

# NC7WZ14

## TinyLogic UHS Dual Inverter with Schmitt Trigger Inputs

### Description

The NC7WZ14 is a dual inverter with Schmitt trigger input from ON Semiconductor's Ultra-High Speed (UHS) Series of TinyLogic. The device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive while maintaining low static power dissipation over a very broad  $V_{CC}$  operating range. The device is specified to operate over the 1.65 V to 5.5 V  $V_{CC}$  range. The inputs and outputs are high-impedance when  $V_{CC}$  is 0 V. Inputs tolerate voltages up to 5.5 V independent of  $V_{CC}$  operating voltage. Schmitt trigger inputs achieve typically 1 V hysteresis between the positive-and negative-going input threshold voltage at 5 V.

### Features

- Ultra High-Speed:  $t_{PD}$  3.2 ns (Typical) into 50 pF at 5 V
- High Output Drive:  $\pm 24$  mA at 3 V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range: 1.65 V to 5.5 V
- Matches Performance of LCX when Operated at 3.3 V  $V_{CC}$
- Power Down High Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC70 Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

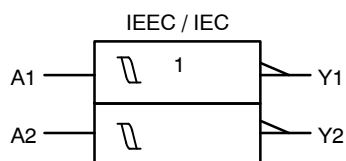


Figure 1. Logic Symbol



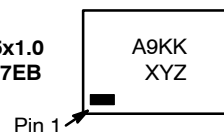
ON Semiconductor®

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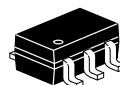
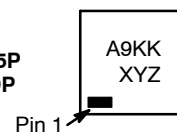
### MARKING DIAGRAMS



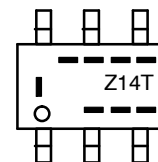
SIP6 1.45x1.0  
CASE 127EB



UDFN6  
1.0x1.0, 0.35P  
CASE 517DP



SC-88  
(SC-70 6 Lead)  
1.25x2  
CASE 419AD-01



- A9, Z14 = Specific Device Code
- KK = 2-Digit Lot Run Traceability Code
- XY = 2-Digit Date Code Format
- Z = Assembly Plant Code
- = Year Coding Scheme
- |- = Plant Code Identifier
- T = Die Run Code
- = Eight-Week Datacoding Scheme

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

# NC7WZ14

## Pin Configurations

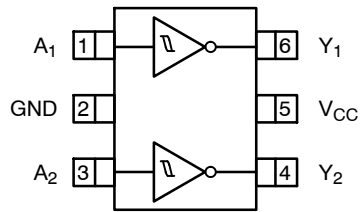


Figure 2. SC70 (Top View)

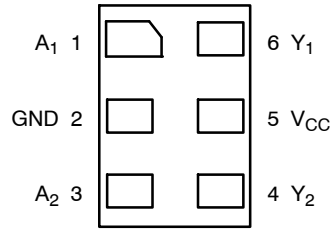
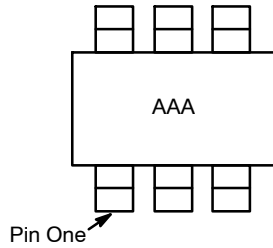


Figure 3. MicroPak (Top Through View)



NOTES:

1. AAA represents Product Code Top Mark (see *Ordering Information*).
2. Orientation of Top Mark determines Pin One location. Read the top mark left to right, pin one is the lower left pin.

Figure 4. SC70 Pin 1 Orientation

### PIN DEFINITIONS

| Pin # SC70 | Pin # MicroPak | Name            | Description    |
|------------|----------------|-----------------|----------------|
| 1          | 1              | A <sub>1</sub>  | Input          |
| 2          | 2              | GND             | Ground         |
| 3          | 3              | A <sub>2</sub>  | Input          |
| 4          | 4              | Y <sub>2</sub>  | Output         |
| 5          | 5              | V <sub>CC</sub> | Supply Voltage |
| 6          | 6              | Y <sub>1</sub>  | Input          |

