

## P-Channel 12 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.)
- 12	0.0098 at V <sub>GS</sub> = - 4.5 V	- 23.5	35 nC
	0.015 at V <sub>GS</sub> = - 2.5 V	- 15.2	
	0.02/ at V <sub>GS</sub> = - 1.8 V	- 10.5	

### FEATURES

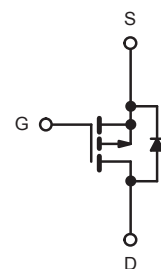
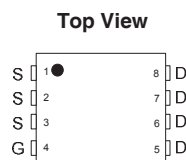
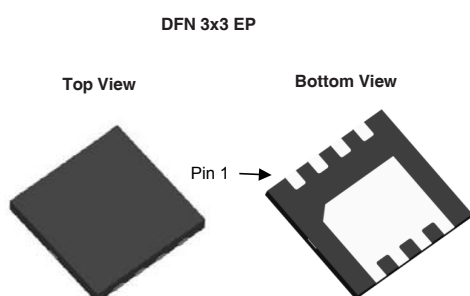
- DT-Trench Power MOSFET
- Ultra Small DFN3x3 Chipscale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

- PA Switch
- Battery Switch
- Load Switch



P-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>	- 12	V
Gate-Source Voltage	V <sub>GS</sub>	± 8	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	- 23.5
		T <sub>C</sub> = 70 °C	- 26.7
		T <sub>A</sub> = 25 °C	- 20.7 <sup>b, c</sup>
		T <sub>A</sub> = 70 °C	- 08.7 <sup>b, c</sup>
Pulsed Drain Current	I <sub>DM</sub>	- 105	A
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	- 16.7
		T <sub>A</sub> = 25 °C	- 3.5 <sup>b, c</sup>
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	37
		T <sub>C</sub> = 70 °C	26
		T <sub>A</sub> = 25 °C	2.9 <sup>b, c</sup>
		T <sub>A</sub> = 70 °C	1.96 <sup>b, c</sup>
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C
Package Reflow Conditions <sup>d</sup>	IR/Convection	260	

Notes:

a. Based on T<sub>C</sub> = 25 °C.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 s.

d. Refer to IPC/JEDEC (J-STD-020), no manual or hand soldering.

e. In this document, any reference to the Case represents the body of the DFN2X2 device and Foot is the bump.

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, b</sup>	$R_{thJA}$	31	42	°C/W
Maximum Junction-to-Foot (Drain)	Steady State $R_{thJF}$	13	16	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Maximum under steady state conditions is 72 °C/W.

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-12			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-13.3		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		2.4			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.75		-0.9	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 0\text{ V}$			-100	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -8\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -8\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$			-10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.0/87	0.012	$\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		0.015	0.018	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		0.020	0.024	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -4\text{ V}, I_D = -1\text{ A}$		8.3		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		2220		pF
Output Capacitance	$C_{oss}$		865			
Reverse Transfer Capacitance	$C_{rss}$		555			
Total Gate Charge	$Q_g$	$V_{DS} = -6\text{ V}, V_{GS} = -5\text{ V}, I_D = -1\text{ A}$		38	57	nC
Gate-Source Charge	$Q_{gs}$	$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		35	53	
Gate-Drain Charge	$Q_{gd}$		7.3			
Gate Resistance	$R_g$		$V_{GS} = -0.1\text{ V}, f = 1\text{ MHz}$		28	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$		14	21	ns
Rise Time	$t_r$		25	40		
Turn-Off Delay Time	$t_{d(off)}$		380	570		
Fall Time	$t_f$		240	360		

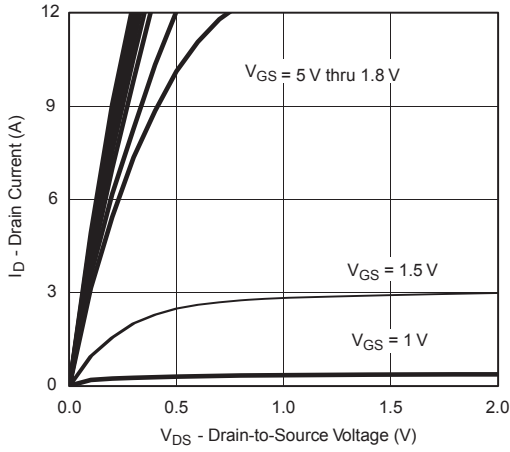
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			- 30.5	A
Pulse Diode Forward Current	$I_{SM}$				- 105	
Body Diode Voltage	$V_{SD}$	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$		- 0.65	- 1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = -1\text{ A}, dI/dt = 100\text{ A}/\delta\text{s}, T_J = 25\text{ }^\circ\text{C}$		311	467	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			1.136	1.705	$\mu\text{C}$
Reverse Recovery Fall Time	$t_a$			116		ns
Reverse Recovery Rise Time	$t_b$			195		

