

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

PRODUCT SUMMARY			
V _{DS} (V)	r _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ)
- 20	0.041 at V _{GS} = - 4.5 V	- 10.0	22 nC
	0.048 at V _{GS} = - 2.5 V	- 9.32	
	0.058 at V _{GS} = - 1.8 V	- 8.48	
	0.075 at V _{GS} = - 1.5 V	- 7.45	

FEATURES

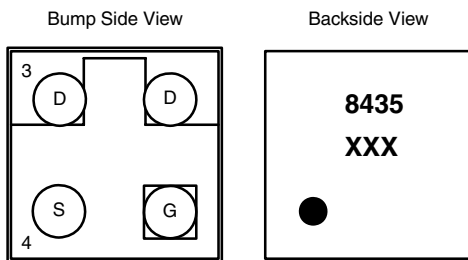
- TrenchFET[®] Power MOSFET
- Ultra Small MICRO FOOT[®] Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area



APPLICATIONS

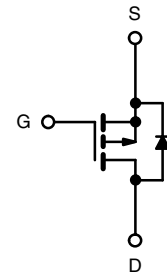
- Low Threshold Load Switch for Portable Devices
 - Low Power Consumption
 - Increased Battery Life

MICRO FOOT



Device Marking: 8435
xxx = Date/Lot Traceability Code

Ordering Information: Si8435DB-T1-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}	- 20	V
Gate-Source Voltage	V _{GS}	± 5	
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 10.0
		T _C = 70 °C	- 8.06
		T _A = 25 °C	- 6.72 ^{b,c}
		T _A = 70 °C	- 5.37 ^{b,c}
Pulsed Drain Current	I _{DM}	- 15	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	
		T _A = 25 °C	- 2.31 ^{b,c}
Maximum Power Dissipation	P _D	T _C = 25 °C	6.25
		T _C = 70 °C	4.0
		T _A = 25 °C	2.78 ^{b,c}
		T _A = 70 °C	1.78 ^{b,c}
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C
Package Reflow Conditions ^d	VPR	260	
	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-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_{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}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 15.5		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 0.35		- 1.0	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ °C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	- 15			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.034	0.041	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		0.040	0.048	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		0.048	0.058	
		$V_{GS} = -1.5\text{ V}, I_D = -1\text{ A}$		0.055	0.075	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -1\text{ A}$		10.5	16	S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1600		pF
Output Capacitance	C_{oss}			265		
Reverse Transfer Capacitance	C_{rss}			175		
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -5\text{ V}, I_D = -1\text{ A}$		23	35	nC
				22	33	
Gate-Source Charge	Q_{gs}	$V_{DS} = -16\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		3.25		
Gate-Drain Charge	Q_{gd}			1.95		
Gate Resistance	R_g	$V_{GS} = -0.1\text{ V}, f = 1\text{ MHz}$		20		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \equiv -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		15	23	ns
Rise Time	t_r			29	44	
Turn-Off Delay Time	$t_{d(off)}$			230	345	
Fall Time	t_f			91	137	



