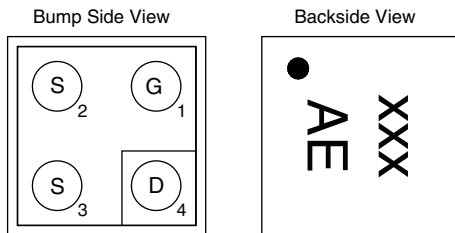




P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
- 20	0.090 at V _{GS} = - 4.5 V	- 2.6	6 nC
	0.119 at V _{GS} = - 2.5 V	- 2.3	
	0.155 at V _{GS} = - 1.8 V	- 2.0	

MICRO FOOT



Device Marking: xxx = Date/Lot Traceability Code
AE

Ordering Information: Si8809EDB-T2-E1 (Lead (Pb)-free and Halogen-free)

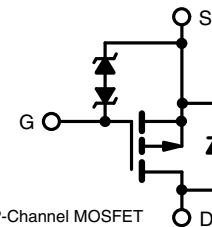
FEATURES

- TrenchFET[®] Power MOSFET
- Ultra Small 0.8 mm x 0.8 mm Outline
- Ultra Thin 0.357 mm Height
- Typical ESD Protection 1000 V HBM
- High Speed Switching
- Material categorization:

For definitions of compliance please see
www.vishay.com/doc?99912

APPLICATIONS

- Portable Devices such as Cell Phones, Smart Phones, Tablet PCs and Media Players
 - Load Switch
 - Battery Switch



P-Channel MOSFET



RoHS
COMPLIANT
HALOGEN
FREE

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}	± 8	
Continuous Drain Current (T _J = 150 °C)	I _D	T _A = 25 °C	- 2.6 ^a
		T _A = 70 °C	- 2.1 ^a
		T _A = 25 °C	- 1.9 ^b
		T _A = 70 °C	- 1.5 ^b
Pulsed Drain Current (t = 300 μs)	I _{DM}	- 13	A
Continuous Source-Drain Diode Current	I _S	T _A = 25 °C	
		T _A = 25 °C	- 0.4 ^b
Maximum Power Dissipation	P _D	T _A = 25 °C	0.9 ^a
		T _A = 70 °C	0.6 ^a
		T _A = 25 °C	0.5 ^b
		T _A = 70 °C	0.3 ^b
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) ^c		260	

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, d}	R _{thJA}	105	135	°C/W
Maximum Junction-to-Ambient ^{b, e}		200	260	

Notes:

- Surface mounted on 1" x 1" FR4 board with full copper, t = 5 s.
- Surface mounted on 1" x 1" FR4 board with minimum copper, t = 5 s.
- Refer to IPC/JEDEC (J-STD-020), no manual or hand soldering.
- Maximum under steady state conditions is 185 °C/W.
- Maximum under steady state conditions is 330 °C/W.

SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = -250\text{ }\mu\text{A}$	-20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-9		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		2.1			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4		-0.9	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 1	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 10	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -10\text{ V}, V_{GS} = -4.5\text{ V}$	-5			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1.5\text{ A}$		0.075	0.090	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -1.5\text{ A}$		0.097	0.119	
		$V_{GS} = -1.8\text{ V}, I_D = -0.5\text{ A}$		0.125	0.155	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -1.5\text{ A}$		8		S
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -1.5\text{ A}$		9.8	15	nC
		$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1.5\text{ A}$		6	10	
Gate-Source Charge	Q_{gs}		0.8			
Gate-Drain Charge	Q_{gd}		1.85			
Gate Resistance	R_g	$f = 1\text{ MHz}$		10		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 3.7\text{ }\Omega$ $I_D \cong -1.5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		15	30	ns
Rise Time	t_r			20	40	
Turn-Off Delay Time	$t_{d(off)}$			30	60	
Fall Time	t_f			10	20	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 3.7\text{ }\Omega$ $I_D \cong -1.5\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$		10	20	
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			25	50	
Fall Time	t_f			7	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-0.7	A
Pulse Diode Forward Current	I_{SM}				-13	
Body Diode Voltage	V_{SD}	$I_S = -1.5\text{ A}, V_{GS} = 0$		-0.8	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1.5\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		20	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			10	20	nC
Reverse Recovery Fall Time	t_a			15		ns
Reverse Recovery Rise Time	t_b			5		

