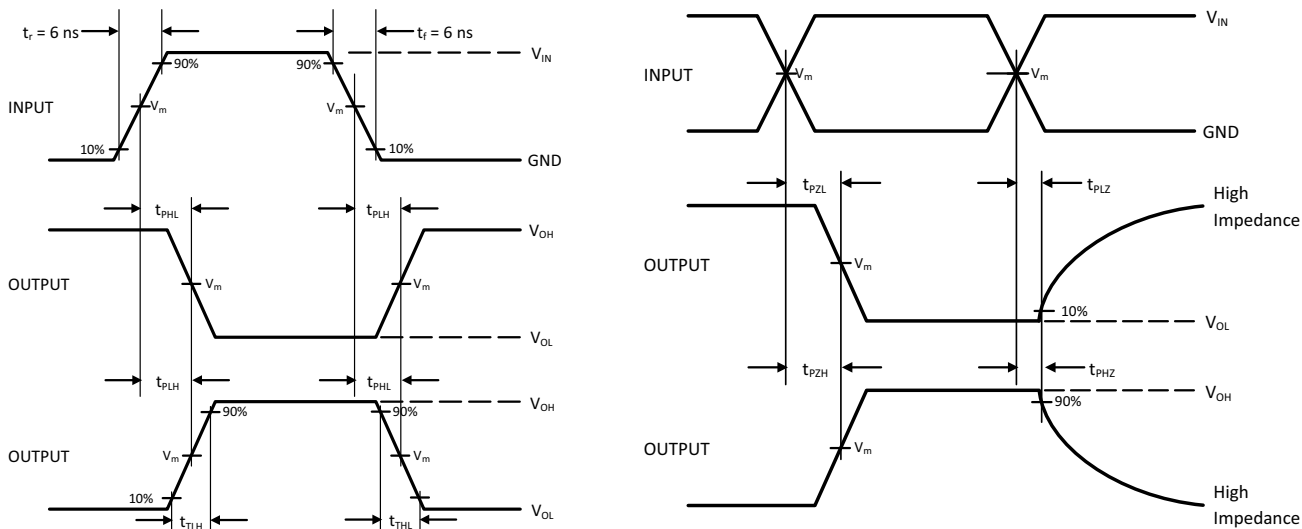
# MC74HC14A, MC74HCT14A



\* $C_L$  Includes probe and jig capacitance

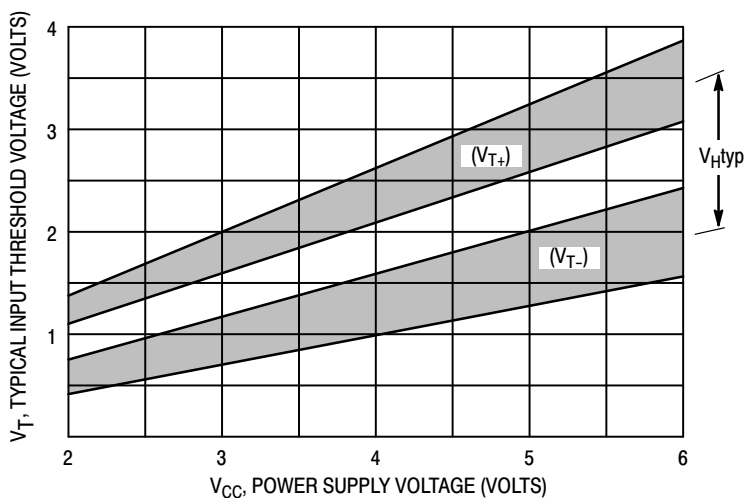
| Test                | Switch Position | $C_L$ | $R_L$        |
|---------------------|-----------------|-------|--------------|
| $t_{PLH} / t_{PHL}$ | Open            | 50 pF | 1 k $\Omega$ |
| $t_{PLZ} / t_{PZL}$ | $V_{CC}$        |       |              |
| $t_{PHZ} / t_{PZH}$ | GND             |       |              |

Figure 1. Test Circuit



| Device     | $V_{IN}, V$ | $V_m, V$             |
|------------|-------------|----------------------|
| MC74HC14A  | $V_{CC}$    | $50\% \times V_{CC}$ |
| MC74HCT14A | 3 V         | 1.3 V                |

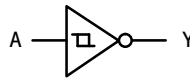
Figure 2. Switching Waveforms



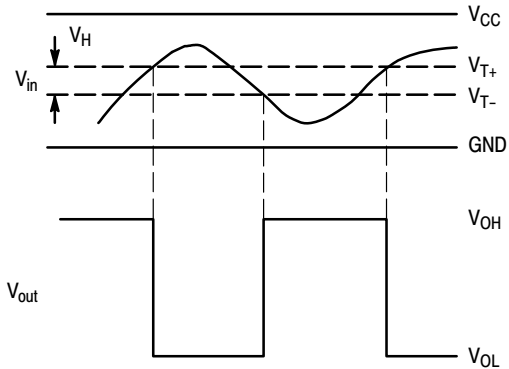
$$V_{HTYP} = (V_{T+ typ}) - (V_{T- typ})$$

