

# 7SB385

## Bus Switch

The 7SB385 Bus Switch is an advanced high-speed line switch in ultra-small footprint.

### Features

- High Speed:  $t_{PD} = 0.25 \text{ ns (Max) @ } V_{CC} = 4.5 \text{ V}$
- $3 \Omega$  Switch Connection Between 2 Ports
- Power Down Protection Provided on Inputs
- Ultra-Small Packages
- These are Pb-Free Devices

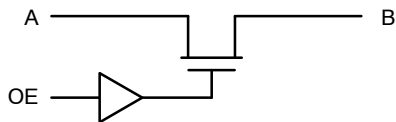


Figure 1. Logic Diagram

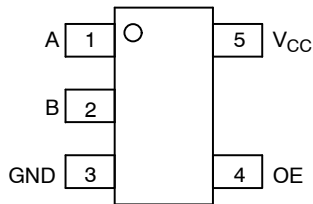


Figure 2. TSOP-5/SC-88A (Top View)

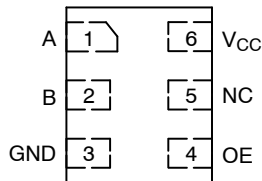


Figure 3. ULLGA6/UDFN6 (Top View)

### Function Table

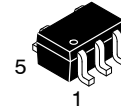
| Input OE | Function   |
|----------|------------|
| L        | Disconnect |
| H        | B = A      |



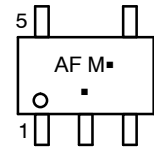
ON Semiconductor®

<http://onsemi.com>

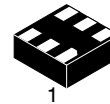
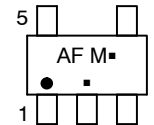
### MARKING DIAGRAMS



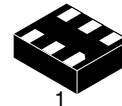
SOT-353/SC70-5/SC-88A  
DF SUFFIX  
CASE 419A



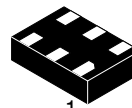
SOT23-5/TSOP-5/SC59-5  
DT SUFFIX  
CASE 483



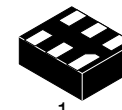
ULLGA6  
1.0 x 1.0  
CASE 613AD



ULLGA6  
1.2 x 1.0  
CASE 613AE



ULLGA6  
1.45 x 1.0  
CASE 613AF



UDFN6  
1.2 x 1.0  
CASE 517AA



AF, 4, V, J, F = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

**Table 1. MAXIMUM RATINGS**

| Symbol        | Parameter   | Value   | Unit                               |
|---------------|---|---|------------------------------------|
| $V_{CC}$      | DC Supply Voltage   | -0.5 to +7.0  | V                                  |
| $V_{IN}$      | Control Pin Input Voltage   | -0.5 to +7.0  | V                                  |
| $V_{I/O}$     | Switch Input / Output Voltage   | -0.5 to +7.0  | V                                  |
| $I_{IK}$      | Control Pin DC Input Diode Current<br>$V_{IN} < GND$                        | -50   | mA                                 |
| $I_{OK}$      | Switch I/O Port DC Diode Current<br>$V_{I/O} < GND$                         | -50   | mA                                 |
| $I_O$         | On-State Switch Current   | $\pm 128$   | mA                                 |
|               | Continuous Current Through $V_{CC}$ or GND                                  | $\pm 150$   | mA                                 |
| $I_{CC}$      | DC Supply Current per Supply Pin  | $\pm 150$   | mA                                 |
| $I_{GND}$     | DC Ground Current per Ground Pin  | $\pm 150$   | mA                                 |
| $T_{STG}$     | Storage Temperature Range   | -65 to +150   | $^{\circ}C$                        |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds                             | 260   | $^{\circ}C$                        |
| $T_J$         | Junction Temperature Under Bias   | 150   | $^{\circ}C$                        |
| $\theta_{JA}$ | Thermal Resistance  | SC70-5/SC-88A (Note 1)<br>TSOP-5<br>ULLGA6/UDFN6                                  | 350<br>230<br>496<br>$^{\circ}C/W$ |
| $P_D$         | Power Dissipation in Still Air at 85 $^{\circ}C$                            | SC70-5/SC-88A (Note 1)<br>TSOP-5<br>ULLGA6/UDFN6                                  | 150<br>200<br>252<br>mW            |
| 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 Mode (Note 2)<br>Machine Mode (Note 3)<br>Charged Device Mode (Note 4) | >2000<br>>200<br>N/A<br>V          |
| $I_{LATCHUP}$ | Latchup Performance Above $V_{CC}$ and Below GND at 85 $^{\circ}C$ (Note 5) | $\pm 100$   | mA                                 |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow.
2. Tested to EIA/ JESD22-A114-A
3. Tested to EIA/ JESD22-A115-A
4. Tested to JESD22-C101-A
5. Tested to EIA / JESD78.

