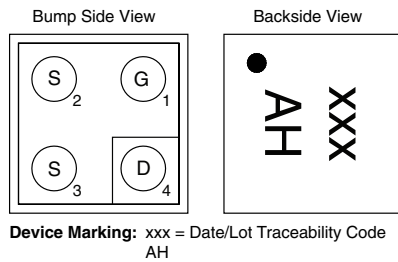


N-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) Max.	I _D (A) ^a	Q _g (Typ.)
30	0.109 at V _{GS} = 10 V	2.3	2.4 nC
	0.116 at V _{GS} = 4.5 V	2.3	
	0.123 at V _{GS} = 3.7 V	2.2	
	0.142 at V _{GS} = 2.5 V	2.0	

MICRO FOOT



Ordering Information: Si8816EDB-T2-E1 (Lead (Pb)-free and Halogen-free)

FEATURES

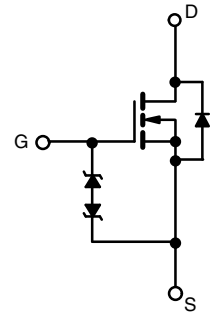
- TrenchFET[®] Power MOSFET
- Ultra Small 0.8 mm x 0.8 mm Outline
- Ultra Thin 0.4 mm max. Height
- Typical ESD Protection 1700 V (HBM)
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switch
- OVP Switch
- High Speed Switching
- DC/DC Converters
- For Smart Phones, Tablet PCs and Mobile Computing



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	30	V
Gate-Source Voltage	V _{GS}	± 12	
Continuous Drain Current (T _J = 150 °C)	I _D	T _A = 25 °C	2.3 ^a
		T _A = 70 °C	1.9 ^a
		T _A = 25 °C	1.5 ^b
		T _A = 70 °C	1.2 ^b
Pulsed Drain Current (t = 300 μs)	I _{DM}	8	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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		30		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 3.2		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	0.6		1.4	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 4.5\text{ V}$			± 0.1	μA
		$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 12\text{ V}$			± 1	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$			1	
		$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 10\text{ V}$	10			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 1\text{ A}$		0.087	0.109	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 1\text{ A}$		0.093	0.116	
		$V_{GS} = 3.7\text{ V}$, $I_D = 1\text{ A}$		0.096	0.123	
		$V_{GS} = 2.5\text{ V}$, $I_D = 0.5\text{ A}$		0.110	0.142	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ A}$		10		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		195		pF
Output Capacitance	C_{oss}			35		
Reverse Transfer Capacitance	C_{rss}			15		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 1\text{ A}$		4.4	8	nC
		$V_{DS} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 1\text{ A}$		2.4	4.5	
Gate-Source Charge	Q_{gs}			0.35		
Gate-Drain Charge	Q_{gd}			0.55		
Gate Resistance	R_g	$f = 1\text{ MHz}$		4		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$, $R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$		15	30	ns
Rise Time	t_r			20	40	
Turn-Off Delay Time	$t_{d(off)}$			20	40	
Fall Time	t_f			10	20	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$, $R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$		5	10	
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			15	30	
Fall Time	t_f			5	10	
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}				8	
Body Diode Voltage	V_{SD}	$I_S = 1\text{ A}$, $V_{GS} = 0\text{ V}$		0.75	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 1\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$		16	30	ns
Body Diode Reverse Recovery Charge	Q_{rr}			6	12	nC
Reverse Recovery Fall Time	t_a			13.5		ns
Reverse Recovery Rise Time	t_b			2.5		

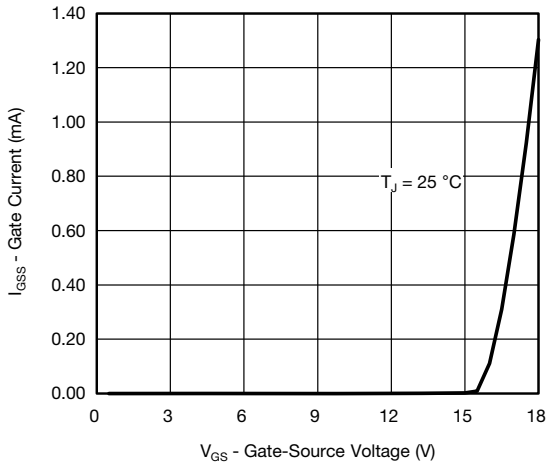
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

