



## P-Channel 12-V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ)
-12	0.037 @ V <sub>GS</sub> = -4.5 V	-7.3	19
	0.046 @ V <sub>GS</sub> = -2.5 V	-6.6	
	0.060 @ V <sub>GS</sub> = -1.8 V	-5.8	

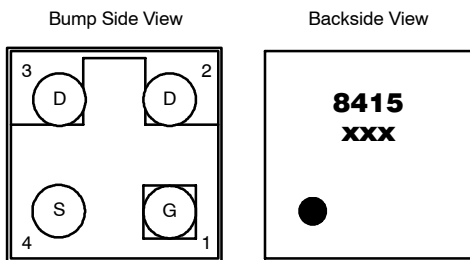
### FEATURES

- TrenchFET® Power MOSFET
- New MICRO FOOT® Chipscale Packaging Reduces Footprint Area Profile (0.62 mm) and On-Resistance Per Footprint Area
- Ultra-Low On-Resistance

### APPLICATIONS

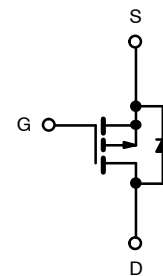
- Load Switch, Charger Switch, and PA Switch for Portable Devices

### MICRO FOOT



Device Marking: 8415  
xxx = Date/Lot Traceability Code

Ordering Information: Si8415DB-T1—E1



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>	-12		V	
Gate-Source Voltage	V <sub>GS</sub>	± 8			
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	-7.3	-5.3	A
		T <sub>A</sub> = 70 °C	-5.9	-4.3	
Pulsed Drain Current	I <sub>DM</sub>	-25		W	
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	-2.5	-1.3		
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			
	IR/Convection	220			

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

a. Surface Mounted on 1" x 1" FR4 Board.

b. Refer to IPC/JEDEC (J-STD-020A), no manual or hand soldering.

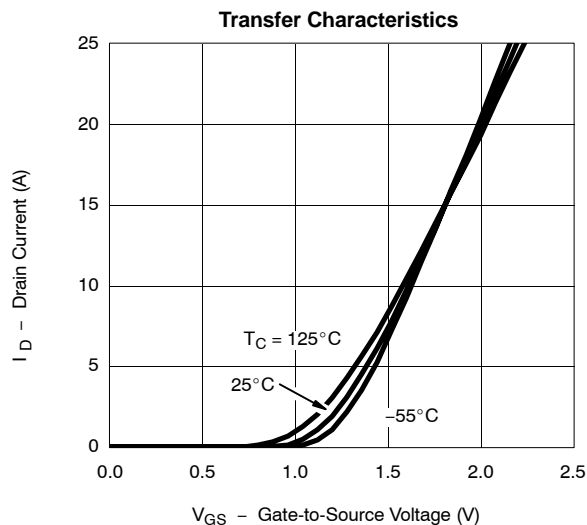
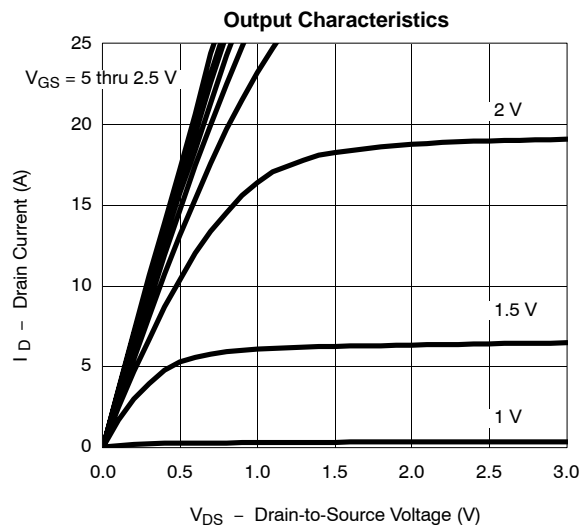
**SPECIFICATIONS ( $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-0.4		-1	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 8\ \text{V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -12\ \text{V}, V_{GS} = 0\ \text{V}$			-1	$\mu\text{A}$
		$V_{DS} = -12\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 70^\circ\text{C}$			-5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5\ \text{V}, V_{GS} = -4.5\ \text{V}$	-5			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = -4.5\ \text{V}, I_D = -1\ \text{A}$		0.031	0.037	$\Omega$
		$V_{GS} = -2.5\ \text{V}, I_D = -1\ \text{A}$		0.038	0.046	
		$V_{GS} = -1.8\ \text{V}, I_D = -1\ \text{A}$		0.050	0.060	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\ \text{V}, I_D = -1\ \text{A}$		11		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -1\ \text{A}, V_{GS} = 0\ \text{V}$		-0.8	-1.1	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -6\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -1\ \text{A}$		19	30	nC
Gate-Source Charge	$Q_{gs}$		1.9			
Gate-Drain Charge	$Q_{gd}$		4.8			
Gate Resistance	$R_g$	$f = 1\ \text{MHz}$		19		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\ \text{V}, R_L = 6\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -4.5\ \text{V}, R_g = 6\ \Omega$		15	25	ns
Rise Time	$t_r$		32	50		
Turn-Off Delay Time	$t_{d(off)}$		180	270		
Fall Time	$t_f$		115	175		
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = -1\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		80	120	