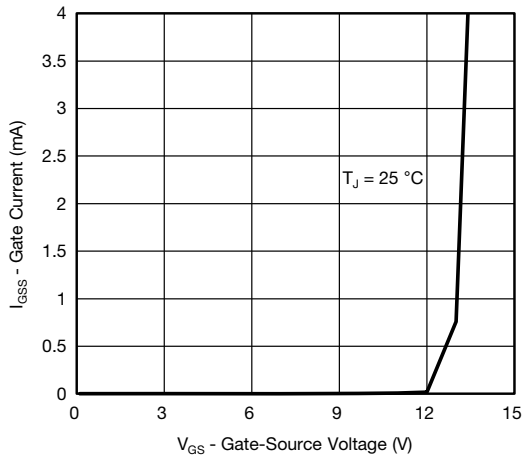
Notes:

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

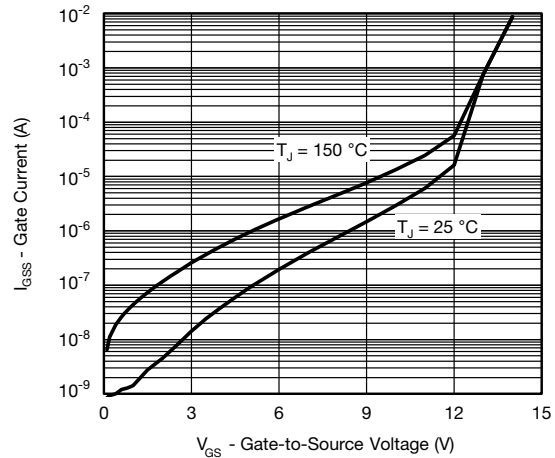
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



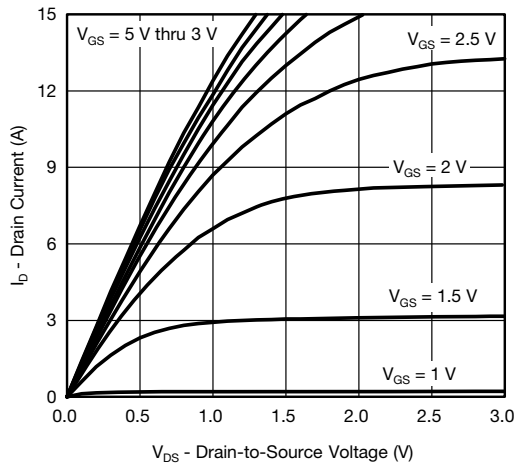
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



