# NL17SG32

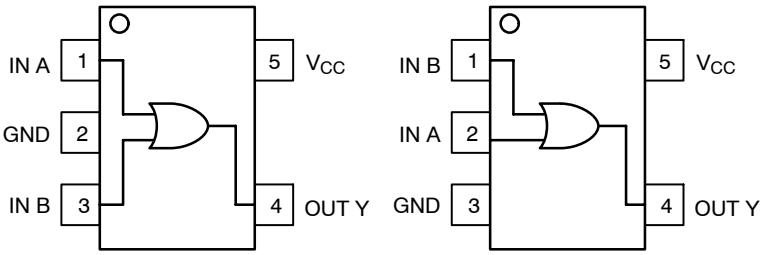
# Single 2-Input OR Gate

The NL17SG32 MiniGate™ is an advanced high−speed CMOS 2−input OR gate in ultra−small footprint.

The NL17SG32 input structures provides protection when voltages up to 4.6 V are applied.

### Features

- Wide Operating $V_{CC}$ Range: 0.9 V to 3.6 V
- High Speed: $t_{PD}$ = 2.4 ns (Typ) at $V_{CC}$ = 3.0 V, $C_L$ = 15 pF
- Low Power Dissipation: $I_{CC}$ = 0.5 μA (Max) at $T_A$ = 25°C
- 4.6 V Overvoltage Tolerant (OVT) Input Pins
- Ultra−Small Packages
- These are Pb−Free and Halide−Free Devices



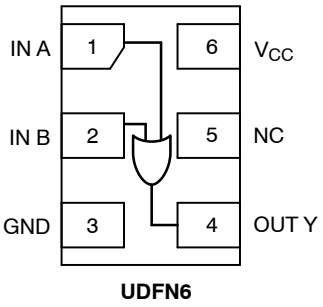




**Figure 1. Pinouts** (Top View)

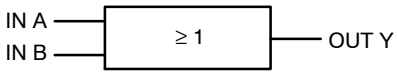
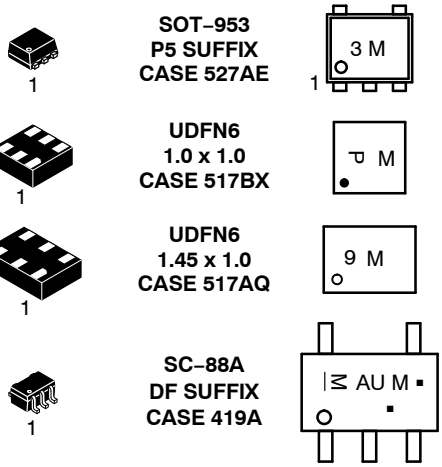



**Figure 2. Logic Symbol**

**ON Semiconductor®**

www.onsemi.com

**MARKING DIAGRAMS**




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.

**PIN ASSIGNMENT**

| | SOT−953 | SC−88A | UDFN6 |
|---|---|---|---|
| 1 | IN A | IN B | IN A |
| 2 | GND | IN A | IN B |
| 3 | IN B | GND | GND |
| 4 | OUT Y | OUT Y | OUT Y |
| 5 | $V_{CC}$ | $V_{CC}$ | NC |
| 6 | | | $V_{CC}$ |

**FUNCTION TABLE**

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

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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## MAXIMUM RATINGS