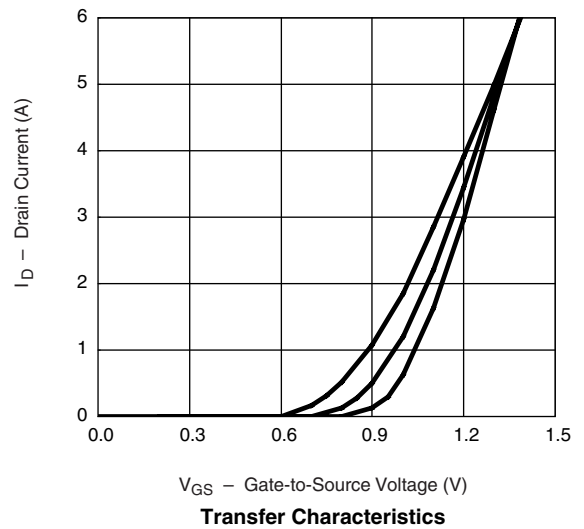
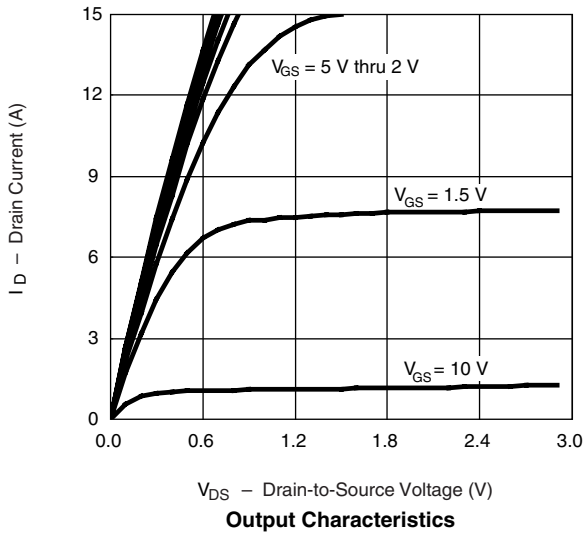
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			- 5.21	A
Pulse Diode Forward Current	I_{SM}				- 15	
Body Diode Voltage	V_{SD}	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$		0.6	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		116	174	ns
Body Diode Reverse Recovery Charge	Q_{rr}			203	305	nC
Reverse Recovery Fall Time	t_a			45		ns
Reverse Recovery Rise Time	t_b			71		

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.

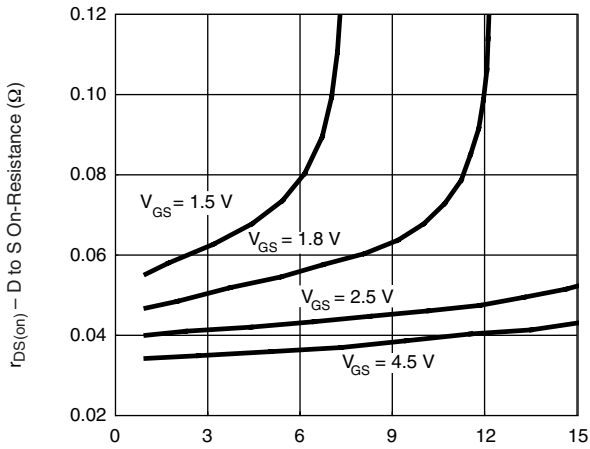
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted

