

# N-Channel 40-V (D-S) MOSFET

## PRODUCT SUMMARY

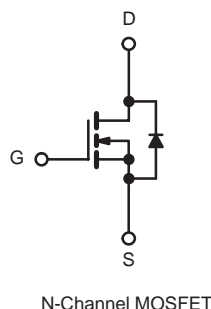
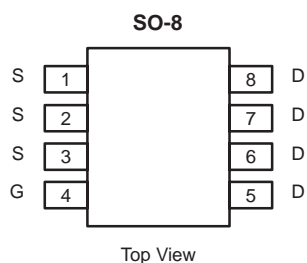
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (Typ.)
40	0.0065 at $V_{GS} = 10$ V	18	18 nC
	0.0079 at $V_{GS} = 4.5$ V	14.5	

## FEATURES

- DT-Trench Power MOSFET
- 100 %  $R_g$  and UIS Tested

## APPLICATIONS

- Notebook CPU Core
- High-Side Switch


**RoHS**  
 COMPLIANT


## ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$T_C = 25^\circ\text{C}$	18	A
	$T_C = 70^\circ\text{C}$	13.5	
	$T_A = 25^\circ\text{C}$	12 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$	9.6 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	60	A
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	18	
	$T_A = 25^\circ\text{C}$	12 <sup>b, c</sup>	
Single Pulse Avalanche Current	$L = 0.1$ mH	$I_{AS}$	20
Avalanche Energy		$E_{AS}$	20
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	$P_D$	9
	$T_C = 70^\circ\text{C}$		4.8
	$T_A = 25^\circ\text{C}$		2.9 <sup>b, c</sup>
	$T_A = 70^\circ\text{C}$		1.8 <sup>b, c</sup>
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	$t \leq 10$ s	$R_{thJA}$	35	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	15	

Notes:

- Based on  $T_C = 25^\circ\text{C}$ .
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$  s.
- Maximum under Steady State conditions is  $85^\circ\text{C/W}$ .

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	40			V	
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA		34		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			- 4.7			
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1.0		3.0	V	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V			± 100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V			1	μA	
		V <sub>DS</sub> = 40 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> = 10 V	30			A	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		0.0065	0.0071	Ω	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		0.0079	0.0086		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 A		66		S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		2185		pF	
Output Capacitance	C <sub>oss</sub>			290			
Reverse Transfer Capacitance	C <sub>rss</sub>			166			
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		18	27	nC	
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		8	12		
Gate-Drain Charge	Q <sub>gd</sub>			2.4			
Gate Resistance	R <sub>g</sub>			2.3			
Turn-On Delay Time	t <sub>d(on)</sub>	f = 1 MHz	0.3	1.3	2.6	Ω	
Rise Time	t <sub>r</sub>		V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω		14	25	ns
Turn-Off Delay Time	t <sub>d(off)</sub>				12	24	
Fall Time	t <sub>f</sub>				19	35	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω			9	18	
Rise Time	t <sub>r</sub>			8	16		
Turn-Off Delay Time	t <sub>d(off)</sub>			10	20		
Fall Time	t <sub>f</sub>			16	30		
				9	18		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			4.5	A	
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				50		
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 3 A		0.76	1.1	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 10 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C		14	28	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>			6			

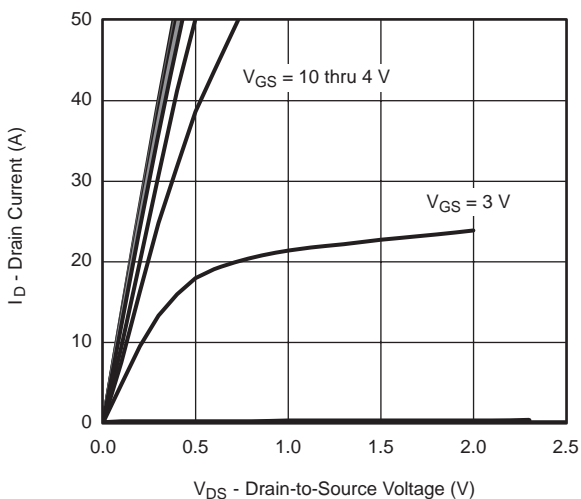
Notes:

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

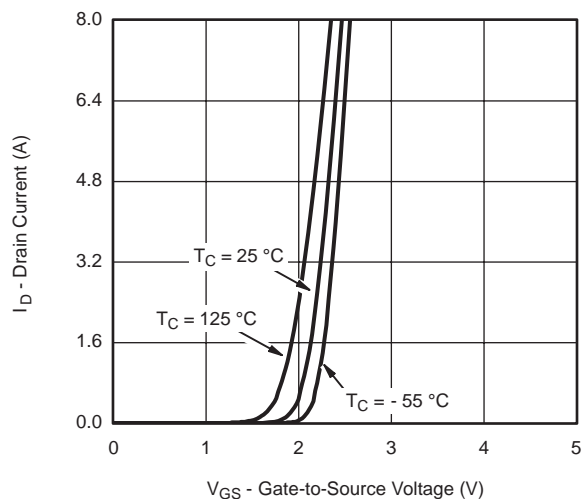
b. Guaranteed by design, not subject to production testing.

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.

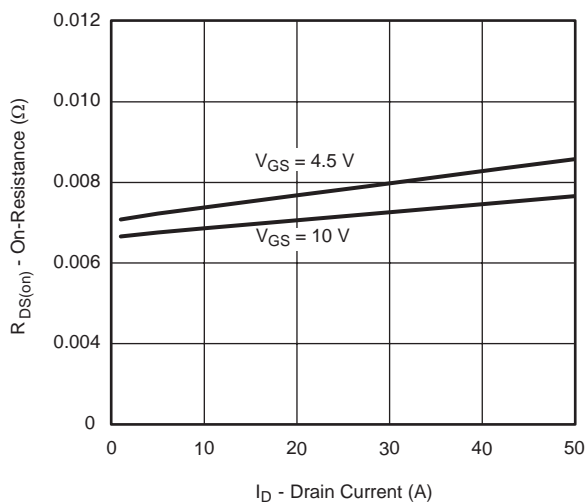
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



