

# Single Schmitt-Trigger Inverter

## MC74VHC1G14, MC74VHC1GT14

The MC74VHC1G14 / MC74VHC1GT14 is a single Schmitt-Trigger Inverter in tiny footprint packages. The MC74VHC1G14 has CMOS-level input thresholds while the MC74VHC1GT14 has TTL-level input thresholds.

The internal circuit is composed of three stages, including a buffered output which provides high noise immunity and stable output.

The input structures provide protection when voltages up to 5.5 V are applied, regardless of the supply voltage. This allows the device to be used to interface 5 V circuits to 3 V circuits. Some output structures also provide protection when  $V_{CC} = 0$  V and when the output voltage exceeds  $V_{CC}$ . These input and output structures help prevent device destruction caused by supply voltage – input/output voltage mismatch, battery backup, hot insertion, etc.

### Features

- Designed for 2.0 V to 5.5 V  $V_{CC}$  Operation
- 4.0 ns  $t_{PD}$  at 5 V (typ)
- Inputs/Outputs Over-Voltage Tolerant up to 5.5 V
- $I_{OFF}$  Supports Partial Power Down Protection
- Source/Sink 8 mA at 3.0 V
- Available in SC-88A, SC-74A, TSOP-5, SOT-953 and UDFN6 Packages
- Chip Complexity < 100 FETs
- NLV Prefix 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

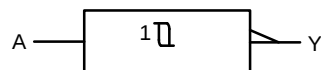
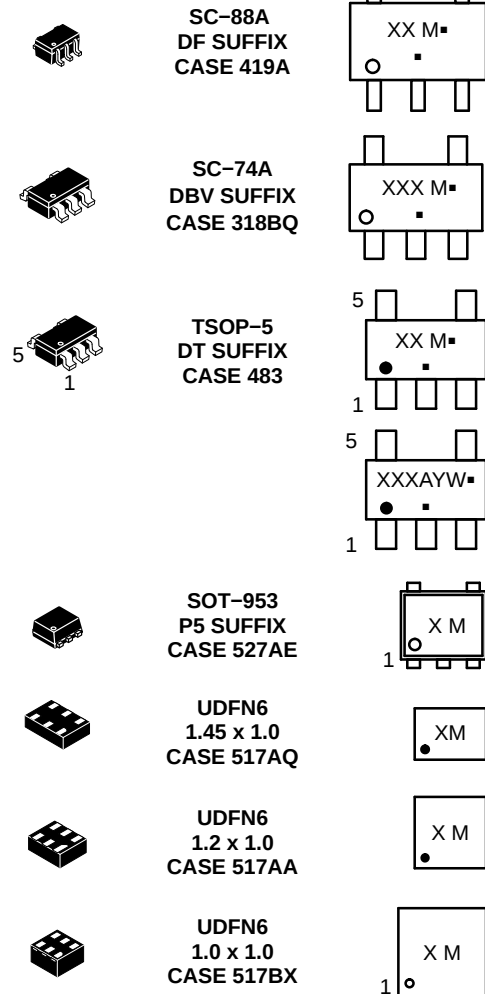


Figure 1. Logic Symbol

### MARKING DIAGRAMS



XX = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 7 of this data sheet.

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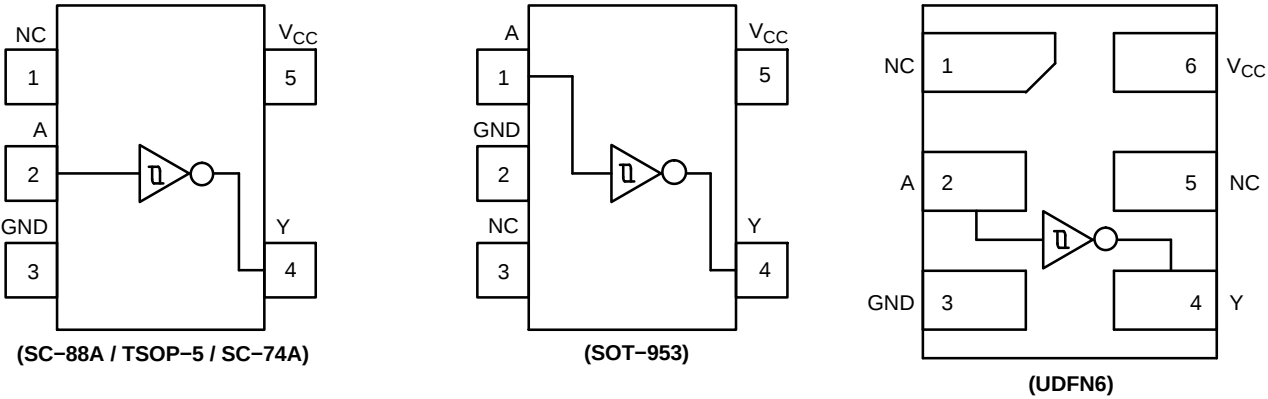


Figure 2. Pinout (Top View)

PIN ASSIGNMENT  
(SC-88A / TSOP-5 / SC-74A)

| Pin | Function        |
|-----|-----------------|
| 1   | NC              |
| 2   | A               |
| 3   | GND             |
| 4   | Y               |
| 5   | V <sub>CC</sub> |

PIN ASSIGNMENT (SOT-953)

| Pin | Function        |
|-----|-----------------|
| 1   | A               |
| 2   | GND             |
| 3   | NC              |
| 4   | Y               |
| 5   | V <sub>CC</sub> |

PIN ASSIGNMENT (UDFN)

| Pin | Function        |
|-----|-----------------|
| 1   | NC              |
| 2   | A               |
| 3   | GND             |
| 4   | Y               |
| 5   | NC              |
| 6   | V <sub>CC</sub> |

FUNCTION TABLE

| A Input | Y Output |
|---------|----------|
| L       | H        |
| H       | L        |

