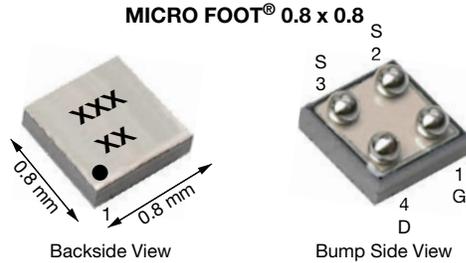


## N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) MAX.	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (TYP.)
20	0.072 at V <sub>GS</sub> = 4.5 V	2.9	3 nC
	0.079 at V <sub>GS</sub> = 2.5 V	2.8	
	0.092 at V <sub>GS</sub> = 1.8 V	2.6	
	0.125 at V <sub>GS</sub> = 1.5 V	2.2	



**Marking Code:** xx = AJ  
xxx = Date/Lot traceability code

**Ordering Information:**  
Si8810EDB-T2-E1 (lead (Pb)-free and halogen-free)

### FEATURES

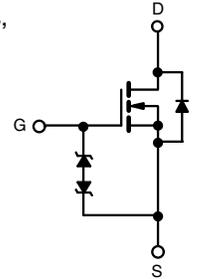
- TrenchFET® power MOSFET
- Ultra small 0.8 mm x 0.8 mm outline
- Ultra thin 0.357 mm height
- Typical ESD protection 2000 V (HBM)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

- Portable devices such as cell phones, smart phones, and tablet PCs
- Load switch
- Small signal switch
- High speed switching



N-Channel MOSFET

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	2.9 <sup>a</sup>
		T <sub>A</sub> = 70 °C	2.3 <sup>a</sup>
		T <sub>A</sub> = 25 °C	2.1 <sup>b</sup>
		T <sub>A</sub> = 70 °C	1.7 <sup>b</sup>
Pulsed Drain Current (t = 300 μs)	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	0.4 <sup>b</sup>
Maximum Power Dissipation	P <sub>D</sub>	T <sub>A</sub> = 25 °C	0.9 <sup>a</sup>
		T <sub>A</sub> = 70 °C	0.6 <sup>a</sup>
		T <sub>A</sub> = 25 °C	0.5 <sup>b</sup>
		T <sub>A</sub> = 70 °C	0.3 <sup>b</sup>
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	t ≤ 5 s
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.



<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	21	-	mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-2.7	-	
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	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$	-	-	$\pm 0.5$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	-	-	$\pm 5$	
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 <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	10	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 1\text{ A}$	-	0.058	0.072	$\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 1\text{ A}$	-	0.063	0.079	
		$V_{GS} = 1.8\text{ V}, I_D = 1\text{ A}$	-	0.072	0.092	
		$V_{GS} = 1.5\text{ V}, I_D = 0.5\text{ A}$	-	0.080	0.125	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ A}$	-	12	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	245	-	pF
Output Capacitance	$C_{oss}$		-	55	-	
Reverse Transfer Capacitance	$C_{rss}$		-	25	-	
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 8\text{ V}, I_D = 1\text{ A}$	-	5.2	8	nC
		$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 1\text{ A}$	-	3	4.5	
$Q_{gs}$	-		0.35	-		
$Q_{gd}$	-		0.45	-		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	-	5	-	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	7	15	ns
Rise Time	$t_r$		-	12	25	
Turn-Off Delay Time	$t_{d(off)}$		-	25	50	
Fall Time	$t_f$		-	7	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 8\text{ V}, R_g = 1\text{ }\Omega$	-	5	10	
Rise Time	$t_r$		-	10	20	
Turn-Off Delay Time	$t_{d(off)}$		-	15	30	
Fall Time	$t_f$		-	7	15	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	0.7	A
Pulse Diode Forward Current	$I_{SM}$		-	-	15	
Body Diode Voltage	$V_{SD}$	$I_S = 1\text{ A}, V_{GS} = 0\text{ V}$	-	0.7	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	11	20	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	5	10	nC
Reverse Recovery Fall Time	$t_a$		-	7	-	ns
Reverse Recovery Rise Time	$t_b$		-	4	-	