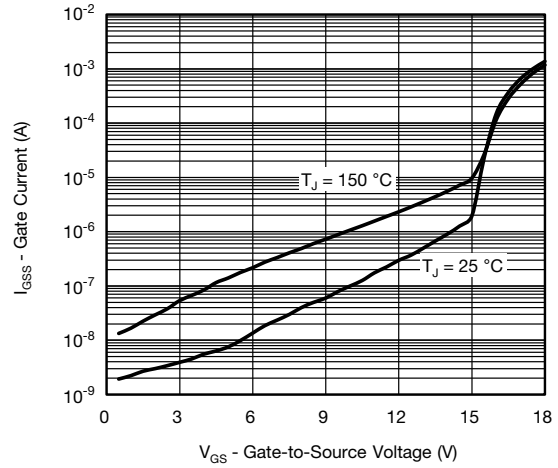
b. Guaranteed by design, not subject to production testing.

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.

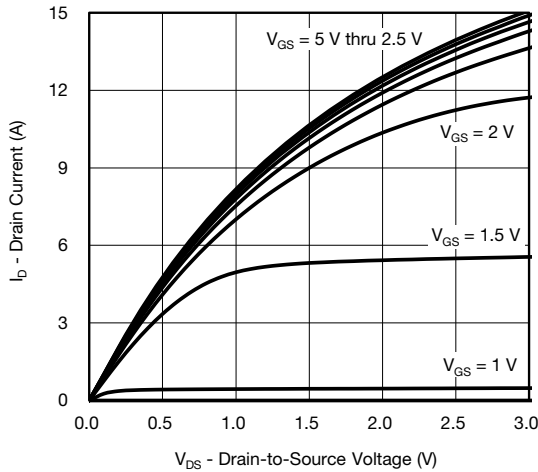
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



