



## P-Channel 20-V (D-S) MOSFET

| PRODUCT SUMMARY     |                                  |                    |
|---------------------|----------------------------------|--------------------|
| V <sub>DS</sub> (V) | r <sub>DS(on)</sub> (Ω)          | I <sub>D</sub> (A) |
| -20                 | 0.065 @ V <sub>GS</sub> = -4.5 V | -4.9               |
|                     | 0.095 @ V <sub>GS</sub> = -2.5 V | -4.1               |

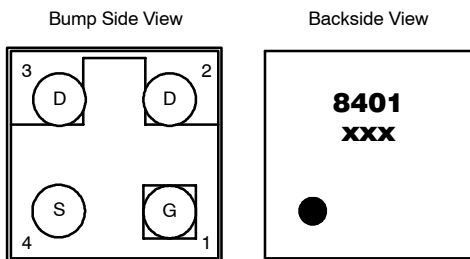
### FEATURES

- TrenchFET® Power MOSFET
- New MICRO FOOT® Chipscale Packaging Reduces Footprint Area Profile (0.62 mm) and On-Resistance Per Footprint Area
- Pin Compatible to Industry Standard Si3443DV

### APPLICATIONS

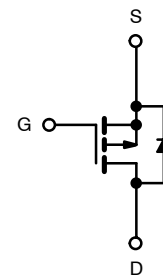
- PA, Battery and Load Switch
- Battery Charger Switch
- PA Switch

### MICRO FOOT



Device Marking: 8401  
xxx = Date/Lot Traceability Code

Ordering Information: Si8401DB-T1  
Si8401DB-T1—E1 (Lead (Pb)-Free)



P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED) |                 |                                   |              |      |    |
|--|-----------------|-----------------------------------|--------------|------|----|
| Parameter  | Symbol          | 5 secs                            | Steady State | Unit |    |
| Drain-Source Voltage   | V <sub>DS</sub> | -20                               |              | V    |    |
| Gate-Source Voltage  | V <sub>GS</sub> | ± 12                              |              |      |    |
| Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>          | I <sub>D</sub>  | T <sub>A</sub> = 25 °C            | -4.9         | -3.6 | A  |
|  |                 | T <sub>A</sub> = 70 °C            | -3.9         | -2.8 |    |
| Pulsed Drain Current   | I <sub>DM</sub> | -10                               |              |      |    |
| continuous Source Current (Diode Conduction) <sup>a</sup>                | I <sub>S</sub>  | -2.5                              | -2.5         |      |    |
| Maximum Power Dissipation <sup>a</sup>                                   | P <sub>D</sub>  | T <sub>A</sub> = 25 °C            | 2.77         | 1.47 | W  |
|  |                 | T <sub>A</sub> = 70 °C            | 1.77         | 0.94 |    |
| Operating Junction and Storage Temperature Range                         |                 | T <sub>J</sub> , T <sub>stg</sub> | -55 to 150   |      | °C |
| Package Reflow Conditions <sup>b</sup>                                   | VPR             | 215/245°                          |              |      |    |
|  | IR/Convection   | 220/250°                          |              |      |    |

| THERMAL RESISTANCE RATINGS               |                   |              |         |      |      |
|--|-------------------|--------------|---------|------|------|
| Parameter                                | Symbol            | Typical      | Maximum | Unit |      |
| Maximum Junction-to-Ambient <sup>a</sup> | R <sub>thJA</sub> | t ≤ 5 sec    | 35      | 45   | °C/W |
|  |                   | Steady State | 72      | 85   |      |
| Maximum Junction-to-Foot (drain)         | R <sub>thJF</sub> | 16           | 20      |      |      |

**Notes**

- Surface Mounted on 1" x 1" FR4 Board.
- Refer to IPC/JEDEC (J-STD-020A), no manual or hand soldering.
- Package reflow conditions for lead-free.

