



New Product

Si8417DB  
Vishay Siliconix

# P-Channel 1.8-V (G-S) MOSFET



RoHS  
COMPLIANT

PRODUCT SUMMARY			
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (Typ)
-12	0.021 @ $V_{GS} = -4.5$ V	-14.5	35 nC
	0.026 @ $V_{GS} = -2.5$ V	-13.0	
	0.033 @ $V_{GS} = -1.8$ V	-11.5	

## FEATURES

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

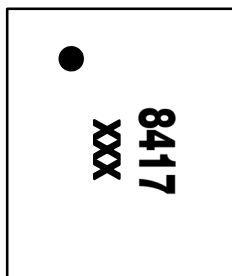
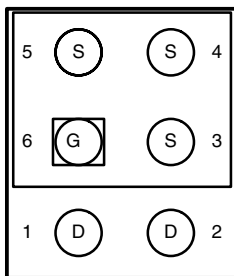
## APPLICATIONS

- PA Switch
- Battery Switch
- Load Switch

### MICRO FOOT

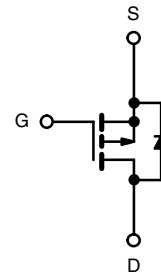
Bump Side View

Backside View



Device Marking: 8417  
xxx = Date/Lot Traceability Code

Ordering Information: Si8417DB-T2-E1



P-Channel MOSFET

## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-12	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	-14.5
		$T_C = 70^\circ\text{C}$	-11.7
		$T_A = 25^\circ\text{C}$	-9.7 <sup>b, c</sup>
		$T_A = 70^\circ\text{C}$	-7.7 <sup>b, c</sup>
Pulsed Drain Current	$I_{DM}$	-20	A
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	-2.5 <sup>b, c</sup>
Maximum Power Dissipation	$P_D$	$T_C = 25^\circ\text{C}$	6.57
		$T_C = 70^\circ\text{C}$	4.2
		$T_A = 25^\circ\text{C}$	2.9 <sup>b, c</sup>
		$T_A = 70^\circ\text{C}$	1.86 <sup>b, c</sup>
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Package Reflow Conditions <sup>d</sup>	VPR	260	
	IR/Convection	260	

### Notes:

- Based on  $T_C = 25^\circ\text{C}$ .
- Surface Mounted on 1" x 1" FR4 Board.
- $t = 10$  sec
- Refer to IPC/JEDEC (J-STD-020C), no manual or hand soldering.
- In this document, any reference to the *Case* represents the body of the MICRO FOOT device and *Foot* is the bump.

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, b</sup>		$R_{thJA}$	35	45	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	16	20	

## Notes:

- a. Surface Mounted on 1" x 1" FR4 Board.  
b. Maximum under steady state conditions is 72°C/W.

SPECIFICATIONS ( $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-12			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\ \mu\text{A}$		-13.3		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		2.4			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-0.35		-0.9	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 5\text{ V}$			-100	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 70^\circ\text{C}$			-10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.0174	0.021	$\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		0.0214	0.026	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		0.0270	0.033	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -4\text{ V}, I_D = -1\text{ A}$		8.3		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		2220		pF
Output Capacitance	$C_{oss}$		865			
Reverse Transfer Capacitance	$C_{rss}$		555			
Total Gate Charge	$Q_g$	$V_{DS} = -6\text{ V}, V_{GS} = -5\text{ V}, I_D = -1\text{ A}$		38	57	nC
		$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		35	53	
Gate-Source Charge	$Q_{gs}$		7.3			
Gate-Drain Charge	$Q_{gd}$		5.9			
Gate Resistance	$R_g$	$V_{GS} = -0.1\text{ V}, f = 1\text{ MHz}$		28		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 4\ \Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\ \Omega$		14	21	ns
Rise Time	$t_r$			25	40	
Turn-Off Delay Time	$t_{d(off)}$			380	570	
Fall Time	$t_f$			240	360	



<b>SPECIFICATIONS (T<sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)</b>						
<b>Parameter</b>	<b>Symbol</b>	<b>Test Condition</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Unit</b>
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			-5.5	A
Pulse Diode Forward Current	I <sub>SM</sub>				-20	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = -1 A, V <sub>GS</sub> = 0 V		-0.65	-1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = -1 A, di/dt = 100A/μs, T <sub>J</sub> = 25 °C		311	467	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			1.136	1.705	μC
Reverse Recovery Fall Time	t <sub>a</sub>			116		ns
Reverse Recovery Rise Time	t <sub>b</sub>			195		