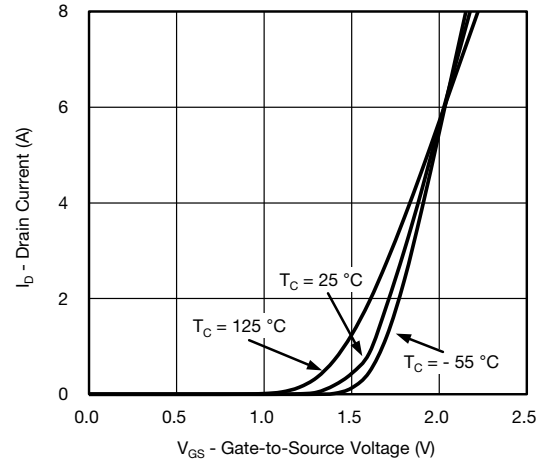
Gate Current vs. Gate-Source Voltage



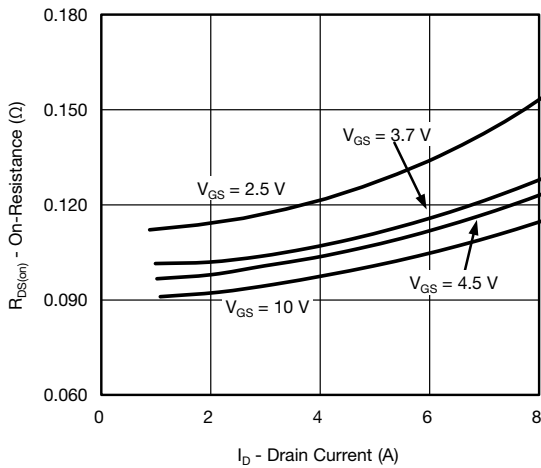
Gate Current vs. Gate-Source Voltage



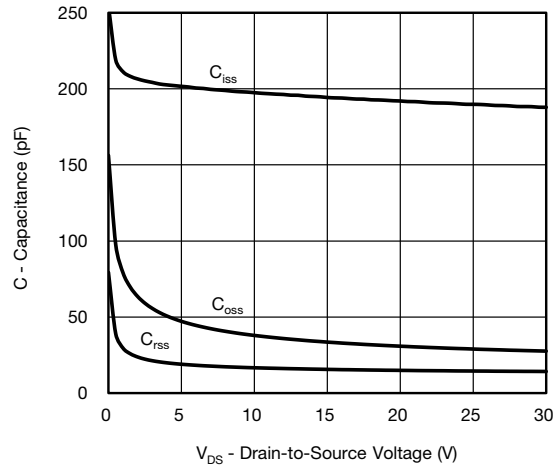
Output Characteristics



Transfer Characteristics

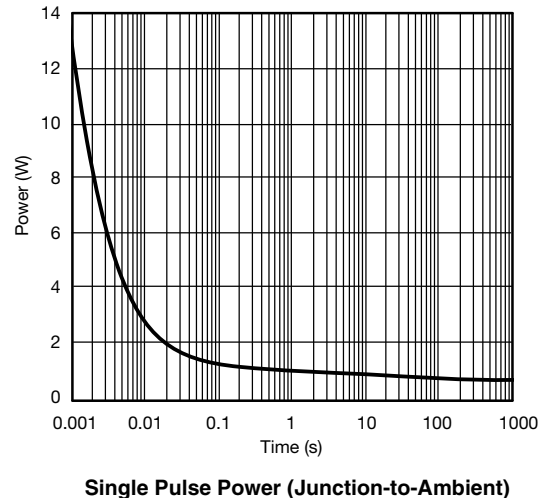
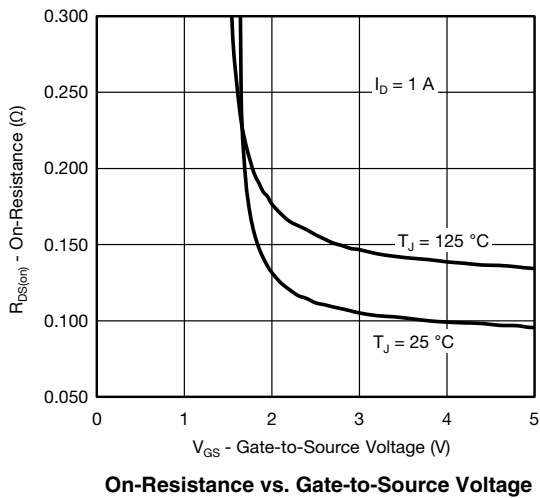
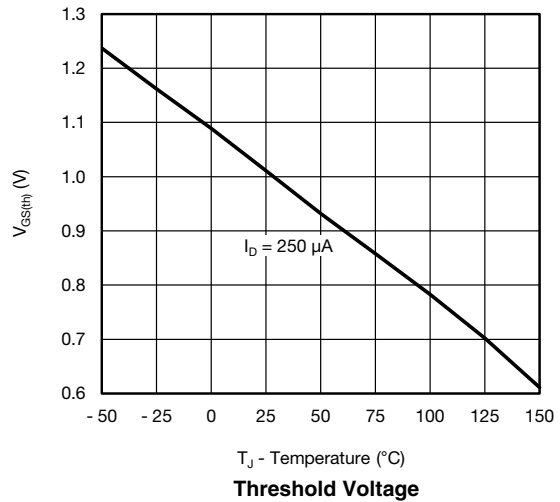
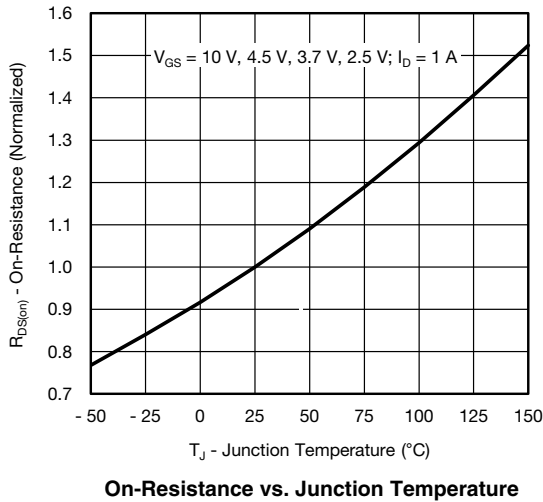
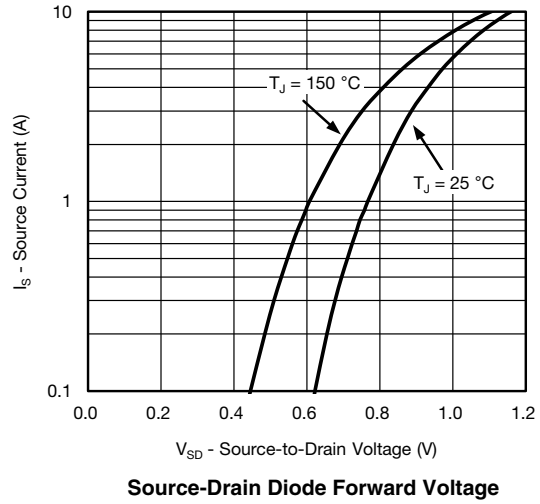
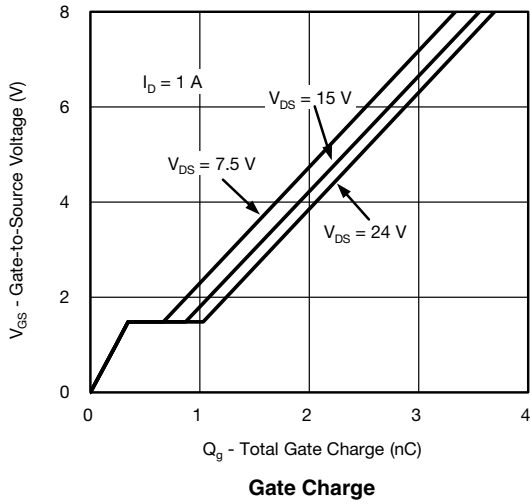


