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

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 12	0.021 at V_{GS} = - 4.5 V	- 14.5	35 nC
	0.026 at V_{GS} = - 2.5 V	- 13.0	
	0.033 at V_{GS} = - 1.8 V	- 11.5	

FEATURES

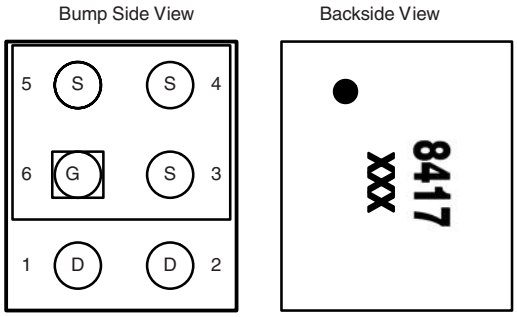
- TrenchFET® Power MOSFET
- Ultra Small MICRO FOOT® Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area

Pb-free
RoHS COMPLIANT

APPLICATIONS

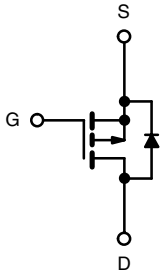
- PA Switch
- Battery Switch
- Load Switch

MICRO FOOT



Device Marking: 8417
xxx = Date/Lot Traceability Code

Ordering Information: Si8417DB-T2-E1 (Lead (Pb)-free)



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	- 12	V
Gate-Source Voltage		V_{GS}	± 8	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 14.5	A
	T_C = 70 °C		- 11.7	
	T_A = 25 °C		- 9.7[b, c]	
	T_A = 70 °C		- 7.7[b, c]	
Pulsed Drain Current		I_{DM}	- 20	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 5.7	
	T_A = 25 °C		- 2.5[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	6.57	W
	T_C = 70 °C		4.2	
	T_A = 25 °C		2.9[b, c]	
	T_A = 70 °C		1.86[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Package Reflow Conditions[d]	IR/Convection		260	

Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Refer to IPC/JEDEC (J-STD-020C), no manual or hand soldering.
e. 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[a, b]		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 °C, unless otherwise noted

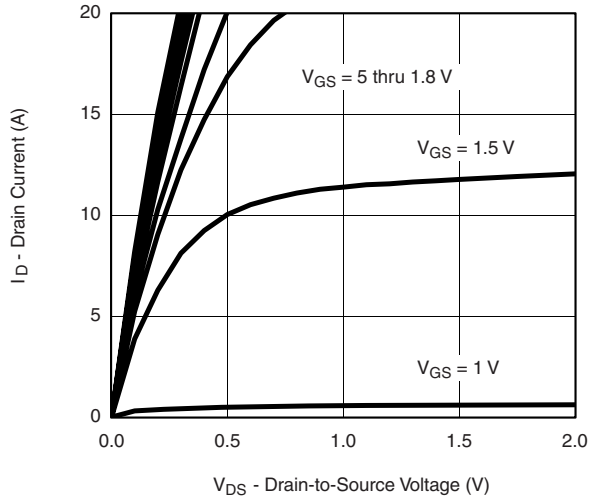
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 13.3		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.4		
Gate-Source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

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 5.5	A
Pulse Diode Forward Current	I_{SM}				- 20	
Body Diode Voltage	V_{SD}	I_S = - 1 A, V_{GS} = 0 V		- 0.65	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 1 A, dI/dt = 100 A/µs, T_J = 25 °C		311	467	ns
Body Diode Reverse Recovery Charge	Q_{rr}			1.136	1.705	µC
Reverse Recovery Fall Time	t_a			116		ns
Reverse Recovery Rise Time	t_b			195		

