

## VS3415AL-VB Datasheet

### P-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a, e</sup>	$Q_g$ (Typ.)
- 30	0.060 at $V_{GS} = - 10$ V	- 5.0	7 nC
	0.075 at $V_{GS} = - 4.5$ V	- 4.6	

#### FEATURES

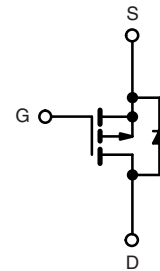
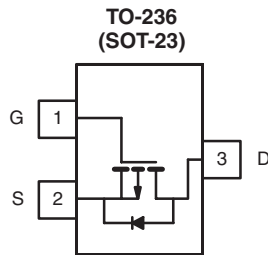
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC



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

#### APPLICATIONS

- Load Switch
- Notebook Adaptor Switch
- DC/DC Converter



P-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	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	- 5.0	A
		$T_C = 70$ °C	- 4.7	
		$T_A = 25$ °C	- 4.2 <sup>b, c</sup>	
		$T_A = 70$ °C	- 3.3 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	- 25		
Continous Source-Drain Diode Current	$I_S$	$T_C = 25$ °C	- 2.1	
		$T_A = 25$ °C	- 1 <sup>b, c</sup>	
Maximum Power Dissipation	$P_D$	$T_C = 25$ °C	2.5	W
		$T_C = 70$ °C	1.6	
		$T_A = 25$ °C	1.25 <sup>b, c</sup>	
		$T_A = 70$ °C	0.8 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>b, d</sup>	$R_{thJA}$	75	100	°C/W	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	40	50		

Notes:

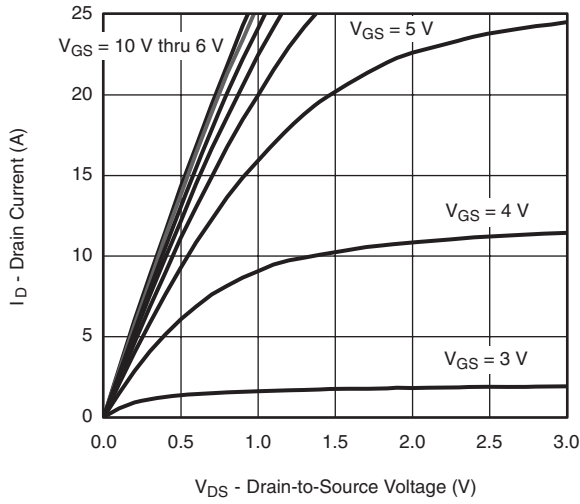
- Based on  $T_C = 25$  °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 5$  s.
- Maximum under Steady State conditions is 166 °C/W.
- Package Limited.

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	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-30			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-19		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			4.4		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-1.0		-2.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -10\text{ V}$	-25			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -4.2\text{ A}$		0.060		$\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -3.2\text{ A}$		0.075		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\text{ V}, I_D = -4.2\text{ A}$		10		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		590		pF
Output Capacitance	$C_{oss}$			115		
Reverse Transfer Capacitance	$C_{rss}$			93		
Total Gate Charge	$Q_g$	$V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -4.2\text{ A}$		13.6	21	nC
		$V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -4.2\text{ A}$		7	11	
Gate-Source Charge	$Q_{gs}$			2.3		
Gate-Drain Charge	$Q_{gd}$		3.2			
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	1	5	10	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 4.5\text{ }\Omega$ $I_D \cong -3.3\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		30	45	ns
Rise Time	$t_r$			25	38	
Turn-Off Delay Time	$t_{d(off)}$			16	24	
Fall Time	$t_f$			8	16	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 4.5\text{ }\Omega$ $I_D \cong -3.3\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		8	16	
Rise Time	$t_r$			10	20	
Turn-Off Delay Time	$t_{d(off)}$			18	27	
Fall Time	$t_f$			8	16	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			-4.2	A
Pulse Diode Forward Current	$I_{SM}$				-25	
Body Diode Voltage	$V_{SD}$	$I_S = -3.3\text{ A}, V_{GS} = 0\text{ V}$		-0.8	-1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = -3.3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		17	26	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			9	18	nC
Reverse Recovery Fall Time	$t_a$			10		ns
Reverse Recovery Rise Time	$t_b$			7		

