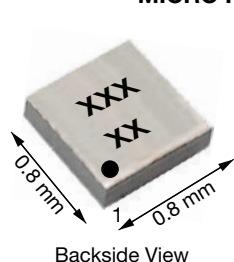


# N-Channel 20 V (D-S) MOSFET

## PRODUCT SUMMARY

V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (TYP.)
20	0.080 at V <sub>GS</sub> = 4.5 V	2.8	3.2 nC
	0.090 at V <sub>GS</sub> = 2.5 V	2.6	
	0.105 at V <sub>GS</sub> = 1.8 V	2.4	
	0.150 at V <sub>GS</sub> = 1.5 V	2.0	

## MICRO FOOT® 0.8 x 0.8



Backside View



Bump Side View

**Marking Code:** xx = AA

xxx = Date/Lot traceability code

## Ordering Information:

Si8800EDB-T2-E1 (lead (Pb)-free and halogen-free)

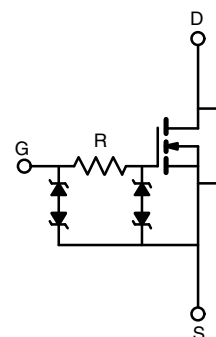
## FEATURES

- TrenchFET® power MOSFET
- Ultra small 0.8 mm x 0.8 mm outline
- Ultra thin 0.357 mm height
- Typical ESD protection 1500 V
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Portable devices such as cell phones, smart phones, and MP3 players
- Load switch
- Small signal switch



## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V <sub>DS</sub>	20	V
Gate-Source Voltage	V <sub>GS</sub>	± 8	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>A</sub> = 25 °C	A
		T <sub>A</sub> = 70 °C	
		T <sub>A</sub> = 25 °C	
		T <sub>A</sub> = 70 °C	
Pulsed Drain Current	I <sub>DM</sub>	15	A
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>A</sub> = 25 °C	
		T <sub>A</sub> = 25 °C	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>A</sub> = 25 °C	W
		T <sub>A</sub> = 70 °C	
		T <sub>A</sub> = 25 °C	
		T <sub>A</sub> = 70 °C	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Soldering Recommendations (Peak Temperature) <sup>c</sup>		260	

## THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum Junction-to-Ambient <sup>a, d</sup>	R <sub>thJA</sub>	105	135	°C/W
Maximum Junction-to-Ambient <sup>b, e</sup>		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.

