SiE816DF

Vishay Siliconix

N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY				
		I_D (A)		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	Silicon Limit	Package Limit	Q_g (Typ.)
60	0.0074 at V_{GS} = 10 V	95	60	51 nC

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Ultra Low Thermal Resistance Using Top-Exposed PolarPAK® Package for Double-Sided Cooling
- Leadframe-Based New Encapsulated Package
  - Die Not Exposed
  - Same Layout Regardless of Die Size
- Low Q_{gd}/Q_{gs} Ratio Helps Prevent Shoot-Through
- 100 % R_g and UIS Tested
- Compliant to RoHS directive 2002/95/EC

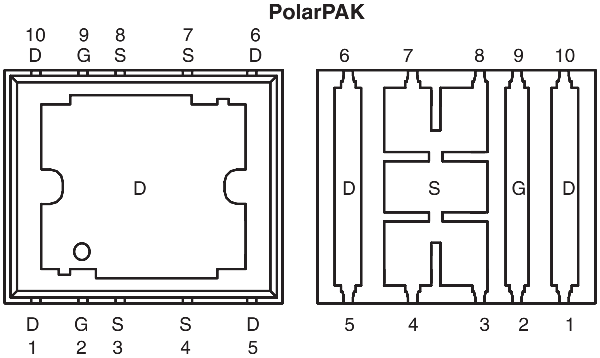
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

- Primary Side Switch
- Half-Bridge

Package Drawing
www.vishay.com/doc?72945

PolarPAK

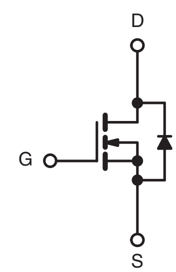


Top View

Bottom View

Top surface is connected to pins 1, 5, 6, and 10

Ordering Information: SiE816DF-T1-E3 (Lead (Pb)-free)
SiE816DF-T1-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel MOSFET

For Related Documents
www.vishay.com/ppg?68641

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	95 (Silicon Limit)	A
			60[a] (Package Limit)	
	T_C = 70 °C		60[a]	
	T_A = 25 °C		19.8[b, c]	
	T_A = 70 °C		14.8[b, c]	
Pulsed Drain Current		I_{DM}	60	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	60[a]	
	T_A = 25 °C		4.3[b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	50	
Single Pulse Avalanche Energy		E_{AS}	125	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	125	W
	T_C = 70 °C		80	
	T_A = 25 °C		5.2[b, c]	
	T_A = 70 °C		3.3[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)[d, e]			260	

Notes:
a. Package limited.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. See Solder Profile (*www.vishay.com/ppg?73257*). The PolarPAK is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
e. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

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THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[a, b]	$t \leq 10$ s	R_{thJA}	20	24	°C/W
Maximum Junction-to-Case (Drain Top)	Steady State	R_{thJC} (Drain)	0.8	1	
Maximum Junction-to-Case (Source)[a, c]		R_{thJC} (Source)	2.2	2.7	

Notes:
a. Surface Mounted on 1" x 1" FR4 board.
b. Maximum under Steady State conditions is 68 °C/W.
c. Measured at source pin (on the side of the package).