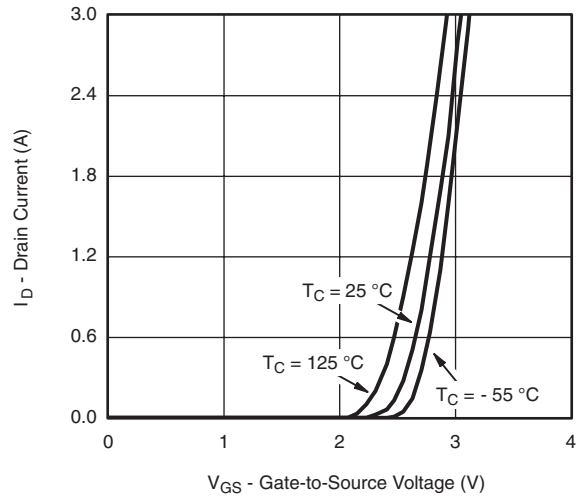
Notes:

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

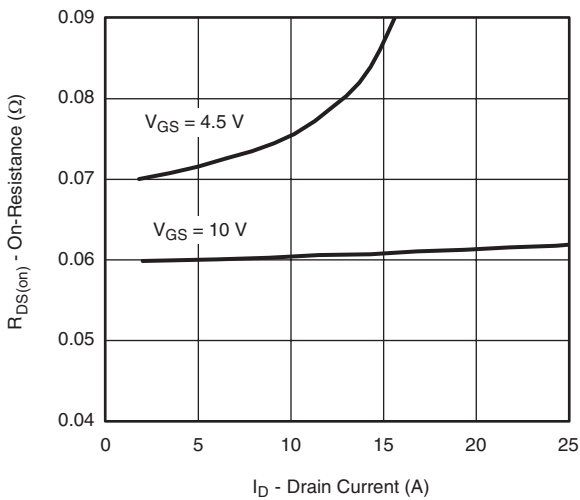
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