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage | | −0.5 to +5.5 | V |
| $V_{IN}$ | DC Input Voltage | | −0.5 to +4.6 | V |
| $V_{OUT}$ | DC Output Voltage | Output at High or Low State<br>Power−Down Mode ($V_{CC}$ = 0 V) | −0.5 to $V_{CC}$ +0.5<br>−0.5 to +4.6 | V |
| $I_{IK}$ | DC Input Diode Current | $V_{IN}$ < GND | −20 | mA |
| $I_{OK}$ | DC Output Diode Current | $V_{OUT}$ < GND | −20 | mA |
| $I_{OUT}$ | DC Output Source/Sink Current | | ±20 | mA |
| $I_{CC}$ | DC Supply Current per Supply Pin | | ±20 | mA |
| $I_{GND}$ | DC Ground Current per Ground Pin | | ±20 | mA |
| $T_{STG}$ | Storage Temperature Range | | −65 to +150 | °C |
| $T_L$ | Lead Temperature, 1 mm from Case for 10 Seconds | | 260 | °C |
| $T_J$ | Junction Temperature Under Bias | | +150 | °C |
| MSL | Moisture Sensitivity | | Level 1 | |
| $F_R$ | Flammability Rating | Oxygen Index: 28 to 34 | UL 94 V−0 @ 0.125 in | |
| $V_{ESD}$ | ESD Withstand Voltage | Human Body Model (Note 2)<br>Machine Model (Note 3) | >2000<br>>200 | V |
| $I_{LATCHUP}$ | Latchup Performance | Above $V_{CC}$ and Below GND at 125°C (Note 4) | ±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. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2−ounce copper trace with no air flow.
2. Tested to EIA/JESD22−A114−A.
3. Tested to EIA/JESD22−A115−A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Characteristics | | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Positive DC Supply Voltage | | 0.9 | 3.6 | V |
| $V_{IN}$ | Digital Input Voltage | | 0.0 | 3.6 | V |
| $V_{OUT}$ | Output Voltage | Output at High or Low State<br>Power−Down Mode ($V_{CC}$ = 0 V) | 0.0<br>0.0 | $V_{CC}$<br>3.6 | V |
| $T_A$ | Operating Temperature Range | | −55 | +125 | °C |
| $\Delta t / \Delta V$ | Input Transition Rise or Fail Rate | $V_{CC}$ = 3.3 V ± 0.3 V | 0 | 10 | ns/V |

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.

## DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Conditions | | $V_{CC}$ (V) | $T_A$ = 25°C | | $T_A$ = -55°C to +125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | Min | Max | |
| $V_{IH}$ | High-Level Input Voltage | | | 0.9 | $V_{CC}$ | | $V_{CC}$ | | V |
| | | | | 1.1 to 1.3 | 0.7x$V_{CC}$ | | 0.7x$V_{CC}$ | | |
| | | | | 1.4 to 1.6 | 0.65x$V_{CC}$ | | 0.65x$V_{CC}$ | | |
| | | | | 1.65 to 1.95 | 0.65x$V_{CC}$ | | 0.65x$V_{CC}$ | | |
| | | | | 2.3 to 2.7 | 1.7 | | 1.7 | | |
| | | | | 3.0 to 3.6 | 2.0 | | 2.0 | | |
| $V_{IL}$ | Low-Level Input Voltage | | | 0.9 | | GND | | GND | V |
| | | | | 1.1 to 1.3 | | 0.3x$V_{CC}$ | | 0.3x$V_{CC}$ | |
| | | | | 1.4 to 1.6 | | 0.35x$V_{CC}$ | | 0.35x$V_{CC}$ | |
| | | | | 1.65 to 1.95 | | 0.35x$V_{CC}$ | | 0.35x$V_{CC}$ | |
| | | | | 2.3 to 2.7 | | 0.7 | | 0.7 | |
| | | | | 3.0 to 3.6 | | 0.8 | | 0.8 | |
| $V_{OH}$ | High-Level Output Voltage | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = −20 μA | 0.9 | 0.75 | | 0.75 | | V |
| | | | $I_{OH}$ = -0.3 mA | 1.1 to 1.3 | 0.75x$V_{CC}$ | | 0.75x$V_{CC}$ | | |
| | | | $I_{OH}$ = -1.7 mA | 1.4 to 1.6 | 0.75x$V_{CC}$ | | 0.75x$V_{CC}$ | | |
| | | | $I_{OH}$ = -3.0 mA | 1.65 to 1.95 | Vcc-0.45 | | Vcc-0.45 | | |
| | | | $I_{OH}$ = -4.0 mA | 2.3 to 2.7 | 2.0 | | 2.0 | | |
| | | | $I_{OH}$ = -8.0 mA | 3.0 to 3.6 | 2.48 | | 2.48 | | |
| $V_{OL}$ | Low-Level Output Voltage | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 20 μA | 0.9 to 3.6 | | 0.1 | | 0.1 | V |
| | | | $I_{OL}$ = 1.1 mA | 1.1 to 1.3 | | 0.25x$V_{CC}$ | | 0.25x$V_{CC}$ | |
| | | | $I_{OL}$ = 1.7 mA | 1.4 to 1.6 | | 0.25x$V_{CC}$ | | 0.25x$V_{CC}$ | |
| | | | $I_{OL}$ = 3.0 mA | 1.65 to 1.95 | | 0.45 | | 0.45 | |
| | | | $I_{OL}$ = 4.0 mA | 2.3 to 2.7 | | 0.4 | | 0.4 | |
| | | | $I_{OL}$ = 8.0 mA | 3.0 to 3.6 | | 0.4 | | 0.4 | |
| $I_{IN}$ | Input Leakage Current | 0 ≤ $V_{IN}$ ≤ 3.6 V | | 0 to 3.6 | | ±0.1 | | ±1.0 | μA |
| $I_{CC}$ | Quiescent Supply Current | $V_{IN}$ = $V_{CC}$ or GND | | 3.6 | | 0.5 | | 10.0 | μA |