### FUNCTION TABLE (Y = /A)

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

H = HIGH Logic Level  
L = LOW Logic Level

# NC7WZ14

## ABSOLUTE MAXIMUM RATINGS

| Symbol                              | Parameter   |                           | Min  | Max  | Unit |
|-------------------------------------|---|---------------------------|------|------|------|
| V <sub>CC</sub>                     | Supply Voltage                                    |                           | -0.5 | 6.5  | V    |
| V <sub>IN</sub>                     | DC Input Voltage                                  |                           | -0.5 | 6.5  | V    |
| V <sub>OUT</sub>                    | DC Output Voltage                                 |                           | -0.5 | 6.5  | V    |
| I <sub>IK</sub>                     | DC Input Diode Current                            | V <sub>IN</sub> < -0.5 V  | -    | -50  | mA   |
| I <sub>OK</sub>                     | DC Output Diode Current                           | V <sub>OUT</sub> < -0.5 V | -    | -50  | mA   |
| I <sub>OUT</sub>                    | DC Output Current                                 |                           | -    | ±100 | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current              |                           | -    | ±50  | mA   |
| T <sub>STG</sub>                    | Storage Temperature Range                         |                           | -65  | +150 | °C   |
| T <sub>J</sub>                      | Junction Temperature Under Bias                   |                           | -    | +150 | °C   |
| T <sub>L</sub>                      | Junction Lead Temperature (Soldering, 10 Seconds) |                           | -    | +260 | °C   |
| P <sub>D</sub>                      | Power Dissipation                                 | SC70-6                    | -    | 190  | mW   |
|                                     |   | MicroPak-6                | -    | 327  |      |
|                                     |   | MicroPak2™-6              | -    | 327  |      |
| ESD                                 | Human Body Model, JEDEC: JESD22-A114              |                           | -    | 4000 | V    |
|                                     | Charge Device Model, JEDEC: JESD22-C101           |                           | -    | 2000 |      |

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.

## RECOMMENDED OPERATING CONDITIONS

| Symbol           | Parameter                     | Conditions  | Min  | Max             | Unit |
|------------------|-------------------------------|-------------|------|-----------------|------|
| V <sub>CC</sub>  | Supply Voltage Operating      |             | 1.65 | 5.50            | V    |
|                  | Supply Voltage Data Retention |             | 1.5  | 5.5             |      |
| V <sub>IN</sub>  | Input Voltage                 |             | 0    | 5.5             | V    |
| V <sub>OUT</sub> | Output Voltage                |             | 0    | V <sub>CC</sub> | V    |
| T <sub>A</sub>   | Operating Temperature         | SC70-6      | -40  | +125            | °C   |
|                  |                               | MicroPak-6  | -40  | +85             |      |
|                  |                               | MicroPak2-6 | -40  | +85             |      |
| θ <sub>JA</sub>  | Thermal Resistance            | SC70-6      | -    | 659             | °C/W |
|                  |                               | MicroPak-6  | -    | 382             |      |
|                  |                               | MicroPak2-6 | -    | 382             |      |

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. Unused inputs must be held HIGH or LOW. They may not float.

## DC ELECTRICAL CHARACTERISTICS

| Symbol         | Parameter                  | V <sub>CC</sub> (V) | Conditions | T <sub>A</sub> = +25°C |     |      | T <sub>A</sub> = -40 to +85°C |      | T <sub>A</sub> = -40 to +125°C |      | Unit |
|----------------|----------------------------|---------------------|------------|------------------------|-----|------|-------------------------------|------|--------------------------------|------|------|
|                |                            |                     |            | Min                    | Typ | Max  | Min                           | Max  | Min                            | Max  |      |
| V <sub>P</sub> | Positive Threshold Voltage | 1.65                |            | -                      | -   | 1.40 | -                             | 1.40 | -                              | 1.40 | V    |
|                |                            | 1.80                |            | -                      | -   | 1.50 | -                             | 1.50 | -                              | 1.50 |      |
|                |                            | 2.30                |            | -                      | -   | 1.80 | -                             | 1.80 | -                              | 1.80 |      |
|                |                            | 3.00                |            | -                      | -   | 2.20 | -                             | 2.20 | -                              | 2.20 |      |
|                |                            | 4.50                |            | -                      | -   | 3.10 | -                             | 3.10 | -                              | 3.20 |      |
|                |                            | 5.50                |            | -                      | -   | 3.60 | -                             | 3.60 | -                              | 3.70 |      |