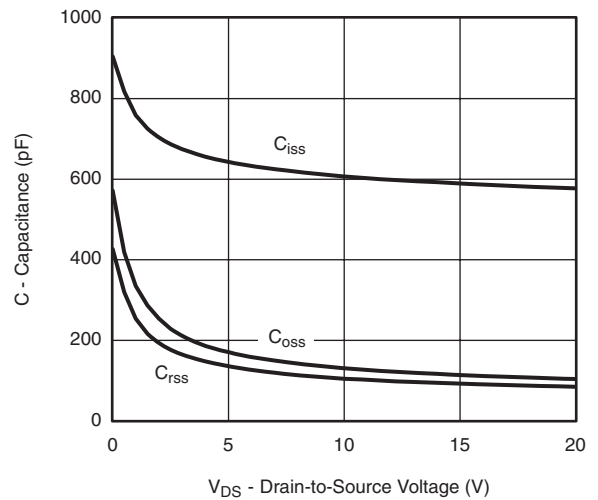
**Output Characteristics**



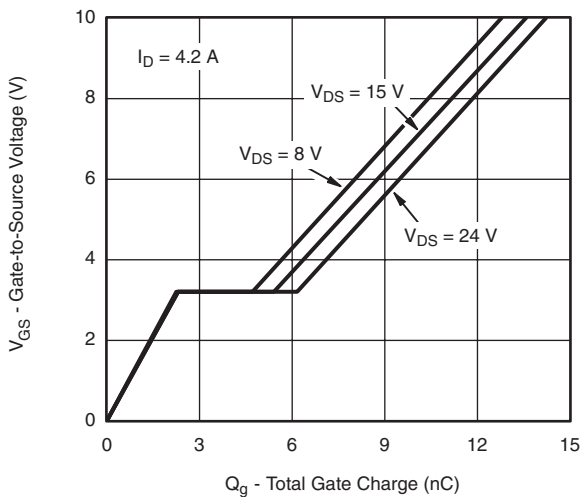
**Transfer Characteristics**



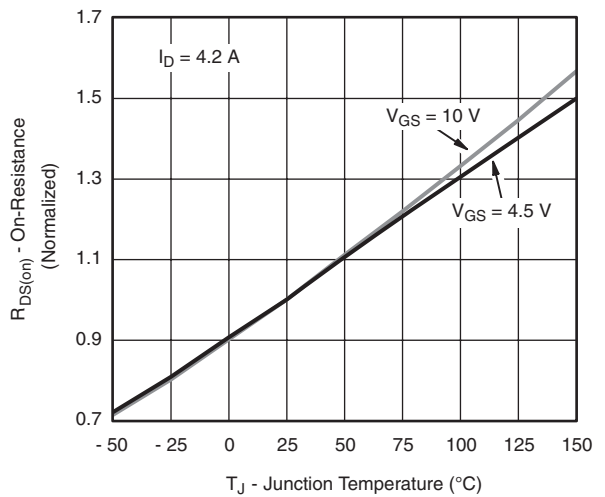
**On-Resistance vs. Drain Current**



**Capacitance**

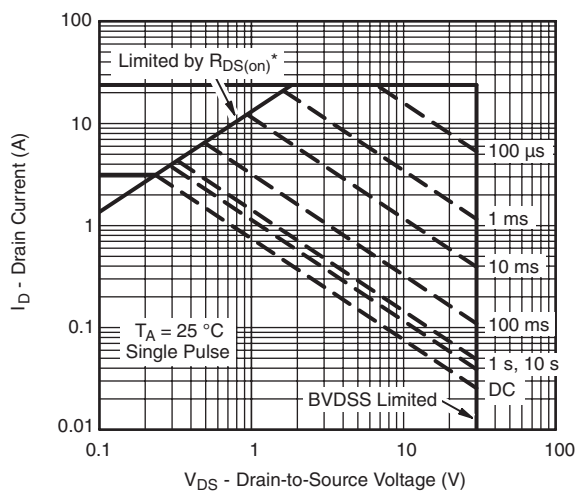
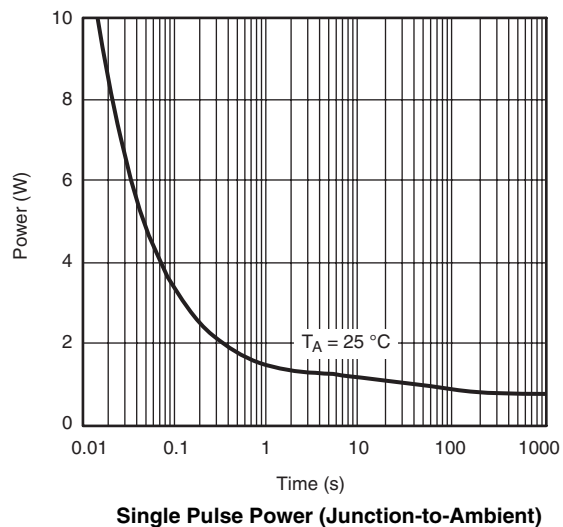
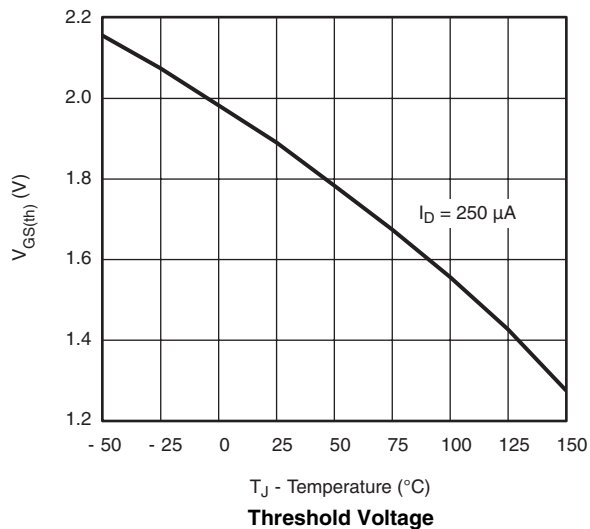
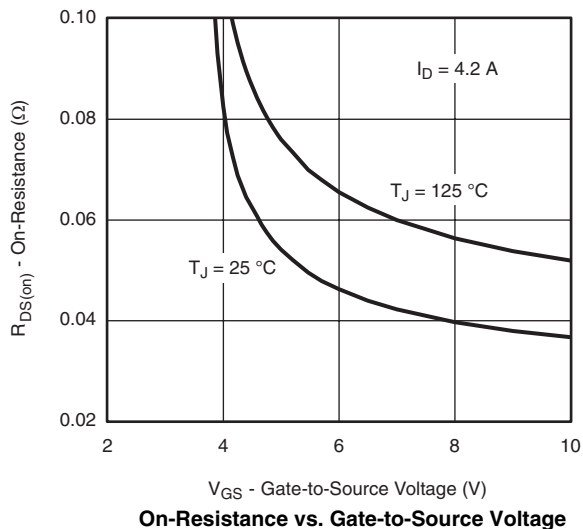
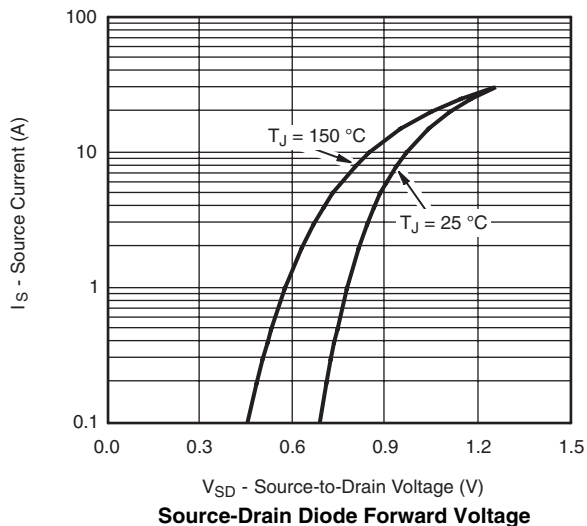