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 ELECTRICAL CHARACTERISTICS** (Input $t_r = t_f = 3.0$ ns)

| Symbol | Parameter | Test Condition | $V_{CC}$ (V) | $T_A$ = 25° C | | | $T_A$ = -55°C to +125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay, A or B to Y | $C_L$ = 10 pF, $R_L$ = 1 MΩ | 0.9 | - | 12.2 | 14.4 | - | 18.0 | ns |
| | | | 1.1 to 1.3 | - | 8.8 | 12.4 | - | 16.2 | |
| | | | 1.4 to 1.6 | - | 5.0 | 8.5 | - | 10.0 | |
| | | | 1.65 to 1.95 | - | 3.6 | 6.2 | - | 6.7 | |
| | | | 2.3 to 2.7 | - | 2.7 | 3.9 | - | 4.4 | |
| | | | 3.0 to 3.6 | - | 2.1 | 3.1 | - | 3.7 | |
| | | $C_L$ = 15 pF, $R_L$ = 1 MΩ | 0.9 | - | 13.0 | 16.0 | - | 18.0 | ns |
| | | | 1.1 to 1.3 | - | 7.8 | 12.0 | - | 16.0 | |
| | | | 1.4 to 1.6 | - | 5.9 | 9.3 | - | 11.2 | |
| | | | 1.65 to 1.95 | - | 4.5 | 6.9 | - | 7.1 | |
| | | | 2.3 to 2.7 | - | 3.0 | 4.4 | - | 5.0 | |
| | | | 3.0 to 3.6 | - | 2.4 | 3.4 | - | 3.9 | |
| | | $C_L$ = 30 pF, $R_L$ = 1 MΩ | 0.9 | - | 14.0 | 17.2 | - | 20.0 | ns |
| | | | 1.1 to 1.3 | - | 11.0 | 14.1 | - | 17.8 | |
| | | | 1.4 to 1.6 | - | 8.0 | 12.1 | - | 15.9 | |
| | | | 1.65 to 1.95 | - | 6.0 | 9.2 | - | 9.6 | |
| | | | 2.3 to 2.7 | - | 3.9 | 5.7 | - | 6.1 | |
| | | | 3.0 to 3.6 | - | 3.0 | 4.4 | - | 4.8 | |
| $C_{IN}$ | Input Capacitance | | 0 to 3.6 | | 3 | - | - | - | pF |
| $C_{PD}$ | Power Dissipation Capacitance (Note 5) | f = 10 MHz | 0.9 to 3.6 | - | 4 | - | - | - | pF |

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.

5. $C_{PD}$ 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: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. $C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

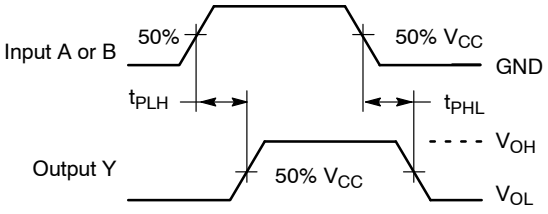
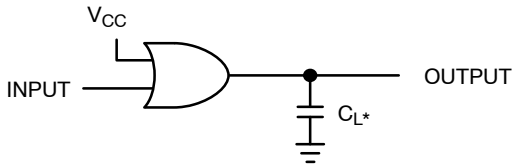



**Figure 3. Switching Waveforms**




*Includes all probe and jig capacitance.
A 1−MHz square input wave is recommended
for propagation delay tests.

**Figure 4. Test Circuit**

## ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| NL17SG32P5T5G | SOT−953<br>(Pb−Free) | 8000 / Tape & Reel |
| NL17SG32DFT2G | SC−88A<br>(Pb−Free) | 3000 / Tape & Reel |
| NL17SG32AMUTCG | UDFN6 1.45 x 1 mm<br>(Pb−Free) | 3000 / Tape & Reel |
| NL17SG32CMUTCG | UDFN6 1 x 1 mm<br>(Pb−Free) | 3000 / 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.