# NC7WZ14

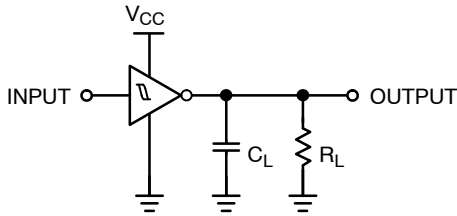
## DC ELECTRICAL CHARACTERISTICS (continued)

| Symbol           | Parameter                  | V <sub>CC</sub> (V) | Conditions   | T <sub>A</sub> = +25°C   |      |      | T <sub>A</sub> = -40 to +85°C |      | T <sub>A</sub> = -40 to +125°C |      | Unit |      |
|------------------|----------------------------|---------------------|--|--------------------------|------|------|-------------------------------|------|--------------------------------|------|------|------|
|                  |                            |                     |  | Min                      | Typ  | Max  | Min                           | Max  | Min                            | Max  |      |      |
| V <sub>N</sub>   | Negative Threshold Voltage | 1.65                |  | 0.20                     | 0.50 | -    | 0.20                          | -    | 0.30                           | -    | V    |      |
|                  |                            | 1.80                |  | 0.25                     | 0.56 | -    | 0.25                          | -    | 0.35                           | -    |      |      |
|                  |                            | 2.30                |  | 0.40                     | 0.75 | -    | 0.40                          | -    | 0.50                           | -    |      |      |
|                  |                            | 3.00                |  | 0.60                     | 0.98 | -    | 0.60                          | -    | 0.70                           | -    |      |      |
|                  |                            | 4.50                |  | 1.00                     | 1.42 | -    | 1.00                          | -    | 1.10                           | -    |      |      |
|                  |                            | 5.50                |  | 1.20                     | 1.68 | -    | 1.20                          | -    | 1.40                           | -    |      |      |
| V <sub>H</sub>   | Hysteresis Voltage         | 1.65                |  | 0.10                     | 0.48 | 0.90 | 0.10                          | 0.90 | 0.10                           | 0.90 | V    |      |
|                  |                            | 1.80                |  | 0.15                     | 0.51 | 1.00 | 0.15                          | 1.00 | 0.15                           | 1.00 |      |      |
|                  |                            | 2.30                |  | 0.25                     | 0.62 | 1.10 | 0.25                          | 1.10 | 0.25                           | 1.10 |      |      |
|                  |                            | 3.00                |  | 0.40                     | 0.76 | 1.20 | 0.40                          | 1.20 | 0.40                           | 1.20 |      |      |
|                  |                            | 4.50                |  | 0.60                     | 1.01 | 1.50 | 0.60                          | 1.50 | 0.60                           | 1.50 |      |      |
|                  |                            | 5.50                |  | 0.70                     | 1.20 | 1.70 | 0.70                          | 1.70 | 0.70                           | 1.70 |      |      |
| V <sub>OH</sub>  | HIGH Level Output Voltage  | 1.65                | V <sub>IN</sub> = V <sub>IL</sub> ,<br>I <sub>OH</sub> = -100 μA | 1.55                     | 1.65 | -    | 1.55                          | -    | 1.55                           | -    | V    |      |
|                  |                            | 1.80                |  | 1.70                     | 1.80 | -    | 1.70                          | -    | 1.70                           | -    |      |      |
|                  |                            | 2.30                |  | 2.20                     | 2.30 | -    | 2.20                          | -    | 2.20                           | -    |      |      |
|                  |                            | 3.00                |  | 2.90                     | 3.00 | -    | 2.90                          | -    | 2.90                           | -    |      |      |
|                  |                            | 4.50                |  | 4.40                     | 4.50 | -    | 4.40                          | -    | 4.40                           | -    |      |      |