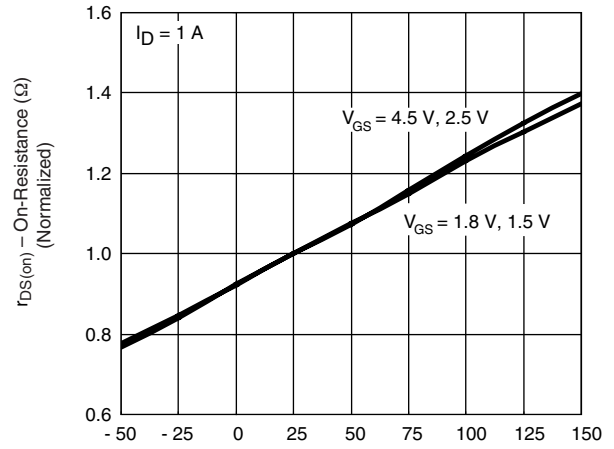




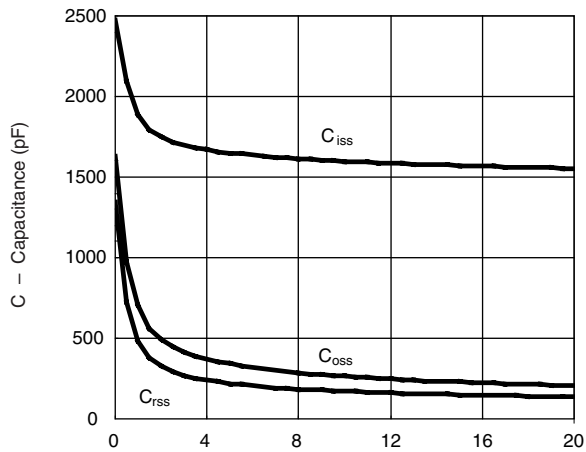
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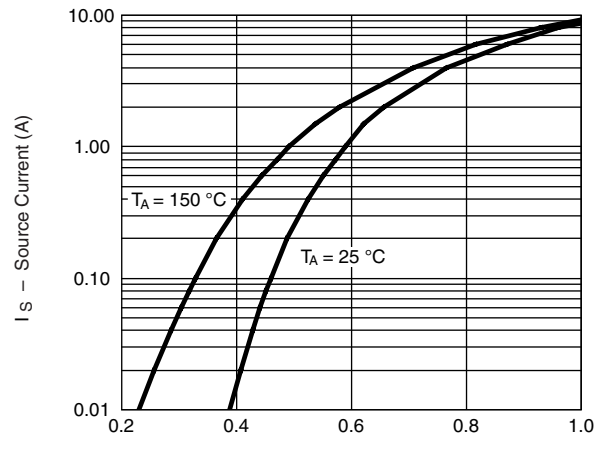
I_D – Drain Current (A)
 $r_{DS(on)}$ vs. Drain Current



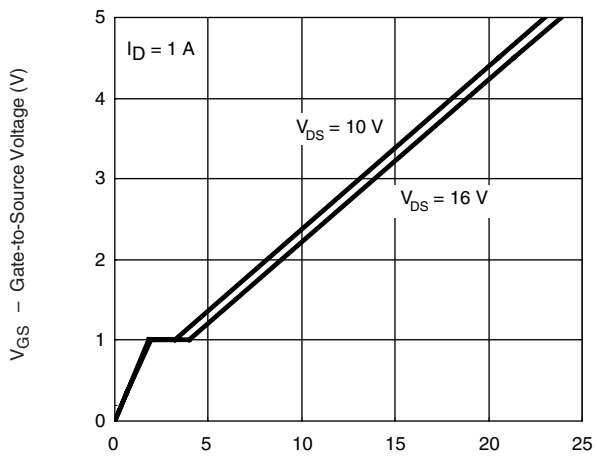
T_J – Junction Temperature ($^\circ\text{C}$)
On-Resistance vs. Junction Temperature



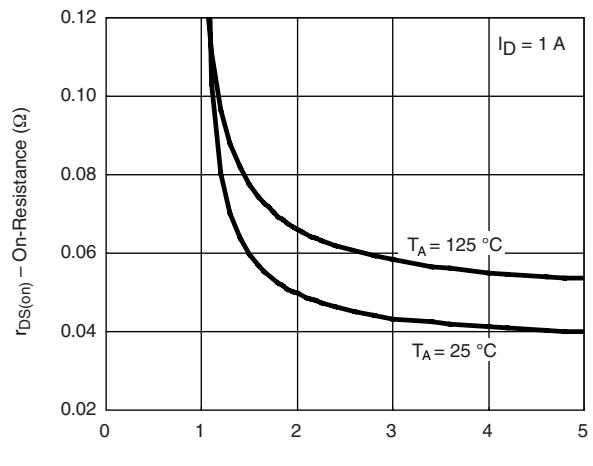
V_{DS} – Drain-Source Voltage (V)
Capacitance