**Notes**

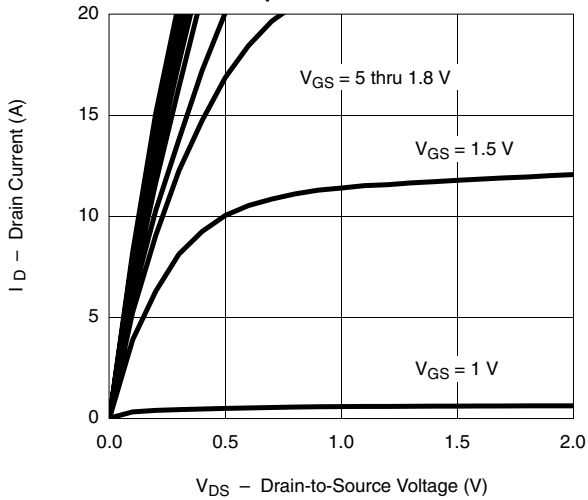
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.

*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.*

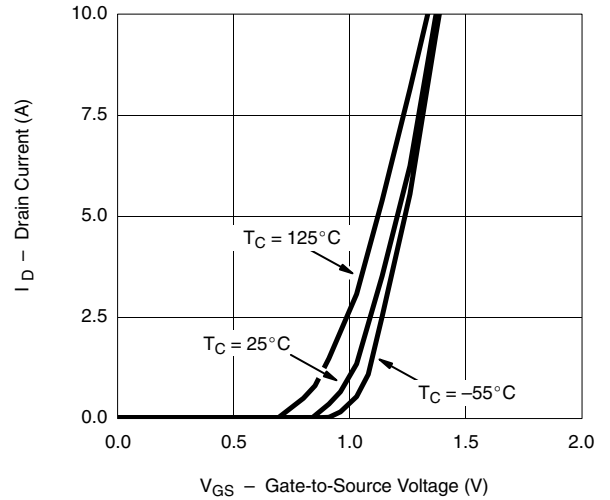


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

