



P-Channel 1.5-V (G-S) MOSFET



Product Is Completely Pb-free

PRODUCT SUMMARY			
V _{DS} (V)	r _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ)
-8	0.035 @ V _{GS} = -4.5 V	-11.7	21 nC
	0.042 @ V _{GS} = -2.5 V	-10.7	
	0.052 @ V _{GS} = -1.8 V	-9.6	
	0.069 @ V _{GS} = -1.5 V	-8.3	

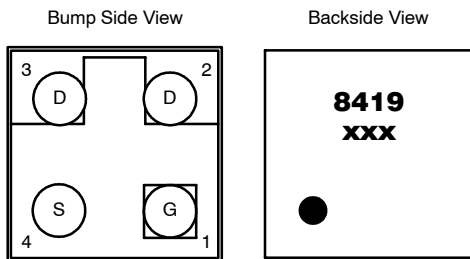
FEATURES

- TrenchFET® Power MOSFET
- Industry First 1.5-V Rated MOSFET
- Ultra Small MICRO FOOT® Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area

APPLICATIONS

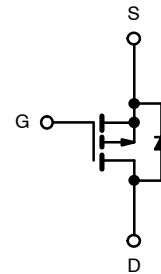
- Low Threshold Load Switch for Portable Devices
 - Low Power Consumption
 - Increased Battery Life

MICRO FOOT



Device Marking: 8419
xxx = Date/Lot Traceability Code

Ordering Information: Si8419DB-T1—E1



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _A = 25°C UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V _{DS}	-8	V
Gate-Source Voltage		V _{GS}	±5	
Continuous Drain Current (T _J = 150°C)	T _C = 25°C	I _D	-11.7	A
	T _C = 70°C		-9.4	
	T _A = 25°C		-7.8 ^{b, c}	
	T _A = 70°C		-6.3 ^{b, c}	
Pulsed Drain Current		I _{DM}	-25	
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	6.25	W
	T _C = 70°C		4	
	T _A = 25°C		2.77 ^{b, c}	
	T _A = 70°C		1.77 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to 150	
Package Reflow Conditions ^d	VPR		260	°C
	IR/Convection		260	

Notes:

- Based on T_C = 25°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 ^{a, b}		R_{thJA}	35	45	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJB}	16	20	

Notes:

- a. Surface Mounted on 1" x 1" FR4 Board.
b. Maximum under steady state conditions is 85°C/W.

SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-8			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\ \mu\text{A}$		-7.5		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-2.2		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-0.35		-0.8	V
		$V_{DS} = V_{GS}, I_D = -5\ \text{mA}$		-0.6		
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = 5\ \text{V}$			-100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 8\ \text{V}, V_{GS} = 0\ \text{V}$			-1	μA
		$V_{DS} = -8\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 70^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5\ \text{V}, V_{GS} = -4.5\ \text{V}$	-5			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = -4.5\ \text{V}, I_D = -1\ \text{A}$		0.029	0.035	Ω
		$V_{GS} = -2.5\ \text{V}, I_D = -1\ \text{A}$		0.035	0.042	
		$V_{GS} = -1.8\ \text{V}, I_D = -1\ \text{A}$		0.043	0.052	
		$V_{GS} = -1.5\ \text{V}, I_D = -1\ \text{A}$		0.051	0.069	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -4\ \text{V}, I_D = -1\ \text{A}$		0.7	1.2	S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -4\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$		1640		pF
Output Capacitance	C_{oss}			590		
Reverse Transfer Capacitance	C_{rss}			380		
Total Gate Charge	Q_g	$V_{DS} = -4\ \text{V}, V_{GS} = -5\ \text{V}, I_D = -1\ \text{A}$		24	26	nC
			$V_{DS} = -4\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = 1\ \text{A}$		21	
Gate-Source Charge	Q_{gs}	$V_{DS} = -4\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = 1\ \text{A}$		1.8		
Gate-Drain Charge	Q_{gd}			3.7		
Gate Resistance	R_g	$V_{GS} = -0.1\ \text{V}, f = 1\ \text{MHz}$		22		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -4\ \text{V}, R_L = 4\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -4.5\ \text{V}, R_g = 6\ \Omega$		12	20	ns
Rise Time	t_r			25	40	
Turn-Off Delay Time	$t_{d(off)}$			260	390	
Fall Time	t_f			155	240	



SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			-2.5	A
Pulse Diode Forward Current	I_{SM}				-25	
Body Diode Voltage	V_{SD}	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$		-0.7	-1.1	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25^\circ\text{C}$		150	250	ns
Body Diode Reverse Recovery Charge	Q_{rr}			0.15	0.23	nC
Reverse Recovery Fall Time	t_a				57	ns
Reverse Recovery Rise Time	t_b				93	

Notes

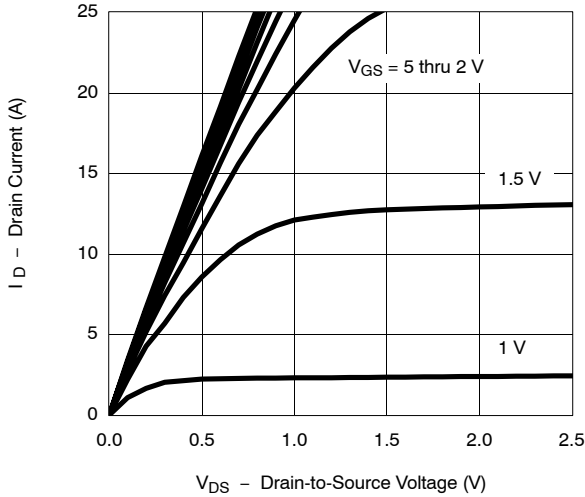
- Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.

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.