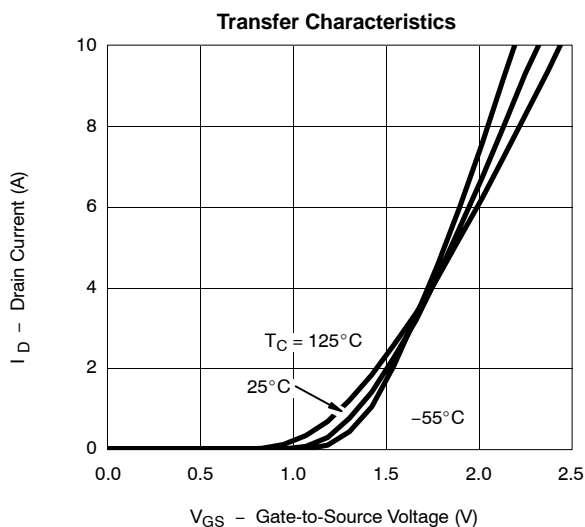
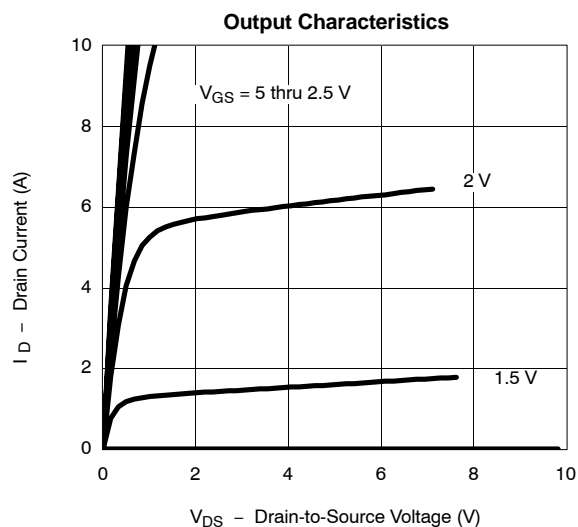
**SPECIFICATIONS (T<sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)**

| Parameter                                     | Symbol              | Test Condition   | Min   | Typ   | Max   | Unit |
|---|---------------------|--|-------|-------|-------|------|
| <b>Static</b>                                 |                     |  |       |       |       |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA   | -0.45 | -0.9  | 1.4   | V    |
| Gate-Body Leakage                             | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V   |       |       | ±100  | nA   |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V   |       |       | -1    | μA   |
|   |                     | V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C   |       |       | -5    |      |
| On-State Drain Current <sup>a</sup>           | I <sub>D(on)</sub>  | V <sub>DS</sub> ≤ -5 V, V <sub>GS</sub> = -4.5 V   | -5    |       |       | A    |
| Drain-Source On-State Resistance <sup>a</sup> | r <sub>DS(on)</sub> | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -1 A  |       | 0.057 | 0.065 | Ω    |
|   |                     | V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -1 A  |       | 0.080 | 0.095 |      |
| Forward Transconductance <sup>a</sup>         | g <sub>fs</sub>     | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 A   |       | 6     |       | S    |
| Diode Forward Voltage <sup>a</sup>            | V <sub>SD</sub>     | I <sub>S</sub> = -1 A, V <sub>GS</sub> = 0 V   |       | -0.73 | -1.1  | V    |
| <b>Dynamic<sup>b</sup></b>                    |                     |  |       |       |       |      |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -1 A   |       | 11    | 17    | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |  |       | 2.1   |       |      |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |  |       | 2.9   |       |      |
| Turn-On Delay Time                            | t <sub>d(on)</sub>  | V <sub>DD</sub> = -10 V, R <sub>L</sub> = 10 Ω<br>I <sub>D</sub> ≅ -1 A, V <sub>GEN</sub> = -4.5 V, R <sub>G</sub> = 6 Ω |       | 17    | 25    | ns   |
| Rise Time                                     | t <sub>r</sub>      |  |       | 28    | 45    |      |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |  |       | 88    | 135   |      |
| Fall Time                                     | t <sub>f</sub>      |  |       | 60    | 90    |      |
| Source-Drain Reverse Recovery Time            | t <sub>rr</sub>     | I <sub>F</sub> = -1 A, di/dt = 100 A/μs  |       | 40    | 60    | ns   |
| Reverse Recovery Charge                       | Q <sub>rr</sub>     |  |       | 20    | 30    |      |

