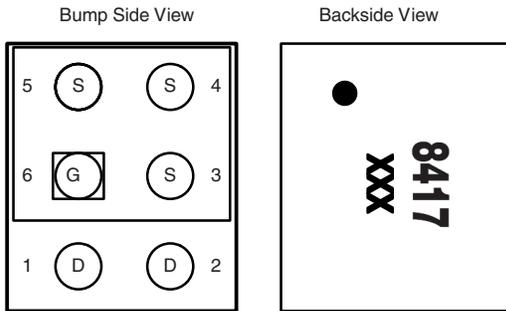


P-Channel 1.8 V (G-S) MOSFET

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	

MICRO FOOT



Device Marking: 8417
xxx = Date/Lot Traceability Code
Ordering Information: Si8417DB-T2-E1 (Lead (Pb)-free)

FEATURES

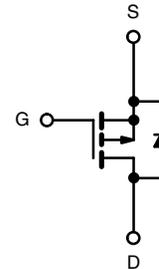
- Halogen-free according to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Ultra Small MICRO FOOT[®] Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- PA Switch
- Battery Switch
- Load Switch



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)	I _D	T _C = 25 °C	- 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	I _S	T _C = 25 °C	- 5.7	
		T _A = 25 °C	- 2.5 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	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:

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- Refer to IPC/JEDEC (J-STD-020), 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 ^{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 ($T_J = 25\text{ °C}$, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-13.3		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.4		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-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	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ °C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.0174	0.021	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		0.0214	0.026	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		0.0270	0.033	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -4\text{ V}, I_D = -1\text{ A}$		8.3		S
Dynamic^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
				35	53	
Gate-Source Charge	Q_{gs}	$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		7.3		
Gate-Drain Charge	Q_{gd}			5.9		
Gate Resistance	R_g	$V_{GS} = -0.1\text{ V}, f = 1\text{ MHz}$		28		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 4\text{ }\Omega$ $I_D \equiv -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$		14	21	ns
Rise Time	t_r			25	40	
Turn-Off Delay Time	$t_{d(off)}$			380	570	
Fall Time	t_f			240	360	



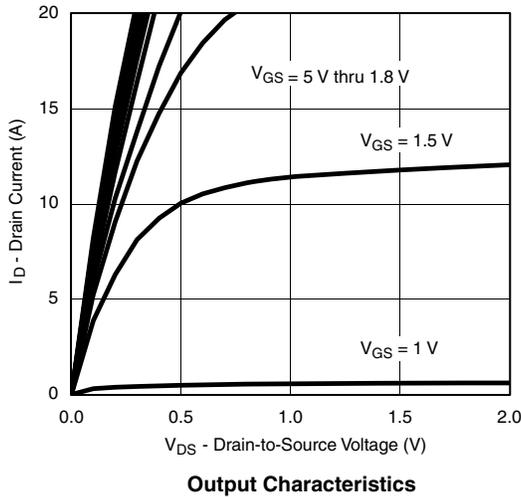
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			- 5.5	A
Pulse Diode Forward Current	I_{SM}				- 20	
Body Diode Voltage	V_{SD}	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$		- 0.65	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		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:

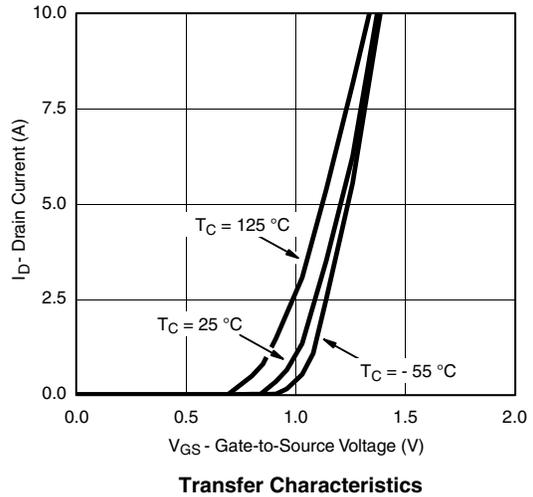
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