**Table 2. RECOMMENDED OPERATING CONDITIONS**

| Symbol                | Parameter                          | Min           | Max     | Unit        |
|-----------------------|------------------------------------|---------------|---------|-------------|
| $V_{CC}$              | Positive DC Supply Voltage         | 4.0           | 5.5     | V           |
| $V_I$                 | Control Pin Input Voltage          | 0             | 5.5     | V           |
| $V_{I/O}$             | Switch Input / Output Voltage      | 0             | 5.5     | V           |
| $T_A$                 | Operating Free-Air Temperature     | -55           | +125    | $^{\circ}C$ |
| $\Delta t / \Delta V$ | Input Transition Rise or Fall Rate | 0<br>0        | 5<br>DC | nS/V        |
|                       |                                    | Control Input |         |             |
|                       |                                    | Switch I/O    |         |             |

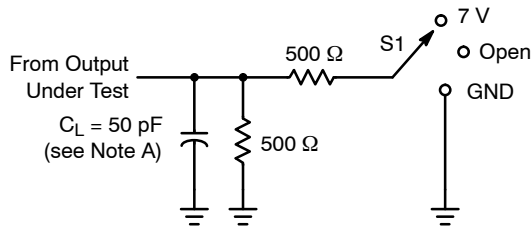
Table 3. DC ELECTRICAL CHARACTERISTICS

| Symbol           | Parameter                                | Conditions  | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |        |        | T <sub>A</sub> = -55°C to +125°C |        | Unit |
|------------------|--|---|---------------------|-----------------------|--------|--------|----------------------------------|--------|------|
|                  |  |   |                     | Min                   | Typ    | Max    | Min                              | Max    |      |
| V <sub>IK</sub>  | Clamp Diode Voltage                      | I <sub>IN</sub> = -18 mA  | 4.5                 |                       |        | -1.2   |                                  | -1.2   | V    |
| V <sub>IH</sub>  | High-Level Input Voltage (Control)       |   | 4.0 to 5.5          | 2.0                   |        |        | 2.0                              |        | V    |
| V <sub>IL</sub>  | Low-Level Input Voltage (Control)        |   | 4.0 to 5.5          |                       |        | 0.8    |                                  | 0.8    | V    |
| I <sub>IN</sub>  | Input Leakage Current                    | 0 ≤ V <sub>IN</sub> ≤ 5.5 V   | 5.5                 |                       |        | ±0.1   |                                  | ±1.0   | μA   |
| I <sub>OFF</sub> | Power Off Leakage Current                | V <sub>I/O</sub> = 0 to 5.5 V   | 0                   |                       |        | ±0.1   |                                  | ±1.0   | μA   |
| I <sub>CC</sub>  | Quiescent Supply Current                 | I <sub>O</sub> = 0, V <sub>IN</sub> = V <sub>CC</sub> or 0 V                  | 5.5                 |                       |        | ±0.1   |                                  | ±1.0   | μA   |
| ΔI <sub>CC</sub> | Increase in Supply Current (Control Pin) | One input at 3.4 V; Other inputs at V <sub>CC</sub> or GND                    | 5.5                 |                       |        |        |                                  | 2.5    | mA   |
| R <sub>ON</sub>  | Switch ON Resistance                     | V <sub>I/O</sub> = 0,<br>I <sub>I/O</sub> = 64 mA<br>I <sub>I/O</sub> = 30 mA | 4.5                 |                       | 3<br>3 | 7<br>7 |                                  | 7<br>7 | Ω    |
|                  |  | V <sub>I/O</sub> = 2.4,<br>I <sub>I/O</sub> = 15 mA                           | 4.5                 |                       | 6      | 15     |                                  | 15     |      |
|                  |  | V <sub>I/O</sub> = 2.4,<br>I <sub>I/O</sub> = 15 mA                           | 4.0                 |                       | 10     | 20     |                                  | 20     |      |