Notes:

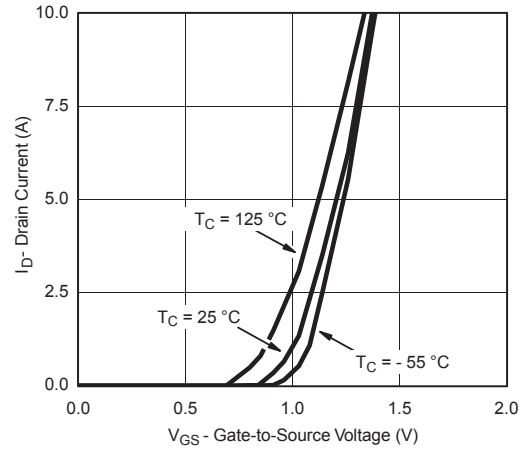
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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.

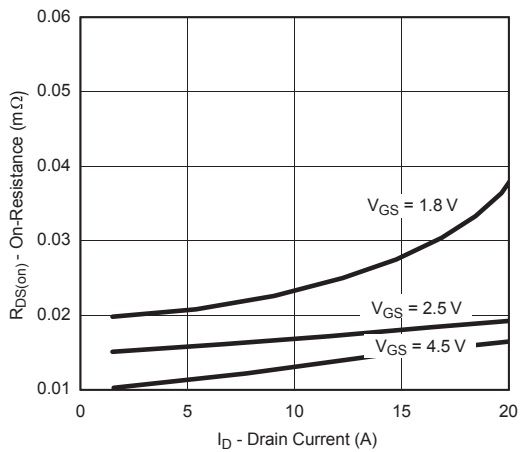
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



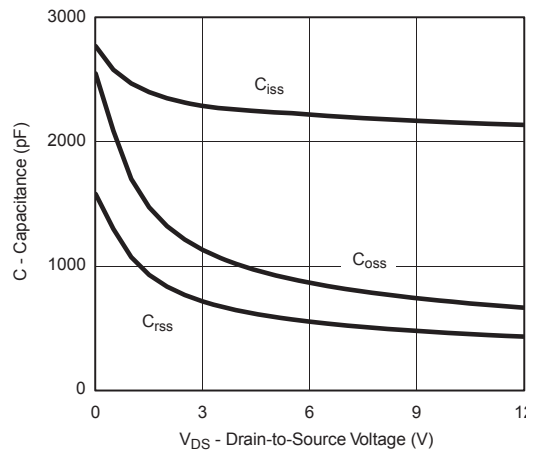
**Output Characteristics**



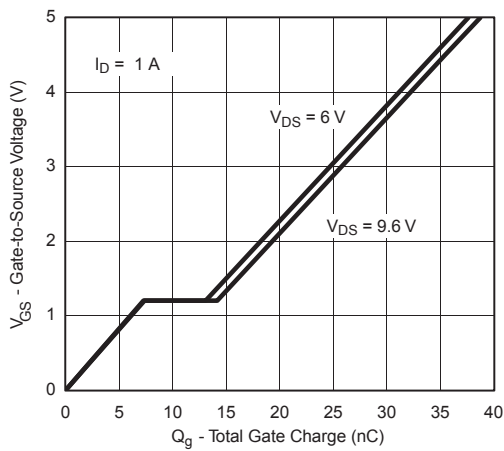
**Transfer Characteristics**



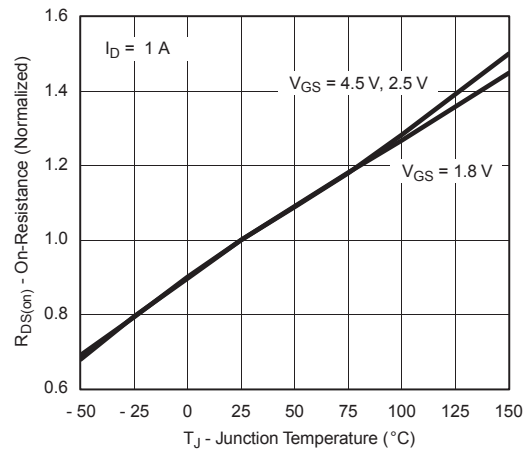
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**