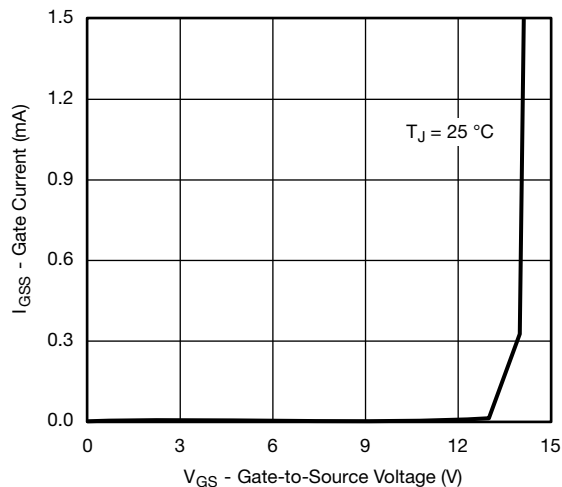
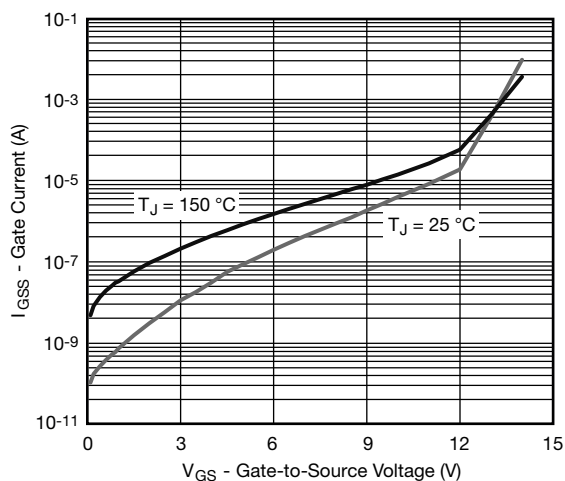
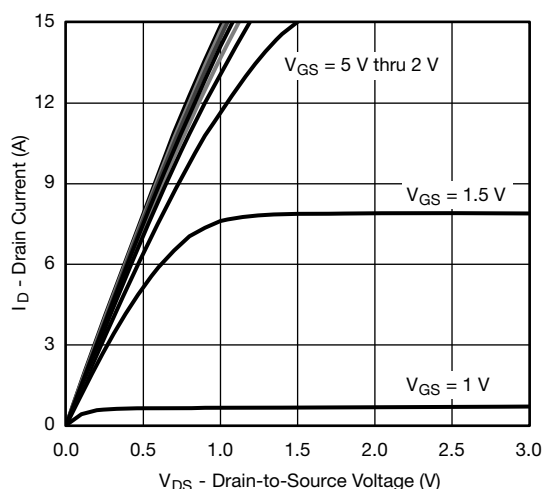
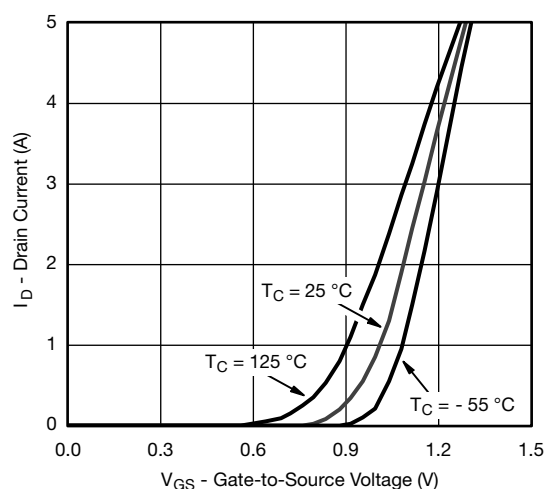
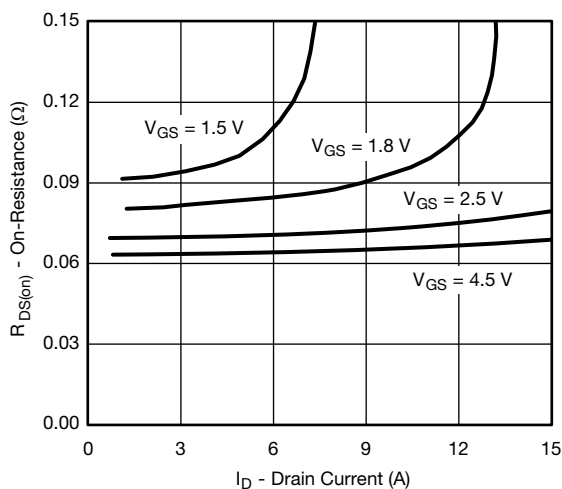
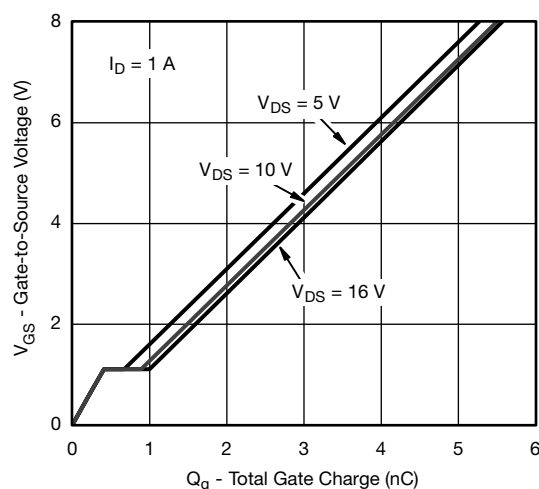