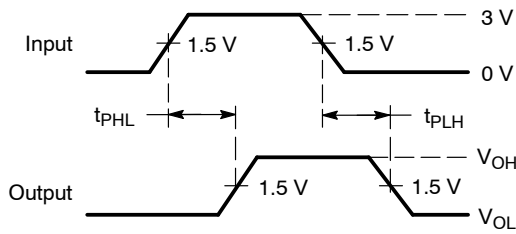
Table 4. AC ELECTRICAL CHARACTERISTICS

| Symbol               | Parameter                           | V <sub>CC</sub> (V) | Test Condition             | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> = -55°C to +125°C |      | Unit |
|----------------------|-------------------------------------|---------------------|----------------------------|-----------------------|------|------|----------------------------------|------|------|
|                      |                                     |                     |                            | Min                   | Typ  | Max  | Min                              | Max  |      |
| t <sub>PD</sub>      | Propagation Delay, A to B or B to A | 4.0 to 5.5          | See Figure 3               |                       |      | 0.25 |                                  | 0.25 | ns   |
|                      |                                     |                     |                            |                       | 0.25 |      | 0.25                             |      |      |
| t <sub>EN</sub>      | Output Enable Time                  | 4.5 to 5.5          |                            | 0.8                   | 2.5  | 4.2  | 0.8                              | 4.2  | ns   |
|                      |                                     | 4.0                 |                            | 0.8                   | 3.0  | 4.6  | 0.8                              | 4.6  |      |
| t <sub>DIS</sub>     | Output Disable Time                 | 4.5 to 5.5          |                            | 0.8                   | 3.1  | 4.8  | 0.8                              | 4.8  | ns   |
|                      |                                     | 4.0                 |                            | 0.8                   | 2.9  | 4.4  | 0.8                              | 4.4  |      |
| C <sub>IN</sub>      | Control Input Capacitance           | 5.0                 | V <sub>IN</sub> = 3 V or 0 |                       | 2.0  |      |                                  | pF   |      |
| C <sub>IO(ON)</sub>  | Switch On Capacitance               | 5.0                 | Switch ON                  |                       | 10   |      |                                  | pF   |      |
| C <sub>IO(OFF)</sub> | Switch Off Capacitance              | 5.0                 | Switch OFF                 |                       | 3.5  |      |                                  | pF   |      |

AC Loading and Waveforms

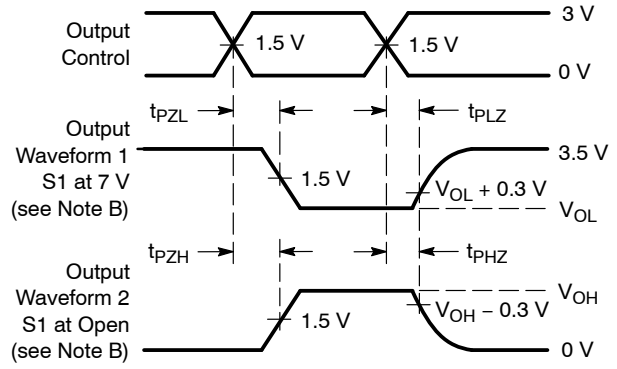


LOAD CIRCUIT



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES

| TEST              | S1   |
|-------------------|------|
| $t_{PD}$          | Open |
| $t_{PLZ}/t_{PZL}$ | 7 V  |
| $t_{PHZ}/t_{PZH}$ | GND  |



VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES

- A.  $C_L$  includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5$  ns,  $t_f \leq 2.5$  ns.
- D. The output is measured with one input transition per measurement.
- E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 4. Load Circuit and Voltage Waveforms

DEVICE ORDERING INFORMATION

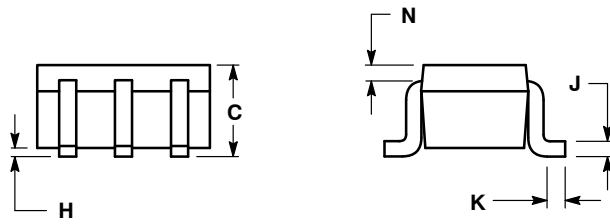
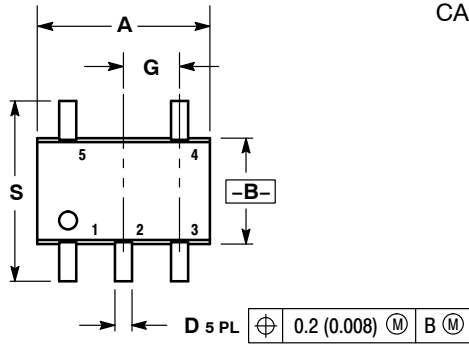
| Device        | Package                             | Shipping†          |
|---------------|-------------------------------------|--------------------|
| 7SB385DTT1G   | TSOP-5<br>(Pb-Free)                 | 3000 / Tape & Reel |
| 7SB385DFT2G   | SC-88A<br>(Pb-Free)                 | 3000 / Tape & Reel |
| 7SB385AMX1TCG | ULLGA6 – 0.5 mm Pitch<br>(Pb-Free)  | 3000 / Tape & Reel |
| 7SB385BMX1TCG | ULLGA6 – 0.4 mm Pitch<br>(Pb-Free)  | 3000 / Tape & Reel |
| 7SB385CMX1TCG | ULLGA6 – 0.35 mm Pitch<br>(Pb-Free) | 3000 / Tape & Reel |
| 7SB385MUTCG   | UDFN6 – 0.4 mm Pitch<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.