## Notes

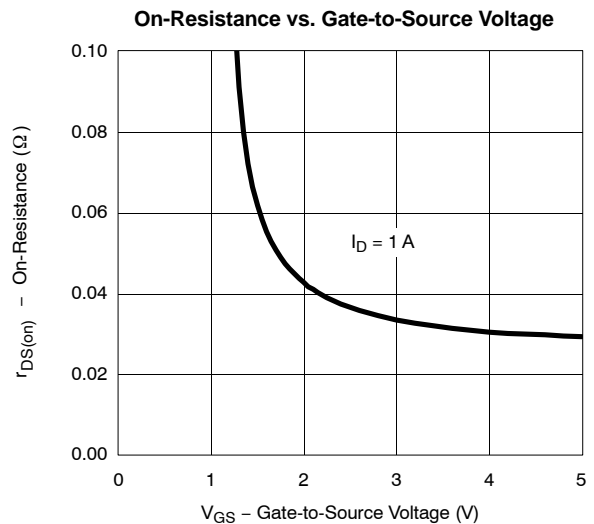
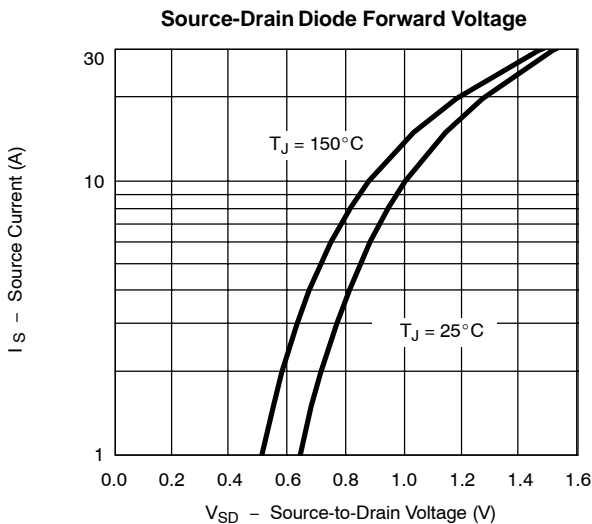
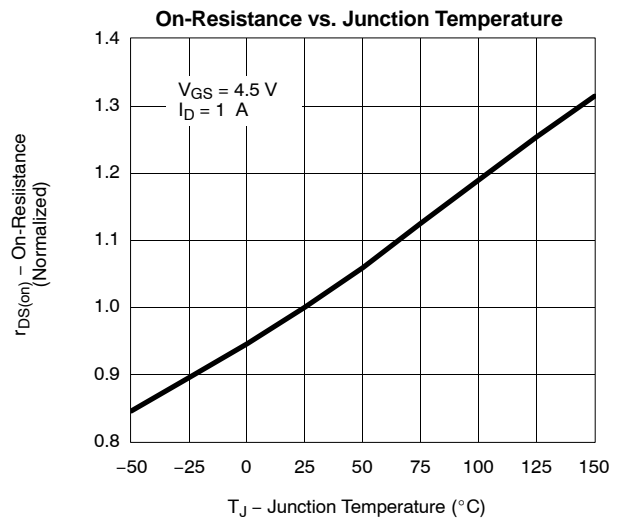
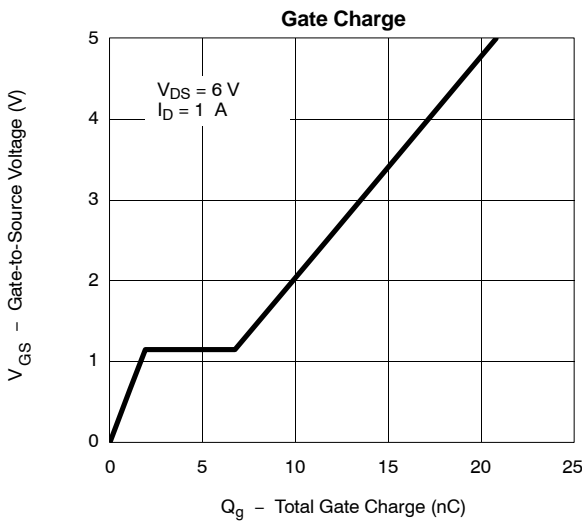