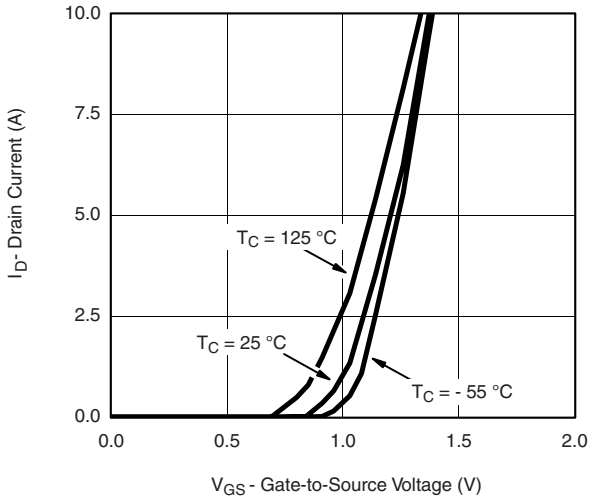
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

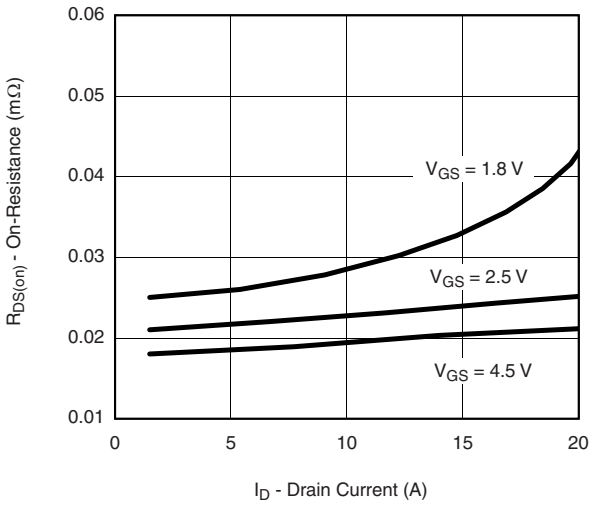
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