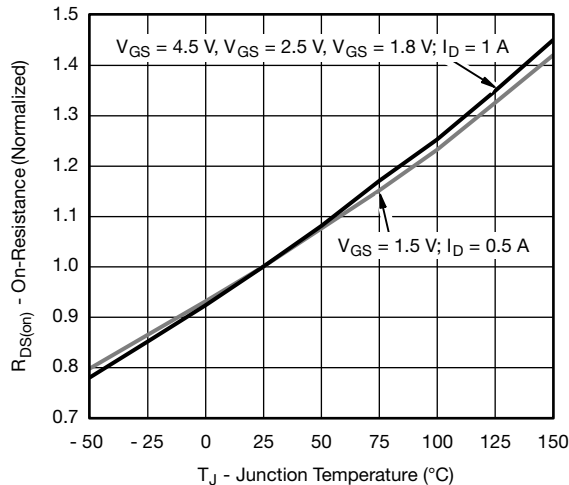
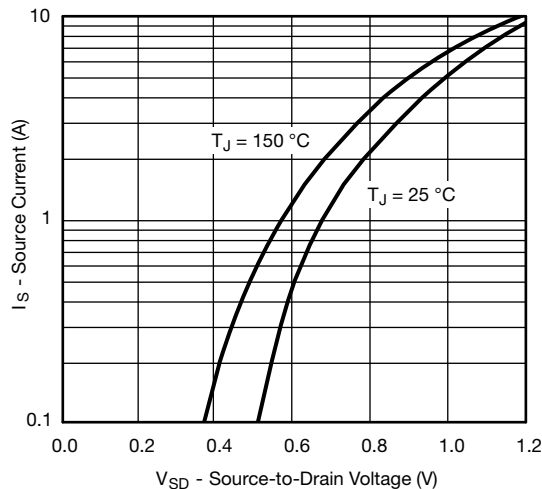
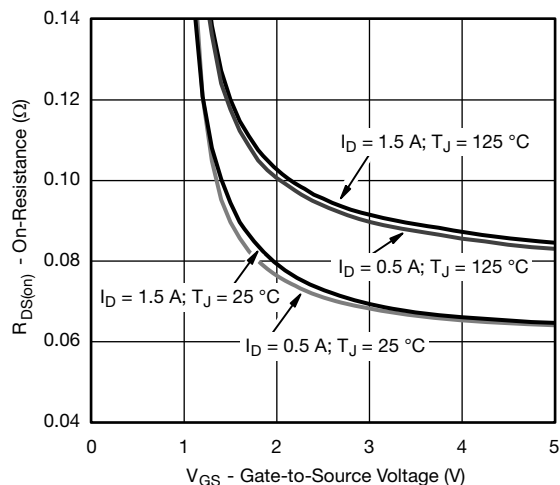
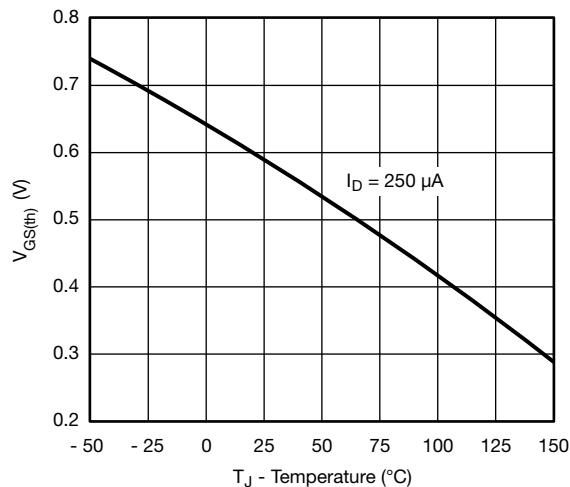
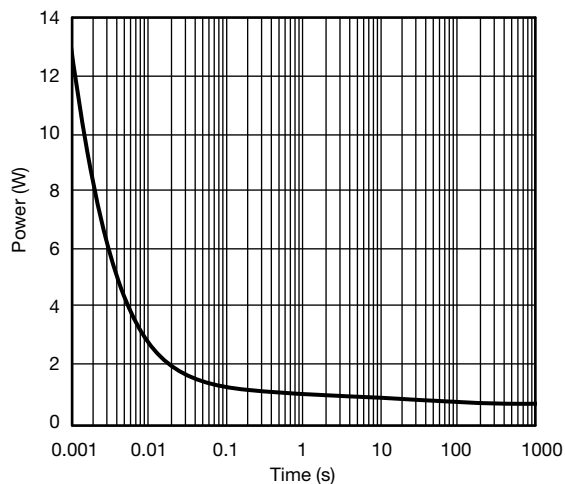
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20	-	-	V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA	-	18	-	mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>		-	-2.3	-	
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	0.4	-	1	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 4.5 V	-	-	± 0.5	μA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 8 V	-	-	± 6	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V	-	-	1	
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C	-	-	10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 4.5 V	10	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1 A	-	0.066	0.080	Ω
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 1 A	-	0.072	0.090	
		V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 1 A	-	0.082	0.105	
		V <sub>GS</sub> = 1.5 V, I <sub>D</sub> = 0.5 A	-	0.095	0.150	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 A	-	10	-	S
Dynamic <sup>b</sup>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 8 V, I <sub>D</sub> = 1 A	-	5.5	8.3	nC
		V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1 A	-	3.2	5	
Gate-Source Charge	Q <sub>gs</sub>		-	0.42	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	0.5	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz	-	1	-	kΩ
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ 1 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω	-	65	130	ns
Rise Time	t <sub>r</sub>		-	85	170	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	900	1800	
Fall Time	t <sub>f</sub>		-	350	700	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ 1 A, V <sub>GEN</sub> = 8 V, R <sub>g</sub> = 1 Ω	-	25	50	
Rise Time	t <sub>r</sub>		-	40	80	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	1100	2200	
Fall Time	t <sub>f</sub>		-	350	700	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	-	-	0.7	A
Pulse Diode Forward Current	I <sub>SM</sub>		-	-	15	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 1 A, V <sub>GS</sub> = 0 V	-	1	1.5	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 1 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C	-	13	25	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	5	10	nC
Reverse Recovery Fall Time	t <sub>a</sub>		-	8	-	ns
Reverse Recovery Rise Time	t <sub>b</sub>		-	5	-	