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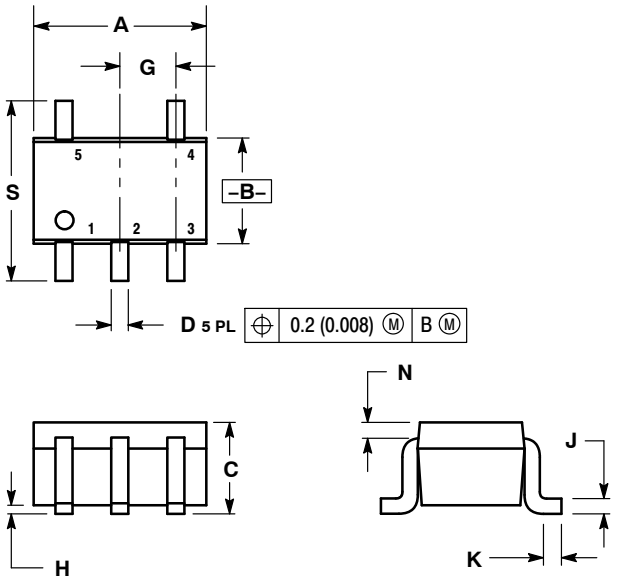
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

ON Semiconductor®

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

**SCALE 2:1**

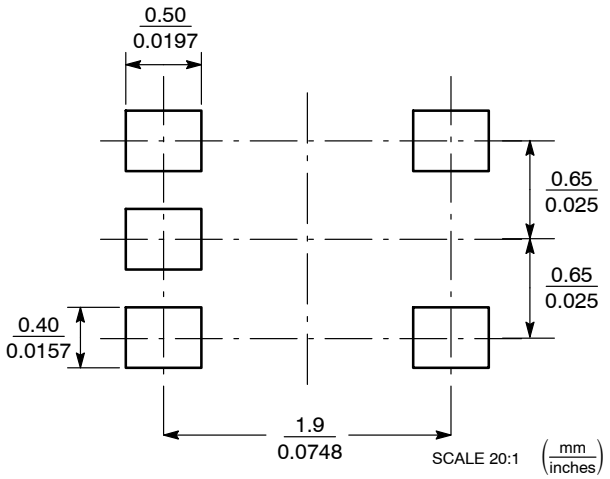
DATE 17 JAN 2013



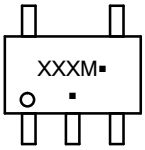

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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

## SOLDER FOOTPRINT




## 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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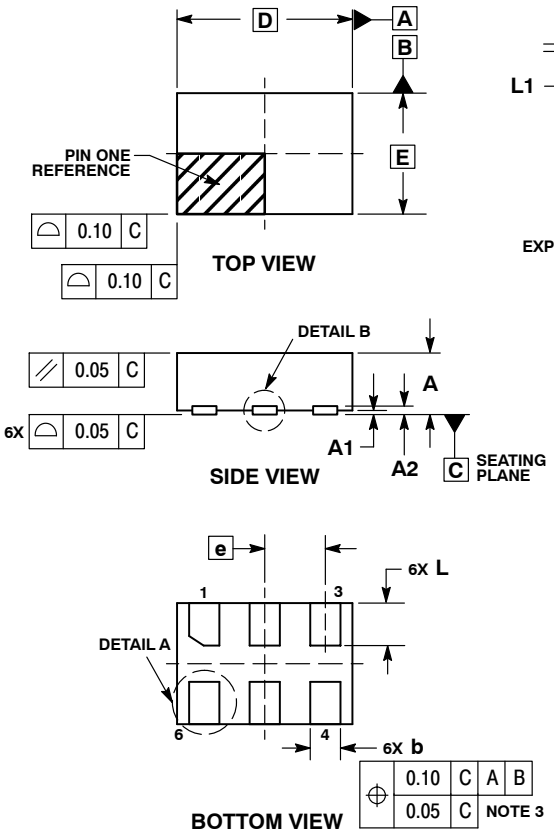
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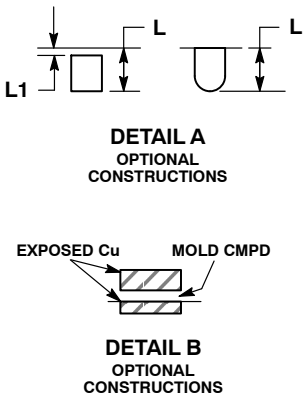
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