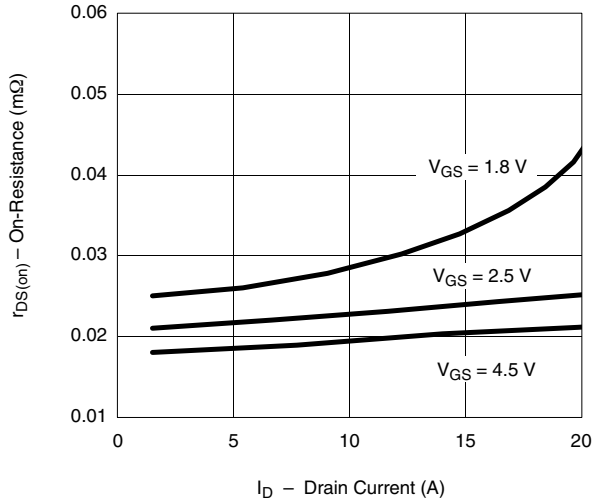
**Output Characteristics**



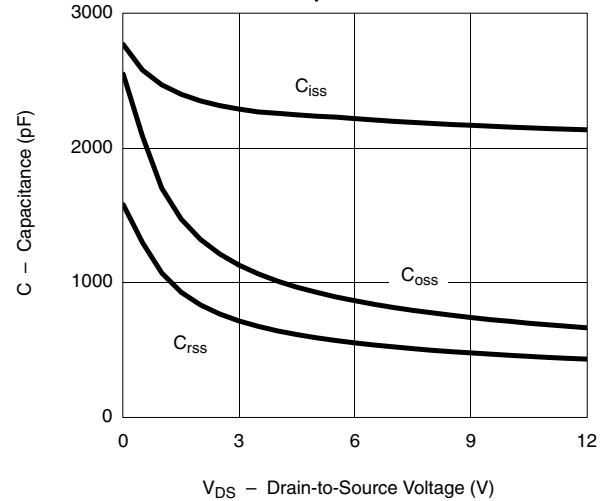
**Transfer Characteristics**



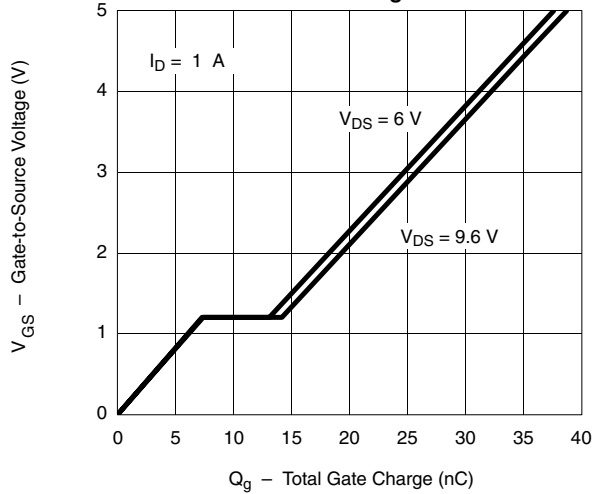
**On-Resistance vs. Drain Current**



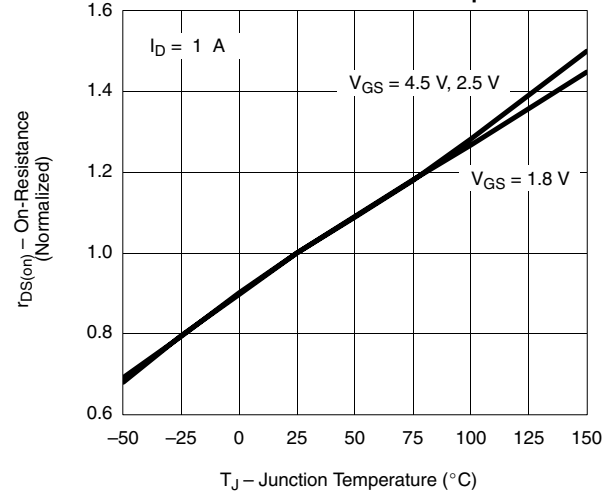