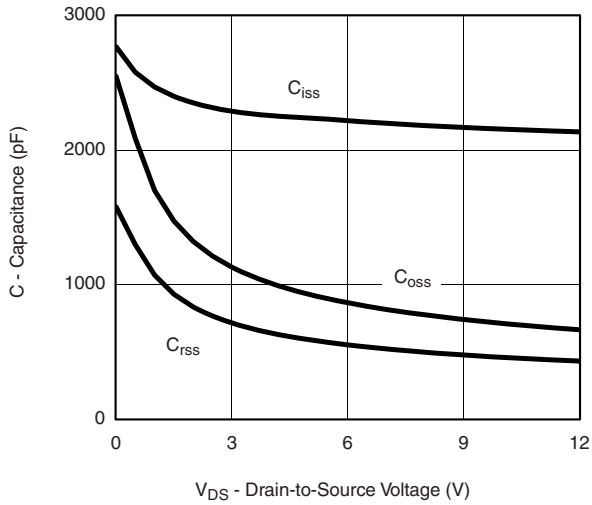
Output Characteristics



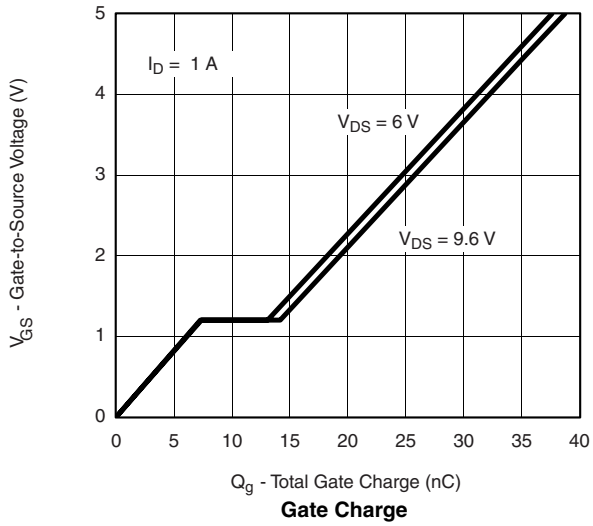
Transfer Characteristics



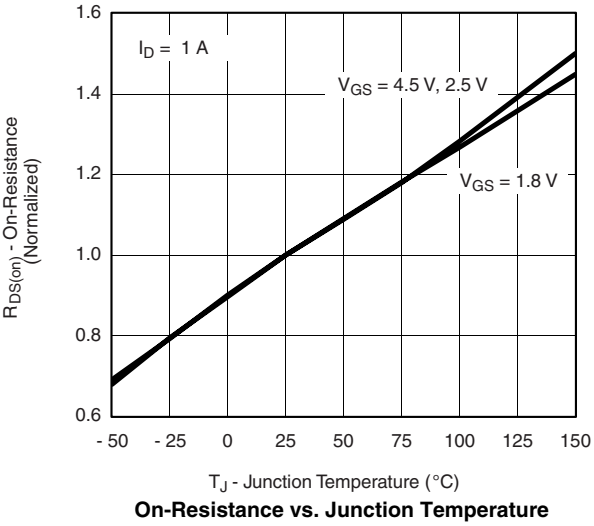
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

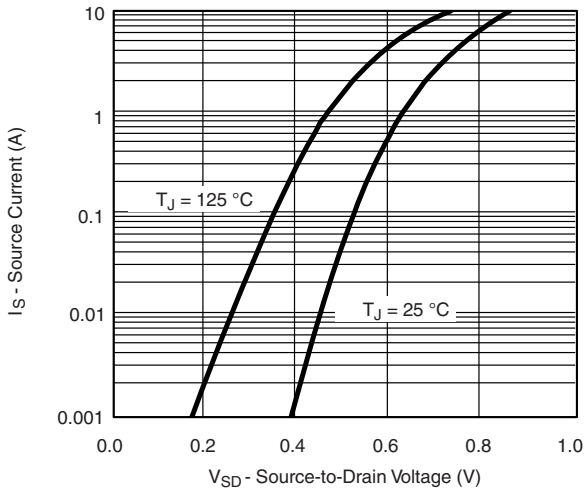


Gate Charge

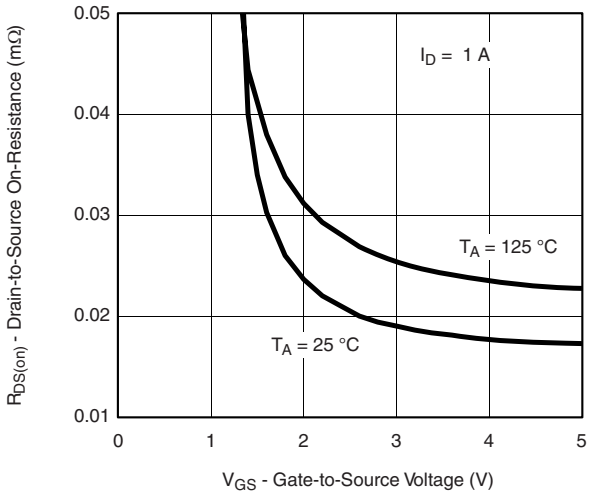


On-Resistance vs. Junction Temperature

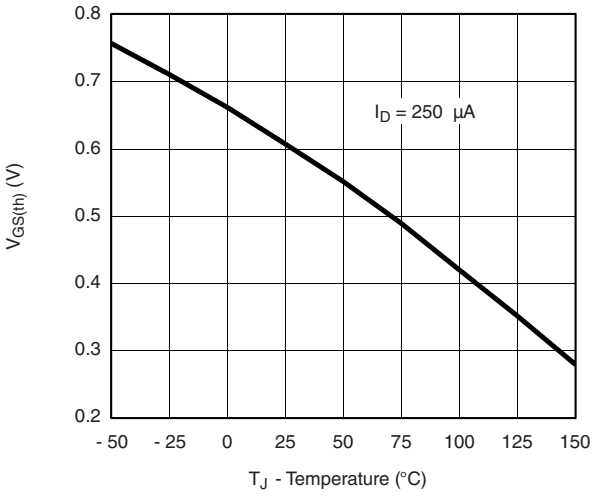
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