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## MAXIMUM RATINGS

| Symbol                | Characteristics                                                                                                      |                                                                                                       | Value                                                  | Unit |
|-----------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------|
| $V_{CC}$              | DC Supply Voltage<br>TSOP-5, SC-88A (NLV)<br>SC-74A, SC-88A, UDFN6, SOT-953                                          |                                                                                                       | -0.5 to +7.0<br>-0.5 to +6.5                           | V    |
| $V_{IN}$              | DC Input Voltage<br>TSOP-5, SC-88A (NLV)<br>SC-74A, SC-88A, UDFN6, SOT-953                                           |                                                                                                       | -0.5 to +7.0<br>-0.5 to +6.5                           | V    |
| $V_{OUT}$             | DC Output Voltage (NLV)                                                                                              | 1Gxx                                                                                                  | -0.5 to $V_{CC} + 0.5$                                 | V    |
|                       |                                                                                                                      | 1GTxx Active-Mode (High or Low State)<br>Tri-State Mode (Note 1)<br>Power-Down Mode ( $V_{CC} = 0$ V) | -0.5 to $V_{CC} + 0.5$<br>-0.5 to +7.0<br>-0.5 to +7.0 |      |
|                       | DC Output Voltage<br>Active-Mode (High or Low State)<br>Tri-State Mode (Note 1)<br>Power-Down Mode ( $V_{CC} = 0$ V) |                                                                                                       | -0.5 to $V_{CC} + 0.5$<br>-0.5 to +6.5<br>-0.5 to +6.5 | V    |
| $I_{IK}$              | DC Input Diode Current<br>$V_{IN} < GND$                                                                             |                                                                                                       | -20                                                    | mA   |
| $I_{OK}$              | DC Output Diode Current (NLV)                                                                                        | 1Gxx $V_{OUT} > V_{CC}$ , $V_{OUT} < GND$                                                             | $\pm 20$                                               | mA   |
|                       |                                                                                                                      | 1GTxx $V_{OUT} < GND$                                                                                 | -20                                                    |      |
|                       | DC Output Diode Current<br>$V_{OUT} < GND$                                                                           |                                                                                                       | -20                                                    | mA   |
| $I_{OUT}$             | DC Output Source/Sink Current                                                                                        |                                                                                                       | $\pm 25$                                               | mA   |
| $I_{CC}$ or $I_{GND}$ | DC Supply Current per Supply Pin or Ground Pin                                                                       |                                                                                                       | $\pm 50$                                               | mA   |
| $T_{STG}$             | Storage Temperature Range                                                                                            |                                                                                                       | -65 to +150                                            | °C   |
| $T_L$                 | Lead Temperature, 1 mm from Case for 10 secs                                                                         |                                                                                                       | 260                                                    | °C   |
| $T_J$                 | Junction Temperature Under Bias                                                                                      |                                                                                                       | +150                                                   | °C   |
| $\theta_{JA}$         | Thermal Resistance (Note 2)<br>SC-88A<br>SC-74A<br>SOT-953<br>UDFN6                                                  |                                                                                                       | 377<br>320<br>254<br>154                               | °C/W |
| $P_D$                 | Power Dissipation in Still Air<br>SC-88A<br>SC-74A<br>SOT-953<br>UDFN6                                               |                                                                                                       | 332<br>390<br>491<br>812                               | mW   |
| MSL                   | Moisture Sensitivity                                                                                                 |                                                                                                       | Level 1                                                | -    |
| $F_R$                 | Flammability Rating<br>Oxygen Index: 28 to 34                                                                        |                                                                                                       | UL 94 V-0 @ 0.125 in                                   | -    |
| $V_{ESD}$             | ESD Withstand Voltage (Note 3)<br>Human Body Model<br>Charged Device Model                                           |                                                                                                       | 2000<br>1000                                           | V    |
| $I_{Latchup}$         | Latchup Performance (Note 4)                                                                                         |                                                                                                       | $\pm 100$                                              | mA   |

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. Applicable to devices with outputs that may be tri-stated.
2. Measured with minimum pad spacing on an FR4 board, using 10mm-by-1inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

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## RECOMMENDED OPERATING CONDITIONS

| Symbol                          | Characteristics             |                                         | Min | Max             | Unit |
|---------------------------------|-----------------------------|-----------------------------------------|-----|-----------------|------|
| V <sub>CC</sub>                 | Positive DC Supply Voltage  |                                         | 2.0 | 5.5             | V    |
| V <sub>IN</sub>                 | DC Input Voltage            |                                         | 0   | 5.5             | V    |
| V <sub>OUT</sub>                | DC Output Voltage (NLV)     | 1Gxx                                    | 0   | V <sub>CC</sub> | V    |
|                                 |                             | 1GTxx Active-Mode (High or Low State)   | 0   | V <sub>CC</sub> |      |
|                                 |                             | Tri-State Mode (Note 5)                 | 0   | 5.5             |      |
|                                 |                             | Power-Down Mode (V <sub>CC</sub> = 0 V) | 0   | 5.5             |      |
|                                 | DC Output Voltage           | Active-Mode (High or Low State)         | 0   | V <sub>CC</sub> | V    |
|                                 |                             | Tri-State Mode (Note 5)                 | 0   | 5.5             |      |
|                                 |                             | Power-Down Mode (V <sub>CC</sub> = 0 V) | 0   | 5.5             |      |
|                                 |                             |                                         |     |                 |      |
| T <sub>A</sub>                  | Operating Temperature Range |                                         | -55 | +125            | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time    | TSOP-5, SC-88A (NLV)                    |     |                 | ns/V |
|                                 |                             | V <sub>CC</sub> = 3.0 V to 3.6 V        | 0   | No Limit        |      |
|                                 |                             | V <sub>CC</sub> = 4.5 V to 5.5 V        | 0   | No Limit        |      |
|                                 | Input Rise and Fall Time    | SC-74A, SC-88A, UDFN6, SOT-953          |     |                 |      |
|                                 |                             | V <sub>CC</sub> = 2.0 V                 | 0   | No Limit        |      |
|                                 |                             | V <sub>CC</sub> = 2.3 V to 2.7 V        | 0   | No Limit        |      |
|                                 |                             | V <sub>CC</sub> = 3.0 V to 3.6 V        | 0   | No Limit        |      |
|                                 |                             | V <sub>CC</sub> = 4.5 V to 5.5 V        | 0   | No Limit        |      |

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.