V_{SD} – Source-to-Drain Voltage (V)
Forward Diode Voltage vs Temp



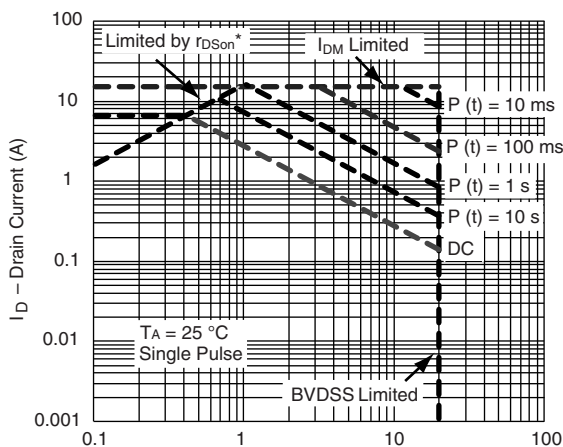
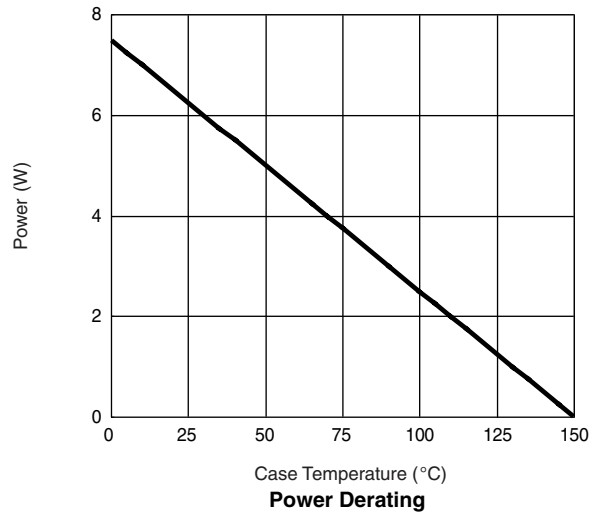
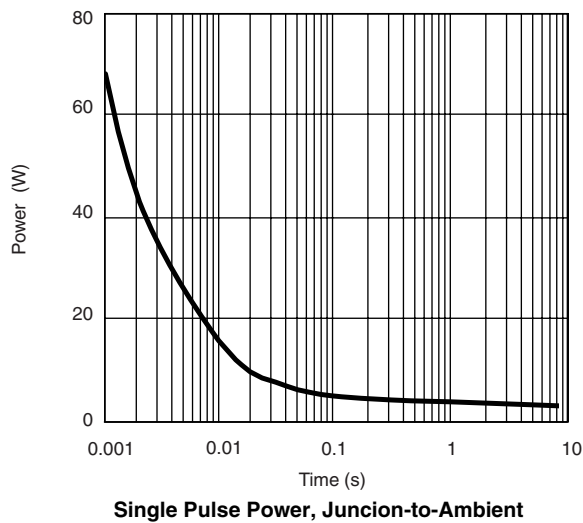
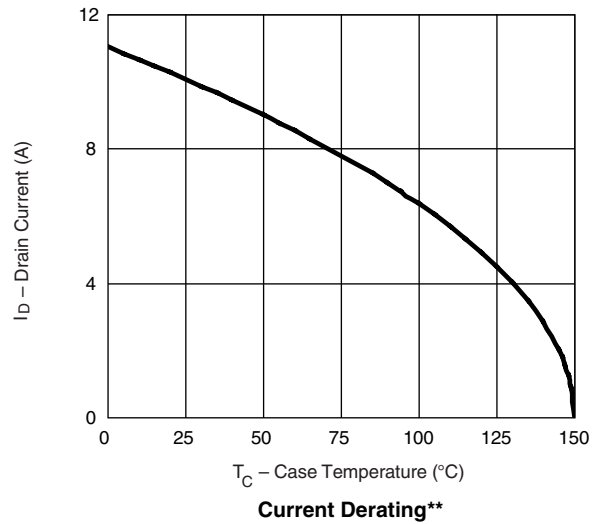
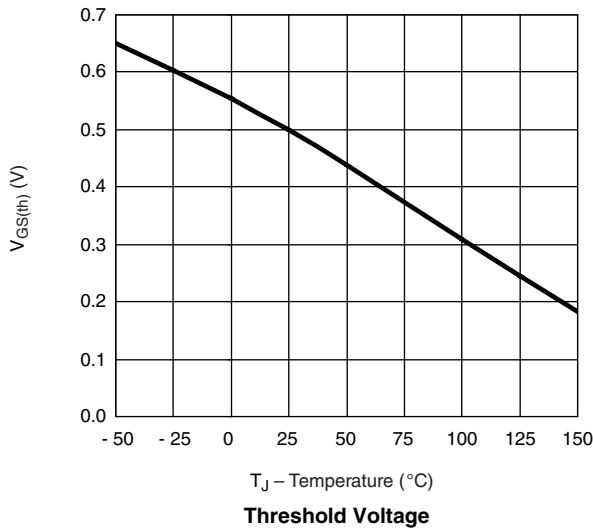
Q_g – Total Gate Charge (nC)
Gate Charge