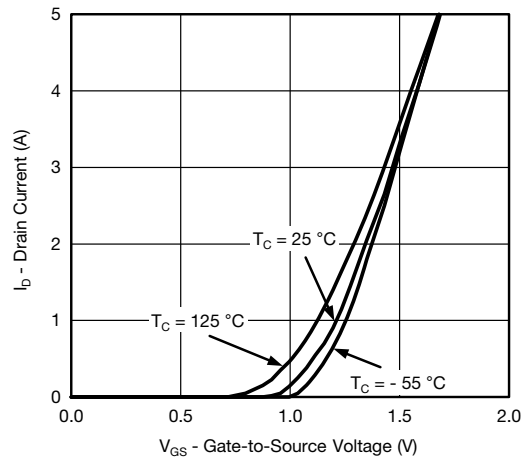
Gate Current vs. Gate-Source Voltage



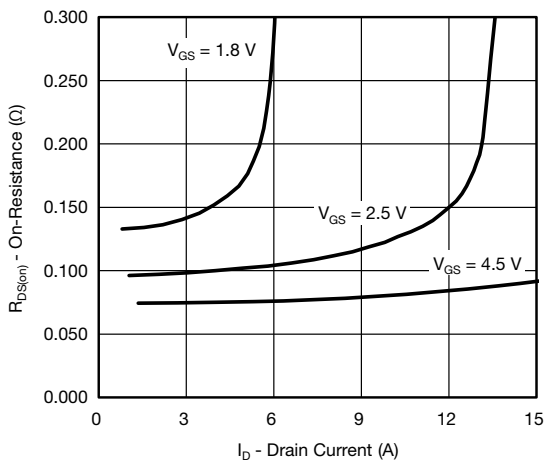
Gate Current vs. Gate-Source Voltage



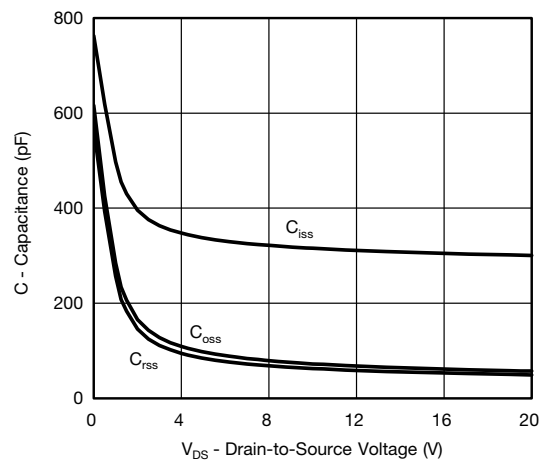
Output Characteristics



Transfer Characteristics