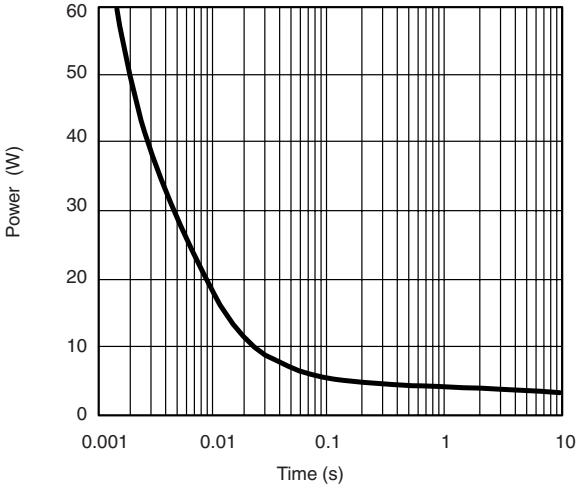
Source-Drain Diode Forward Voltage



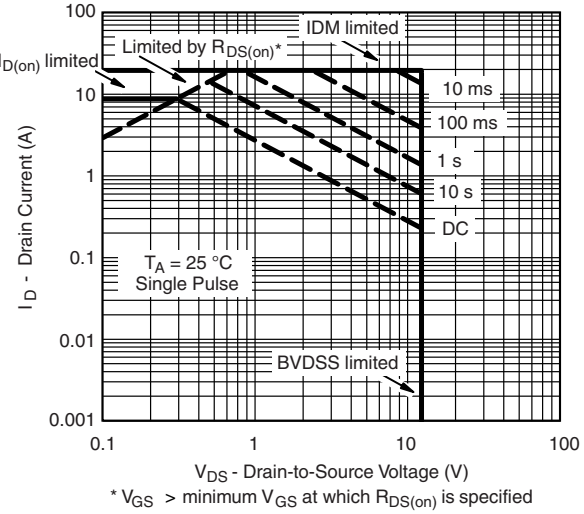
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



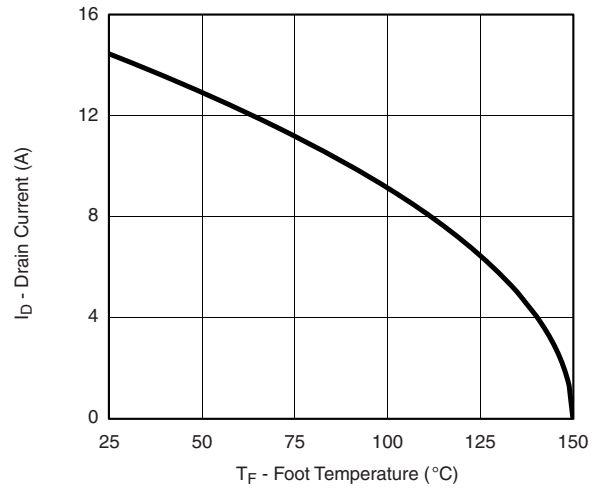
Single Pulse Power, Junction-to-Ambient



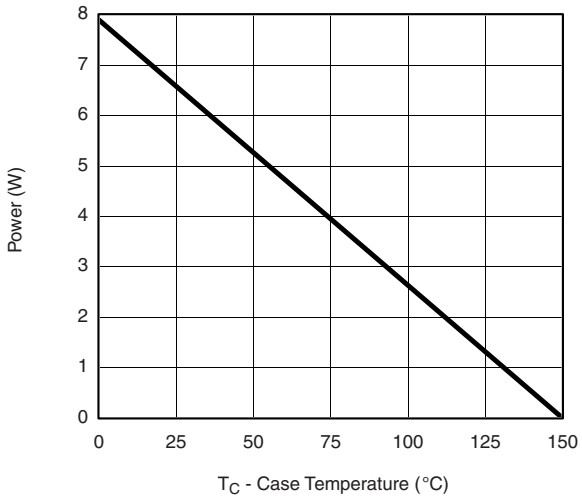
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