# 7SB385

## PACKAGE DIMENSIONS

SC-88A, SOT-353, SC-70  
CASE 419A-02  
ISSUE J



### NOTES:

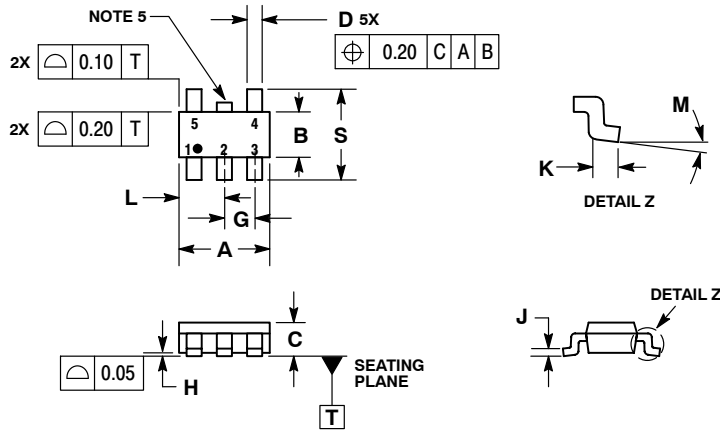
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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 |

# 7SB385

## PACKAGE DIMENSIONS

### TSOP-5 CASE 483-02 ISSUE H

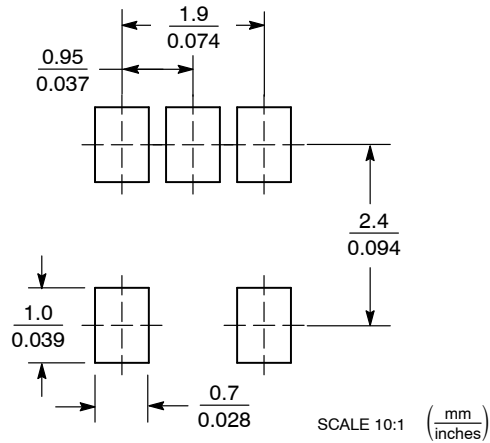


#### NOTES:

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.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

| MILLIMETERS |      |      |
|-------------|------|------|
| DIM         | MIN  | MAX  |
| A           | 3.00 | BSC  |
| B           | 1.50 | BSC  |
| 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 |
| L           | 1.25 | 1.55 |
| M           | 0°   | 10°  |
| S           | 2.50 | 3.00 |

### SOLDERING FOOTPRINT\*

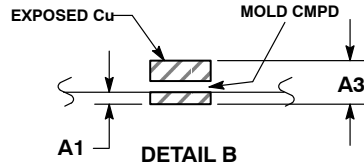
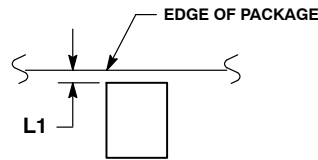
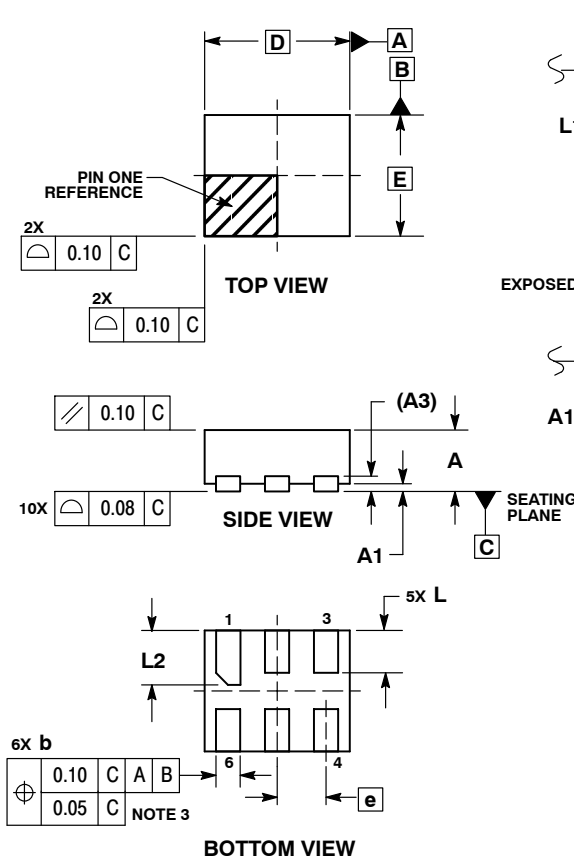