## Notes

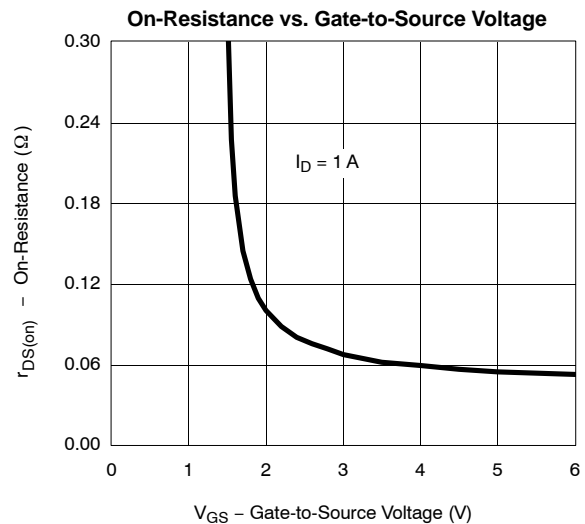
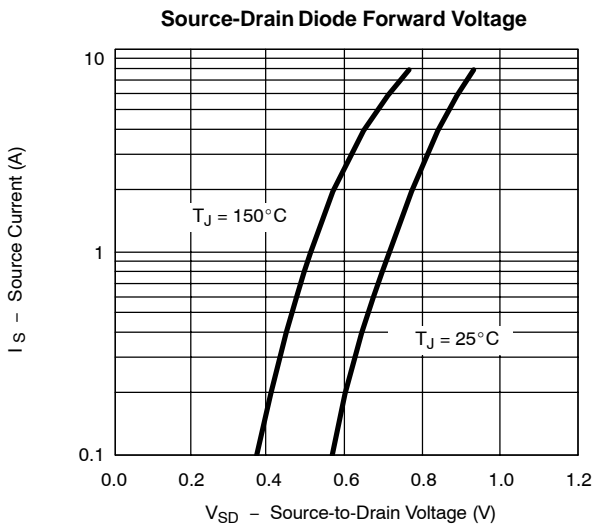
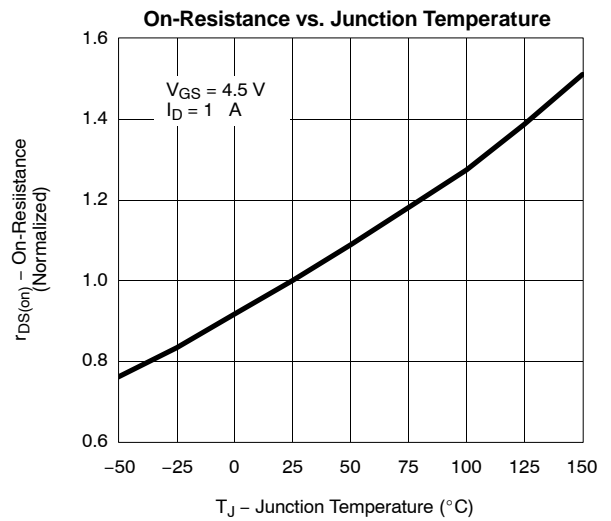
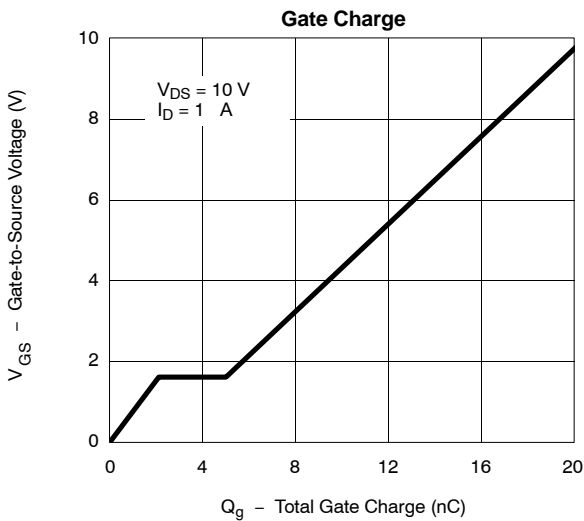
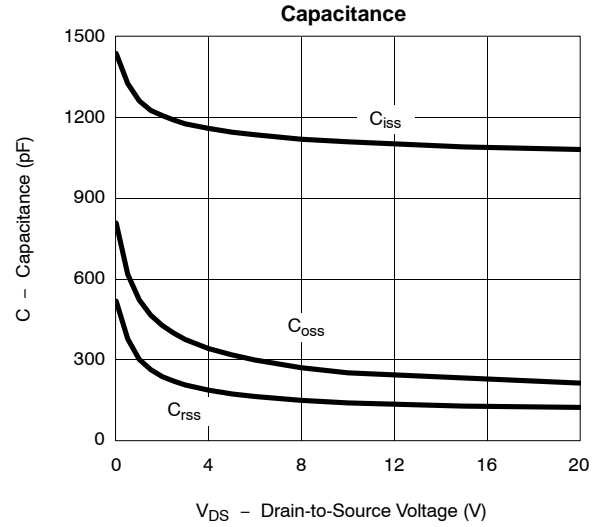
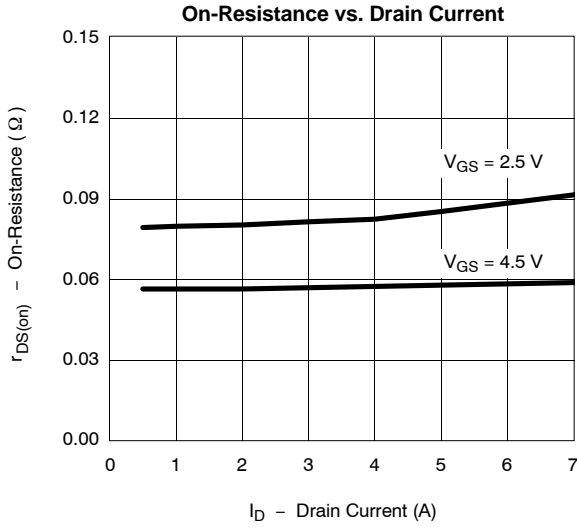
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.  
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