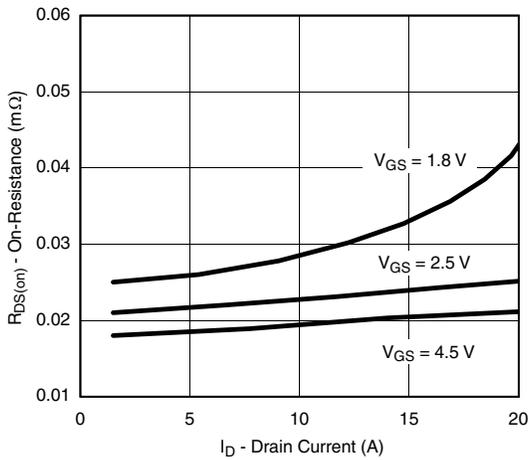
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



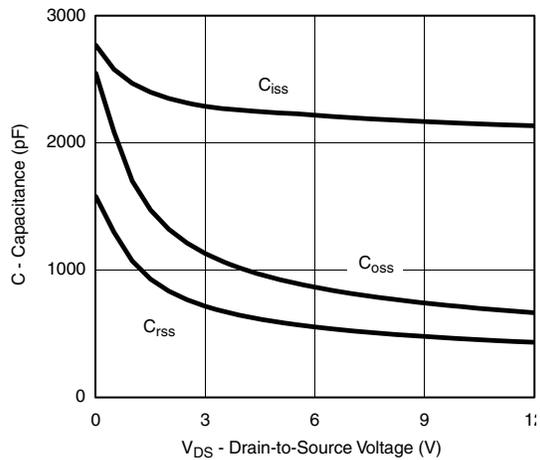
Output Characteristics



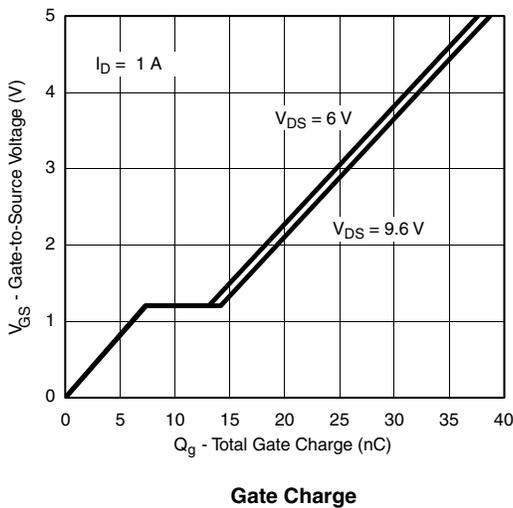
Transfer Characteristics



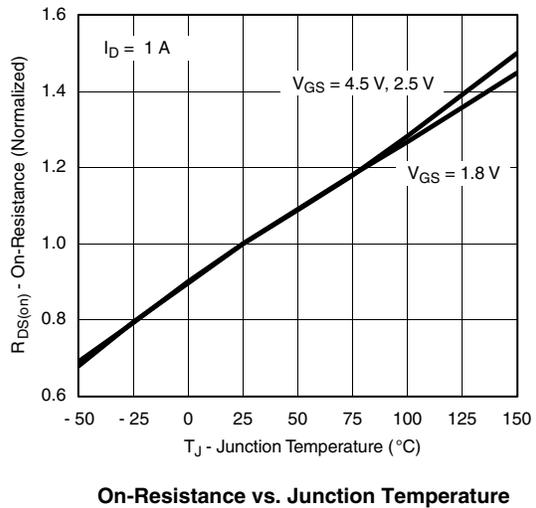
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