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# 7SB385

## PACKAGE DIMENSIONS

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

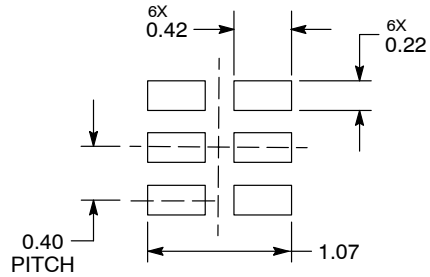


**NOTES:**

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 |

**MOUNTING FOOTPRINT\***



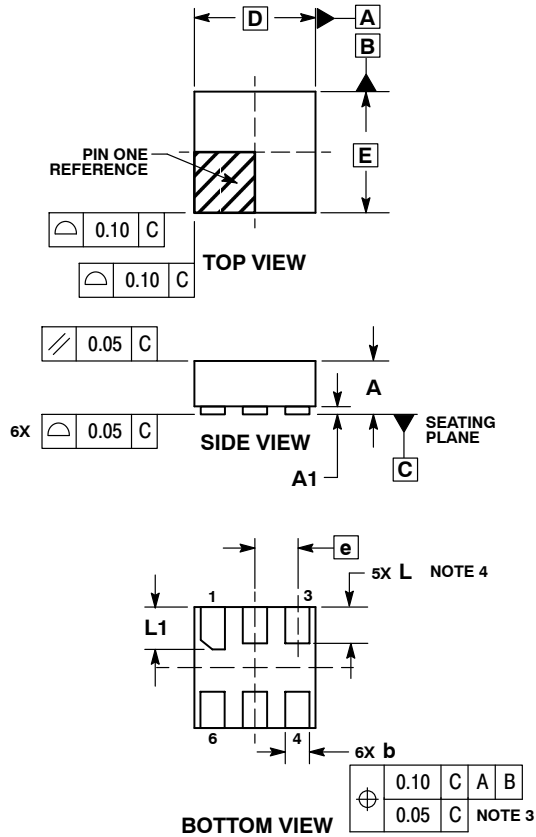
DIMENSIONS: MILLIMETERS

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

# 7SB385

## PACKAGE DIMENSIONS

### ULLGA6 1.0x1.0, 0.35P CASE 613AD-01 ISSUE A

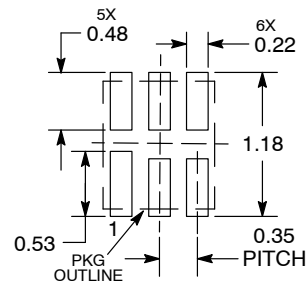


NOTES:

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.
4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

| MILLIMETERS |          |      |
|-------------|----------|------|
| DIM         | MIN      | MAX  |
| A           | ---      | 0.40 |
| A1          | 0.00     | 0.05 |
| 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 |