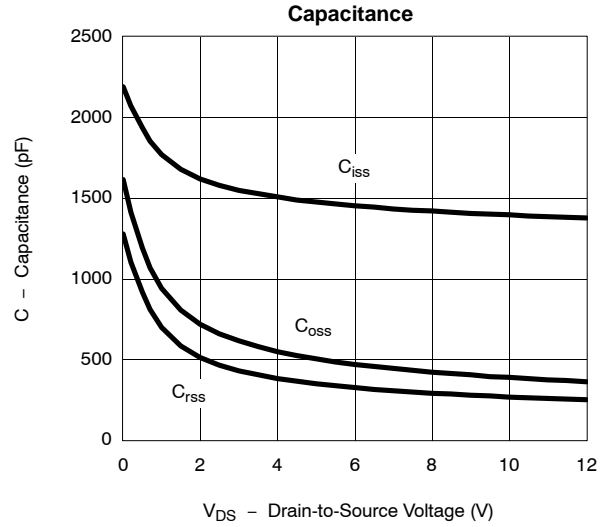
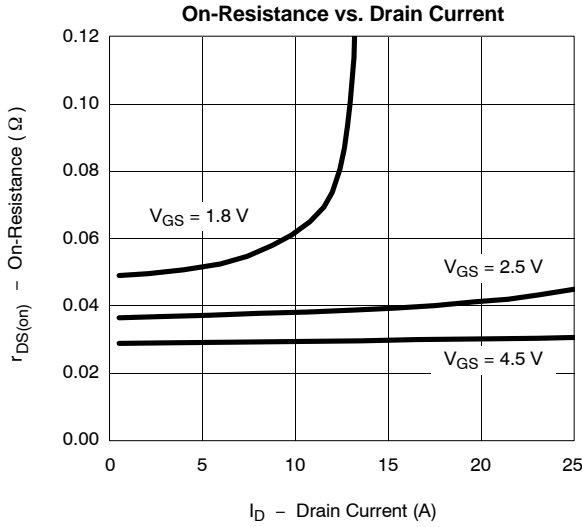
- a. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