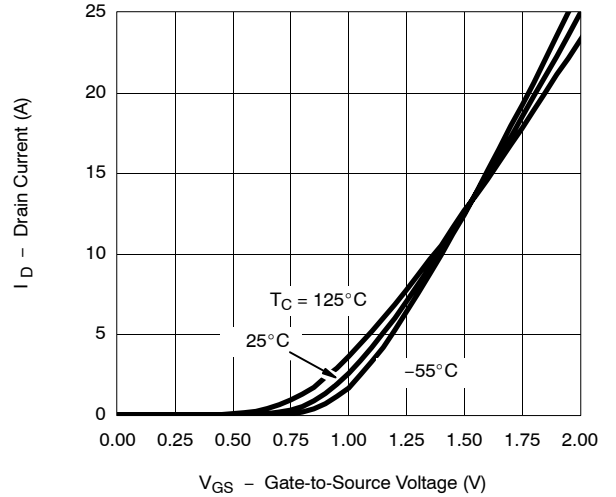


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

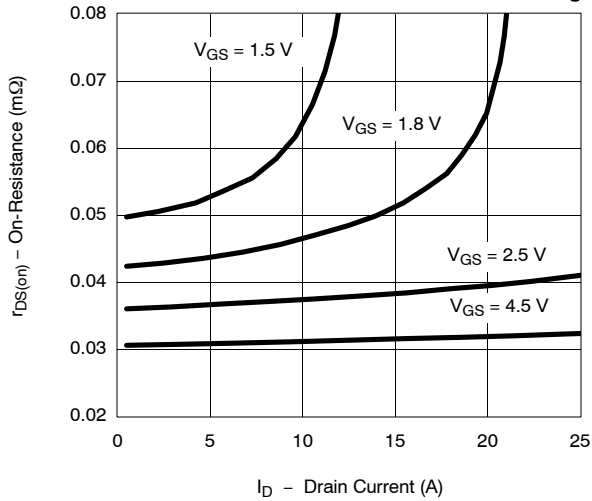
Output Characteristics



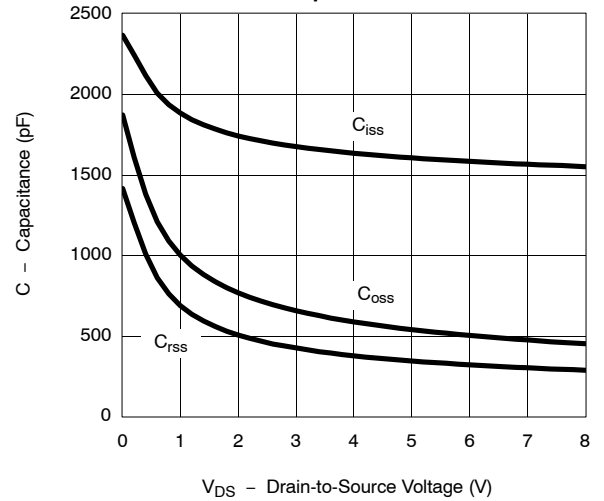
Transfer Characteristics



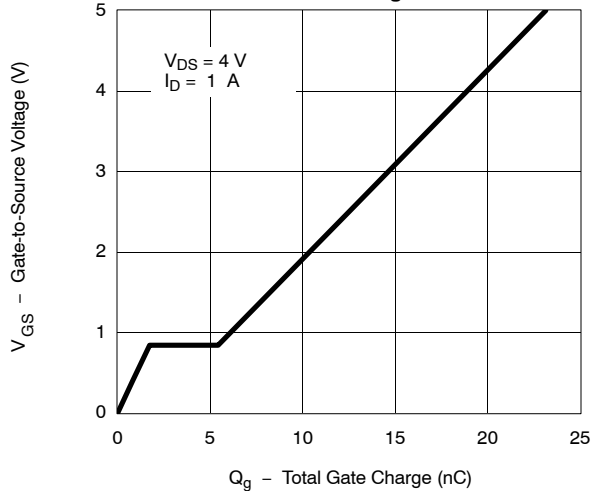
On-Resistance vs. Drain Current and Gate Voltage