**Gate Charge**



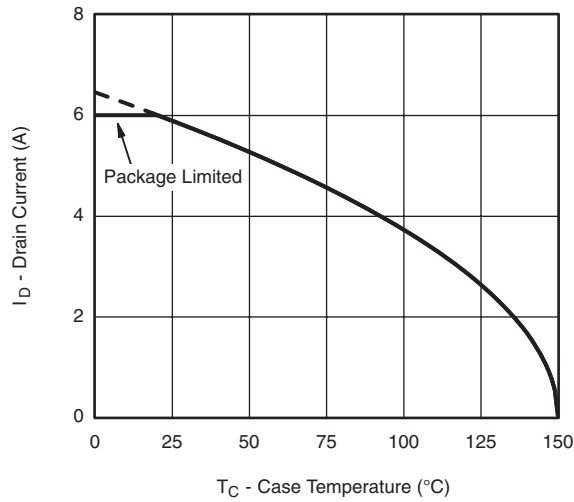
**On-Resistance vs. Junction Temperature**

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

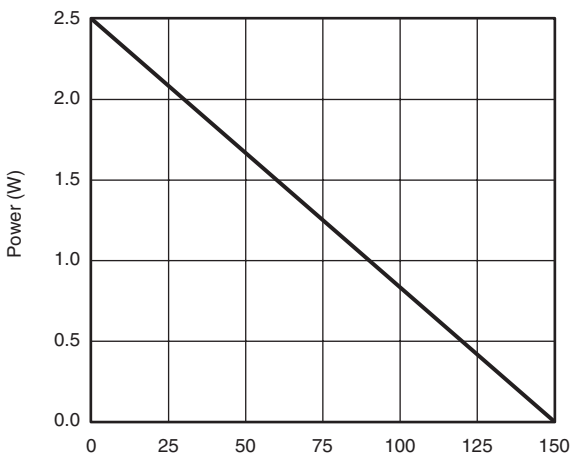


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

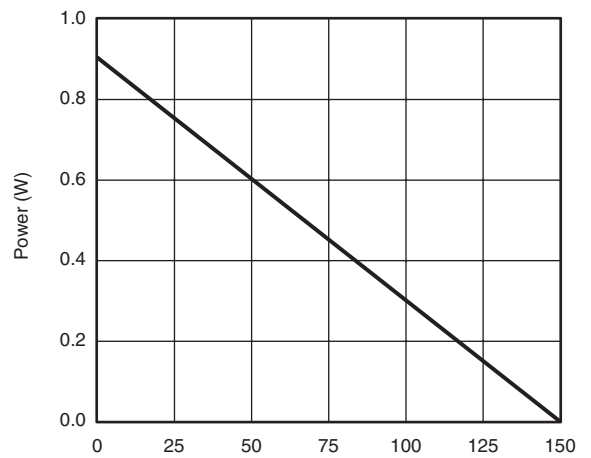
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Current Derating\***