|                  |                            | 1.65                | I <sub>OH</sub> = -4 mA  | 1.29                     | 1.52 | -    | 1.29                          | -    | 1.26                           | -    |      |      |
|                  |                            | 2.30                |  | I <sub>OH</sub> = -8 mA  | 1.90 | 2.14 | -                             | 1.90 | -                              | 1.80 |      | -    |
|                  |                            | 3.00                |  | I <sub>OH</sub> = -16 mA | 2.40 | 2.75 | -                             | 2.40 | -                              | 2.30 |      | -    |
|                  |                            | 3.00                |  | I <sub>OH</sub> = -24 mA | 2.30 | 2.62 | -                             | 2.30 | -                              | 2.20 |      | -    |
|                  |                            | 4.50                |  | I <sub>OH</sub> = -32 mA | 3.80 | 4.13 | -                             | 3.80 | -                              | 3.70 |      | -    |
| V <sub>OL</sub>  | LOW Level Output Voltage   | 1.65                | V <sub>IN</sub> = V <sub>IH</sub> ,<br>I <sub>OL</sub> = 100 μA  | -                        | 0.00 | 0.10 | -                             | 0.10 | -                              | 0.10 | V    |      |
|                  |                            | 1.80                |  | -                        | 0.00 | 0.10 | -                             | 0.10 | -                              | 0.10 |      |      |
|                  |                            | 2.30                |  | -                        | 0.00 | 0.10 | -                             | 0.10 | -                              | 0.10 |      |      |
|                  |                            | 3.00                |  | -                        | 0.00 | 0.10 | -                             | 0.10 | -                              | 0.10 |      |      |
|                  |                            | 4.50                |  | -                        | 0.00 | 0.10 | -                             | 0.10 | -                              | 0.10 |      |      |
|                  |                            | 1.65                | I <sub>OL</sub> = 4 mA   | -                        | 0.08 | 0.24 | -                             | 0.24 | -                              | 0.26 |      |      |
|                  |                            | 2.30                |  | I <sub>OL</sub> = 8 mA   | -    | 0.10 | 0.30                          | -    | 0.30                           | -    |      | 0.32 |
|                  |                            | 3.00                |  | I <sub>OL</sub> = 16 mA  | -    | 0.16 | 0.40                          | -    | 0.40                           | -    |      | 0.43 |
|                  |                            | 3.00                |  | I <sub>OL</sub> = 24 mA  | -    | 0.24 | 0.55                          | -    | 0.55                           | -    |      | 0.60 |
|                  |                            | 4.50                |  | I <sub>OL</sub> = 32 mA  | -    | 0.25 | 0.55                          | -    | 0.55                           | -    |      | 0.60 |
|                  |                            |                     |  |                          |      |      |                               |      |                                |      |      |      |
| I <sub>IN</sub>  | Input Leakage Current      | 1.65 to 5.5         | V <sub>IN</sub> = 5.5 V,<br>GND                                  | -                        | -    | ±0.1 | -                             | ±1.0 | -                              | ±2.0 | μA   |      |
| I <sub>OFF</sub> | Power Off Leakage Current  | 0                   | V <sub>IN</sub> or<br>V <sub>OUT</sub> = 5.5 V                   | -                        | -    | 1    | -                             | 10   | -                              | 20   | μA   |      |
| I <sub>CC</sub>  | Quiescent Supply Current   | 1.65 to 5.5         | V <sub>IN</sub> = 5.5 V,<br>GND                                  | -                        | -    | 1.0  | -                             | 10   | -                              | 20   | μA   |      |