On-Resistance vs. Drain Current

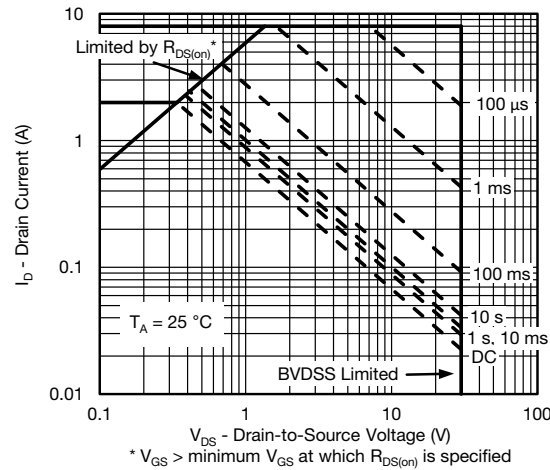


Capacitance vs. Drain-to-Source Voltage

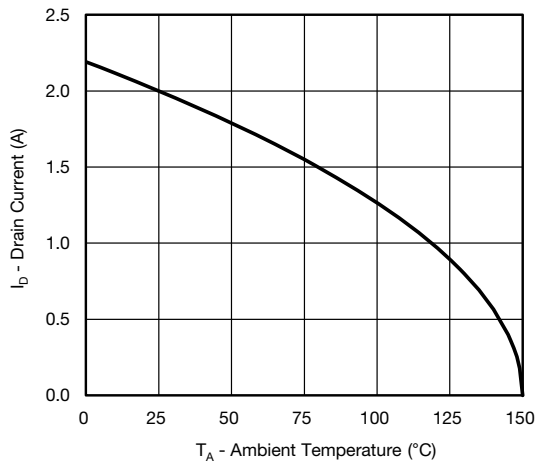
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