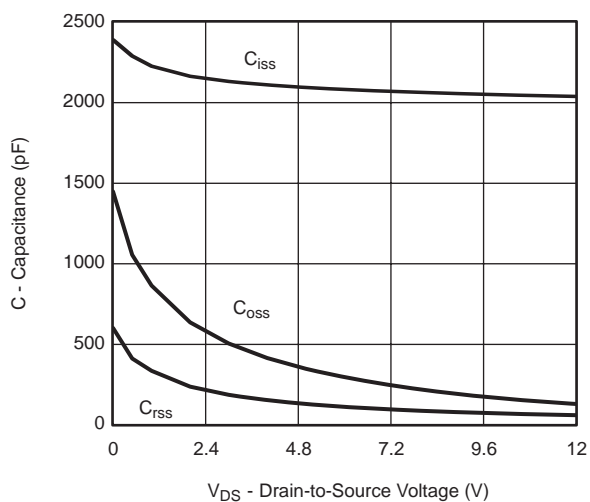
**Output Characteristics**



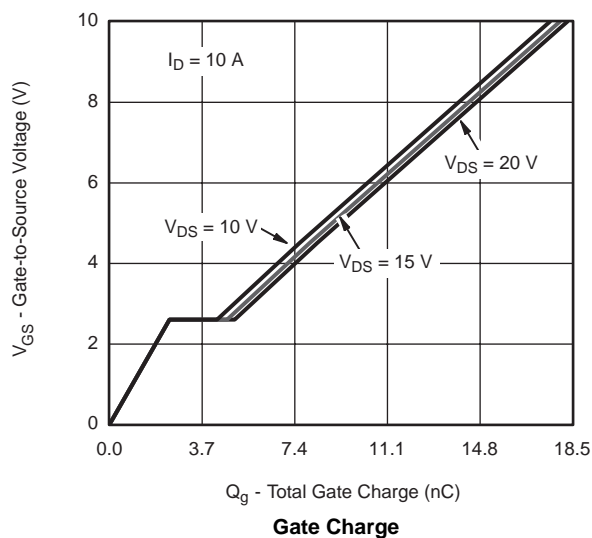
**Transfer Characteristics**



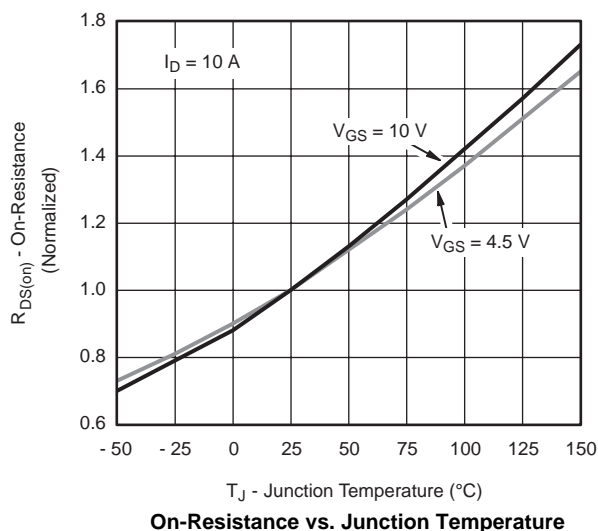
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**

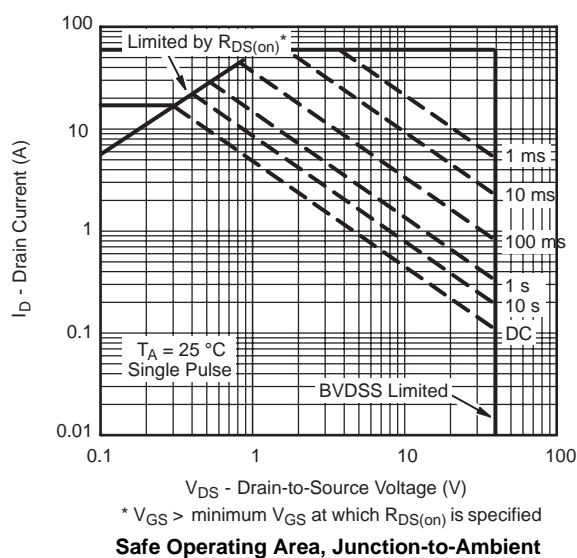
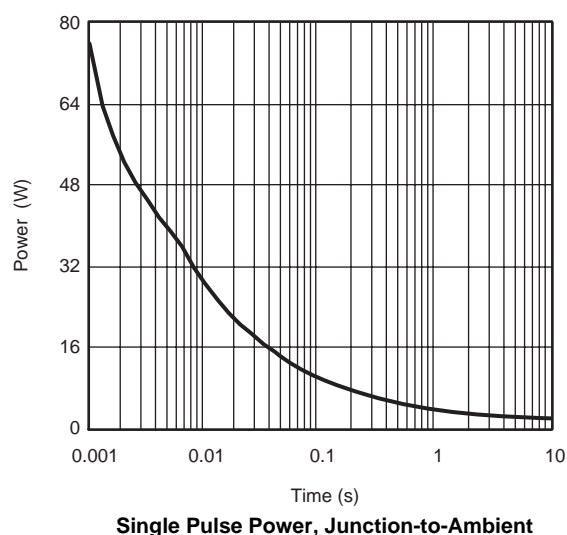
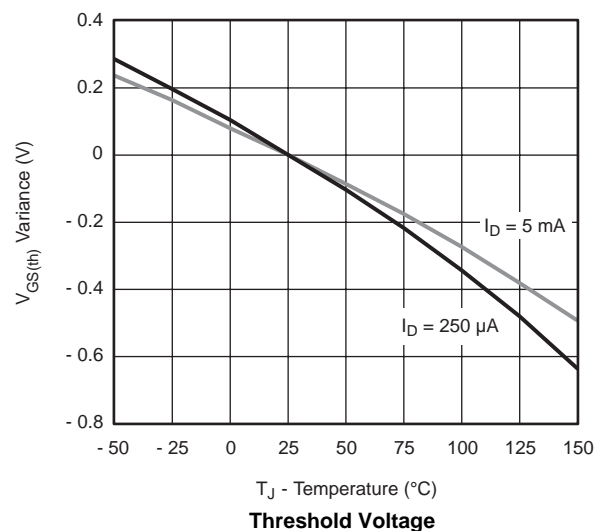
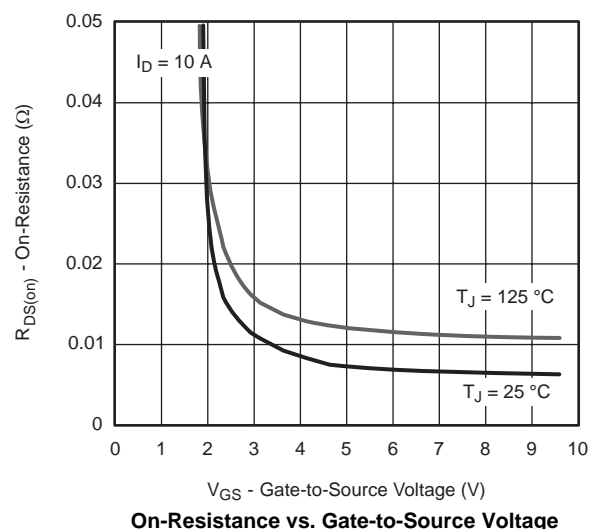
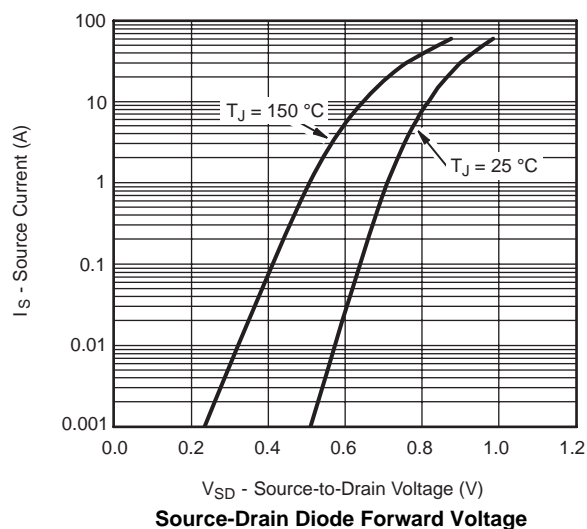