**Capacitance**



**Gate Charge**

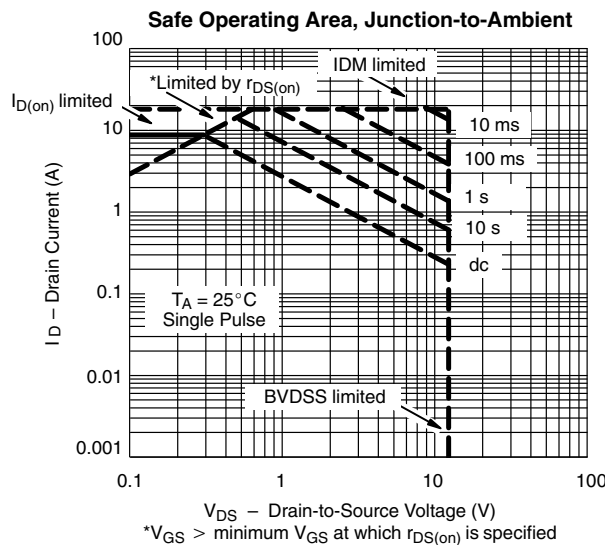
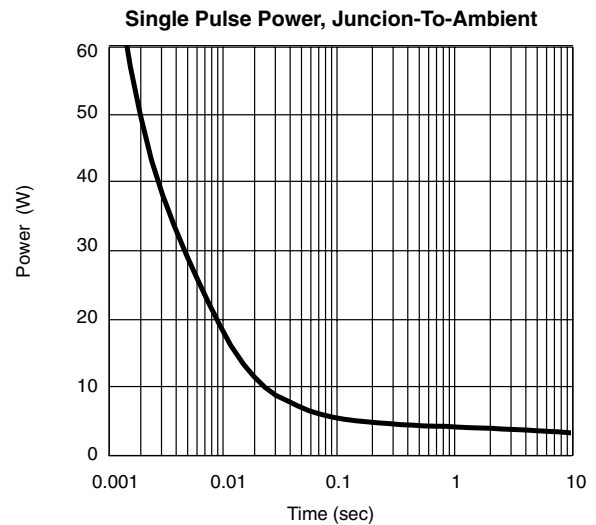
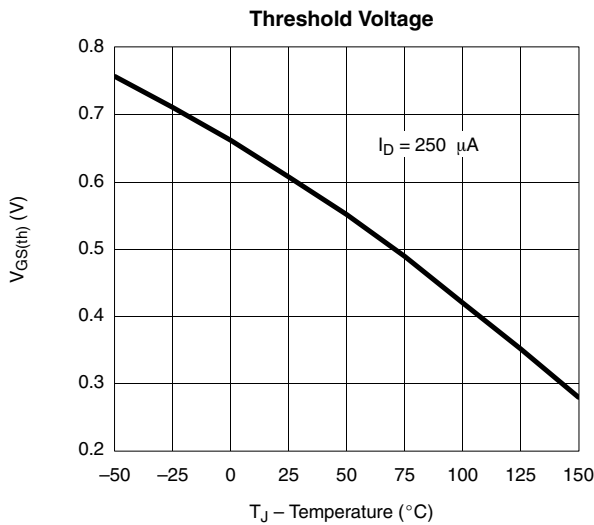
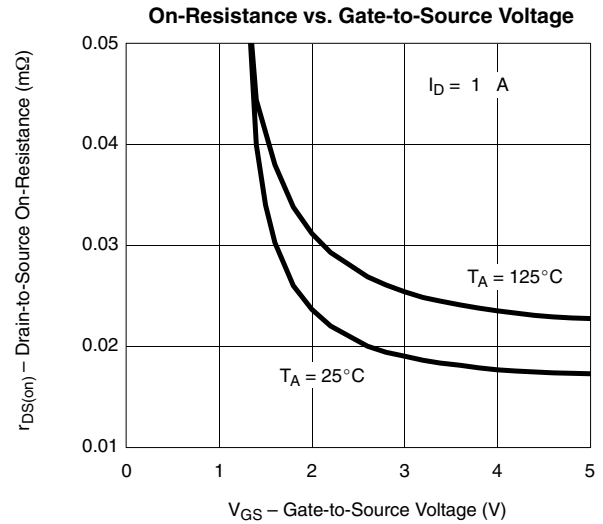
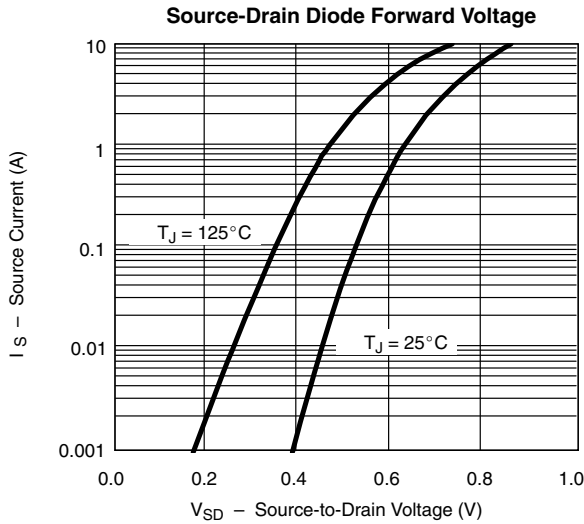