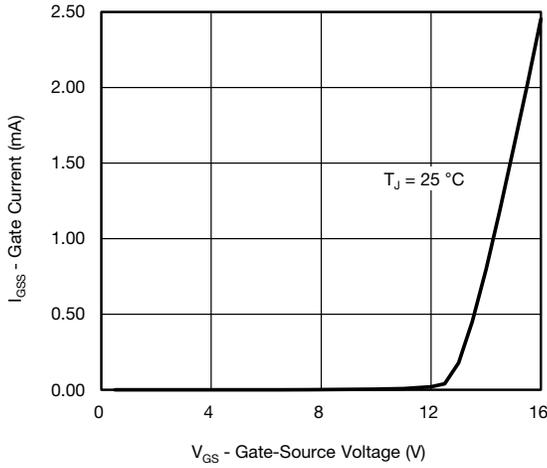
**Notes**

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

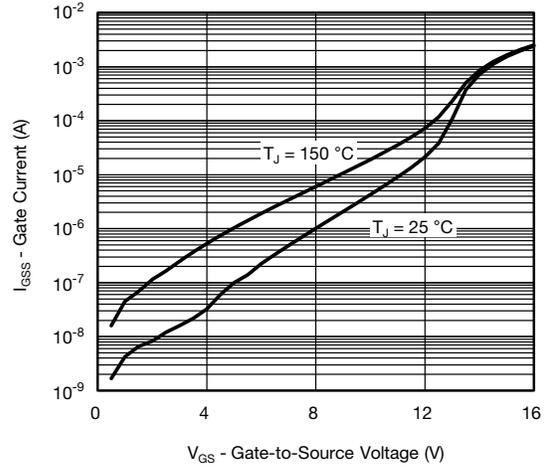
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



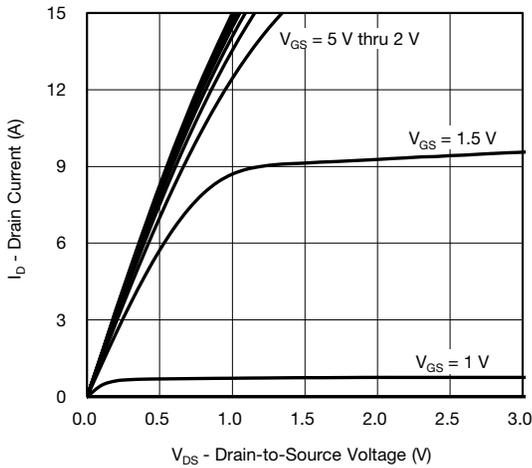
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