V_{GS} – Gate-to-Source Voltage (V)
 $r_{DS(on)}$ vs V_{GS} vs Temperature



TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



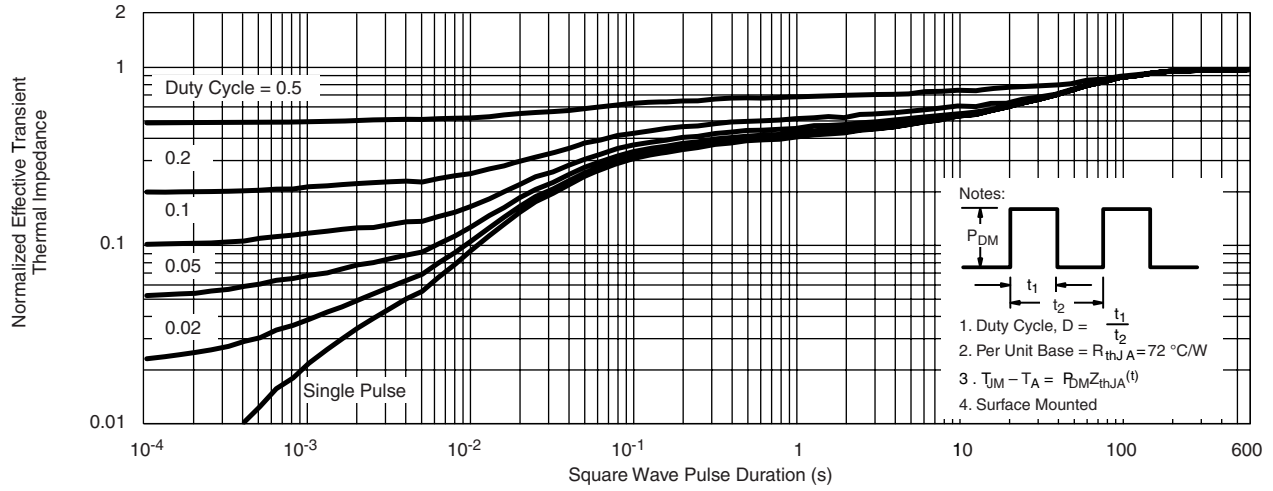
V_{DS} - Drain-to-Source Voltage (V)
* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