Figure 3. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  versus Power Supply Voltage

# MC74HC14A, MC74HCT14A



(a) A Schmitt-Trigger Squares Up Inputs With Slow Rise and Fall Times



(b) A Schmitt-Trigger Offers Maximum Noise Immunity

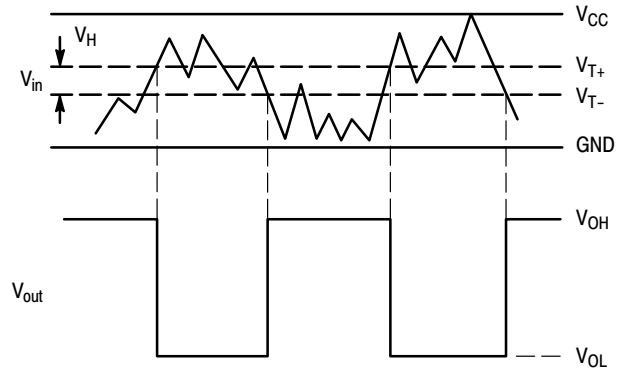


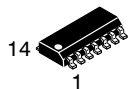
Figure 4. Typical Schmitt-Trigger Applications

## ORDERING INFORMATION

| Device             | Marking†   | Package  | Shipping†          |
|--------------------|------------|----------|--------------------|
| MC74HC14ADG        | HC14AG     | SOIC-14  | 55 Units / Rail    |
| MC74HC14ADR2G      | HC14AG     | SOIC-14  | 2500 / Tape & Reel |
| MC74HC14ADR2G-Q*   | HC14AG     | SOIC-14  | 2500 / Tape & Reel |
| MC74HC14ADTG       | HC<br>14A  | TSSOP-14 | 96 Units / Rail    |
| MC74HC14ADTR2G     | HC<br>14A  | TSSOP-14 | 2500 / Tape & Reel |
| MC74HC14ADTR2G-Q*  | HC<br>14A  | TSSOP-14 | 2500 / Tape & Reel |
| MC74HCT14ADG       | HCT14AG    | SOIC-14  | 55 Units / Rail    |
| MC74HCT14ADR2G     | HCT14AG    | SOIC-14  | 2500 / Tape & Reel |
| MC74HCT14ADR2G-Q*  | HCT14AG    | SOIC-14  | 2500 / Tape & Reel |
| MC74HCT14ADTR2G    | HCT<br>14A | TSSOP-14 | 2500 / Tape & Reel |
| MC74HCT14ADTR2G-Q* | HCT<br>14A | TSSOP-14 | 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.

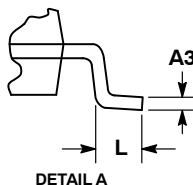
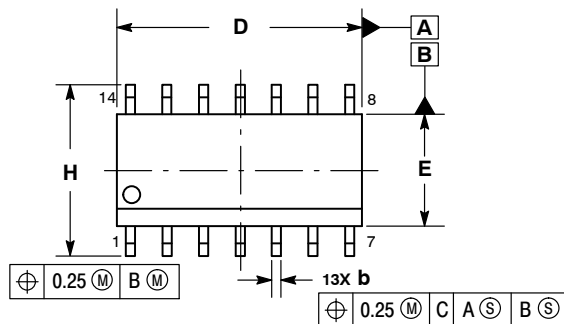
\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable



SCALE 1:1

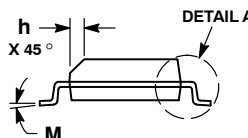
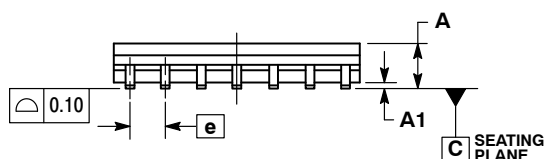
SOIC-14 NB  
CASE 751A-03  
ISSUE L