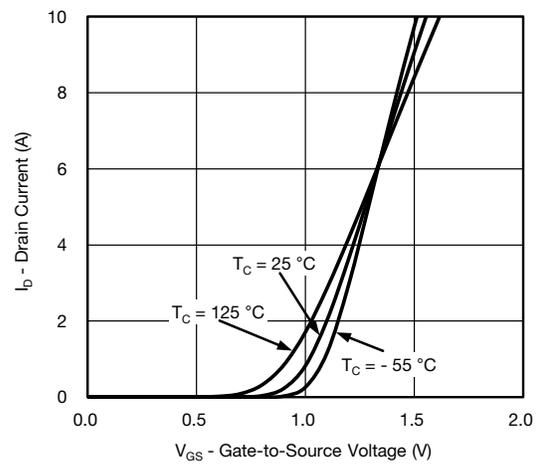
Gate Current vs. Gate-Source Voltage



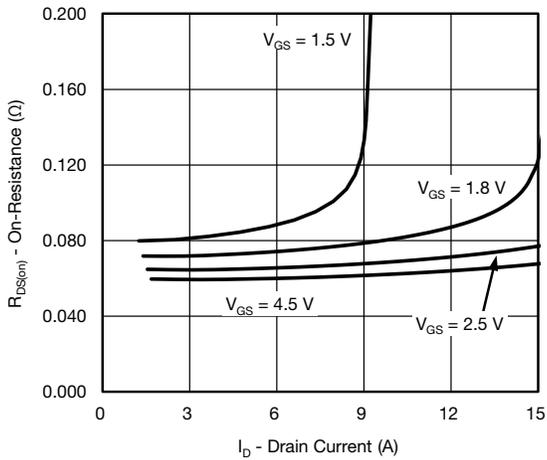
Gate Current vs. Gate-Source Voltage



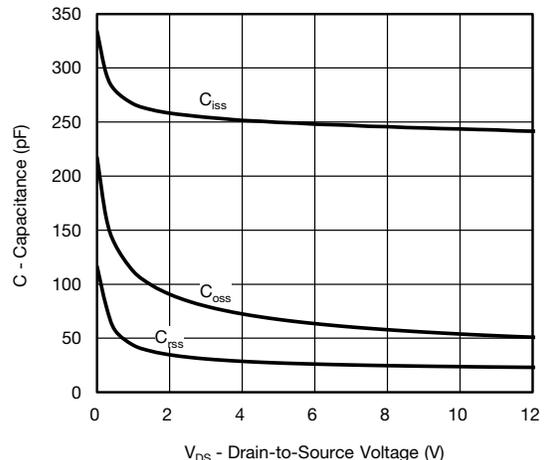
Output Characteristics



Transfer Characteristics

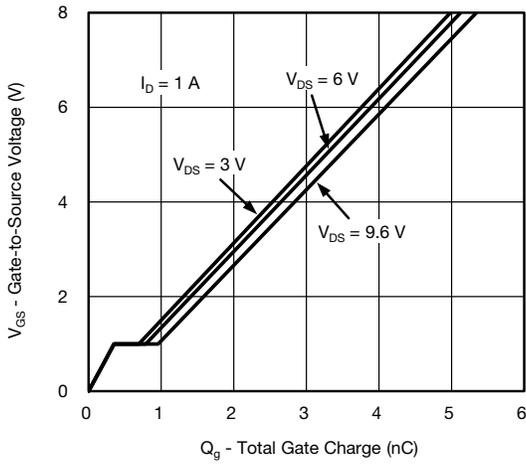


On-Resistance vs. Drain Current

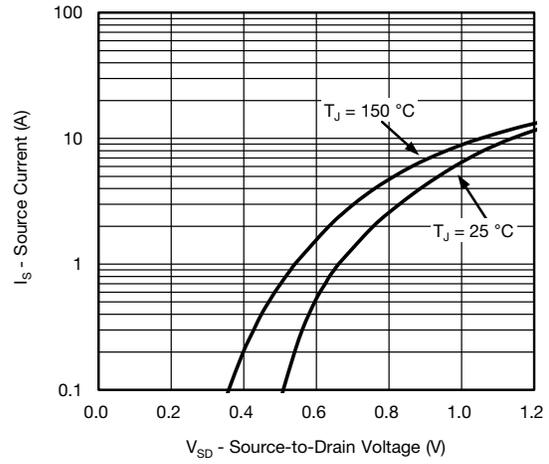


Capacitance vs. Drain-to-Source Voltage

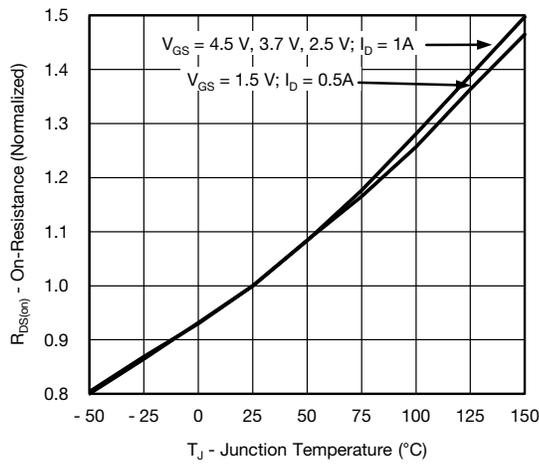
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