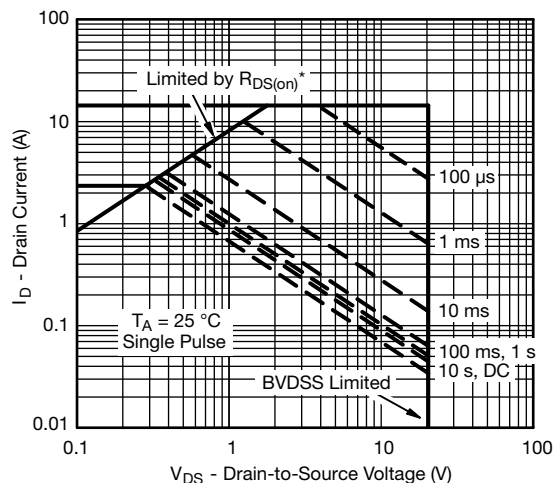
**Notes**

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

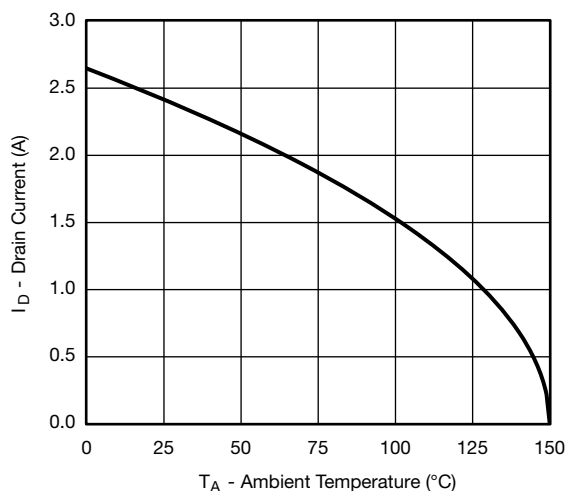
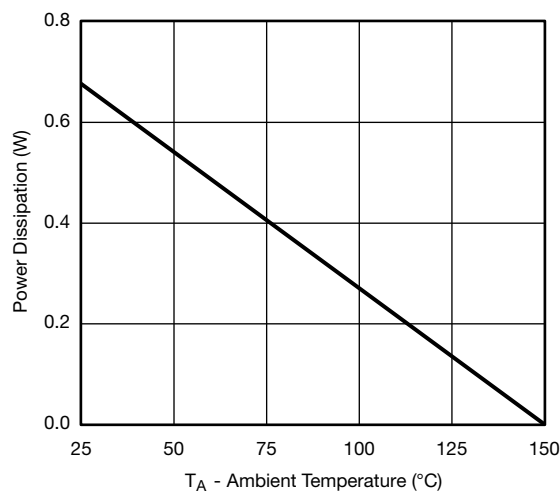
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**Gate Charge**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**On-Resistance vs. Junction Temperature**