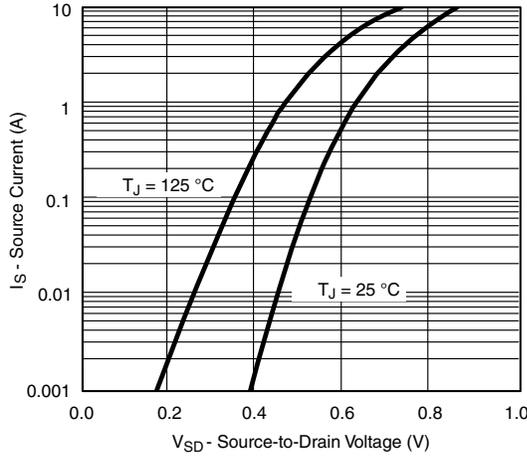


Gate Charge

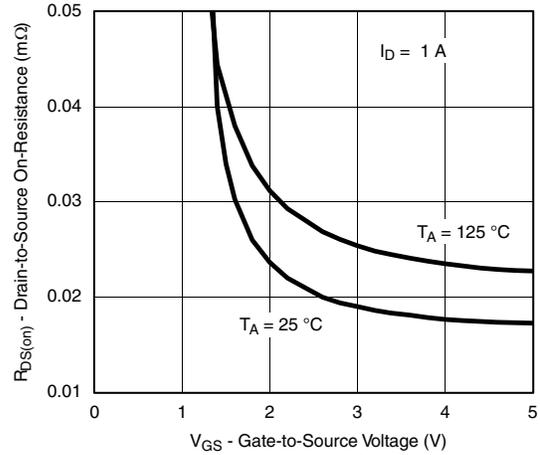


On-Resistance vs. Junction Temperature

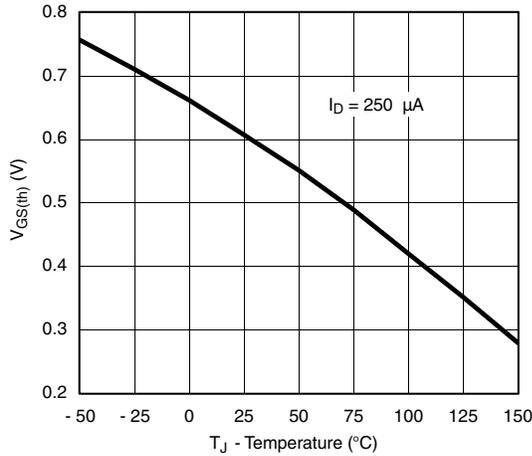
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



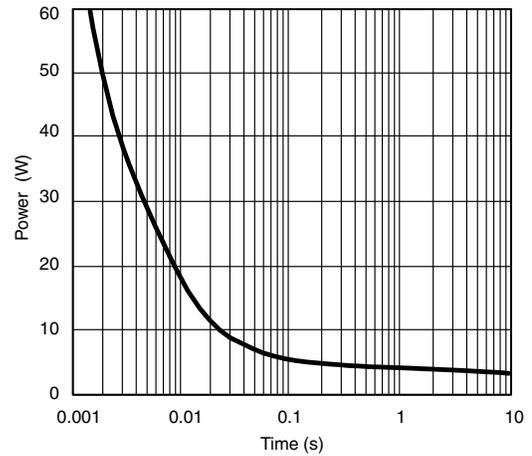
Source-Drain Diode Forward Voltage



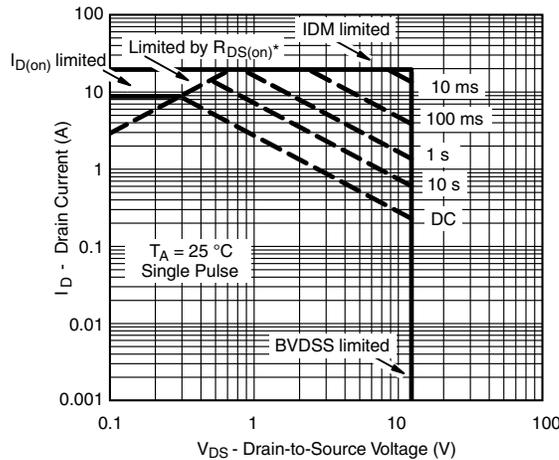
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