5. Applicable to devices with outputs that may be tri-stated.

## DC ELECTRICAL CHARACTERISTICS (MC74VHC1G14)

| Symbol           | Parameter                              | Test Conditions                                      | V <sub>CC</sub><br>(V) | T <sub>A</sub> = 25°C |      |      | -40°C ≤ T <sub>A</sub> ≤ 85°C |      | -55°C ≤ T <sub>A</sub> ≤ 125°C |      | Unit |
|------------------|----------------------------------------|------------------------------------------------------|------------------------|-----------------------|------|------|-------------------------------|------|--------------------------------|------|------|
|                  |                                        |                                                      |                        | Min                   | Typ  | Max  | Min                           | Max  | Min                            | Max  |      |
| V <sub>T+</sub>  | Positive Input Threshold Voltage (NLV) |                                                      | 3.0                    | 1.2                   | 2.0  | 2.2  | –                             | 2.2  | –                              | 2.2  | V    |
|                  |                                        |                                                      | 4.5                    | 1.75                  | 3.0  | 3.15 | –                             | 3.15 | –                              | 3.15 |      |
|                  |                                        |                                                      | 5.5                    | 2.15                  | 3.6  | 3.85 | –                             | 3.85 | –                              | 3.85 |      |
|                  | Positive Input Threshold Voltage       |                                                      | 3.0                    | –                     | 2.0  | 2.2  | –                             | 2.2  | –                              | 2.2  | V    |
|                  |                                        |                                                      | 4.5                    | –                     | 3.0  | 3.15 | –                             | 3.15 | –                              | 3.15 |      |
|                  |                                        |                                                      | 5.5                    | –                     | 3.6  | 3.85 | –                             | 3.85 | –                              | 3.85 |      |
| V <sub>T-</sub>  | Negative Input Threshold Voltage (NLV) |                                                      | 3.0                    | 0.9                   | 1.5  | 1.9  | 0.9                           | –    | 0.9                            | –    | V    |
|                  |                                        |                                                      | 4.5                    | 1.35                  | 2.3  | 2.75 | 1.35                          | –    | 1.35                           | –    |      |
|                  |                                        |                                                      | 5.5                    | 1.65                  | 2.9  | 3.35 | 1.65                          | –    | 1.65                           | –    |      |
|                  | Negative Input Threshold Voltage       |                                                      | 3.0                    | 0.9                   | 1.5  | –    | 0.9                           | –    | 0.9                            | –    | V    |
|                  |                                        |                                                      | 4.5                    | 1.35                  | 2.3  | –    | 1.35                          | –    | 1.35                           | –    |      |
|                  |                                        |                                                      | 5.5                    | 1.65                  | 2.9  | –    | 1.65                          | –    | 1.65                           | –    |      |
| V <sub>H</sub>   | Hysteresis Voltage                     |                                                      | 3.0                    | 0.30                  | 0.57 | 1.20 | 0.30                          | 1.20 | 0.30                           | 1.20 | V    |
|                  |                                        |                                                      | 4.5                    | 0.40                  | 0.67 | 1.40 | 0.40                          | 1.40 | 0.40                           | 1.40 |      |
|                  |                                        |                                                      | 5.5                    | 0.50                  | 0.74 | 1.60 | 0.50                          | 1.60 | 0.50                           | 1.60 |      |
| V <sub>OH</sub>  | High-Level Output Voltage              | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> |                        |                       |      |      |                               |      |                                |      | V    |
|                  |                                        | I <sub>OH</sub> = -50 μA                             | 2.0                    | 1.9                   | 2.0  | –    | 1.9                           | –    | 1.9                            | –    |      |
|                  |                                        | I <sub>OH</sub> = -50 μA                             | 3.0                    | 2.9                   | 3.0  | –    | 2.9                           | –    | 2.9                            | –    |      |
|                  |                                        | I <sub>OH</sub> = -50 μA                             | 4.5                    | 4.4                   | 4.5  | –    | 4.4                           | –    | 4.4                            | –    |      |
|                  |                                        | I <sub>OH</sub> = -4 mA                              | 3.0                    | 2.58                  | –    | –    | 2.48                          | –    | 2.34                           | –    |      |
|                  |                                        | I <sub>OH</sub> = -8 mA                              | 4.5                    | 3.94                  | –    | –    | 3.80                          | –    | 3.66                           | –    |      |
| V <sub>OL</sub>  | Low-Level Output Voltage               | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> |                        |                       |      |      |                               |      |                                |      | V    |
|                  |                                        | I <sub>OL</sub> = 50 μA                              | 2.0                    | –                     | 0.0  | 0.1  | –                             | 0.1  | –                              | 0.1  |      |
|                  |                                        | I <sub>OL</sub> = 50 μA                              | 3.0                    | –                     | 0.0  | 0.1  | –                             | 0.1  | –                              | 0.1  |      |
|                  |                                        | I <sub>OL</sub> = 50 μA                              | 4.5                    | –                     | 0.0  | 0.1  | –                             | 0.1  | –                              | 0.1  |      |
|                  |                                        | I <sub>OL</sub> = 4 mA                               | 3.0                    | –                     | –    | 0.36 | –                             | 0.44 | –                              | 0.52 |      |
|                  |                                        | I <sub>OL</sub> = 8 mA                               | 4.5                    | –                     | –    | 0.36 | –                             | 0.44 | –                              | 0.52 |      |
| I <sub>IN</sub>  | Input Leakage Current                  | V <sub>IN</sub> = 5.5 V or GND                       | 2.0 to 5.5             | –                     | –    | ±0.1 | –                             | ±1.0 | –                              | ±1.0 | μA   |
| I <sub>OFF</sub> | Power Off Leakage Current (NLV)        | V <sub>IN</sub> = 5.5 V                              | 0.0                    | –                     | –    | 1.0  | –                             | 10   | –                              | 10   | μA   |
|                  | Power Off Leakage Current              | V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V  | 0.0                    | –                     | –    | 1.0  | –                             | 10   | –                              | 10   | μA   |
| I <sub>CC</sub>  | Quiescent Supply Current               | V <sub>IN</sub> = V <sub>CC</sub> or GND             | 5.5                    | –                     | –    | 1.0  | –                             | 20   | –                              | 40   | μA   |