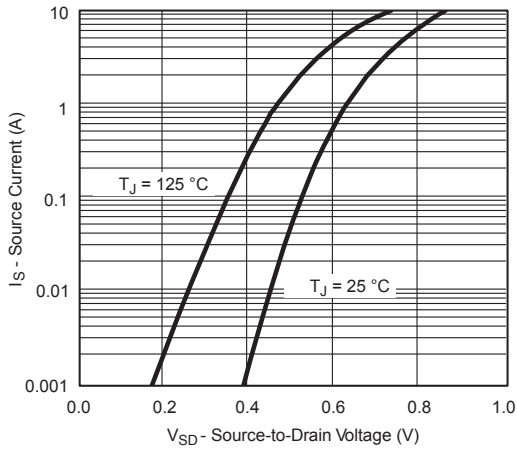


**Gate Charge**

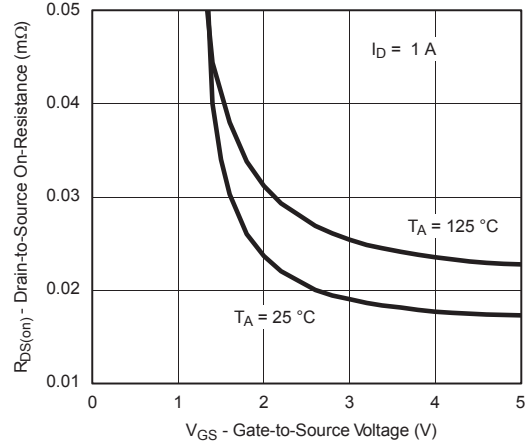


**On-Resistance vs. Junction Temperature**

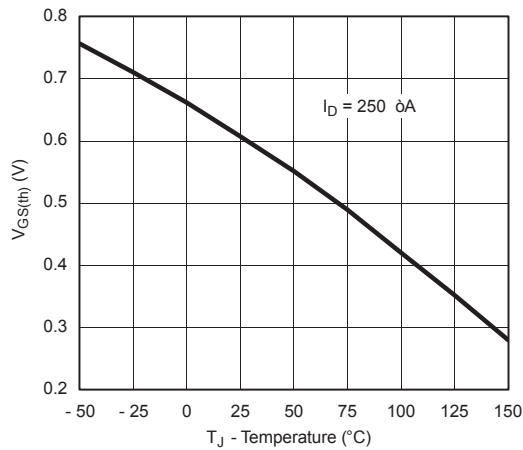
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



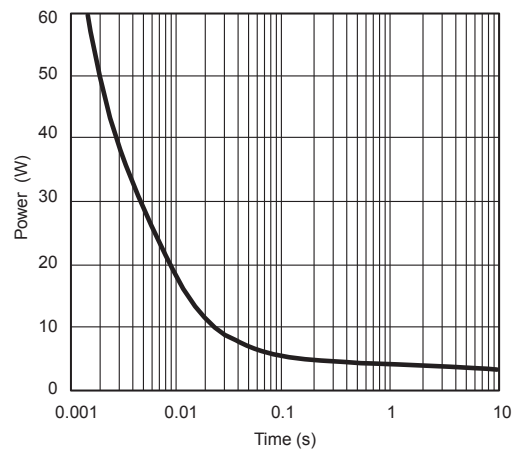
**Source-Drain Diode Forward Voltage**



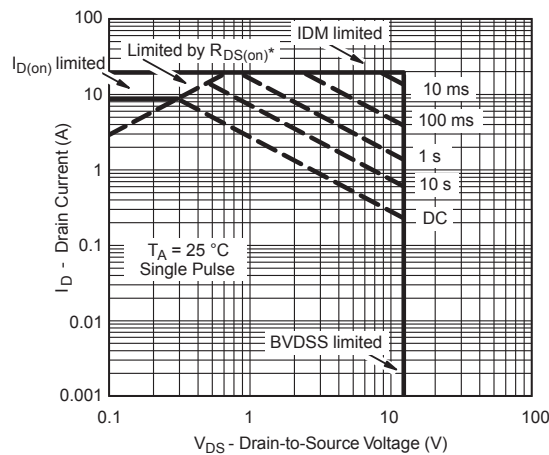
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**