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.

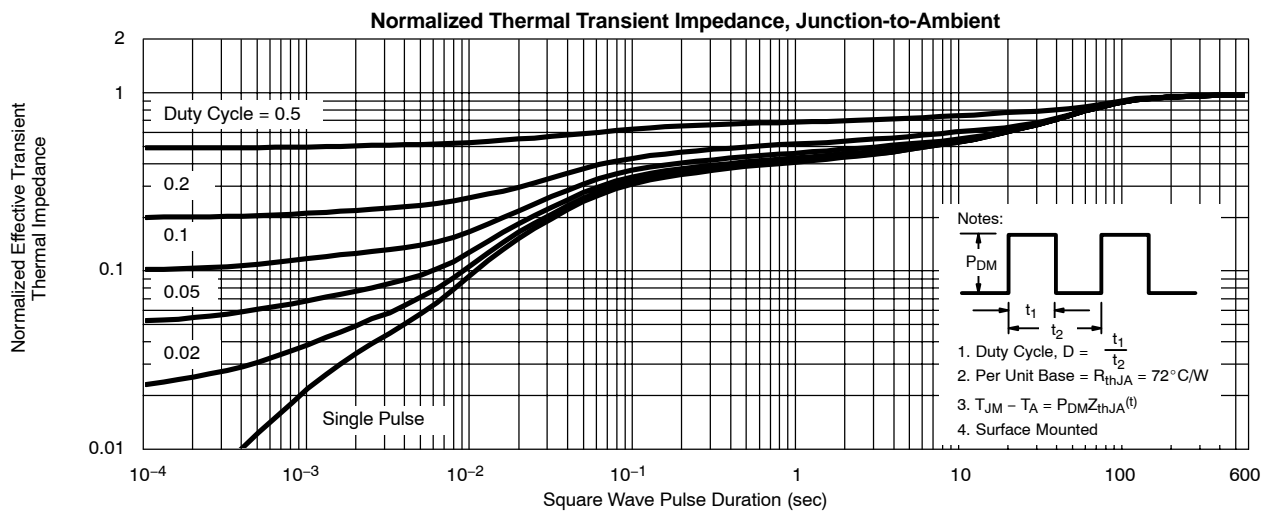
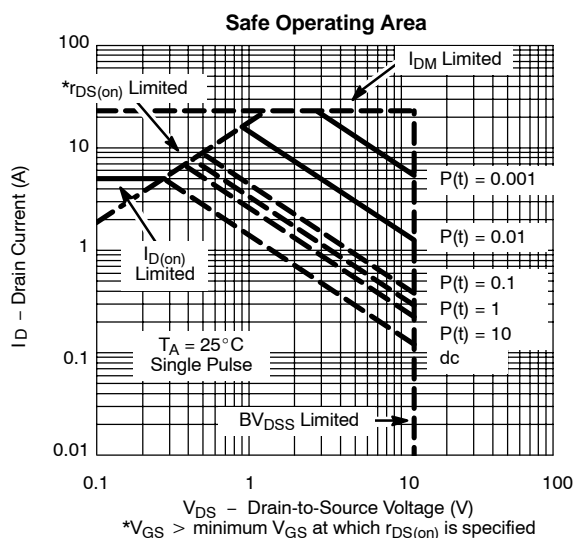
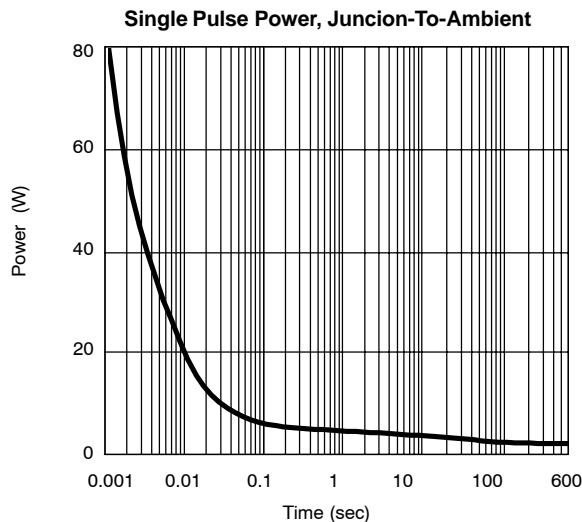
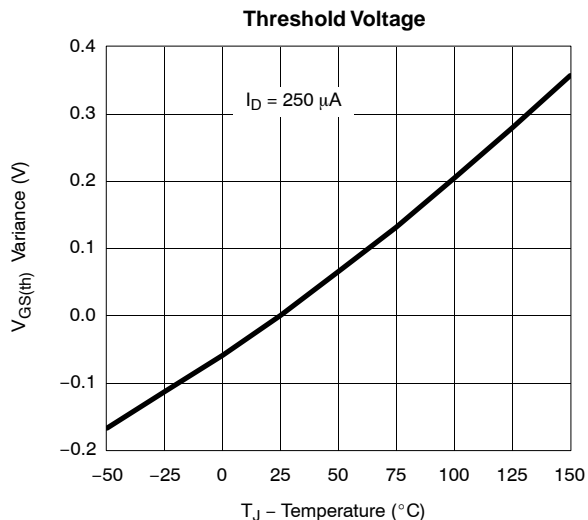
**TYPICAL CHARACTERISTICS ( $25^\circ\text{C}$  UNLESS NOTED)**