DATE 03 FEB 2016

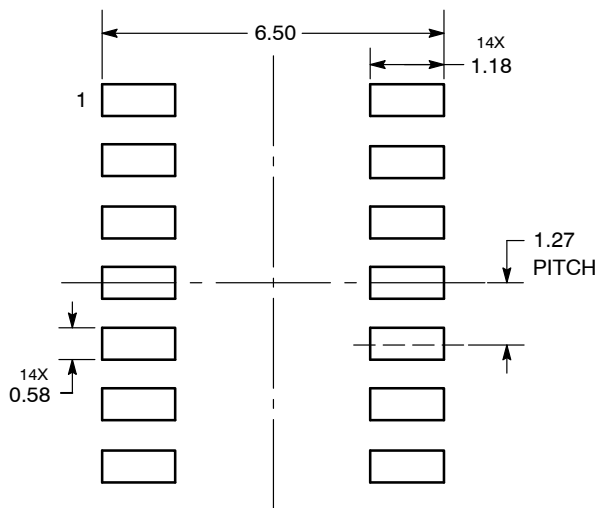


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
  4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
  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°    |



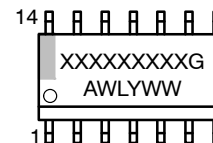
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi 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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**SOIC-14**  
**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

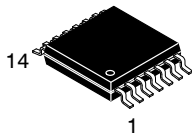
STYLE 8:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. NO CONNECTION  
 5. ANODE/CATHODE  
 6. ANODE/CATHODE  
 7. COMMON ANODE  
 8. COMMON ANODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. NO CONNECTION  
 12. ANODE/CATHODE  
 13. ANODE/CATHODE  
 14. COMMON CATHODE

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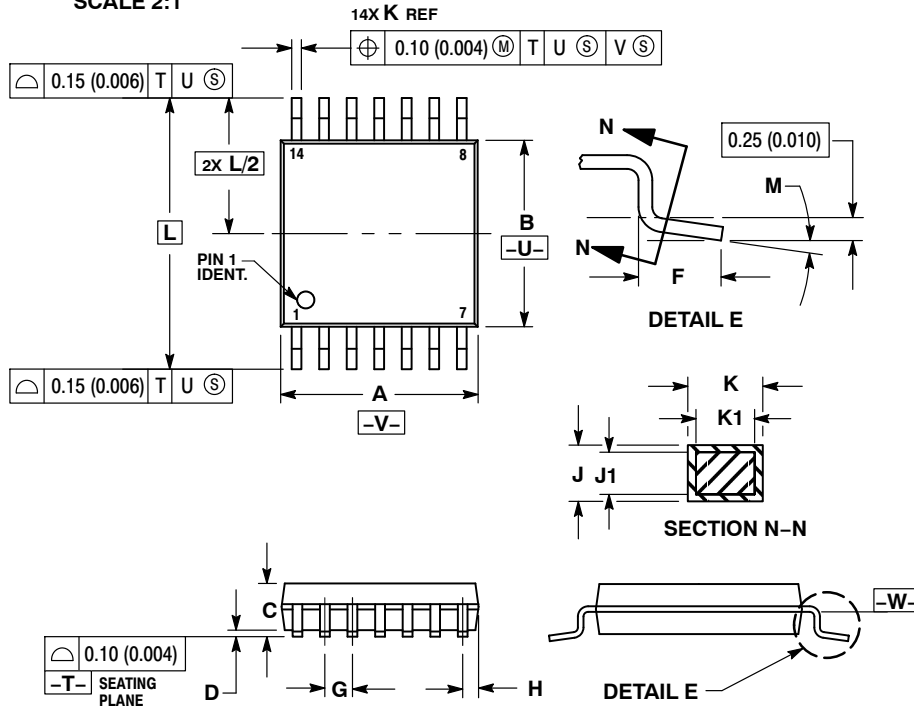
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



**TSSOP-14 WB**  
CASE 948G  
ISSUE C

DATE 17 FEB 2016

SCALE 2:1

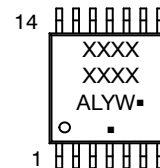


**NOTES:**

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- 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.
- DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
- 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.
- TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- 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°    |

**GENERIC MARKING DIAGRAM\***

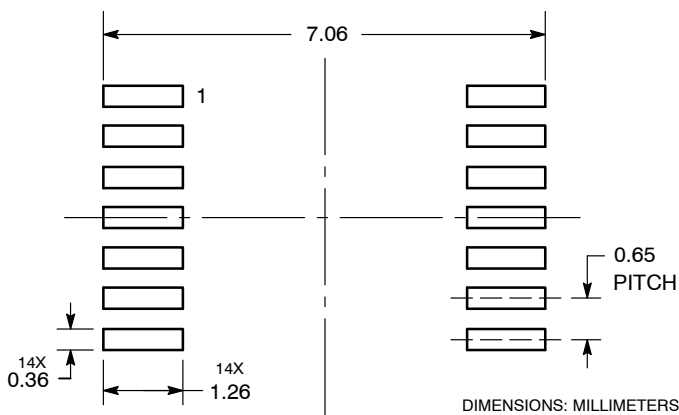


- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

\*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.

**SOLDERING FOOTPRINT**



|                         |                    |  |
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