AC ELECTRICAL CHARACTERISTICS

| Symbol                              | Parameter   | V <sub>CC</sub> (V) | Conditions   | T <sub>A</sub> = +25°C |      |      | T <sub>A</sub> = -40 to +85°C |      | T <sub>A</sub> = -40 to +125°C |      | Unit |
|-------------------------------------|---|---------------------|--|------------------------|------|------|-------------------------------|------|--------------------------------|------|------|
|                                     |   |                     |  | Min                    | Typ  | Max  | Min                           | Max  | Min                            | Max  |      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation Delay<br>(Figure 5, 6)                      | 1.65                | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ,  | -                      | 7.6  | 13.1 | -                             | 14.5 | -                              | 14.7 | ns   |
|                                     |   | 1.80                |  | -                      | 6.3  | 10.9 | -                             | 12.0 | -                              | 12.3 |      |
|                                     |   | 2.50 ±0.20          |  | -                      | 4.3  | 7.4  | -                             | 8.1  | -                              | 8.4  |      |
|                                     |   | 3.30 ±0.30          | -  | 3.3                    | 5.0  | -    | 5.5                           | -    | 5.8                            |      |      |
|                                     |   | 5.00 ±0.50          | -  | 2.7                    | 4.1  | -    | 4.5                           | -    | 4.8                            |      |      |
|                                     |   | 3.30 ±0.30          | C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω, | -                      | 4.0  | 6.0  | -                             | 6.6  | -                              | 6.9  |      |
|                                     |   | 5.00 ±0.50          |  | -                      | 3.2  | 4.9  | -                             | 5.4  | -                              | 5.7  |      |
| C <sub>IN</sub>                     | Input Capacitance                                       | 0.00                |  | -                      | 2.5  | -    | -                             | -    | -                              | pF   |      |
| C <sub>PD</sub>                     | Power Dissipation<br>Capacitance (Note 4)<br>(Figure 7) | 3.30                |  | -                      | 11.0 | -    | -                             | -    | -                              | pF   |      |
|                                     |   | 5.00                |  | -                      | 12.5 | -    | -                             | -    | -                              |      |      |

4. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression:  
I<sub>CCD</sub> = (C<sub>PD</sub>) (V<sub>CC</sub>) (f<sub>IN</sub>) + (I<sub>CCstatic</sub>).



NOTE:  
5. C<sub>L</sub> includes load and stray capacitance;  
Inputs PRR = 1.0 MHz, t<sub>W</sub> = 500 ns.

Figure 5. AC Test Circuit

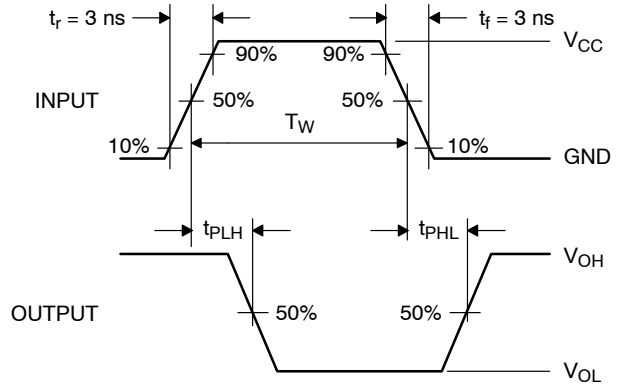
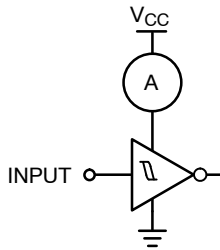


Figure 6. AC Waveforms



NOTE:  
6. Input = AC Waveform; t<sub>r</sub> = t<sub>f</sub> = 1.8 ns; PRR = variable;  
Duty Cycle = 50%.

Figure 7. I<sub>CCD</sub> Test Circuit

# NC7WZ14

## ORDERING INFORMATION

| Device      | Operating Temperature | Top Mark | Packages                                     | Shipping <sup>†</sup> |
|-------------|-----------------------|----------|--|-----------------------|
| NC7WZ14P6X  | -40 to +85°C          | Z14      | 6-Lead SC70, EIAJ SC-88a, 1.25 mm Wide       | 3000 / Tape & Reel    |
| NC7WZ14EP6X | -40 to +125°C         | Z14      | 6-Lead SC70, EIAJ SC-88a, 1.25 mm Wide       | 3000 / Tape & Reel    |
| NC7WZ14L6X  | -40 to +85°C          | A9       | 6-Lead MicroPak, 1.00 mm Wide                | 5000 / Tape & Reel    |
| NC7WZ14FHX  | -40 to +85°C          | A9       | 6-Lead, MicroPak2, 1x1 mm Body, .35 mm Pitch | 5000 / Tape & Reel    |