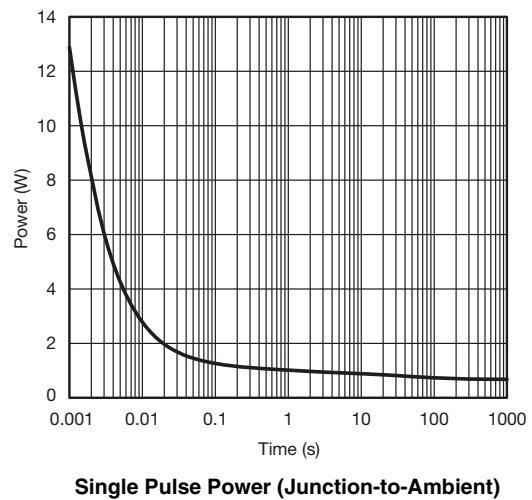
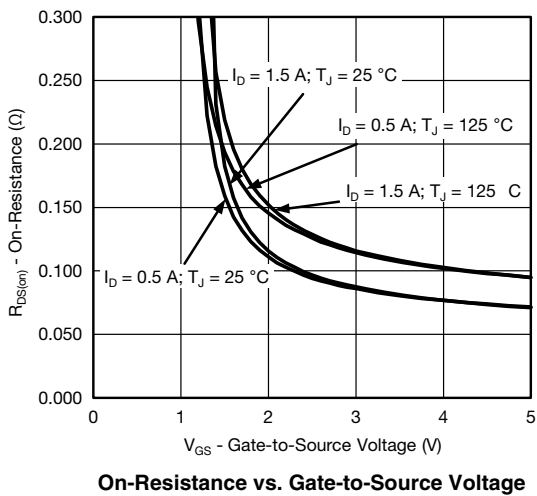
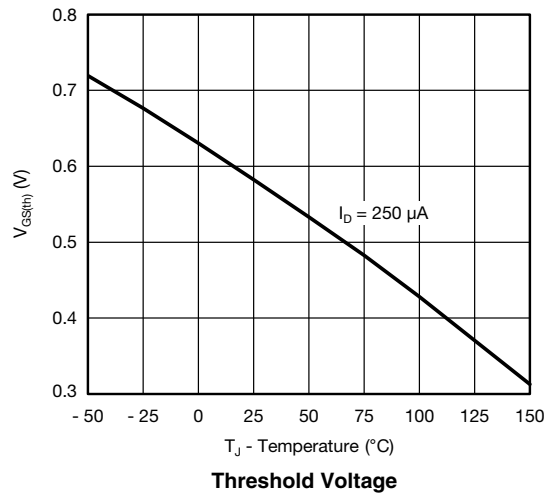
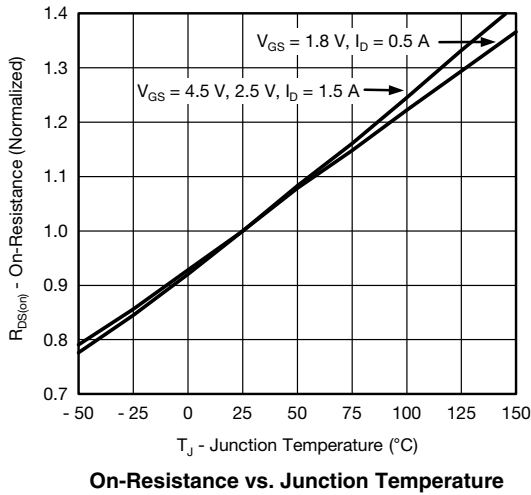
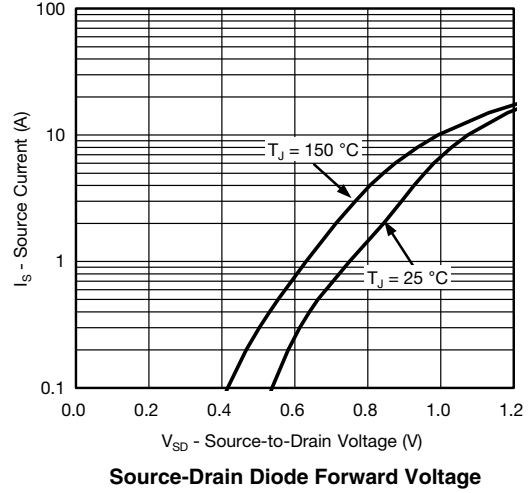
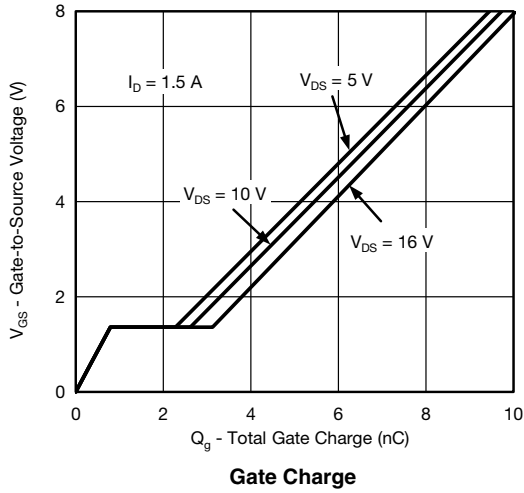