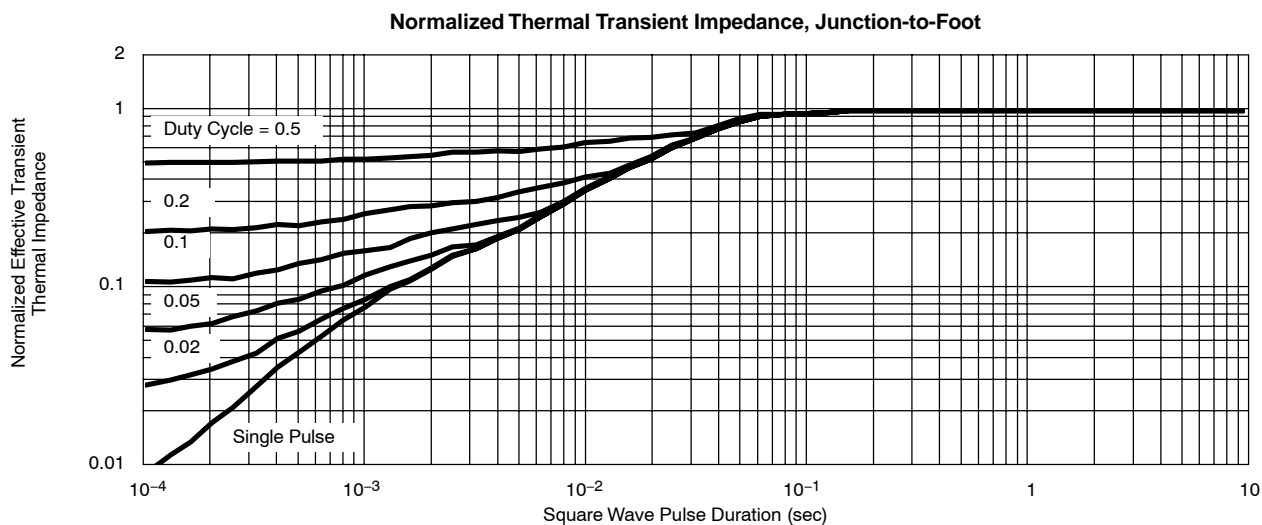
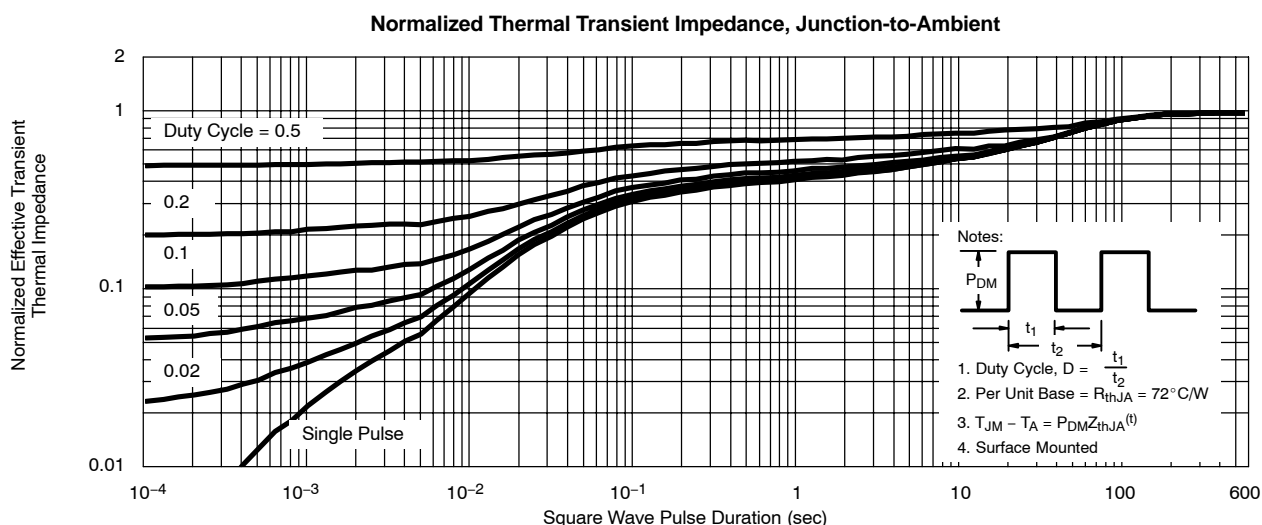
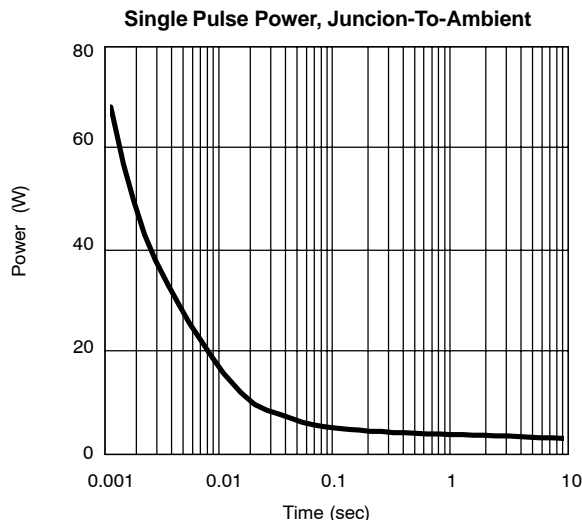
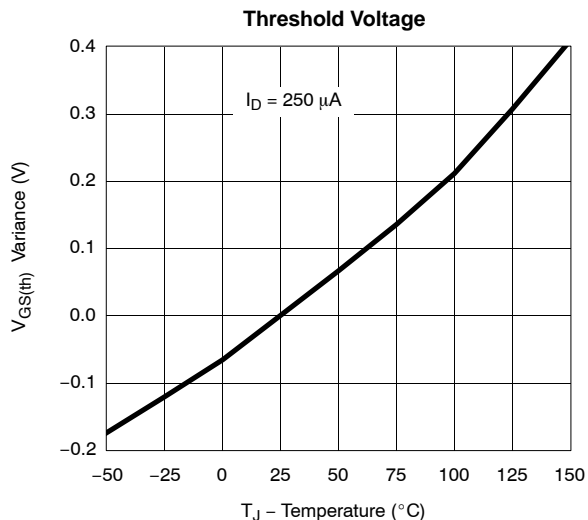
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