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

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



SIP6 1.45X1.0  
CASE 127EB  
ISSUE O

DATE 31 AUG 2016



NOTES:

1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

|                         |                      |  |
|-------------------------|----------------------|--|
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| <b>DESCRIPTION:</b>     | <b>SIP6 1.45X1.0</b> | <b>PAGE 1 OF 1</b>   |

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# MECHANICAL CASE OUTLINE

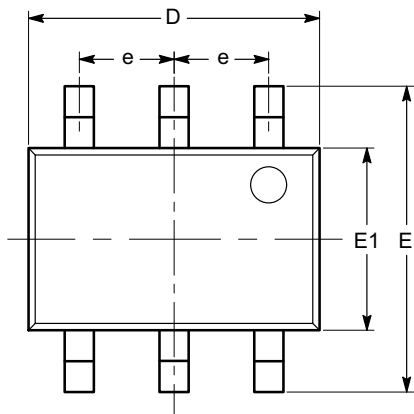
## PACKAGE DIMENSIONS

ON Semiconductor®



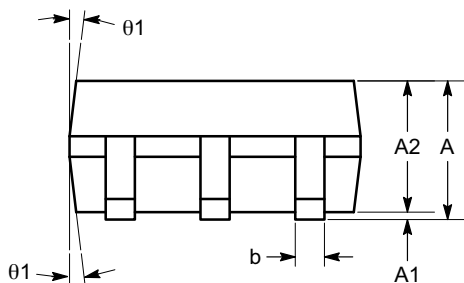
SC-88 (SC-70 6 Lead), 1.25x2  
CASE 419AD-01  
ISSUE A

DATE 07 JUL 2010

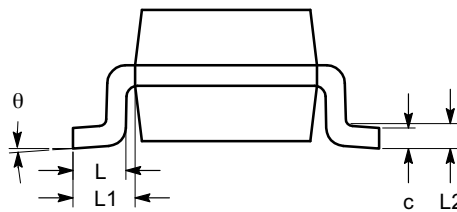


TOP VIEW

| SYMBOL     | MIN      | NOM  | MAX  |
|------------|----------|------|------|
| A          | 0.80     |      | 1.10 |
| A1         | 0.00     |      | 0.10 |
| A2         | 0.80     |      | 1.00 |
| b          | 0.15     |      | 0.30 |
| c          | 0.10     |      | 0.18 |
| D          | 1.80     | 2.00 | 2.20 |
| E          | 1.80     | 2.10 | 2.40 |
| E1         | 1.15     | 1.25 | 1.35 |
| e          | 0.65 BSC |      |      |
| L          | 0.26     | 0.36 | 0.46 |
| L1         | 0.42 REF |      |      |
| L2         | 0.15 BSC |      |      |
| $\theta$   | 0°       |      | 8°   |
| $\theta_1$ | 4°       |      | 10°  |



SIDE VIEW



END VIEW

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

|                         |                                     |  |
|-------------------------|-------------------------------------|--|
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| <b>DESCRIPTION:</b>     | <b>SC-88 (SC-70 6 LEAD), 1.25X2</b> | <b>PAGE 1 OF 1</b>   |