On-Resistance vs. Drain Current



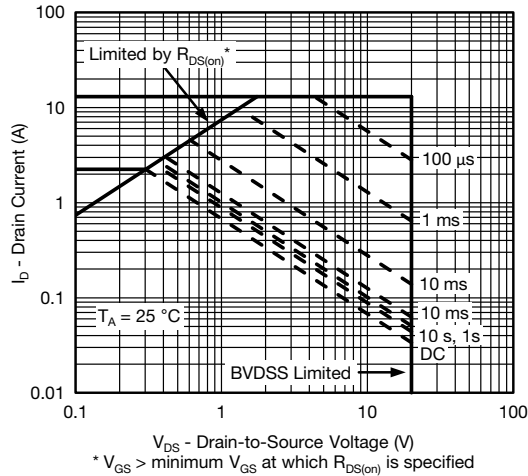
Capacitance

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

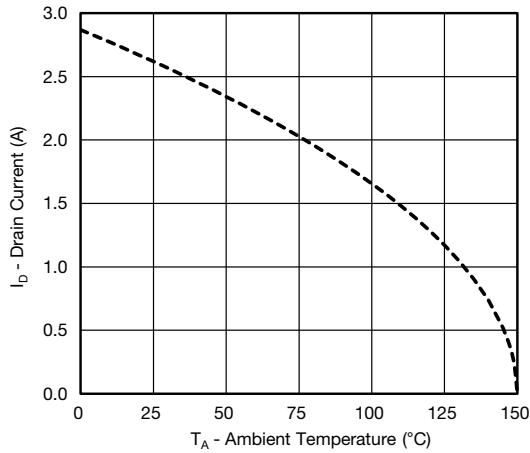




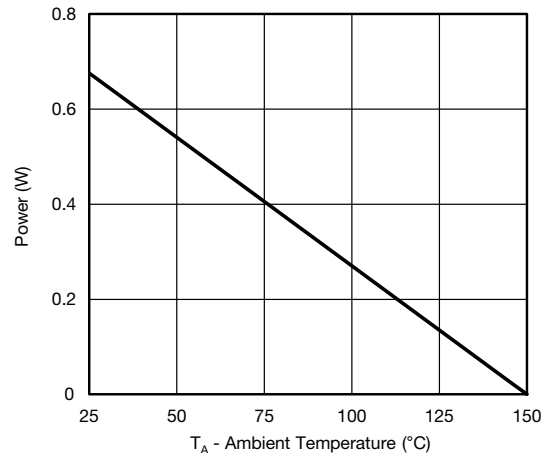
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Current Derating*

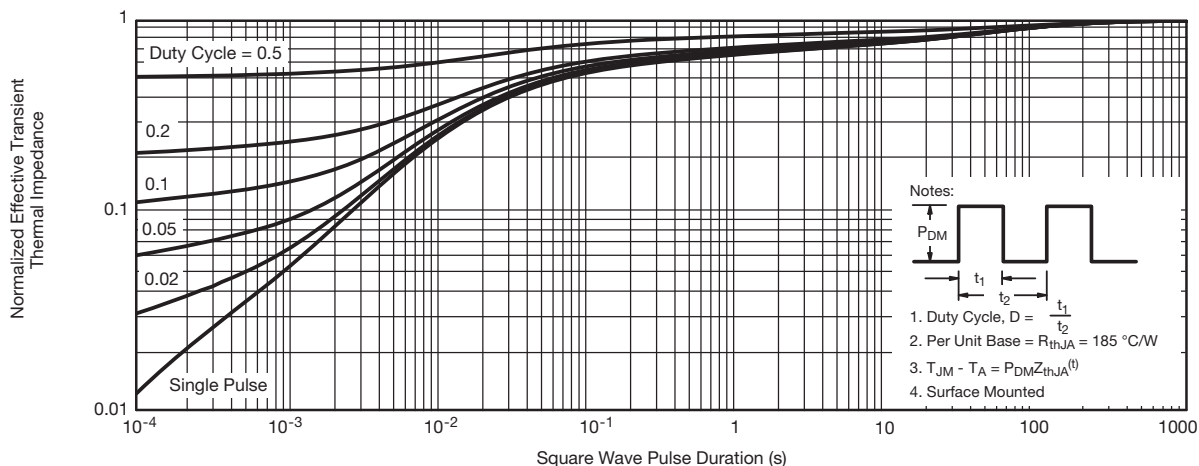


Power Derating

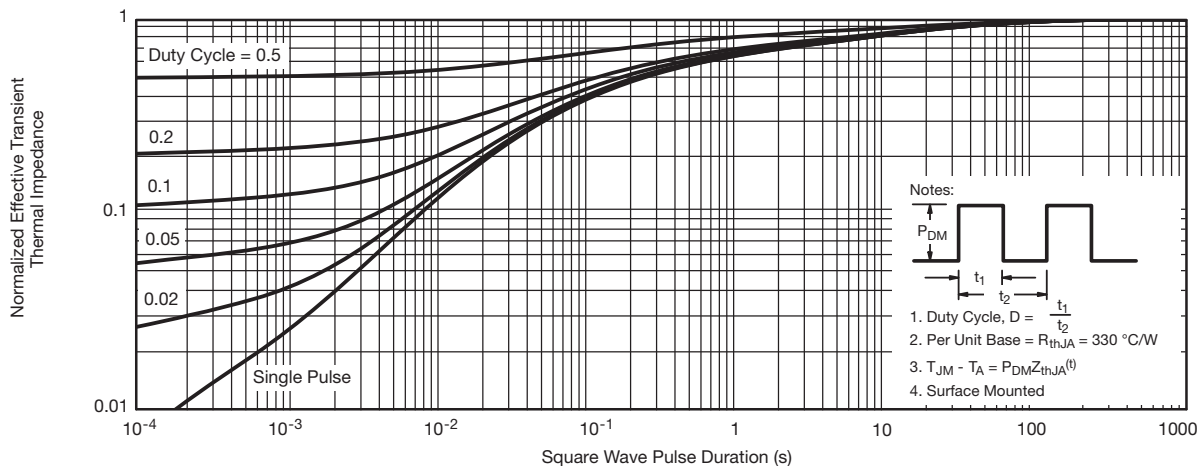
Note:
When mounted on 1" x 1" FR4 with full copper.