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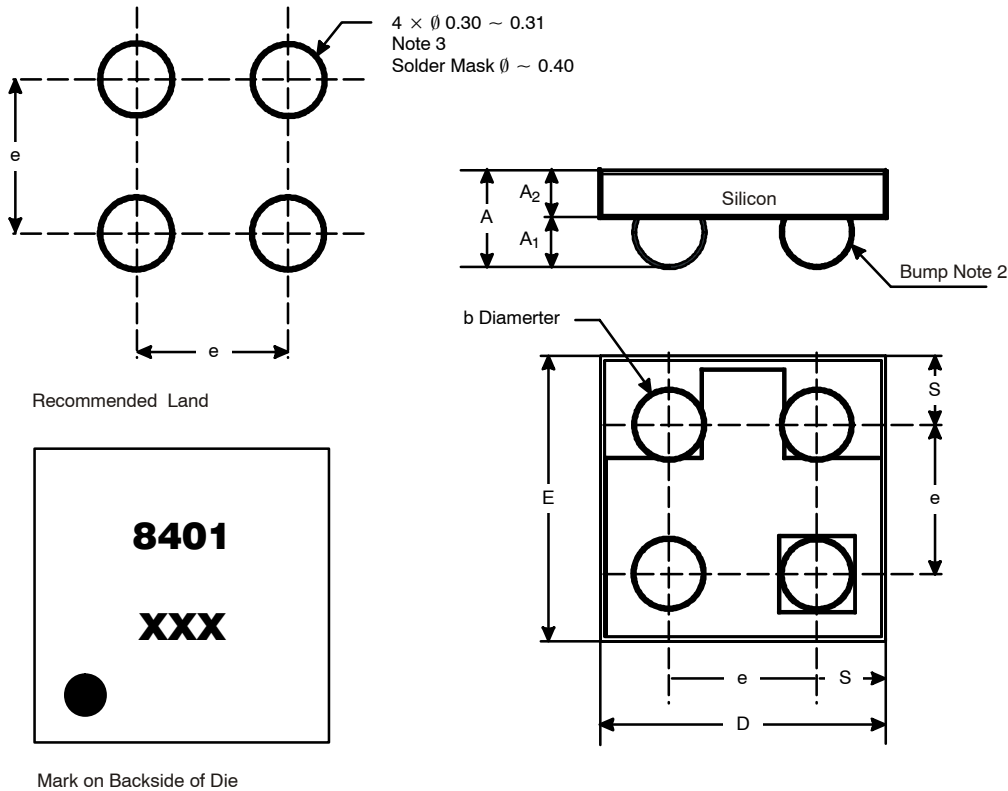