# MC74VHC1G14, MC74VHC1GT14

## DC ELECTRICAL CHARACTERISTICS (MC74VHC1GT14)

| Symbol            | Parameter                                          | Test Conditions                                                           | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |      |      | -40°C ≤ T <sub>A</sub> ≤ 85°C |      | -55°C ≤ T <sub>A</sub> ≤ 125°C |      | Unit |
|-------------------|----------------------------------------------------|---------------------------------------------------------------------------|---------------------|-----------------------|------|------|-------------------------------|------|--------------------------------|------|------|
|                   |                                                    |                                                                           |                     | Min                   | Typ  | Max  | Min                           | Max  | Min                            | Max  |      |
| V <sub>T+</sub>   | Positive Input Threshold Voltage (NLV)             |                                                                           | 3.0                 | 1.2                   | 1.4  | 1.6  | –                             | 1.6  | –                              | 1.6  | V    |
|                   |                                                    |                                                                           | 4.5                 | 1.58                  | 1.74 | 2.0  | –                             | 2.0  | –                              | 2.0  |      |
|                   |                                                    |                                                                           | 5.5                 | 1.79                  | 1.94 | 2.1  | –                             | 2.1  | –                              | 2.1  |      |
|                   | Positive Input Threshold Voltage                   |                                                                           | 3.0                 | –                     | 1.4  | 1.6  | –                             | 1.6  | –                              | 1.6  | V    |
|                   |                                                    |                                                                           | 4.5                 | –                     | 1.74 | 2.0  | –                             | 2.0  | –                              | 2.0  |      |
|                   |                                                    |                                                                           | 5.5                 | –                     | 1.94 | 2.1  | –                             | 2.1  | –                              | 2.1  |      |
| V <sub>T–</sub>   | Negative Input Threshold Voltage (NLV)             |                                                                           | 3.0                 | 0.35                  | 0.76 | 0.93 | 0.35                          | –    | 0.35                           | –    | V    |
|                   |                                                    |                                                                           | 4.5                 | 0.5                   | 1.01 | 1.18 | 0.5                           | –    | 0.5                            | –    |      |
|                   |                                                    |                                                                           | 5.5                 | 0.6                   | 1.13 | 1.29 | 0.6                           | –    | 0.6                            | –    |      |
|                   | Negative Input Threshold Voltage                   |                                                                           | 3.0                 | 0.35                  | 0.76 | –    | 0.35                          | –    | 0.35                           | –    | V    |
|                   |                                                    |                                                                           | 4.5                 | 0.5                   | 1.01 | –    | 0.5                           | –    | 0.5                            | –    |      |
|                   |                                                    |                                                                           | 5.5                 | 0.6                   | 1.13 | –    | 0.6                           | –    | 0.6                            | –    |      |
| V <sub>H</sub>    | Hysteresis Voltage                                 |                                                                           | 3.0                 | 0.30                  | 0.64 | 1.20 | 0.30                          | 1.20 | 0.30                           | 1.20 | V    |
|                   |                                                    |                                                                           | 4.5                 | 0.40                  | 0.73 | 1.40 | 0.40                          | 1.40 | 0.40                           | 1.40 |      |
|                   |                                                    |                                                                           | 5.5                 | 0.50                  | 0.81 | 1.60 | 0.50                          | 1.60 | 0.50                           | 1.60 |      |
| V <sub>OH</sub>   | High-Level Output Voltage                          | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                      | 2.0                 | 1.9                   | 2.0  | –    | 1.9                           | –    | 1.9                            | –    | V    |
|                   |                                                    | I <sub>OH</sub> = –50 μA                                                  | 3.0                 | 2.9                   | 3.0  | –    | 2.9                           | –    | 2.9                            | –    |      |
|                   |                                                    | I <sub>OH</sub> = –50 μA                                                  | 4.5                 | 4.4                   | 4.5  | –    | 4.4                           | –    | 4.4                            | –    |      |
|                   |                                                    | I <sub>OH</sub> = –4 mA                                                   | 3.0                 | 2.58                  | –    | –    | 2.48                          | –    | 2.34                           | –    |      |
|                   |                                                    | I <sub>OH</sub> = –8 mA                                                   | 4.5                 | 3.94                  | –    | –    | 3.80                          | –    | 3.66                           | –    |      |
|                   |                                                    |                                                                           |                     |                       |      |      |                               |      |                                |      |      |
| V <sub>OL</sub>   | Low-Level Output Voltage                           | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                      | 2.0                 | –                     | 0.0  | 0.1  | –                             | 0.1  | –                              | 0.1  | V    |
|                   |                                                    | I <sub>OL</sub> = 50 μA                                                   | 3.0                 | –                     | 0.0  | 0.1  | –                             | 0.1  | –                              | 0.1  |      |
|                   |                                                    | I <sub>OL</sub> = 50 μA                                                   | 4.5                 | –                     | 0.0  | 0.1  | –                             | 0.1  | –                              | 0.1  |      |
|                   |                                                    | I <sub>OL</sub> = 4 mA                                                    | 3.0                 | –                     | –    | 0.36 | –                             | 0.44 | –                              | 0.52 |      |
|                   |                                                    | I <sub>OL</sub> = 8 mA                                                    | 4.5                 | –                     | –    | 0.36 | –                             | 0.44 | –                              | 0.52 |      |
|                   |                                                    |                                                                           |                     |                       |      |      |                               |      |                                |      |      |
| I <sub>IN</sub>   | Input Leakage Current                              | V <sub>IN</sub> = 5.5 V or GND                                            | 2.0 to 5.5          | –                     | –    | ±0.1 | –                             | ±1.0 | –                              | ±1.0 | μA   |
| I <sub>OFF</sub>  | Power Off Leakage Current                          | V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V                       | 0                   | –                     | –    | 1.0  | –                             | 10   | –                              | 10   | μA   |
| I <sub>CC</sub>   | Quiescent Supply Current                           | V <sub>IN</sub> = V <sub>CC</sub> or GND                                  | 5.5                 | –                     | –    | 1.0  | –                             | 20   | –                              | 40   | μA   |
| I <sub>CCCT</sub> | Increase in Quiescent Supply Current per Input Pin | One Input: V <sub>IN</sub> = 3.4 V; Other Input at V <sub>CC</sub> or GND | 5.5                 | –                     | –    | 1.35 | –                             | 1.5  | –                              | 1.65 | mA   |

## AC ELECTRICAL CHARACTERISTICS

| Symbol                                 | Parameter                                   | Conditions                     | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |     |      | −40°C ≤ T <sub>A</sub> ≤ 85°C |      | −55°C ≤ T <sub>A</sub> ≤ 125°C          |      | Unit |
|----------------------------------------|---------------------------------------------|--------------------------------|---------------------|-----------------------|-----|------|-------------------------------|------|-----------------------------------------|------|------|
|                                        |                                             |                                |                     | Min                   | Typ | Max  | Min                           | Max  | Min                                     | Max  |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub> | Propagation Delay, A to Y (Figures 3 and 4) | C <sub>L</sub> = 15 pF         | 3.0 to 3.6          | –                     | 7.0 | 12.8 | –                             | 15.0 | –                                       | 17.0 | ns   |
|                                        |                                             | C <sub>L</sub> = 50 pF         |                     | –                     | 8.5 | 16.3 | –                             | 18.5 | –                                       | 20.5 |      |
|                                        |                                             | C <sub>L</sub> = 15 pF         | 4.5 to 5.5          | –                     | 4.0 | 8.6  | –                             | 10.0 | –                                       | 11.5 |      |
|                                        |                                             | C <sub>L</sub> = 50 pF         |                     | –                     | 5.5 | 10.6 | –                             | 12.0 | –                                       | 13.5 |      |
| C <sub>IN</sub>                        | Input Capacitance                           |                                |                     | –                     | 4.0 | 10   | –                             | 10   | –                                       | 10   | pF   |
| C <sub>OUT</sub>                       | Output Capacitance                          | Output in High Impedance State |                     | –                     | 6.0 | –    | –                             | –    | –                                       | –    | pF   |
|                                        |                                             |                                |                     |                       |     |      |                               |      | Typical @ 25°C, V <sub>CC</sub> = 5.0 V |      |      |
| C <sub>PD</sub>                        | Power Dissipation Capacitance (Note 6)      |                                |                     |                       |     |      |                               | 8.0  |                                         | pF   |      |

6. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is 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<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

MC74VHC1G14, MC74VHC1GT14

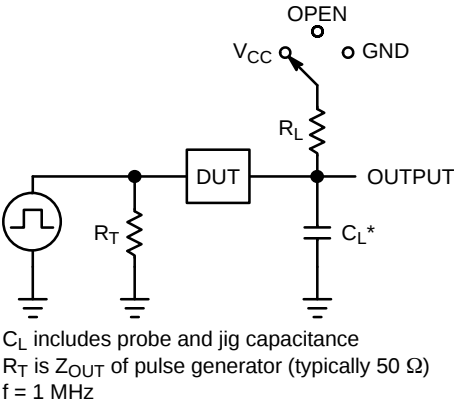


Figure 3. Test Circuit

| Test                | Switch Position | $C_L$ , pF                   | $R_L$ , $\Omega$ |
|---------------------|-----------------|------------------------------|------------------|
| $t_{PLH} / t_{PHL}$ | Open            | See AC Characteristics Table | X                |
| $t_{PLZ} / t_{PZL}$ | $V_{CC}$        |                              | 1 k              |
| $t_{PHZ} / t_{PZH}$ | GND             |                              | 1 k              |