* The power dissipation P_D is based on $T_{J(max)} = 150\text{ °C}$, using junction-to-ambient 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.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



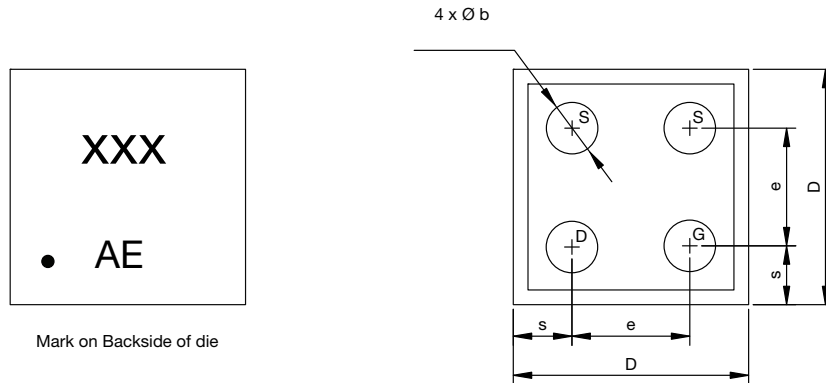
Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with maximum copper)



Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with minimum copper)

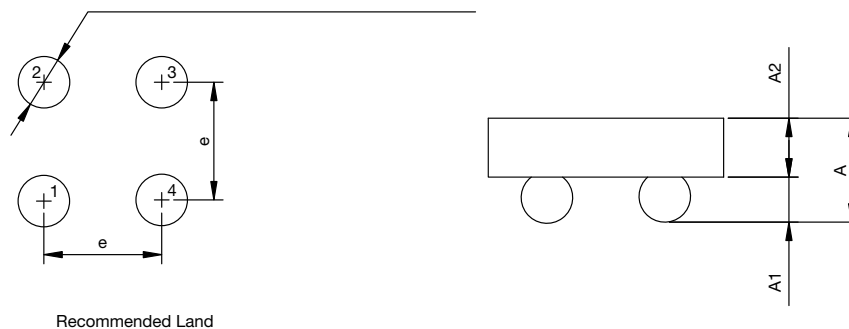
PACKAGE OUTLINE

MICRO FOOT 0.8 mm x 0.8 mm: 4-BUMP (2 x 2, 0.4 mm PITCH)



Mark on Backside of die

4 x \varnothing 0.205 to 0.225 Note 4
Solder Mask ~ \varnothing 0.215



Recommended Land

Notes (unless otherwise specified):

1. All dimensions are in millimeters.
2. Four (4) solder bumps are lead (Pb)-free 95.5Sn/3.5Ag/0.7Cu with diameter \varnothing 0.165 mm to \varnothing 0.185 mm.
3. Backside surface is coated with a Ti/Ni/Ag layer.
4. Non-solder mask defined copper landing pad.
5. • is location of pin 1.

Dim.	Millimeters ^a			Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.314	0.357	0.400	0.0124	0.0141	0.0157
A₁	0.127	0.157	0.187	0.0050	0.0062	0.0074
A₂	0.187	0.200	0.213	0.0074	0.0079	0.0084
b	0.165	0.175	0.185	0.0064	0.0068	0.0072
e		0.400			0.0157	
s	0.180	0.200	0.220	0.0070	0.0078	0.0086
D	0.760	0.800	0.840	0.0299	0.0314	0.0330

Notes:

- a. Use millimeters as the primary measurement.

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