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

**SCALE 4:1**

DATE 15 MAY 2008

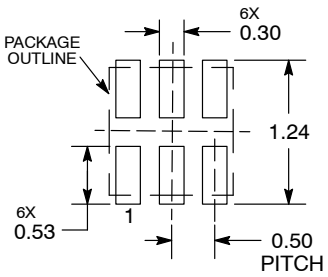



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

| | 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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| **DESCRIPTION:** | **UDFN6, 1.45x1.0, 0.5P** | | **PAGE 1 OF 1** |

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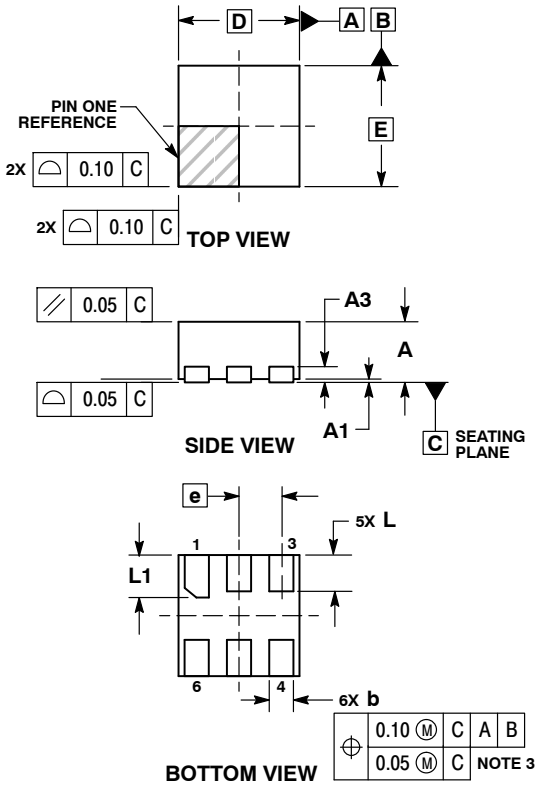
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# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

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

**SCALE 4:1**

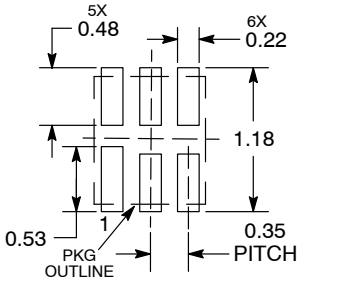
DATE 18 MAY 2011




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 |

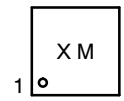
### RECOMMENDED SOLDERING FOOTPRINT*




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. 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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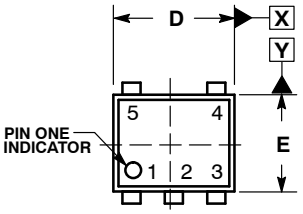
# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

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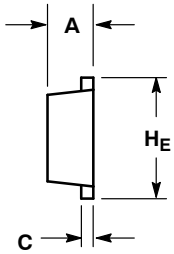
**SOT−953**
CASE 527AE
ISSUE E

DATE 02 AUG 2011

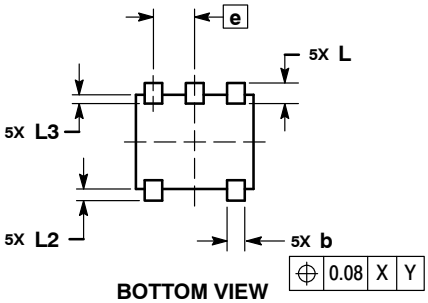
**SCALE 4:1**




**TOP VIEW**




**SIDE VIEW**

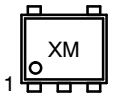



**BOTTOM VIEW**

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.

| | MILLIMETERS | | |
|---|---|---|---|
| DIM | 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 | | |
| $H_E$ | 0.95 | 1.00 | 1.05 |
| L | 0.175 REF | | |
| L2 | 0.05 | 0.10 | 0.15 |
| L3 | −−− | −−− | 0.15 |

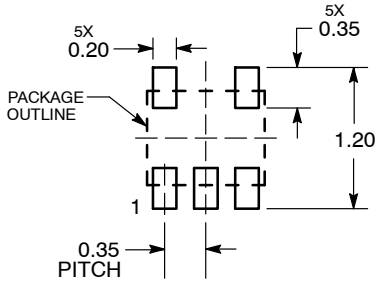
### GENERIC MARKING DIAGRAM*




X = Specific Device Code
M = Month 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.

### SOLDERING FOOTPRINT*




DIMENSIONS: MILLIMETERS

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

| | | |
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