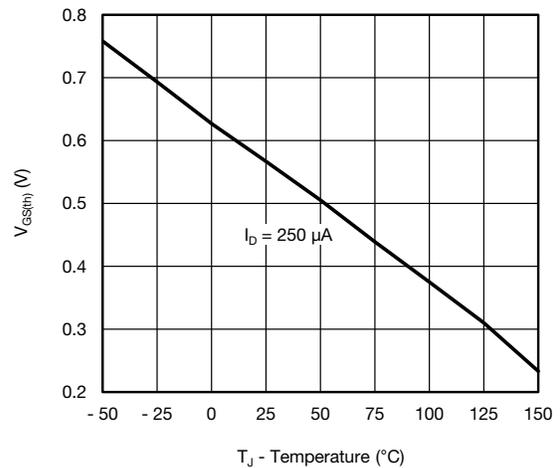
**Gate Charge**



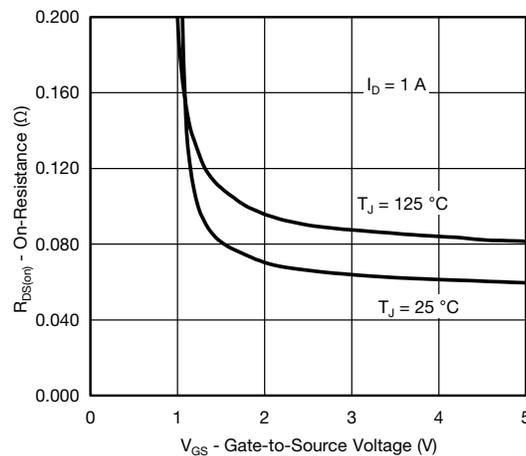
**Source-Drain Diode Forward Voltage**



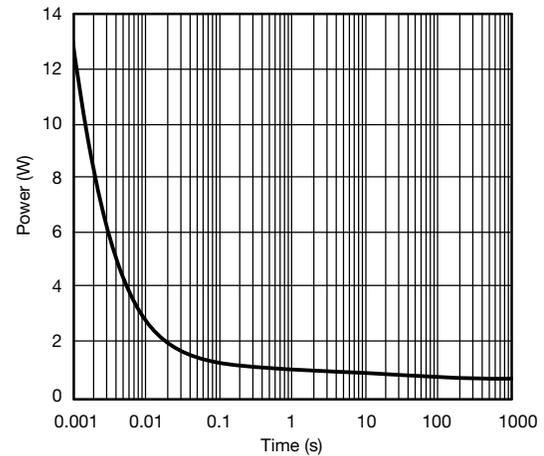
**On-Resistance vs. Junction Temperature**



**Threshold Voltage**



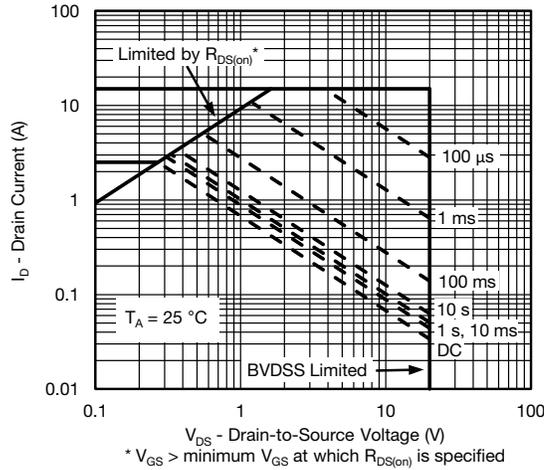
**On-Resistance vs. Gate-to-Source Voltage**



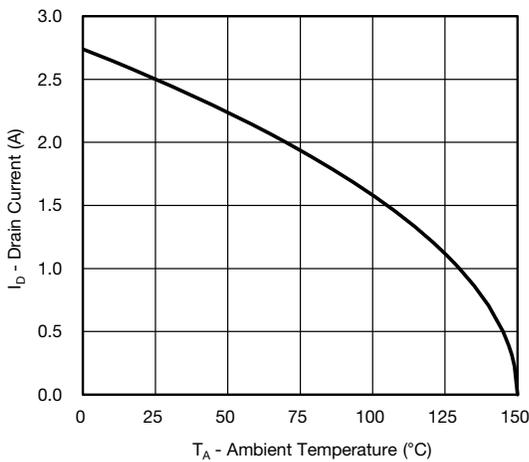
**Single Pulse Power (Junction-to-Ambient)**



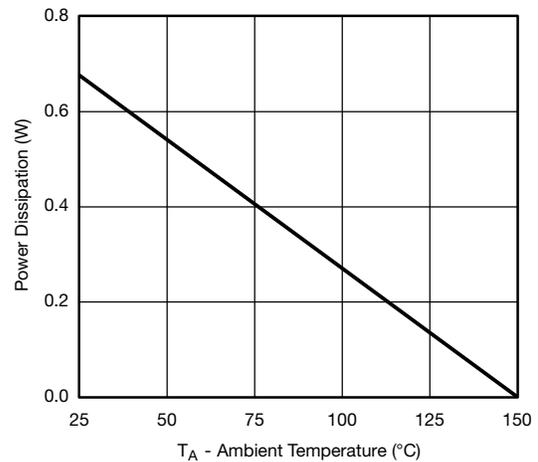
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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