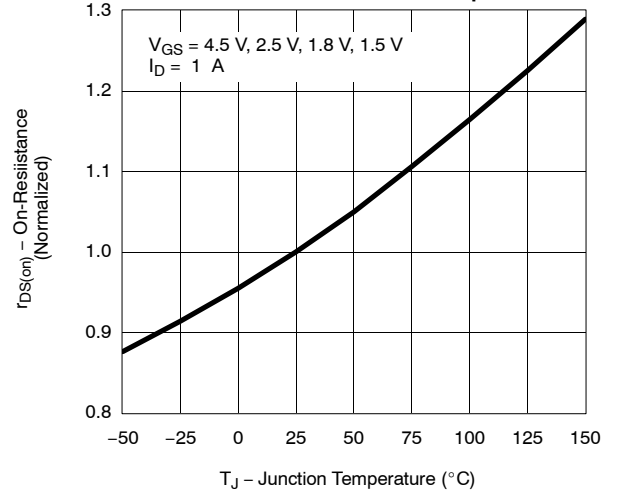
Capacitance



Gate Charge



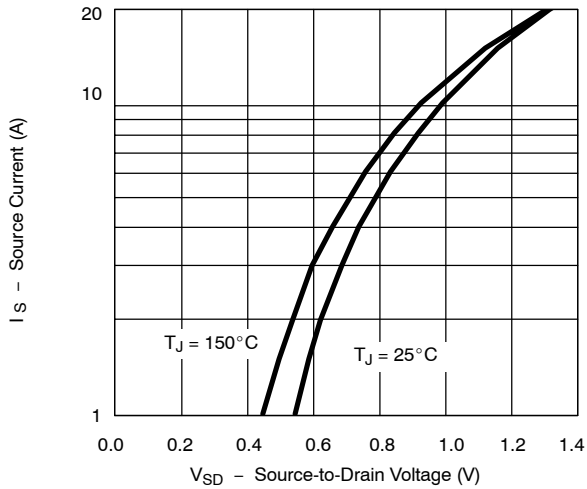
On-Resistance vs. Junction Temperature



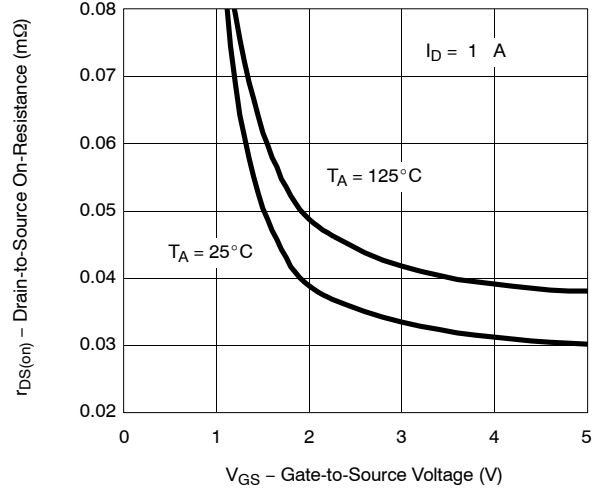


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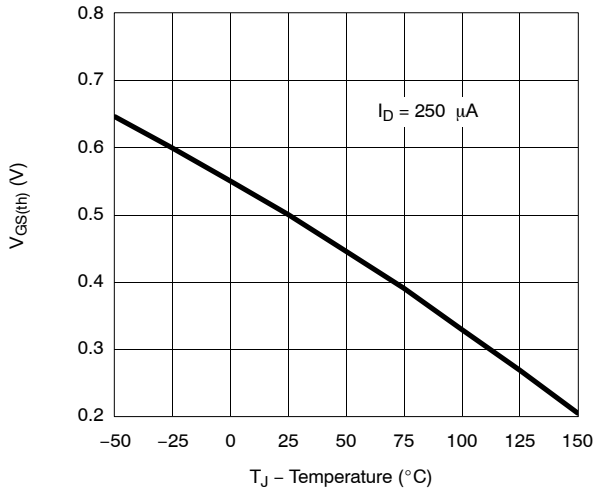
Source-Drain Diode Forward Voltage



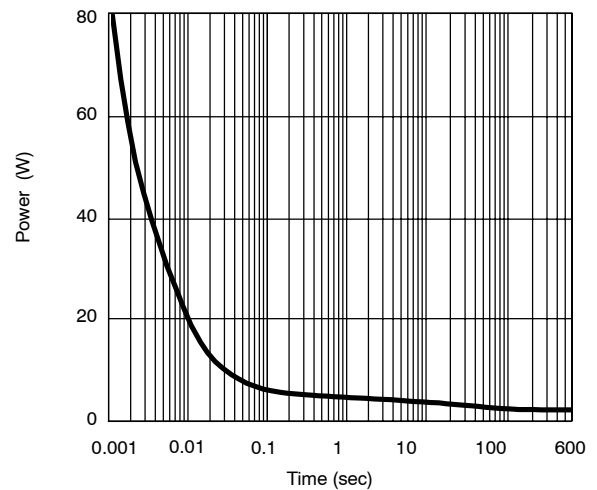
On-Resistance vs. Gate-to-Source Voltage