**Source-Drain Diode Forward Voltage**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

**Single Pulse Power (Junction-to-Ambient)**

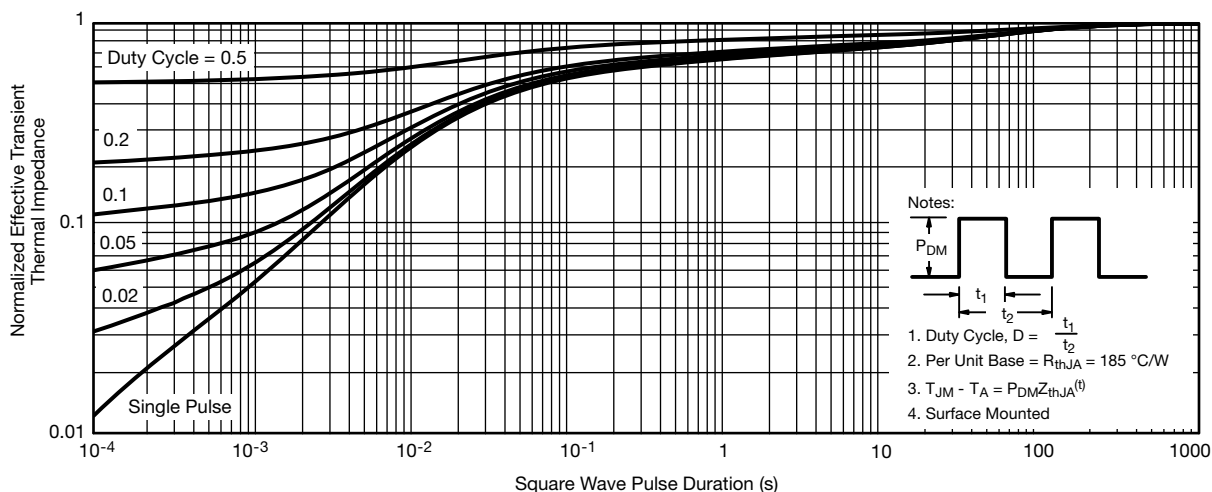
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)


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

**Safe Operating Area, Junction-to-Ambient**

**Current Derating\***

**Power Derating**
**Note**

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

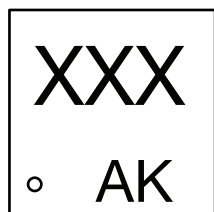
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150\text{ }^{\circ}\text{C}$ , using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating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

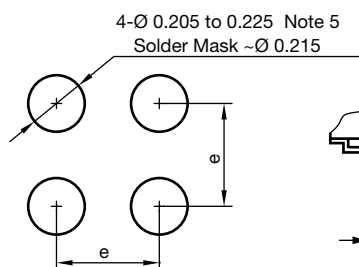
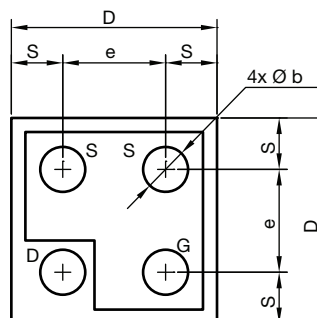
**Normalized Thermal Transient Impedance, Junction-to-Ambient (On 1" x 1" FR4 Board with Minimum Copper)**

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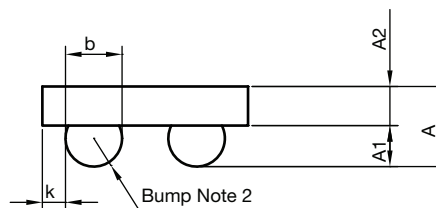
## MICRO FOOT®: 4-Bump (0.8 mm x 0.8 mm, 0.4 mm Pitch)



Mark on Backside of die



Note 4



### Notes

- (1) Laser mark on the backside surface of die
- (2) Bumps are 95.5 % Sn, 3.8 % Ag, 0.7 % Cu
- (3) "i" is the 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 <sup>a</sup>			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.328	0.365	0.402	0.0129	0.0144	0.0158
A1	0.136	0.160	0.184	0.0053	0.0062	0.0072
A2	0.192	0.205	0.218	0.0076	0.0081	0.0086
b	0.200	0.220	0.240	0.0078	0.0086	0.0094
b1	0.175			0.0068		
e	0.400			0.0157		
S	0.160	0.180	0.200	0.0062	0.0070	0.0078
D	0.720	0.760	0.800	0.0283	0.0299	0.0314
K	0.040	0.070	0.100	0.0015	0.0027	0.0039

### Note

- a. Use millimeters as the primary measurement.

ECN: T15-0053-Rev. A, 16-Feb-15  
DWG: 6033



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