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

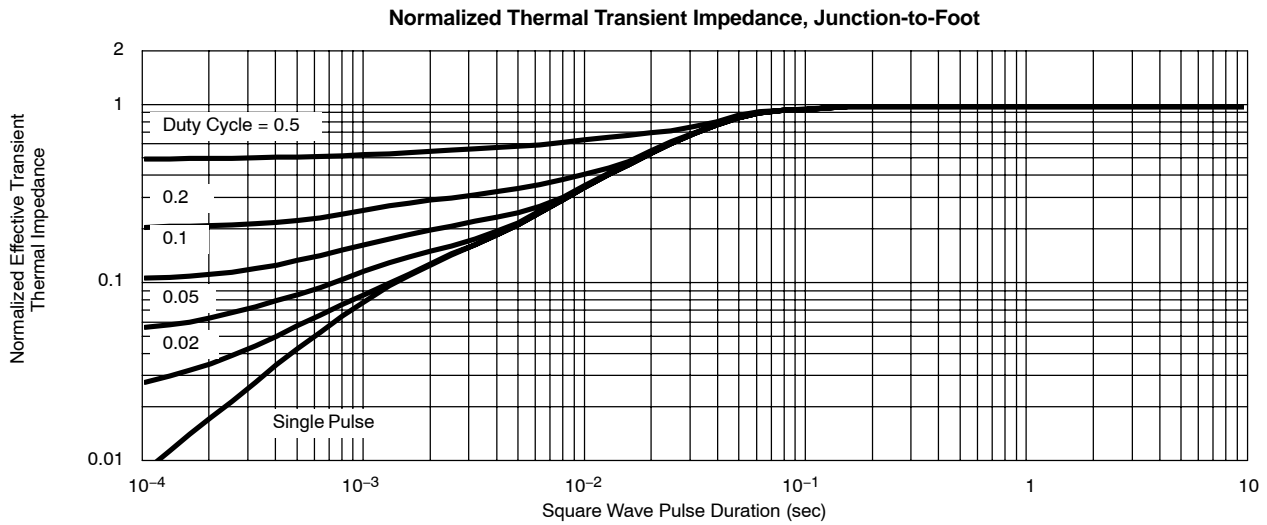


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



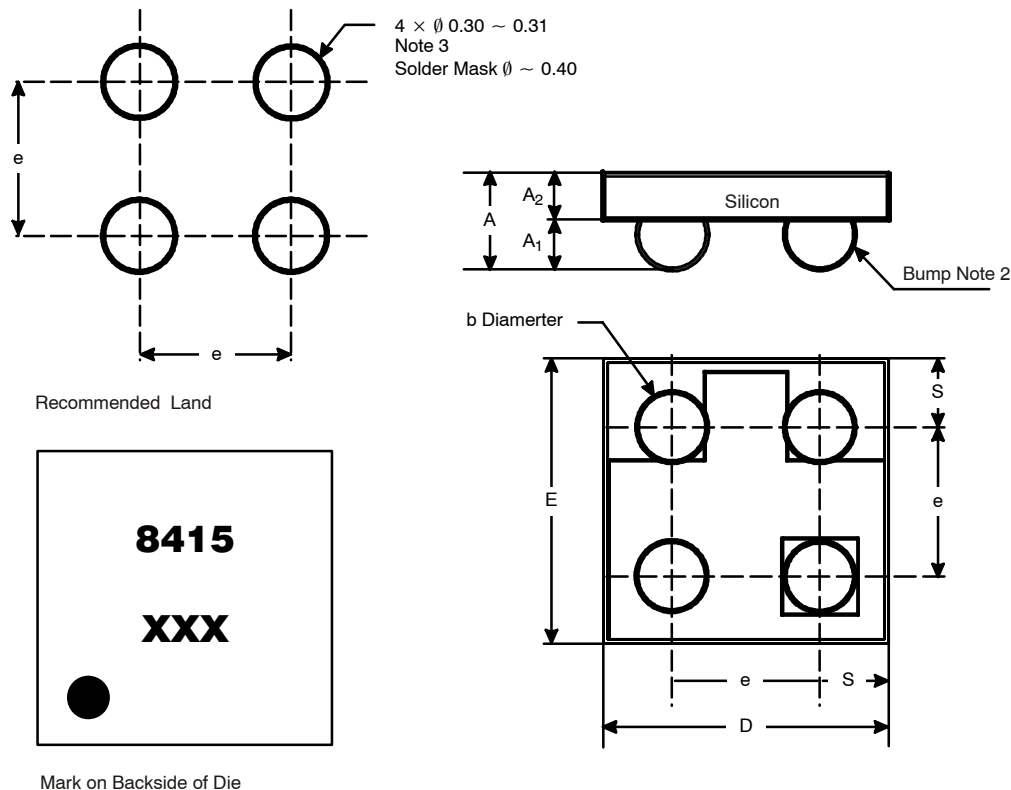


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



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

\* Use millimeters as the primary measurement.

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