**On-Resistance vs. Junction Temperature**



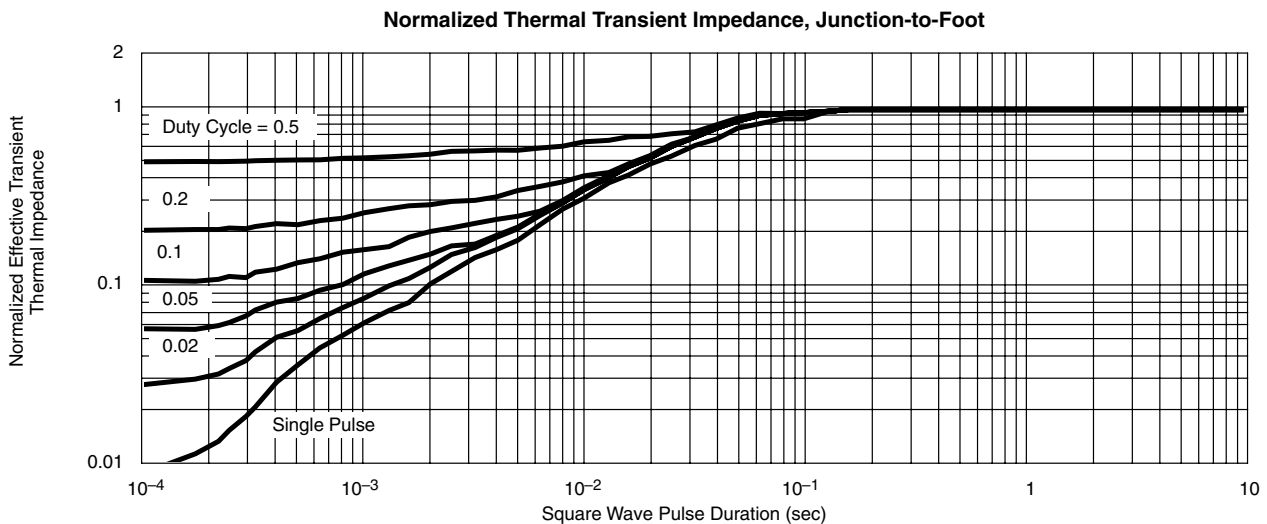
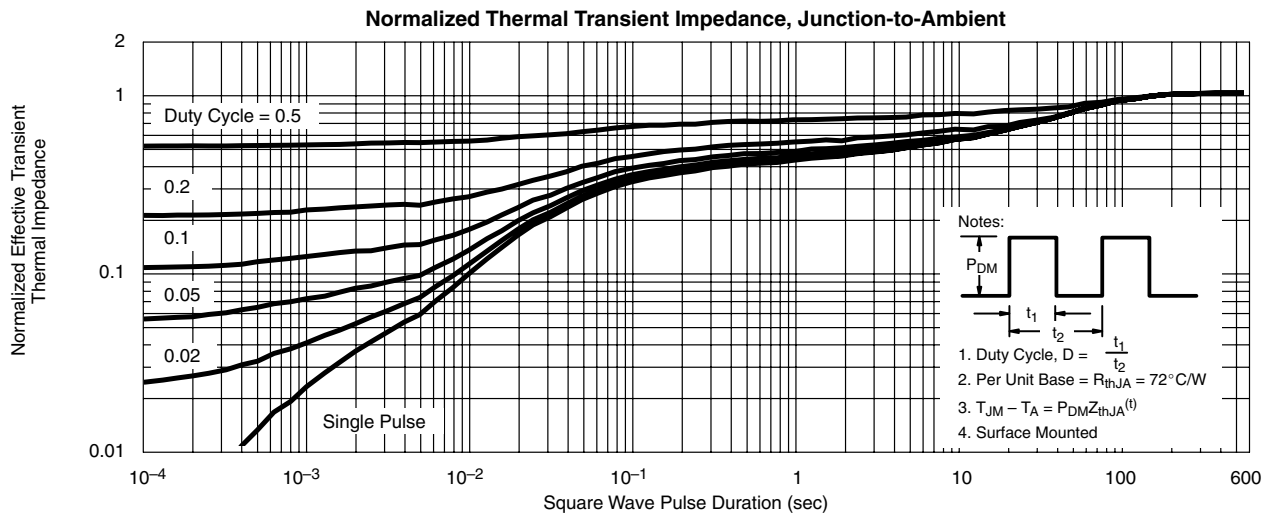
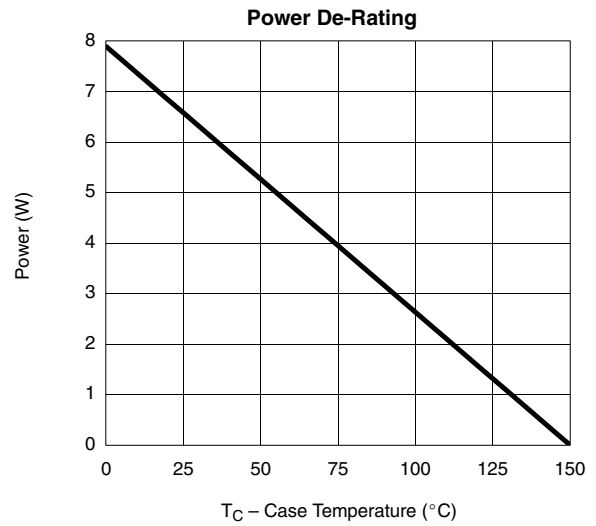
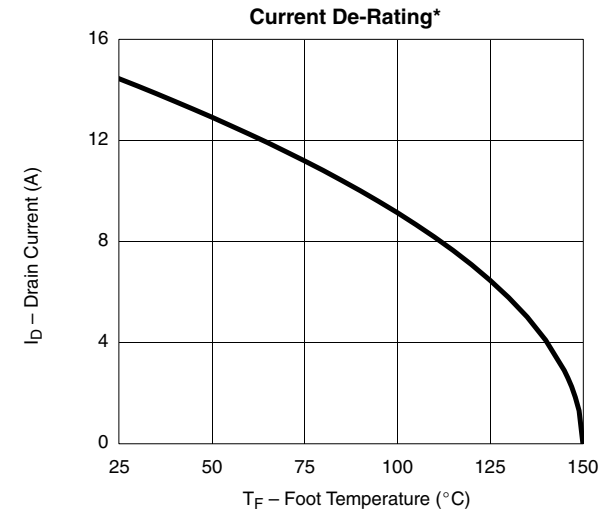