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



**PACKAGE OUTLINE**

**MICRO FOOT: 4-BUMP (2 X 2, 0.8-mm PITCH)**



NOTES (Unless Otherwise Specified):

1. Laser mark on the silicon die back, coated with a thin metal.
2. Bumps are Eutectic solder 63/57 Sn/Pb. (Sn 3.8 Ag, 0.7 Cu for Pb-free bumps)
3. Non-solder mask defined copper landing pad.
4. The flat side of wafers is oriented at the bottom.

| Dim                  | MILLIMETERS* |       | INCHES |        |
|----------------------|--------------|-------|--------|--------|
|                      | Min          | Max   | Min    | Max    |
| <b>A</b>             | 0.600        | 0.650 | 0.0236 | 0.0256 |
| <b>A<sub>1</sub></b> | 0.260        | 0.290 | 0.0102 | 0.0114 |
| <b>A<sub>2</sub></b> | 0.340        | 0.360 | 0.0134 | 0.0142 |
| <b>b</b>             | 0.370        | 0.410 | 0.0146 | 0.0161 |
| <b>D</b>             | 1.520        | 1.600 | 0.0598 | 0.0630 |
| <b>E</b>             | 1.520        | 1.600 | 0.0598 | 0.0630 |
| <b>e</b>             | 0.750        | 0.850 | 0.0295 | 0.0335 |
| <b>S</b>             | 0.370        | 0.380 | 0.0146 | 0.0150 |

\* Use millimeters as the primary measurement.

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