X = Don't Care

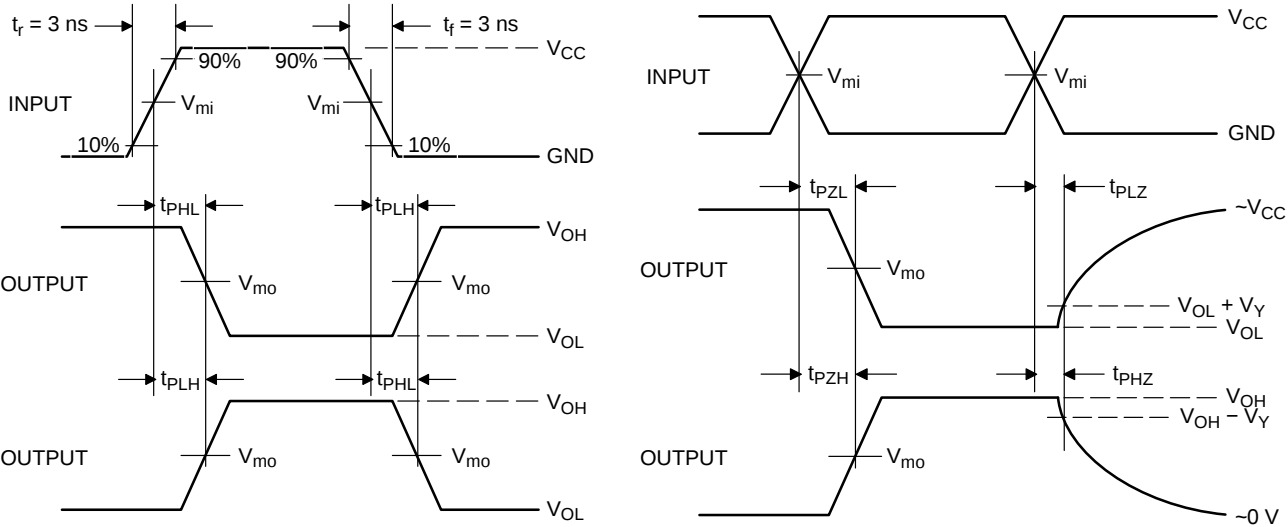


Figure 4. Switching Waveforms

| $V_{CC}$ , V | $V_{mi}$ , V | $V_{mo}$ , V          |                                               | $V_Y$ , V |
|--------------|--------------|-----------------------|-----------------------------------------------|-----------|
|              |              | $t_{PLH}$ , $t_{PHL}$ | $t_{PZL}$ , $t_{PLZ}$ , $t_{PZH}$ , $t_{PHZ}$ |           |
| 3.0 to 3.6   | $V_{CC}/2$   | $V_{CC}/2$            | $V_{CC}/2$                                    | 0.3       |
| 4.5 to 5.5   | $V_{CC}/2$   | $V_{CC}/2$            | $V_{CC}/2$                                    | 0.3       |

# MC74VHC1G14, MC74VHC1GT14

## ORDERING INFORMATION

| Device                                | Packages                | Specific Device Code | Pin 1 Orientation<br>(See below) | Shipping <sup>†</sup> |
|---------------------------------------|-------------------------|----------------------|----------------------------------|-----------------------|
| MC74VHC1G14DFT1G                      | SC-88A                  | VA                   | Q2                               | 3000 / Tape & Reel    |
| MC74VHC1G14DFT2G                      | SC-88A                  | VA                   | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1G14DFT2G-F22038**             | SC-88A                  | VA                   | Q4                               | 3000 / Tape & Reel    |
| NLVVHC1G14DFT1G*                      | SC-88A                  | VA                   | Q2                               | 3000 / Tape & Reel    |
| NLVVHC1G14DFT2G*                      | SC-88A                  | VA                   | Q4                               | 3000 / Tape & Reel    |
| M74VHC1GT14DFT1G                      | SC-88A                  | VC                   | Q2                               | 3000 / Tape & Reel    |
| M74VHC1GT14DFT1G-L22038**             | SC-88A                  | VC                   | Q2                               | 3000 / Tape & Reel    |
| M74VHC1GT14DFT2G                      | SC-88A                  | VC                   | Q4                               | 3000 / Tape & Reel    |
| M74VHC1GT14DFT2G-L22038**             | SC-88A                  | VC                   | Q4                               | 3000 / Tape & Reel    |
| NLVVHC1GT14DFT1G*                     | SC-88A                  | VC                   | Q2                               | 3000 / Tape & Reel    |
| NLVVHC1GT14DFT2G*                     | SC-88A                  | VC                   | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1G14DBVT1G                     | SC-74A                  | VA                   | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1GT14DBVT1G                    | SC-74A                  | VC                   | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1G14DTT1G**                    | TSOP-5                  | VA                   | Q4                               | 3000 / Tape & Reel    |
| NLVVHC1G14DTT1G*                      | TSOP-5                  | VA                   | Q4                               | 3000 / Tape & Reel    |
| M74VHC1GT14DTT1G**                    | TSOP-5                  | VC                   | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1G14P5T5G                      | SOT-953                 | R                    | Q2                               | 8000 / Tape & Reel    |
| MC74VHC1G14P5T5G-L22088**             | SOT-953                 | R                    | Q2                               | 8000 / Tape & Reel    |
| MC74VHC1GT14P5T5G<br>(In Development) | SOT-953                 | TBD                  | Q2                               | 8000 / Tape & Reel    |
| MC74VHC1G14MU1TCG<br>(In Development) | UDFN6, 1.45 x 1.0, 0.5P | TBD                  | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1GT14MU1TCG                    | UDFN6, 1.45 x 1.0, 0.5P | Q                    | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1G14MU2TCG<br>(In Development) | UDFN6, 1.2 x 1.0, 0.4P  | P                    | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1GT14MU2TCG                    | UDFN6, 1.2 x 1.0, 0.4P  | M                    | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1G14MU3TCG<br>(In Development) | UDFN6, 1.0 x 1.0, 0.35  | TBD                  | Q4                               | 3000 / Tape & Reel    |
| MC74VHC1GT14MU3TCG                    | UDFN6, 1.0 x 1.0, 0.35  | M                    | Q4                               | 3000 / Tape & Reel    |

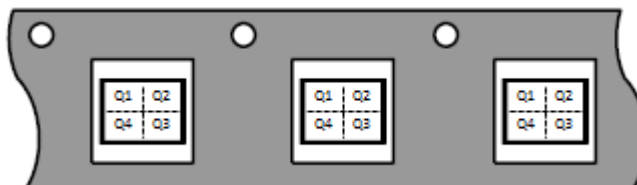
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

\*\*Please refer to NLV specifications for this device.