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



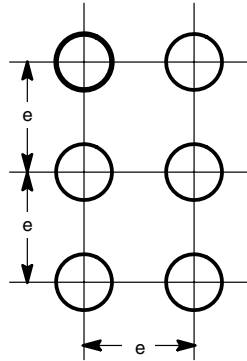


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

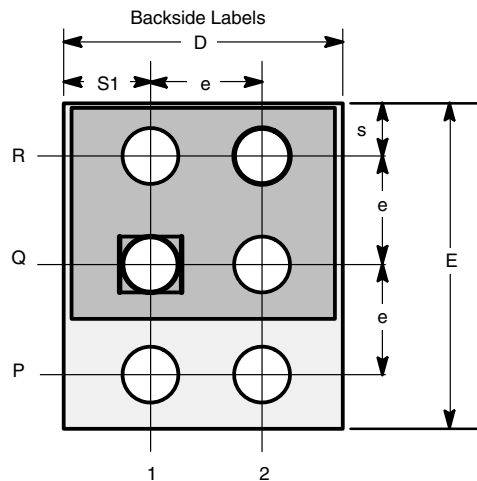
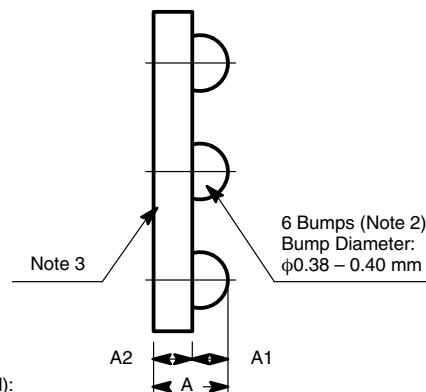
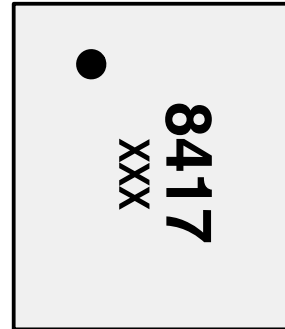


**PACKAGE OUTLINE**

**MICRO FOOT: 6-BUMP (2.4 X 2.0, 8-mm PITCH)**



Recommended Land



NOTES (Unless Otherwise Specified):

1. All dimensions are in millimeters.
2. Six (6) solder bumps are Pb-free 95.5Sn/3.8Ag/0.7Cu with diameter  $\phi 0.38 - 0.40$  mm.
3. Backside surface is coated with a Ti/Ni/Ag layer.
4. Non-solder mask defined copper landing pad.
5. The flat side of wafers is oriented at the bottom.
6. ● is location of Pin 1P.

**PAD DISTRIBUTION TABLE**

	P	Q	R
1	Drain	Gate	Source
2	Drain	Source	Source

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	1.920	2.000	0.0756	0.0787
E	2.320	2.400	0.0913	0.0945
e	0.750	0.850	0.0295	0.0335
S	0.370	0.400	0.0150	0.0157
S1	0.580	0.600	0.0228	0.0236

\* Use millimeters as the primary measurement

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?73531>.



## Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.