**Gate Charge**

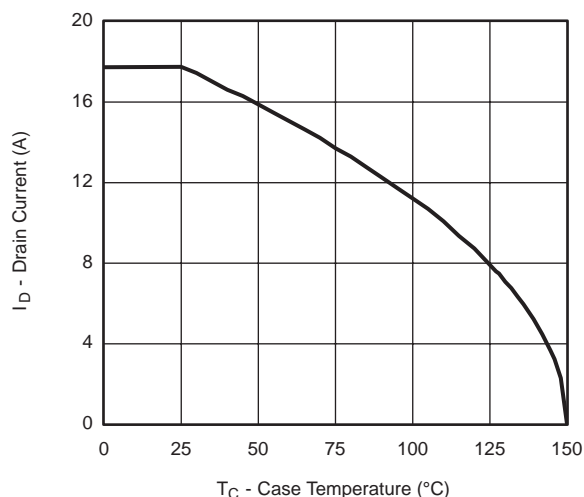


**On-Resistance vs. Junction Temperature**

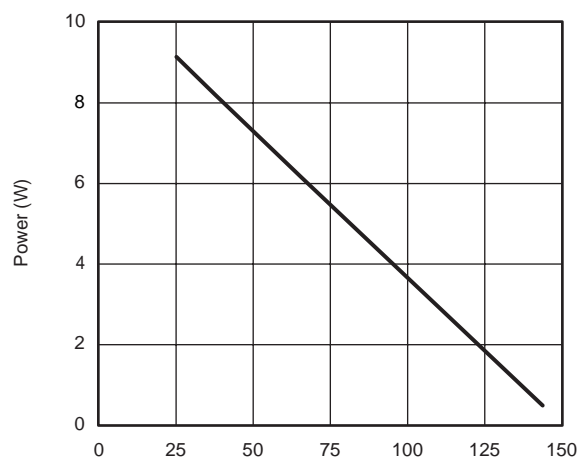
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



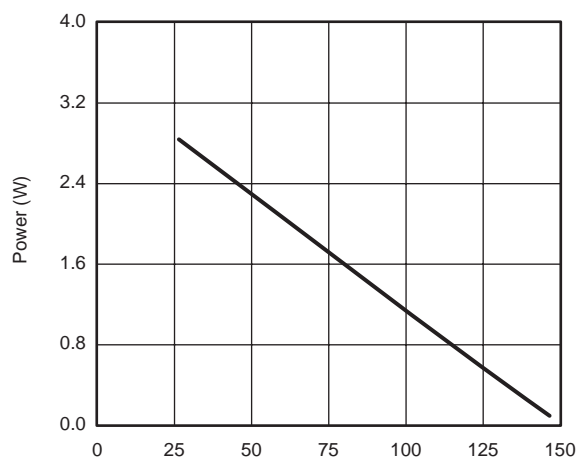
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Current Derating\***