**Current Derating\***



**Power Derating**

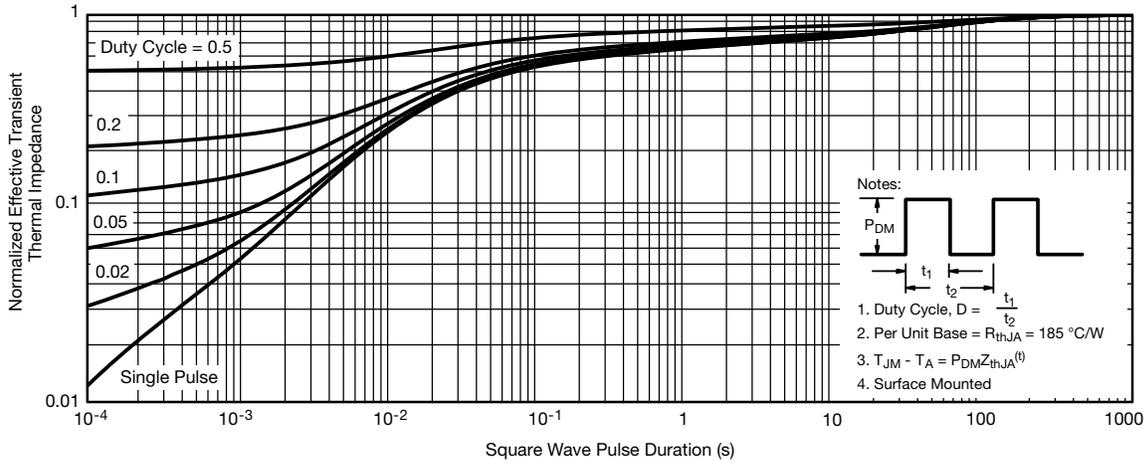
**Note**

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

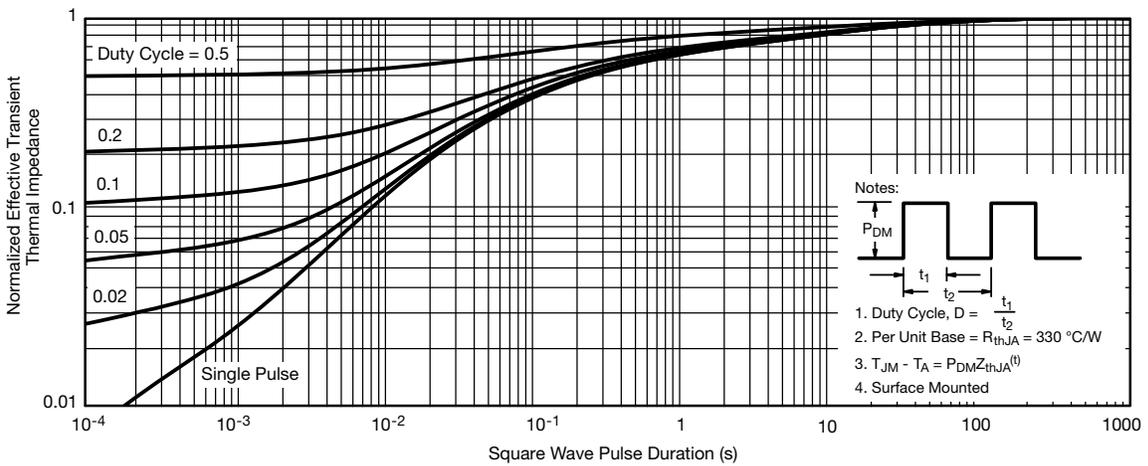
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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

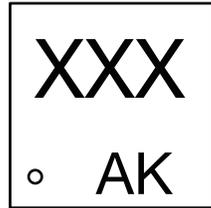


Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with minimum copper)

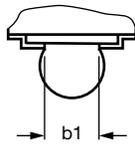
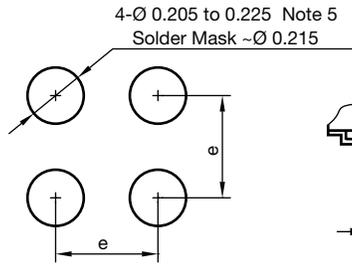
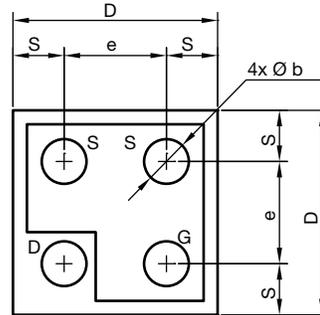
Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?62829](http://www.vishay.com/ppg?62829).



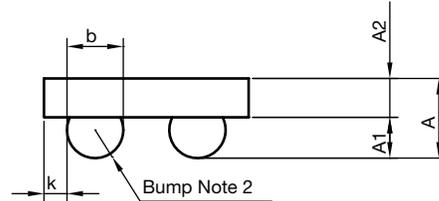
# MICRO FOOT®: 4-Bump (0.8 mm x 0.8 mm, 0.4 mm Pitch)



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



## Disclaimer

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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**





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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.