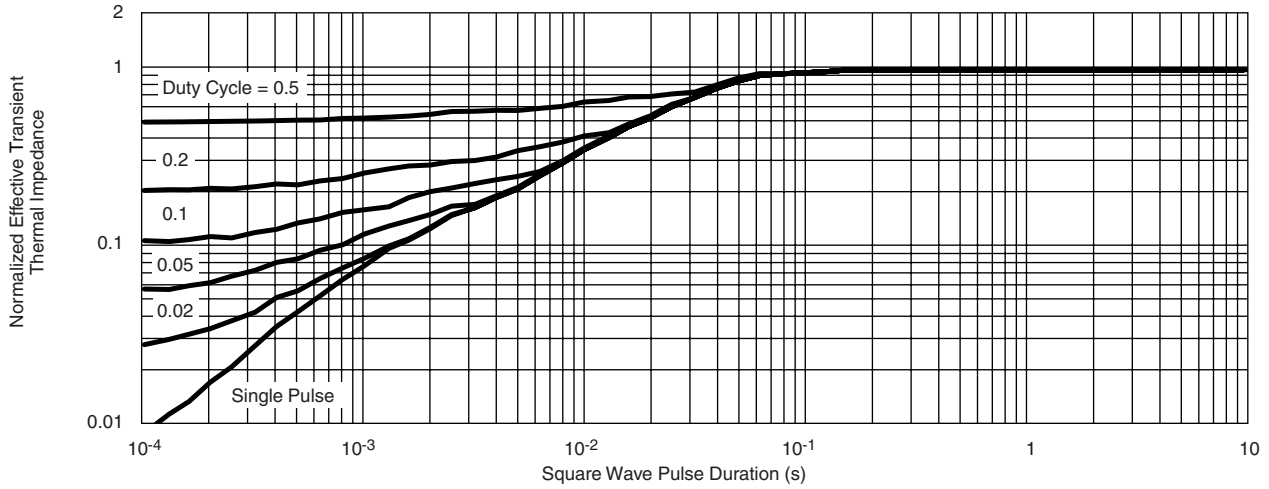
** The power dissipation P_D is based on $T_{J(max)} = 150\text{ }^\circ\text{C}$, using junction-to-foot thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below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



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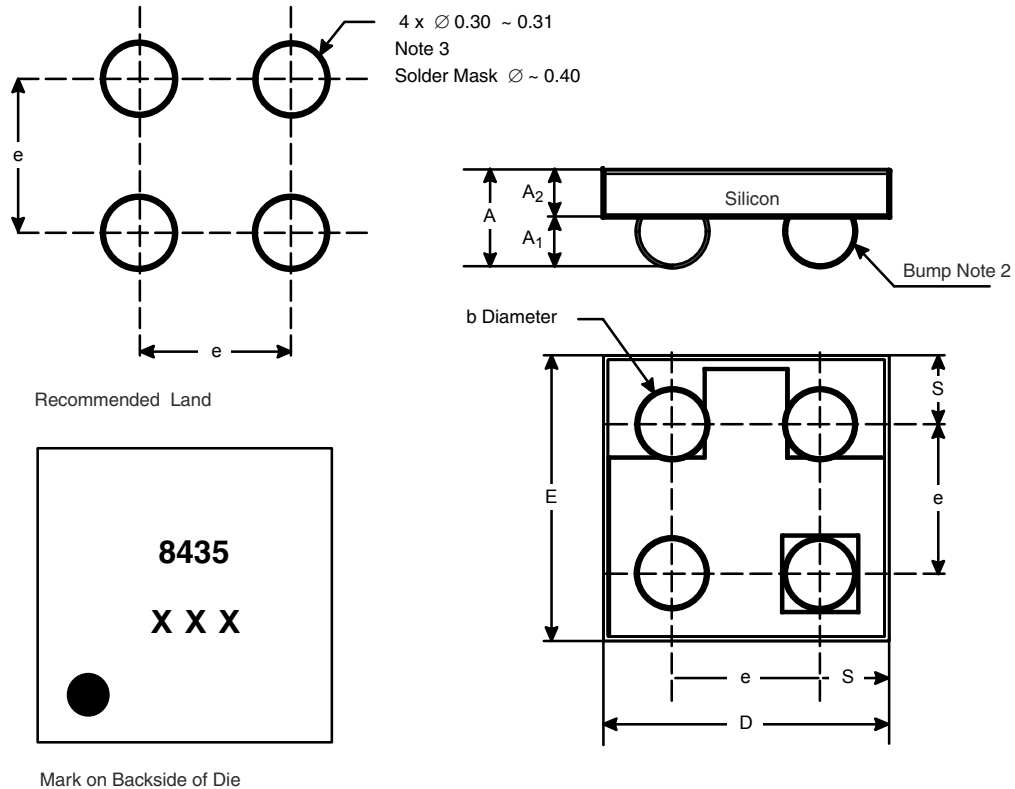
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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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