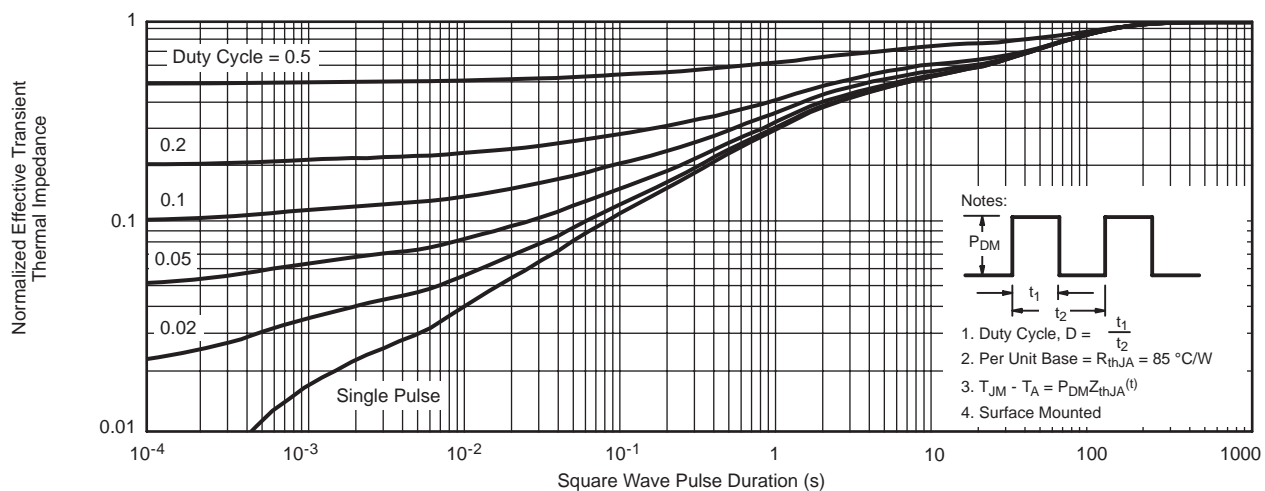
**Power, Junction-to-Ambient**



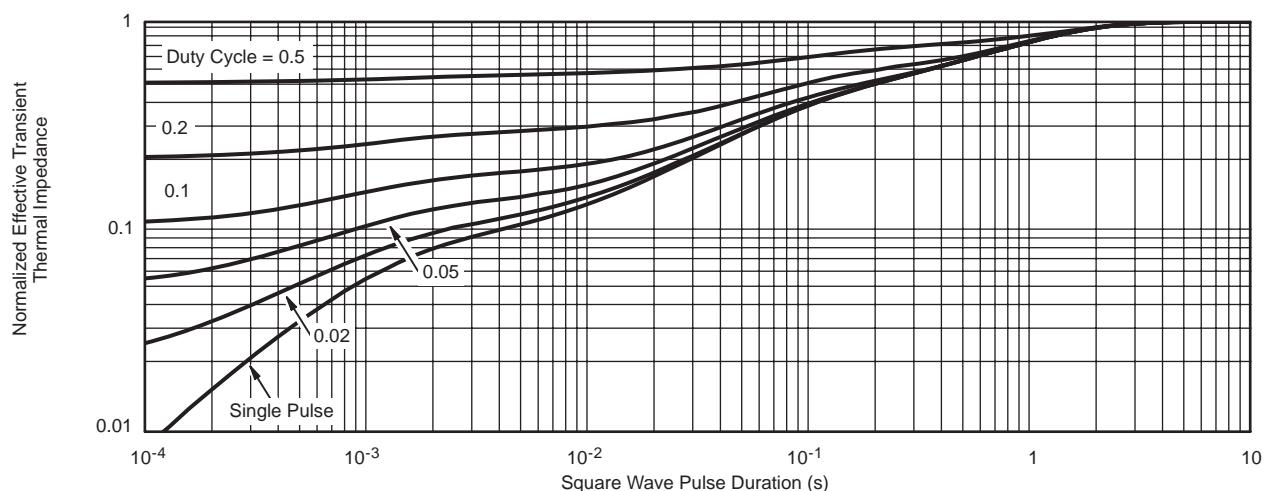
**Power Derating, Junction-to-Foot**

\* 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**



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

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