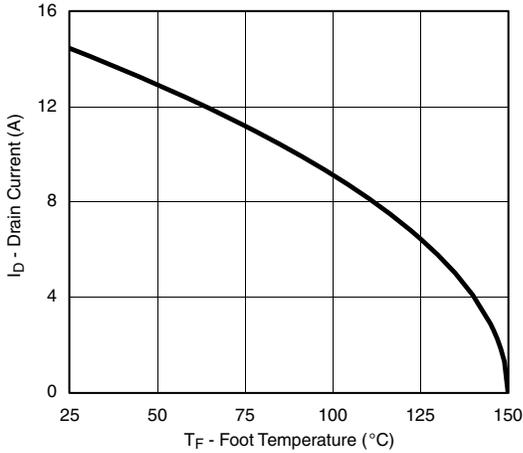
Single Pulse Power, Junction-to-Ambient



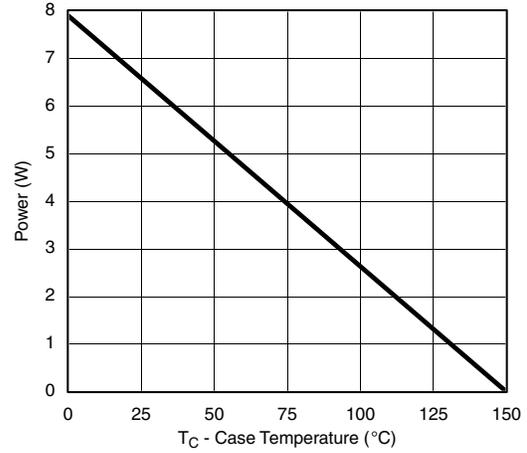
Safe Operating Area, Junction-to-Ambient

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

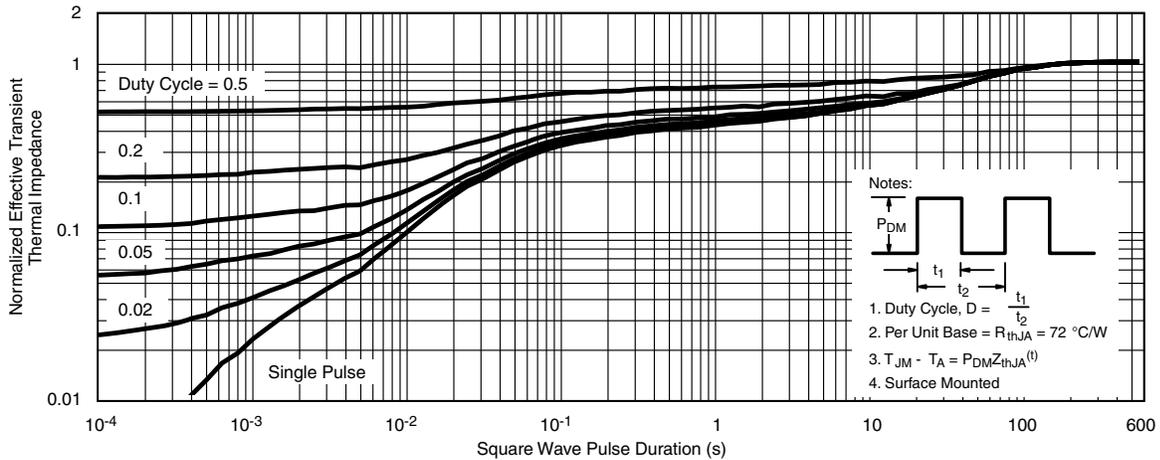
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