### MOUNTING FOOTPRINT SOLDERMASK DEFINED\*



DIMENSIONS: MILLIMETERS

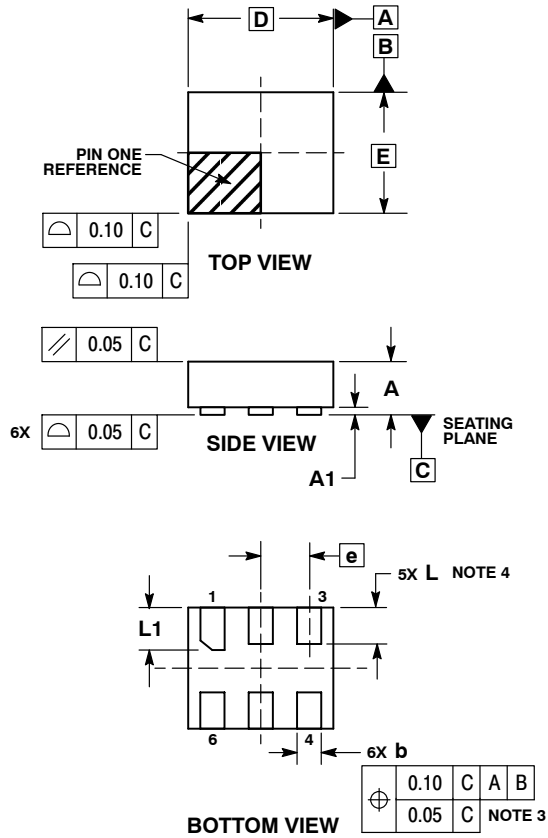
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



# 7SB385

## PACKAGE DIMENSIONS

ULLGA6 1.2x1.0, 0.4P  
CASE 613AE-01  
ISSUE A

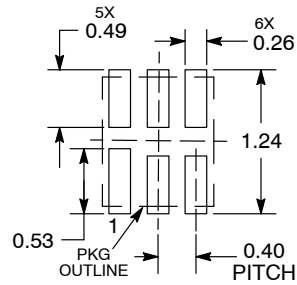


**NOTES:**

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.
4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

| MILLIMETERS |          |      |
|-------------|----------|------|
| DIM         | MIN      | MAX  |
| A           | ---      | 0.40 |
| A1          | 0.00     | 0.05 |
| b           | 0.15     | 0.25 |
| D           | 1.20 BSC |      |
| E           | 1.00 BSC |      |
| e           | 0.40 BSC |      |
| L           | 0.25     | 0.35 |
| L1          | 0.35     | 0.45 |

**MOUNTING FOOTPRINT  
SOLDERMASK DEFINED\***



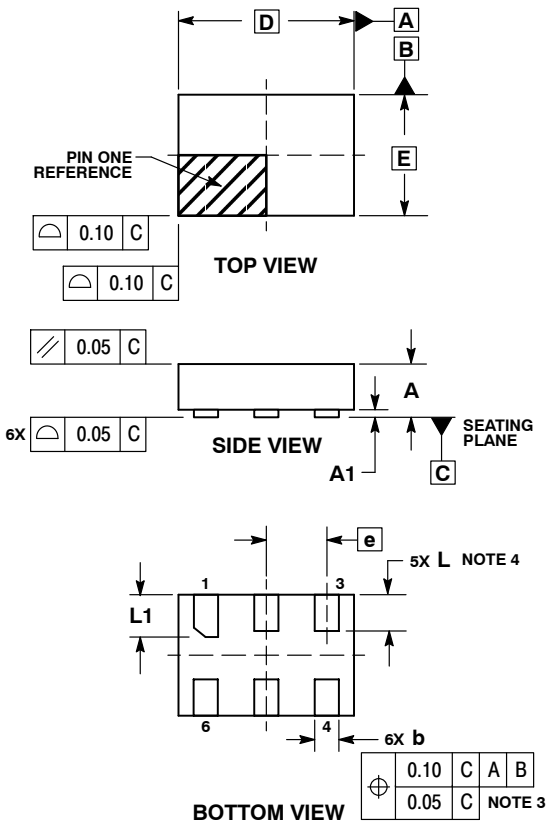
DIMENSIONS: MILLIMETERS

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

# 7SB385

## PACKAGE DIMENSIONS

ULLGA6 1.45x1.0, 0.5P  
CASE 613AF-01  
ISSUE A

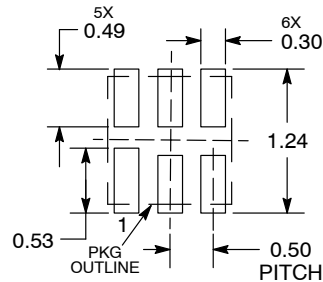


### NOTES:

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.
4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | ---         | 0.40 |
| A1  | 0.00        | 0.05 |
| b   | 0.15        | 0.25 |
| D   | 1.45 BSC    |      |
| E   | 1.00 BSC    |      |
| e   | 0.50 BSC    |      |
| L   | 0.25        | 0.35 |
| L1  | 0.30        | 0.40 |

### MOUNTING FOOTPRINT SOLDERMASK DEFINED\*



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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