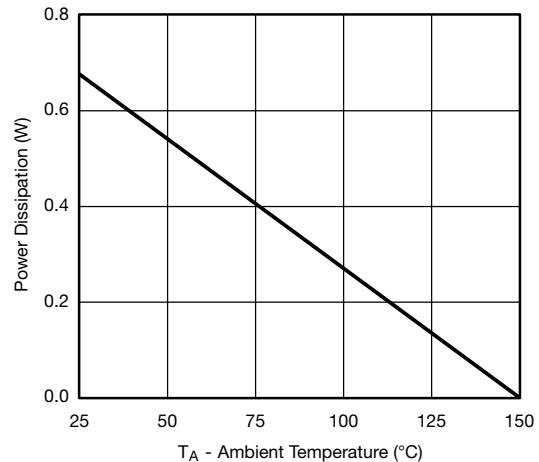
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Current Derating*

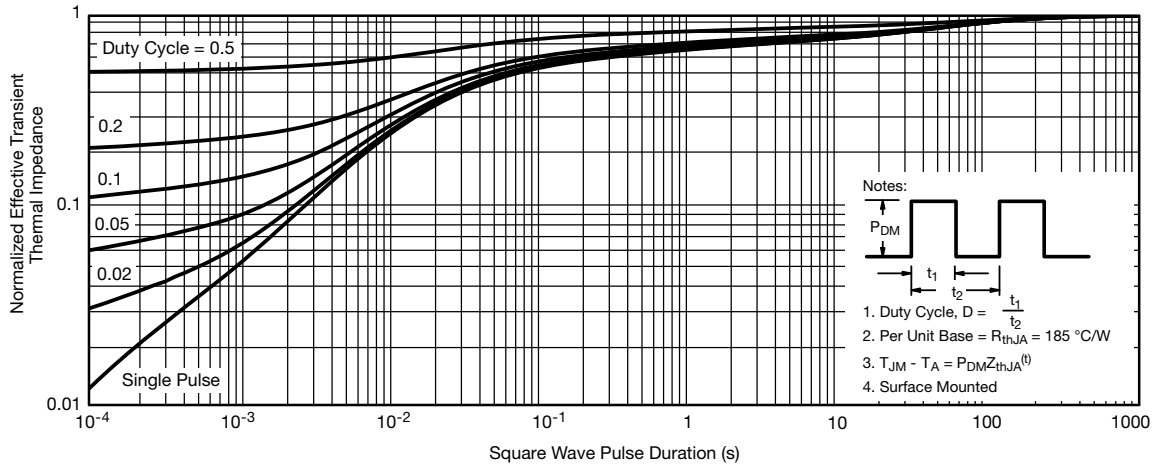


Power Derating

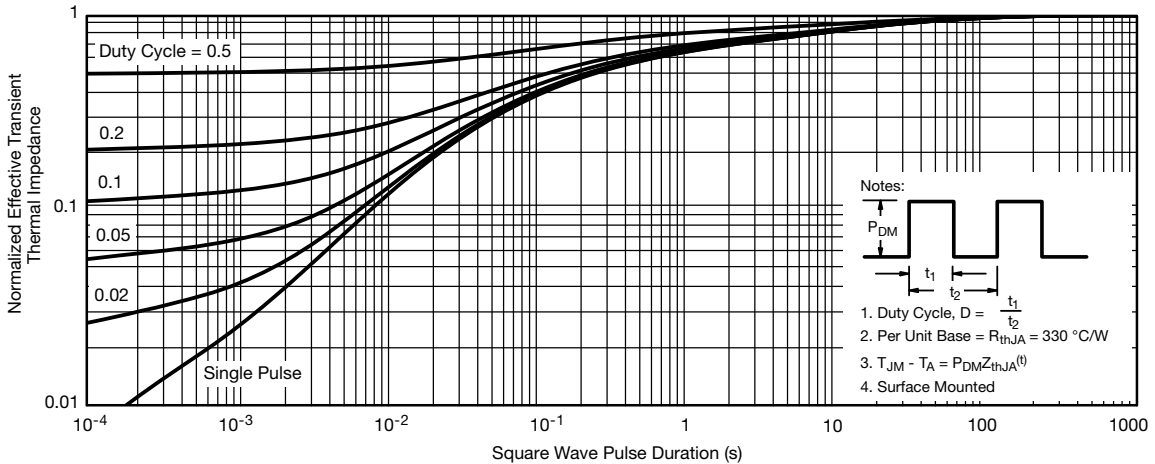
Note:
When mounted on 1" x 1" FR4 with full copper.