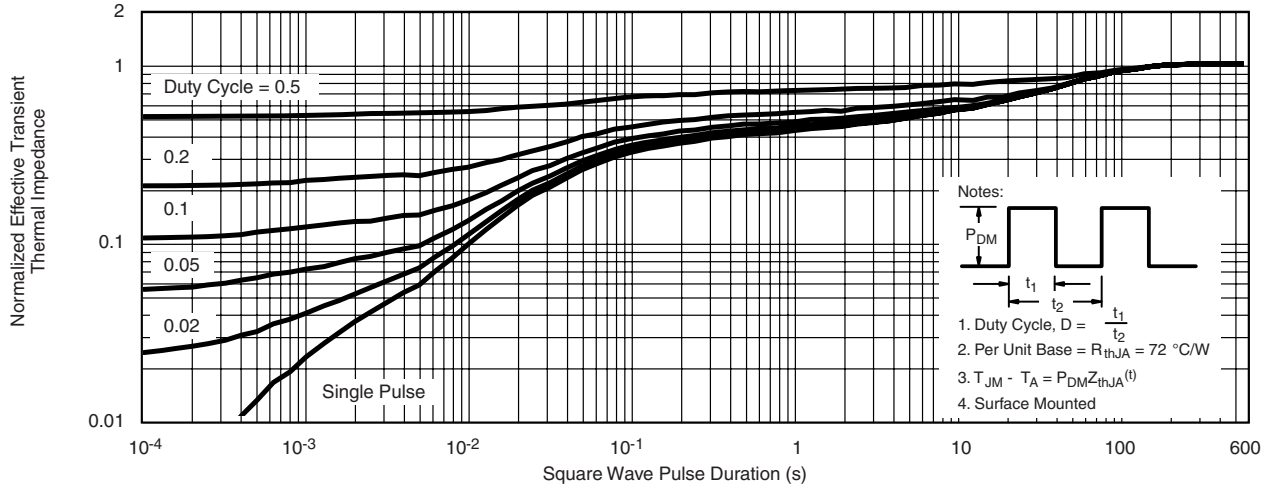
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