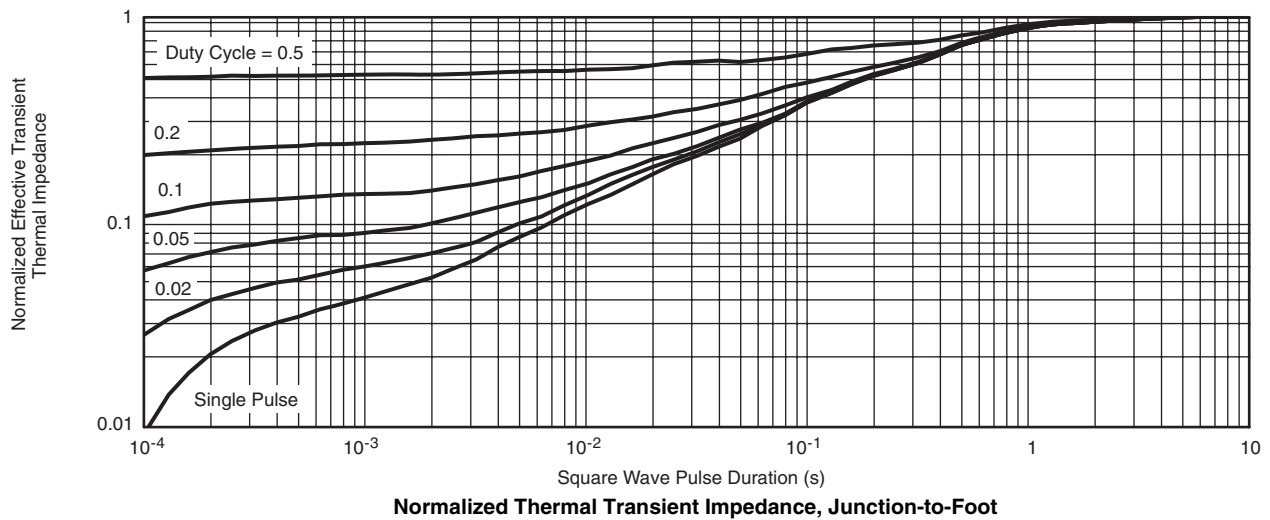
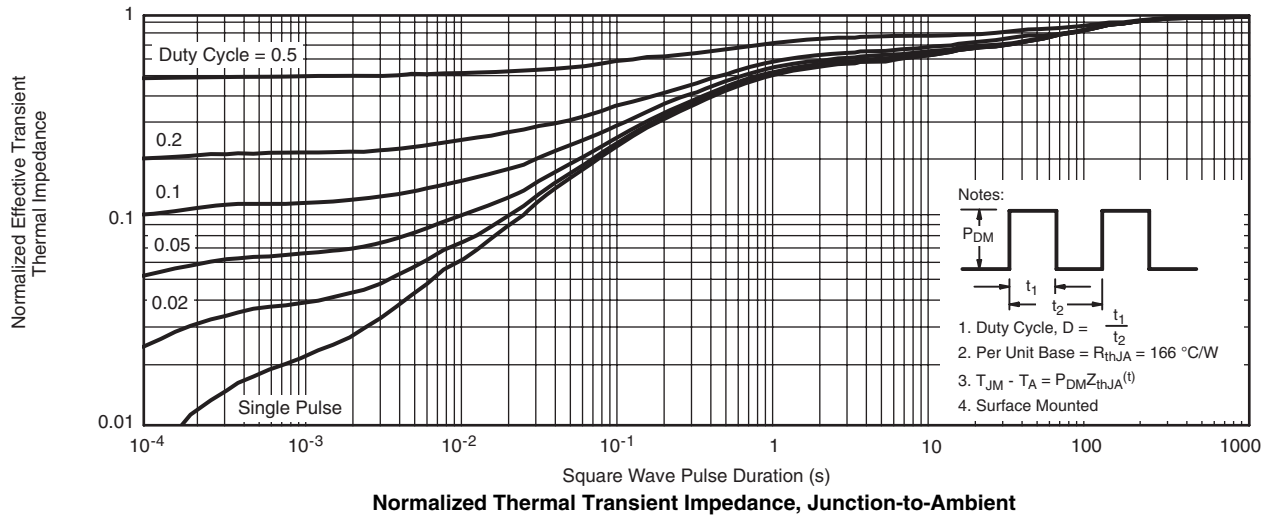
**Power, Junction-to-Foot**



**Power, Junction-to-Ambient**

\* 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



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