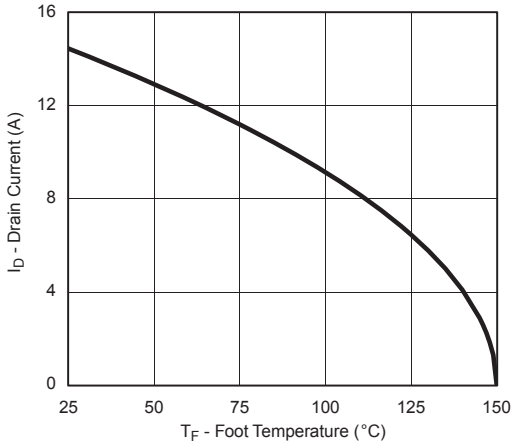


**Single Pulse Power, Junction-to-Ambient**

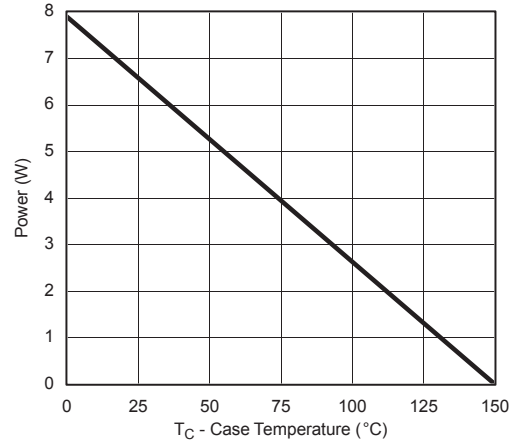


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified  
**Safe Operating Area, Junction-to-Ambient**

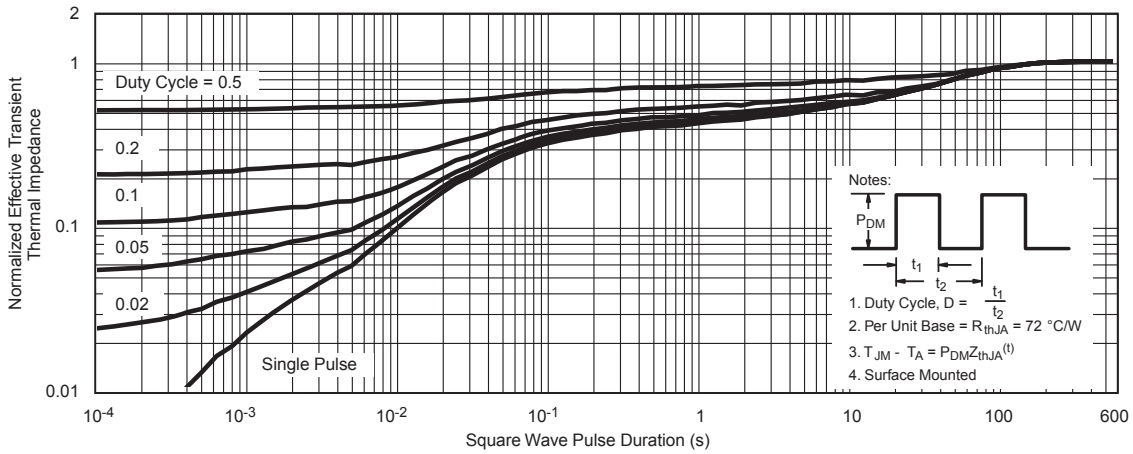
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