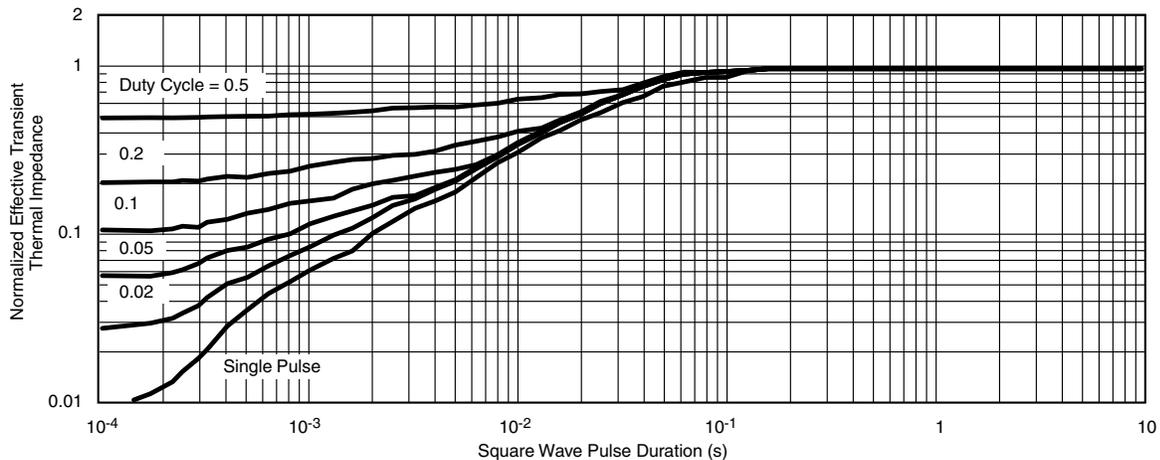
Current Derating*



Power Derating



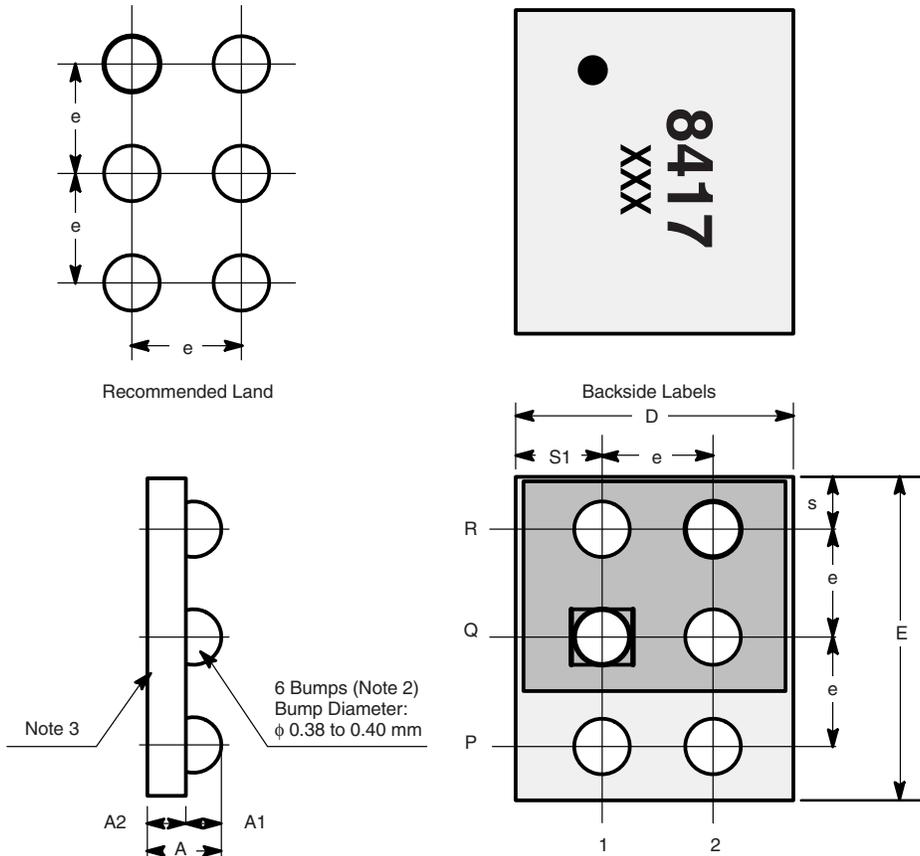
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

PACKAGE OUTLINE

MICRO FOOT: 6-BUMP (2.4 mm x 2 mm, 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 \varnothing 0.38 mm to 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.

Dim.	Millimeters ^a		Inches	
	Min.	Max.	Min.	Max.
A	0.600	0.650	0.0236	0.0256
A₁	0.260	0.290	0.0102	0.0114
A₂	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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