## Pin 1 Orientation in Tape and Reel

Direction of Feed



# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

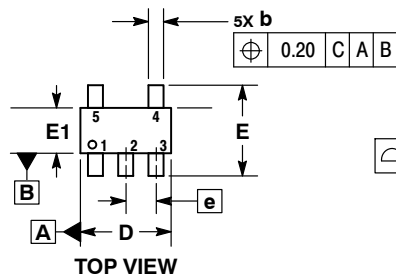
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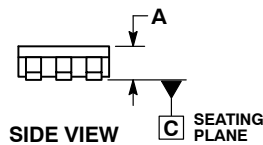
SCALE 2:1

### SC-74A CASE 318BQ ISSUE B

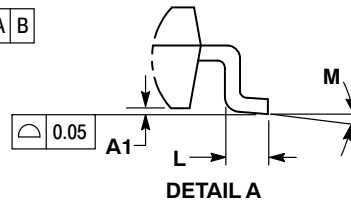
DATE 18 JAN 2018



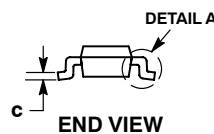
TOP VIEW



SIDE VIEW



DETAIL A



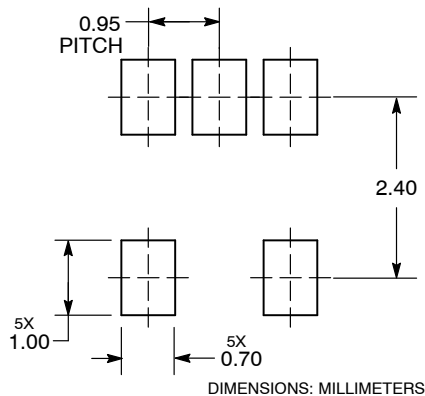
END VIEW

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

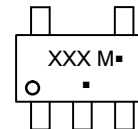
| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.90        | 1.10 |
| A1  | 0.01        | 0.10 |
| b   | 0.25        | 0.50 |
| c   | 0.10        | 0.26 |
| D   | 2.85        | 3.15 |
| E   | 2.50        | 3.00 |
| E1  | 1.35        | 1.65 |
| e   | 0.95 BSC    |      |
| L   | 0.20        | 0.60 |
| M   | 0°          | 10°  |

#### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

#### GENERIC MARKING DIAGRAM\*



- XXX = Specific Device Code  
M = Date Code  
▪ = 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.

\*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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| DESCRIPTION:     | SC-74A      | PAGE 1 OF 1                                                                                                                                                                      |

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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SCALE 2:1

SC-88A (SC-70-5/SOT-353)  
CASE 419A-02  
ISSUE L

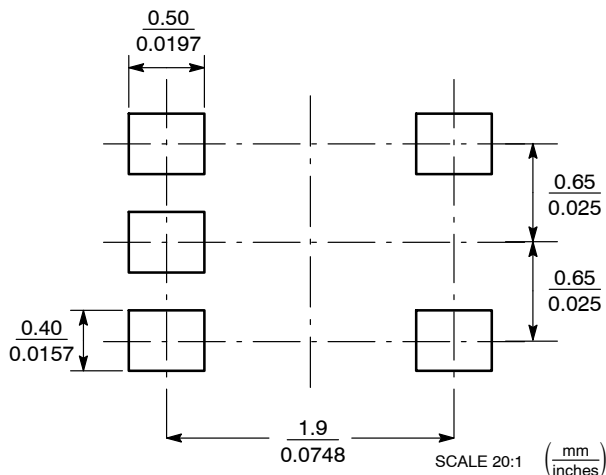
DATE 17 JAN 2013



D 5 PL  $\oplus$  0.2 (0.008) (M) B (M)



## SOLDER FOOTPRINT

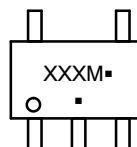


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.071     | 0.087 | 1.80        | 2.20 |
| B   | 0.045     | 0.053 | 1.15        | 1.35 |
| C   | 0.031     | 0.043 | 0.80        | 1.10 |
| D   | 0.004     | 0.012 | 0.10        | 0.30 |
| G   | 0.026 BSC |       | 0.65 BSC    |      |
| H   | ---       | 0.004 | ---         | 0.10 |
| J   | 0.004     | 0.010 | 0.10        | 0.25 |
| K   | 0.004     | 0.012 | 0.10        | 0.30 |
| N   | 0.008 REF |       | 0.20 REF    |      |
| S   | 0.079     | 0.087 | 2.00        | 2.20 |

## GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = 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.

STYLE 1:  
PIN 1. BASE  
2. EMITTER  
3. BASE  
4. COLLECTOR  
5. COLLECTOR

STYLE 2:  
PIN 1. ANODE  
2. EMITTER  
3. BASE  
4. COLLECTOR  
5. CATHODE

STYLE 3:  
PIN 1. ANODE 1  
2. N/C  
3. ANODE 2  
4. CATHODE 2  
5. CATHODE 1

STYLE 4:  
PIN 1. SOURCE 1  
2. DRAIN 1/2  
3. SOURCE 1  
4. GATE 1  
5. GATE 2

STYLE 5:  
PIN 1. CATHODE  
2. COMMON ANODE  
3. CATHODE 2  
4. CATHODE 3  
5. CATHODE 4

STYLE 6:  
PIN 1. EMITTER 2  
2. BASE 2  
3. EMITTER 1  
4. COLLECTOR  
5. COLLECTOR 2/BASE 1

STYLE 7:  
PIN 1. BASE  
2. EMITTER  
3. BASE  
4. COLLECTOR  
5. COLLECTOR

STYLE 8:  
PIN 1. CATHODE  
2. COLLECTOR  
3. N/C  
4. BASE  
5. EMITTER

STYLE 9:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. ANODE  
5. ANODE

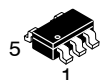
Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

|                  |                          |                                                                                                                                                                                     |
|------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION:     | SC-88A (SC-70-5/SOT-353) | PAGE 1 OF 1                                                                                                                                                                         |

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

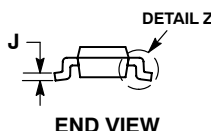
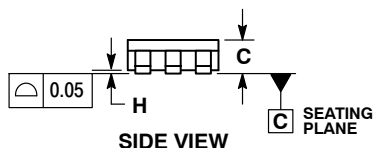
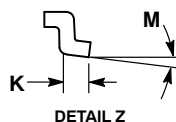
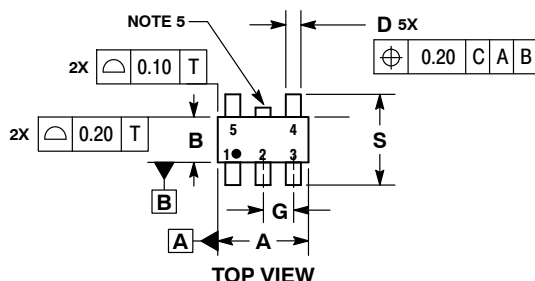
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SCALE 2:1