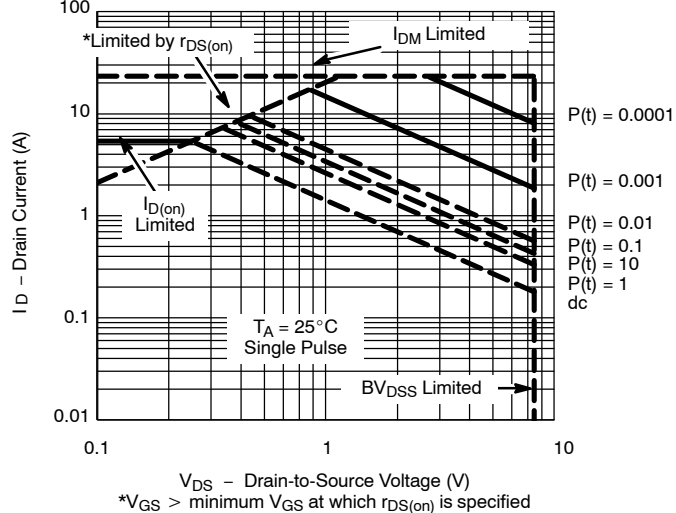
Threshold Voltage



Single Pulse Power, Junction-To-Ambient

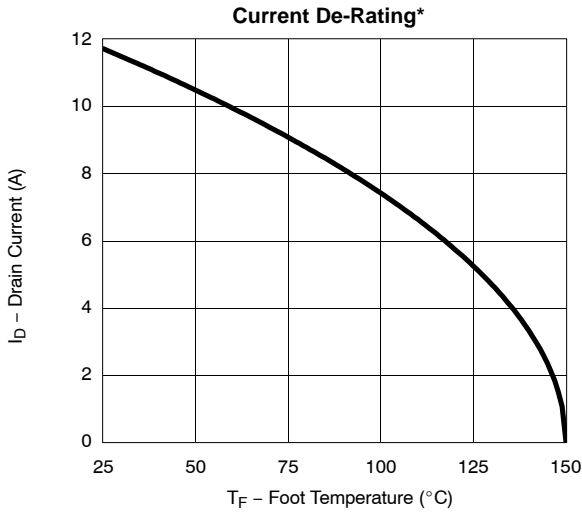


Safe Operating Area, Junction-to-Ambient

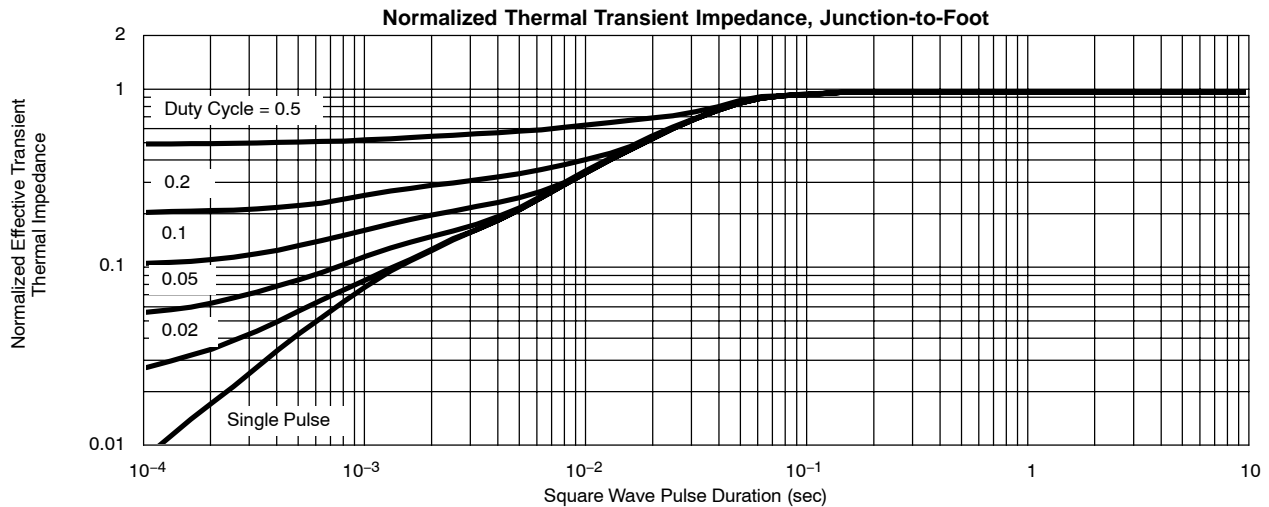
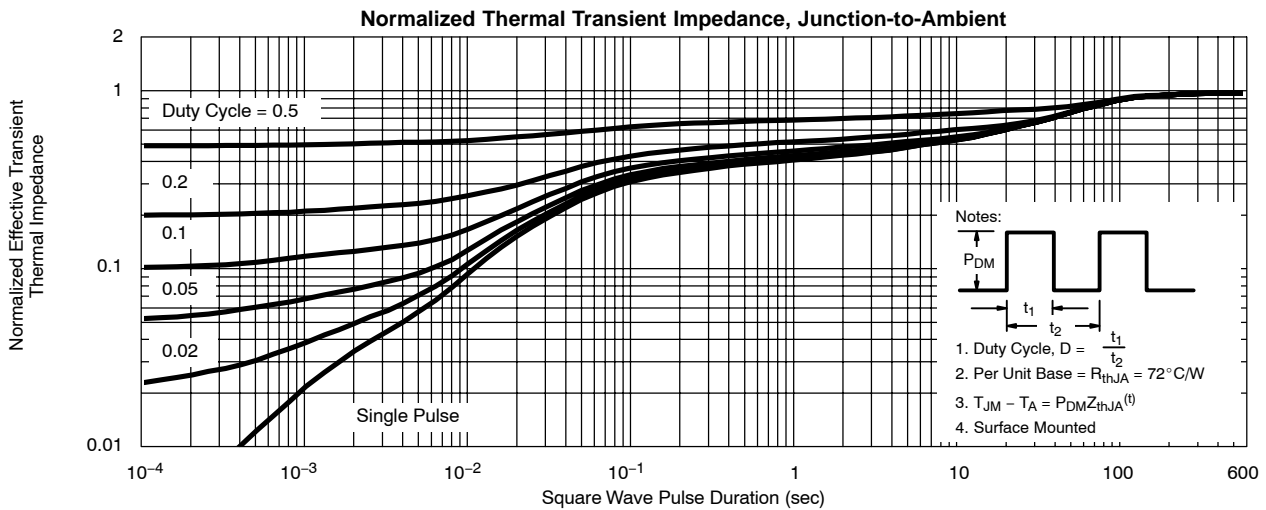