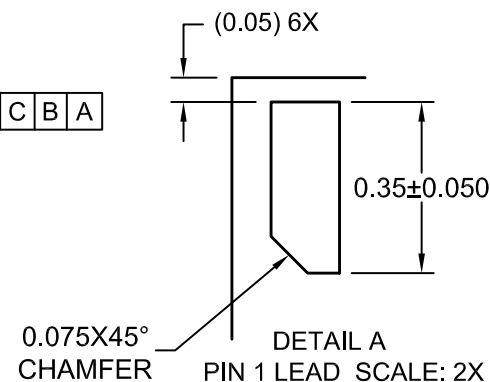
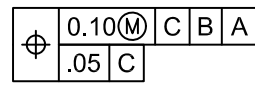
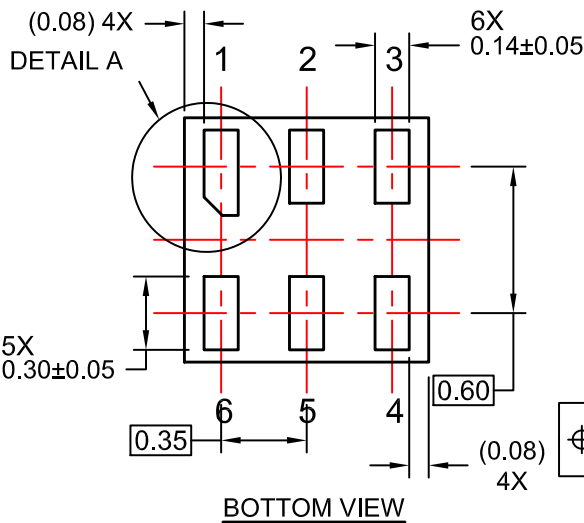
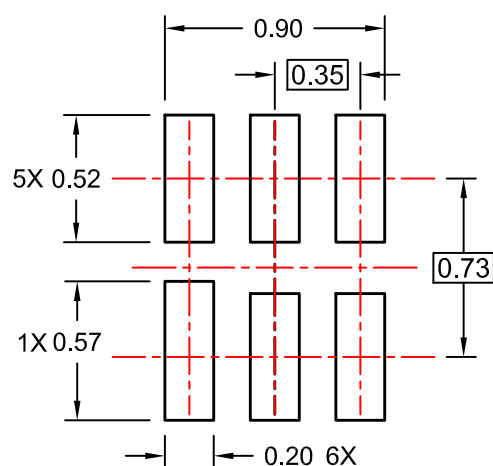
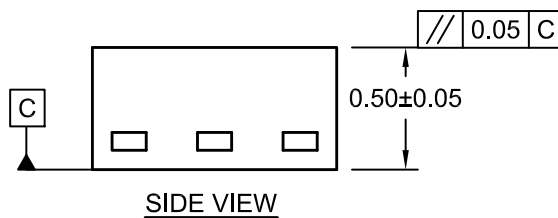
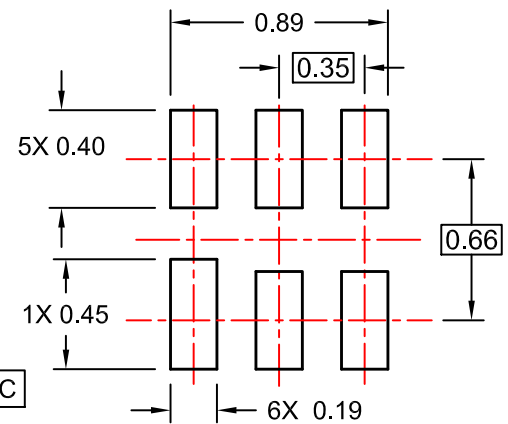
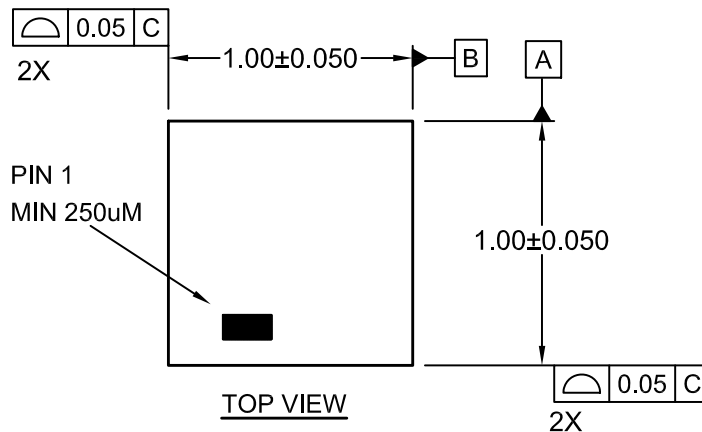
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**UDFN6 1.0X1.0, 0.35P**  
CASE 517DP  
ISSUE O

DATE 31 AUG 2016



- NOTES:  
A. COMPLIES TO JEDEC MO-252 STANDARD  
B. DIMENSIONS ARE IN MILLIMETERS.  
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009

|                         |                             |  |
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