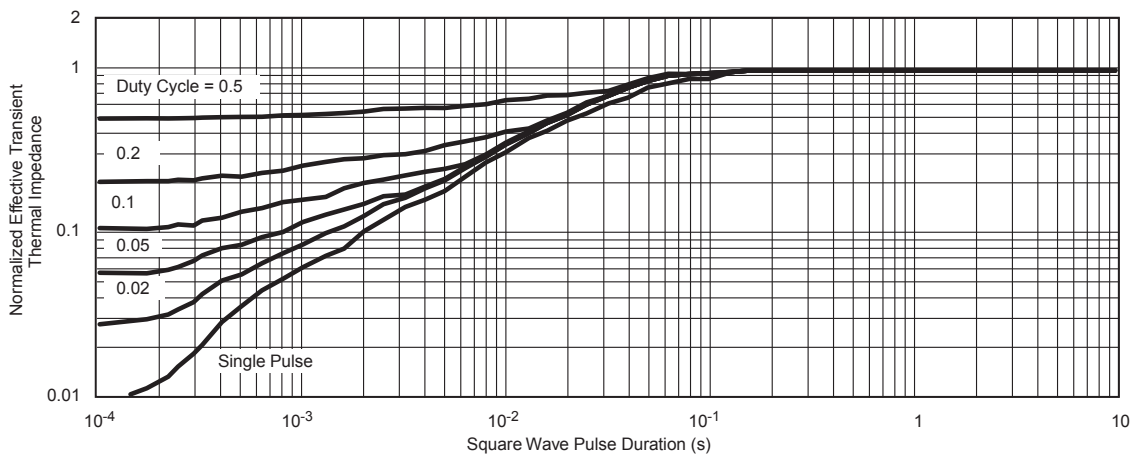
**Current Derating\***



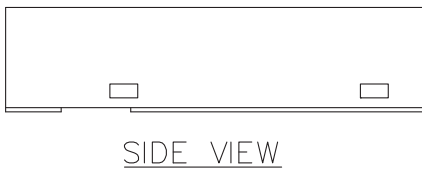
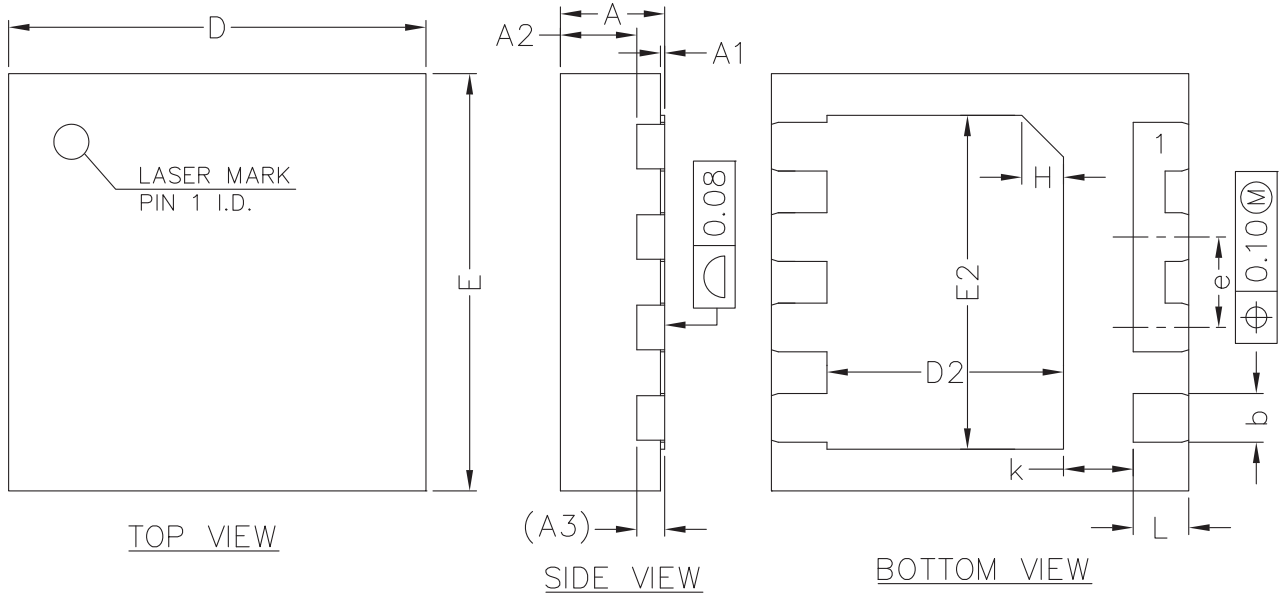
**Power Derating**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Foot**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.50	0.55	0.60
A3	0.20REF		
b	0.30	0.35	0.40
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	1.60	1.70	1.80
E2	2.30	2.40	2.50
e	0.55	0.65	0.75
K	0.40	0.50	0.60
L	0.35	0.40	0.45

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