## TSOP-5 CASE 483 ISSUE N

DATE 12 AUG 2020

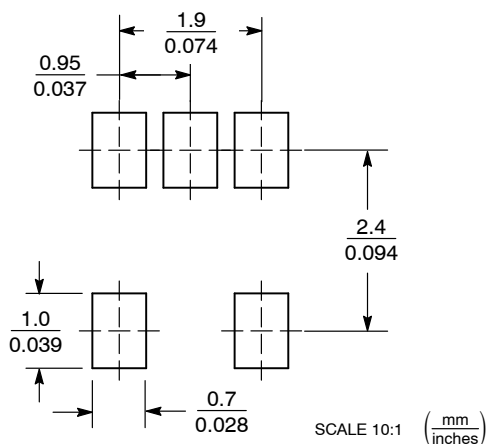


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSION A.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

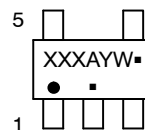
| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 2.85        | 3.15 |
| B   | 1.35        | 1.65 |
| C   | 0.90        | 1.10 |
| D   | 0.25        | 0.50 |
| G   | 0.95 BSC    |      |
| H   | 0.01        | 0.10 |
| J   | 0.10        | 0.26 |
| K   | 0.20        | 0.60 |
| M   | 0°          | 10°  |
| S   | 2.50        | 3.00 |

### SOLDERING FOOTPRINT\*

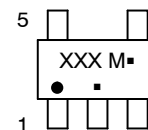


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

### GENERIC MARKING DIAGRAM\*



Analog



Discrete/Logic

XXX = Specific Device Code  
 A = Assembly Location  
 Y = Year  
 W = Work Week  
 ■ = Pb-Free Package

XXX = Specific Device Code  
 M = Date Code  
 ■ = 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.

DOCUMENT NUMBER: 98ARB18753C

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DESCRIPTION: TSOP-5

PAGE 1 OF 1

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# MECHANICAL CASE OUTLINE

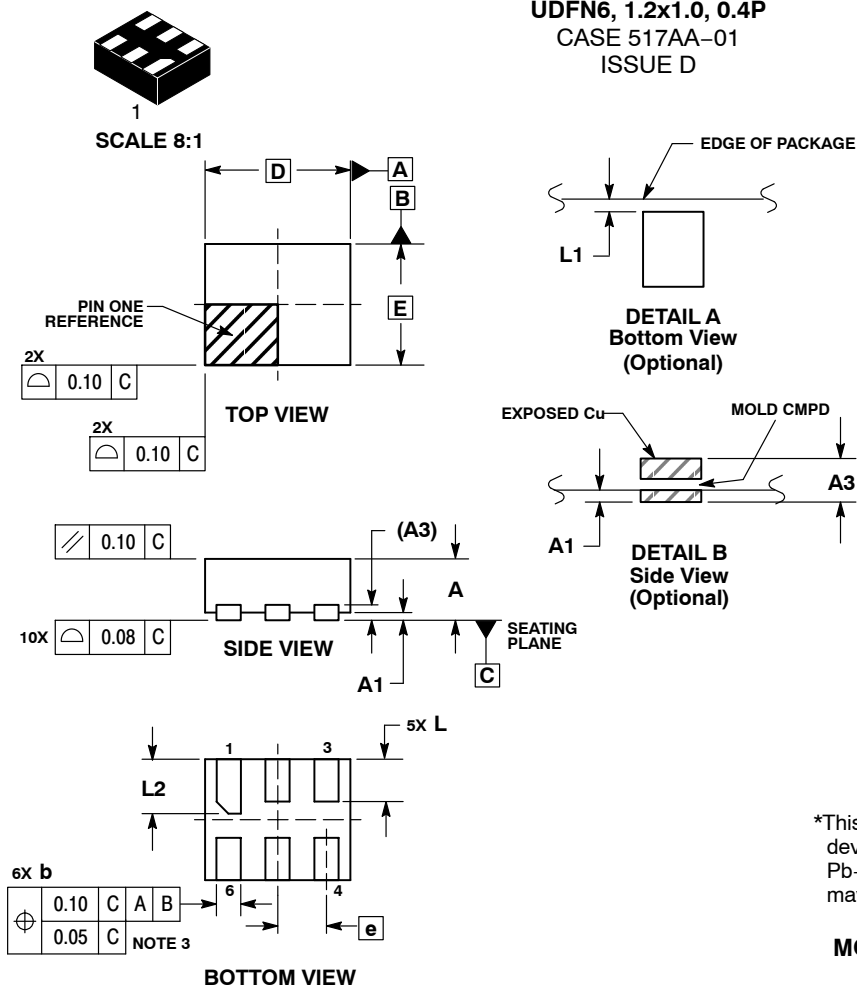
## PACKAGE DIMENSIONS

ON Semiconductor®



UDFN6, 1.2x1.0, 0.4P  
CASE 517AA-01  
ISSUE D

DATE 03 SEP 2010



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| MILLIMETERS |           |      |
|-------------|-----------|------|
| DIM         | MIN       | MAX  |
| A           | 0.45      | 0.55 |
| A1          | 0.00      | 0.05 |
| A3          | 0.127 REF |      |
| b           | 0.15      | 0.25 |
| D           | 1.20 BSC  |      |
| E           | 1.00 BSC  |      |
| e           | 0.40 BSC  |      |
| L           | 0.30      | 0.40 |
| L1          | 0.00      | 0.15 |
| L2          | 0.40      | 0.50 |

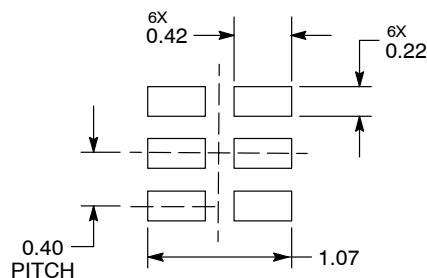
### GENERIC MARKING DIAGRAM\*



X = Specific Device Code  
M = Date Code

\*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.

### MOUNTING 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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| DESCRIPTION:     | 6 PIN UDFN, 1.2X1.0, 0.4P | PAGE 1 OF 1                                                                                                                                                                      |

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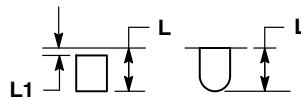
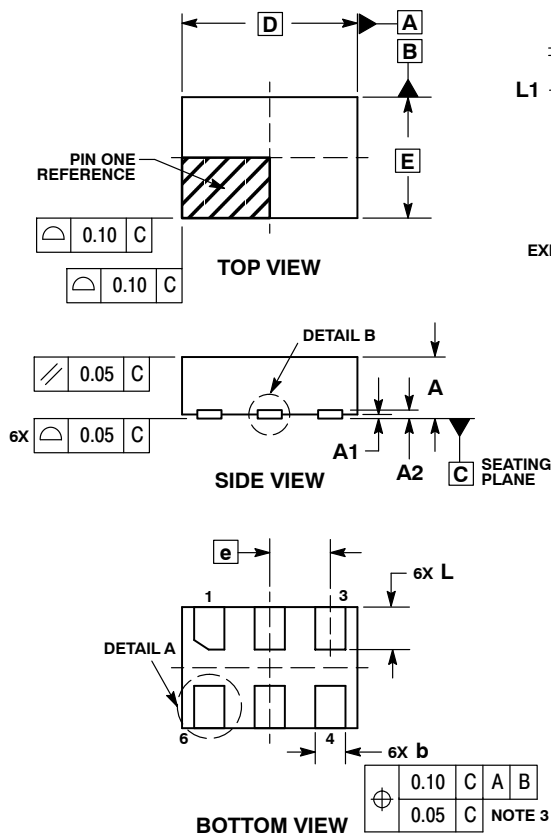
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