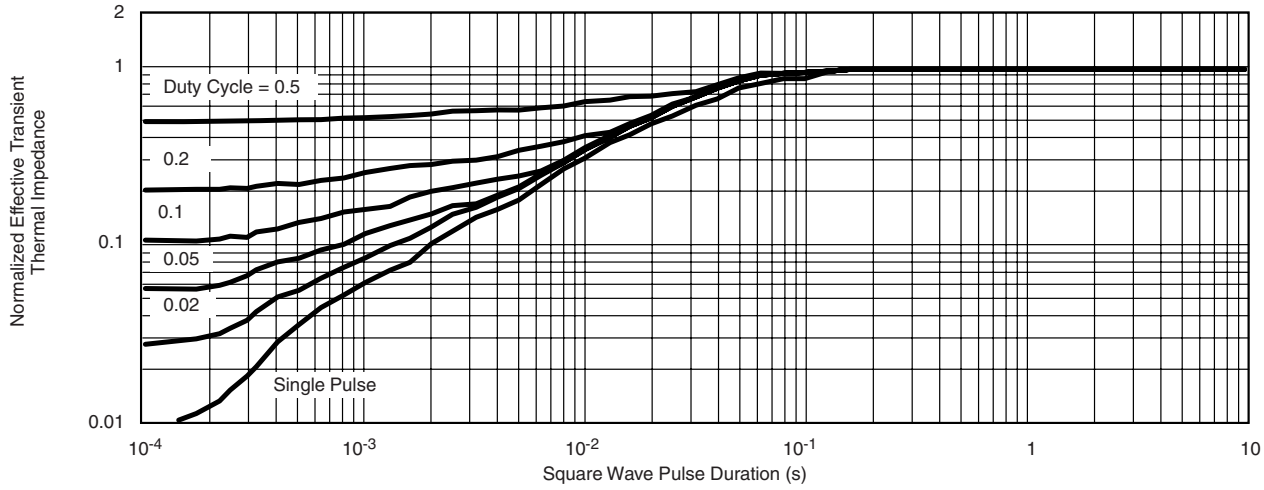
Current Derating*



Power Derating



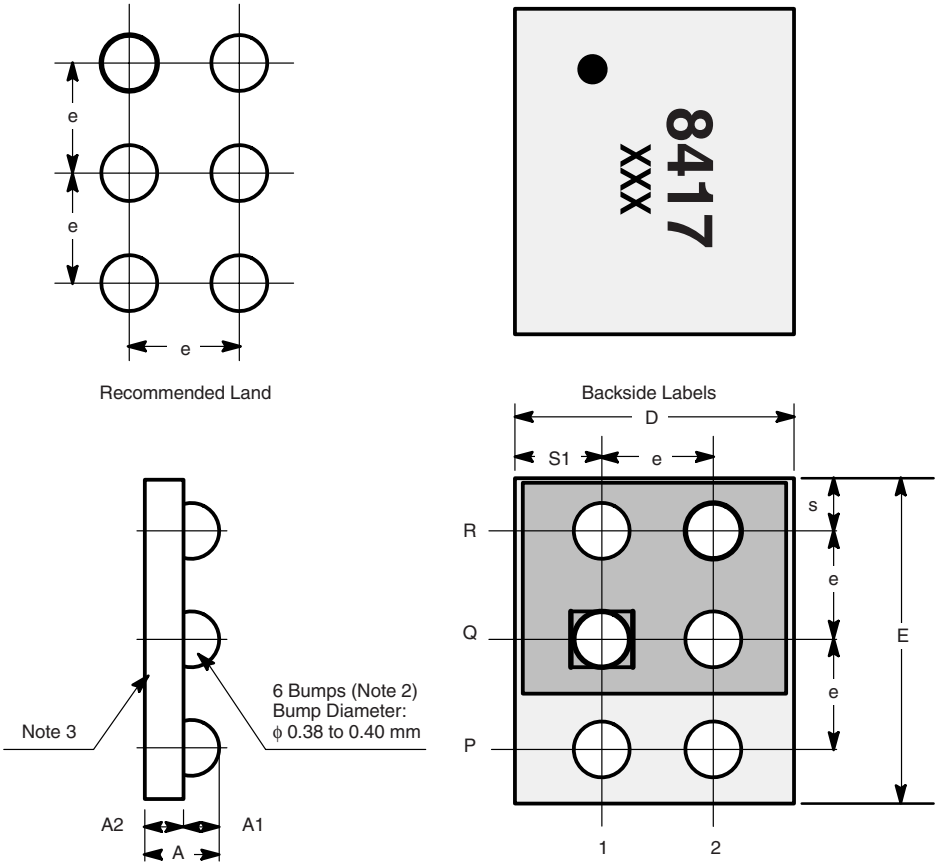
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

PACKAGE OUTLINE

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



Notes (Unless Otherwise Specified):
1. All dimensions are in millimeters.
2. Six (6) solder bumps are 95.5Sn/3.8Ag/0.7Cu with diameter ϕ 0.38 to 0.40 mm.
3. Backside surface is coated with a Ti/Nl/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.

Dim.	Millimeters[a]		Inches	
	Min.	Max.	Min.	Max.
A	0.600	0.650	0.0236	0.0256
A_1	0.260	0.290	0.0102	0.0114
A_2	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

PAD DISTRIBUTION TABLE

	P	Q	R
1	Drain	Gate	Source
2	Drain	Source	Source

Notes:
a. Use millimeters as the primary measurement.

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