* The power dissipation P_D is based on $T_{J(max)} = 150$ °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)



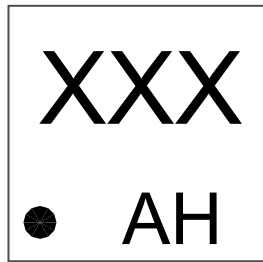
Normalized Thermal Transient Impedance, Junction-to-Ambient (On 1" x 1" FR4 board with maximum copper)



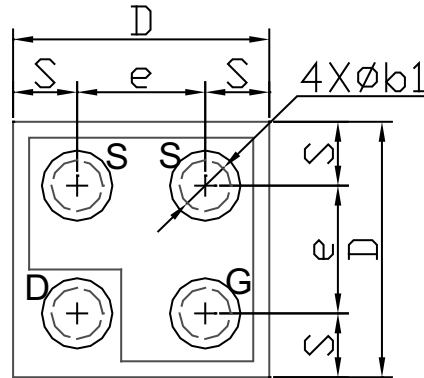
Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with minimum copper)

PACKAGE OUTLINE

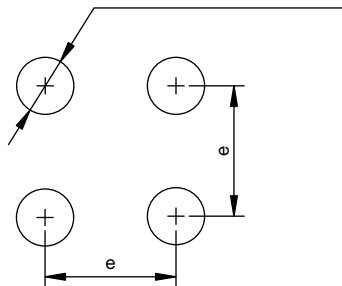
MICRO FOOT 0.8 mm x 0.8 mm: 4-BUMP (0.4 mm PITCH)



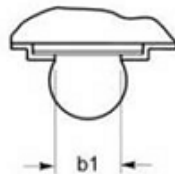
Mark on Backside of die



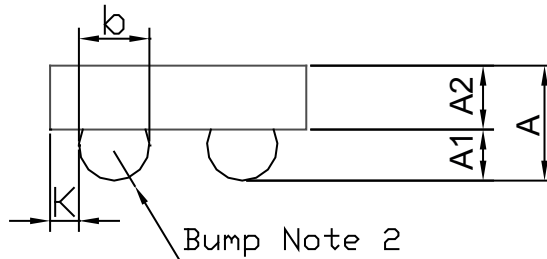
4 x Ø 0.205 to 0.225 Note 5
Solder Mask ~ Ø 0.215



Recommended Land



NOTE 4



Bump Note 2

Notes (Unless otherwise specified):

1. Laser mark on the backside surface of die.
2. Bumps are 95.5 % Sn,3.8 % Ag,0.7 % Cu.
3. * is location of pin 1.
4. " b1 " is the diameter of the solderable substrate surface, defined by an opening in the solder resist layer solder mask defined.
5. Non-solder mask defined copper landing pad.

Dim.	Millimeters ^a			Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.320	0.360	0.400	0.0125	0.0141	0.0157
A ₁	0.136	0.160	0.184	0.0053	0.0062	0.0072
A ₂	0.199	0.200	0.201	0.0078	0.0078	0.0079
b	0.200	0.220	0.240	0.0078	0.0086	0.0094
b ₁		0.175			0.0068	
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
K	0.060	0.090	0.120	0.0023	0.0035	0.0047

Notes:

- a. Use millimeters as the primary measurement.

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