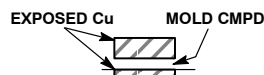
SCALE 4:1

UDFN6, 1.45x1.0, 0.5P  
CASE 517AQ  
ISSUE O

DATE 15 MAY 2008



**DETAIL A**  
OPTIONAL  
CONSTRUCTIONS



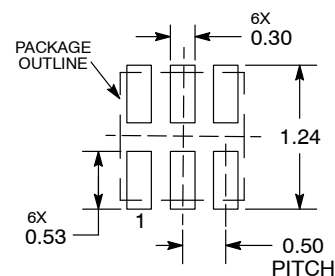
**DETAIL B**  
OPTIONAL  
CONSTRUCTIONS

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

| MILLIMETERS |      |      |
|-------------|------|------|
| DIM         | MIN  | MAX  |
| A           | 0.45 | 0.55 |
| A1          | 0.00 | 0.05 |
| A2          | 0.07 | REF  |
| b           | 0.20 | 0.30 |
| D           | 1.45 | BSC  |
| E           | 1.00 | BSC  |
| e           | 0.50 | BSC  |
| L           | 0.30 | 0.40 |
| L1          | —    | 0.15 |

## MOUNTING 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\*



X = Specific Device Code  
M = Date Code

\*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.

|                         |                              |                                                                                                                                                                                     |
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| <b>DESCRIPTION:</b>     | <b>UDFN6, 1.45x1.0, 0.5P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

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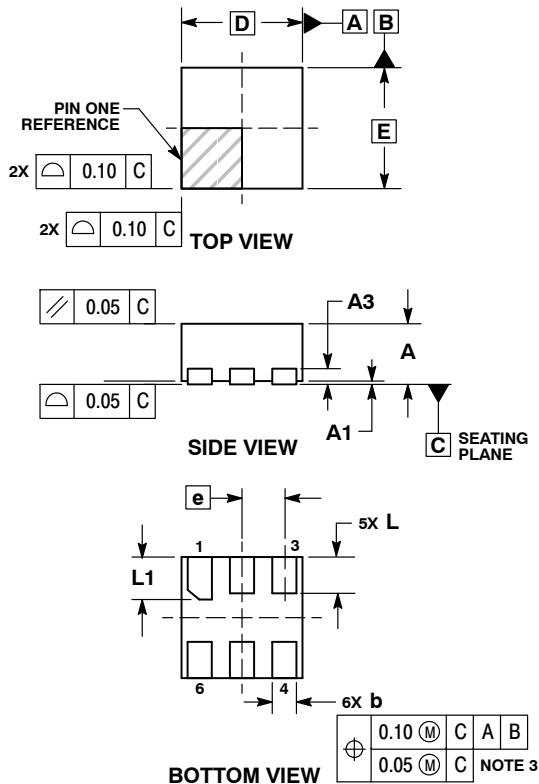
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

UDFN6, 1x1, 0.35P  
CASE 517BX  
ISSUE O

DATE 18 MAY 2011

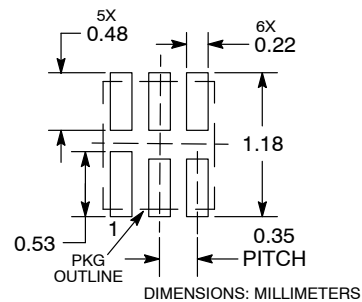


## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

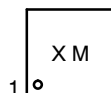
| MILLIMETERS |      |      |
|-------------|------|------|
| DIM         | MIN  | MAX  |
| A           | 0.45 | 0.55 |
| A1          | 0.00 | 0.05 |
| A3          | 0.13 | REF  |
| b           | 0.12 | 0.22 |
| D           | 1.00 | BSC  |
| E           | 1.00 | BSC  |
| e           | 0.35 | BSC  |
| L           | 0.25 | 0.35 |
| L1          | 0.30 | 0.40 |

## RECOMMENDED SOLDERING FOOTPRINT\*



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## GENERIC MARKING DIAGRAM\*



X = Specific Device Code  
M = Date Code

\*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.

|                  |                   |                                                                                                                                                                                  |
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| DESCRIPTION:     | UDFN6, 1x1, 0.35P | PAGE 1 OF 1                                                                                                                                                                      |

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

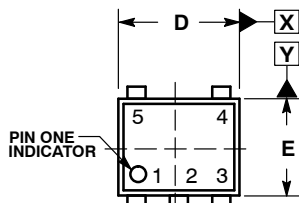
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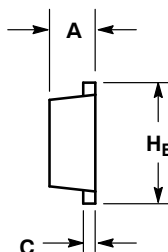
SCALE 4:1

### SOT-953 CASE 527AE ISSUE E

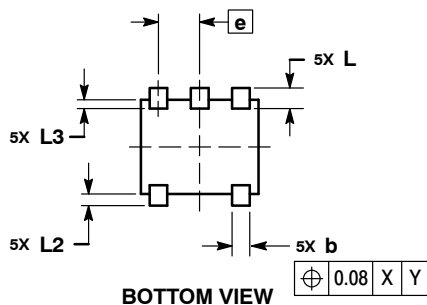
DATE 02 AUG 2011



TOP VIEW

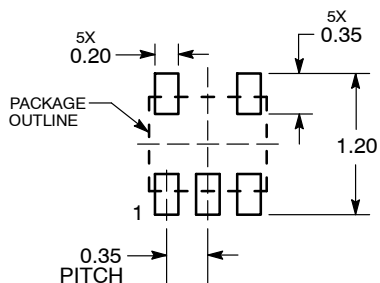


SIDE VIEW



BOTTOM VIEW

### SOLDERING FOOTPRINT\*



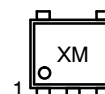
DIMENSIONS: MILLIMETERS

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM            | MILLIMETERS |      |      |
|----------------|-------------|------|------|
|                | MIN         | NOM  | MAX  |
| A              | 0.34        | 0.37 | 0.40 |
| b              | 0.10        | 0.15 | 0.20 |
| C              | 0.07        | 0.12 | 0.17 |
| D              | 0.95        | 1.00 | 1.05 |
| E              | 0.75        | 0.80 | 0.85 |
| e              | 0.35 BSC    |      |      |
| H <sub>E</sub> | 0.95        | 1.00 | 1.05 |
| L              | 0.175 REF   |      |      |
| L2             | 0.05        | 0.10 | 0.15 |
| L3             |             |      | 0.15 |

### GENERIC MARKING DIAGRAM\*



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M = Month Code

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Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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| DESCRIPTION:     | SOT-953     | PAGE 1 OF 1                                                                                                                                                                      |

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