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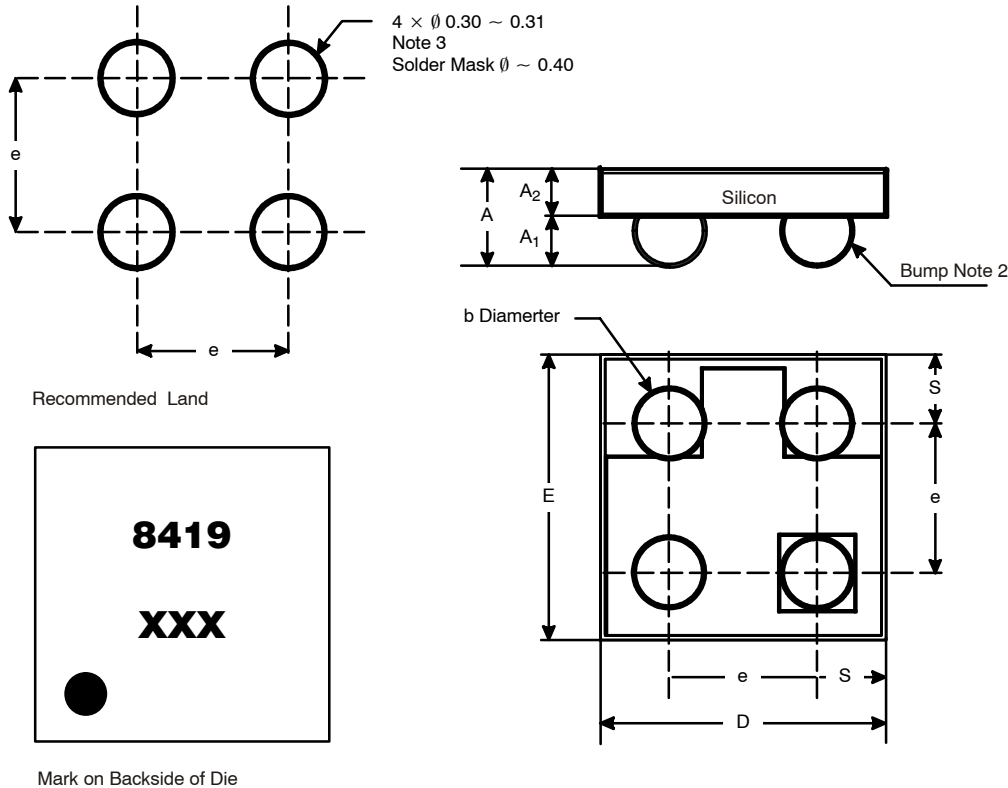


* The power dissipation P_D is based on $T_{J(max)} = 150^\circ\text{C}$, using junction-to-foot thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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 Sn/Ag/Cu.
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 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	1.520	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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