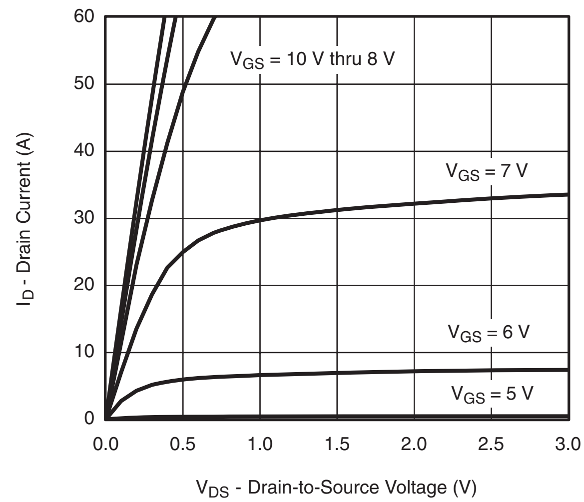
SPECIFICATIONS $T_J = 25$ °C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = 250$ µA	60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250$ µA		70		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 9		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA	2.5		4.4	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60$ V, $V_{GS} = 0$ V			1	µA
		$V_{DS} = 60$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq 5$ V, $V_{GS} = 10$ V	25			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 19.8$ A		0.0061	0.0074	Ω
Forward Transconductance[a]	g_{fs}	$V_{DS} = 15$ V, $I_D = 19.8$ A		30		S
Dynamic[b]						
Input Capacitance	C_{iss}	$V_{DS} = 30$ V, $V_{GS} = 0$ V, f = 1 MHz		3100		pF
Output Capacitance	C_{oss}			480		
Reverse Transfer Capacitance	C_{rss}			180		
Total Gate Charge	Q_g	$V_{DS} = 30$ V, $V_{GS} = 10$ V, $I_D = 19.8$ A		51	77	nC
Gate-Source Charge	Q_{gs}			19		
Gate-Drain Charge	Q_{gd}			15		
Gate Resistance	R_g	f = 1 MHz		1.1	2.2	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30$ V, $R_L = 3$ Ω $I_D \cong 10$ A, $V_{GEN} = 10$ V, $R_g = 1$ Ω		22	30	ns
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			25	40	
Fall Time	t_f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C			60	A
Pulse Diode Forward Current[a]	I_{SM}				60	
Body Diode Voltage	V_{SD}	$I_S = 10$ A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10$ A, dI/dt = 100 A/µs, $T_J = 25$ °C		60	90	ns
Body Diode Reverse Recovery Charge	Q_{rr}			135	205	nC
Reverse Recovery Fall Time	t_a			42		ns
Reverse Recovery Rise Time	t_b			18		

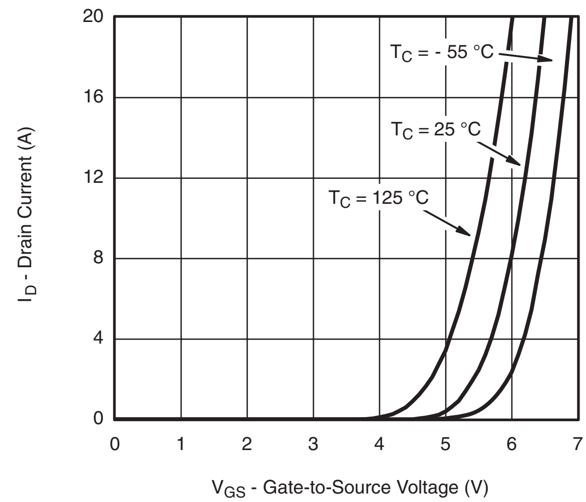
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing.

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.

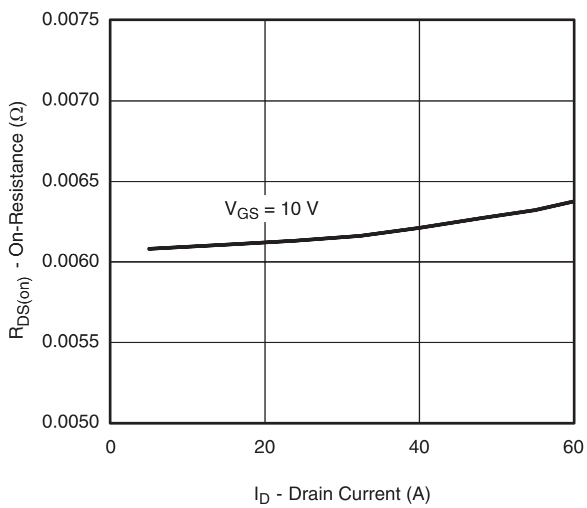
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



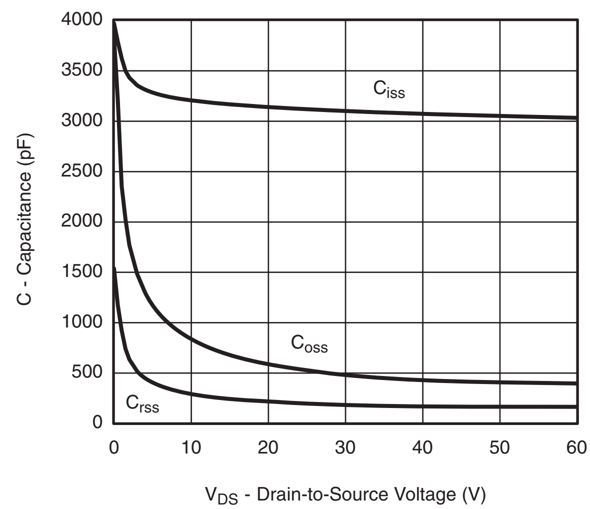
Output Characteristics



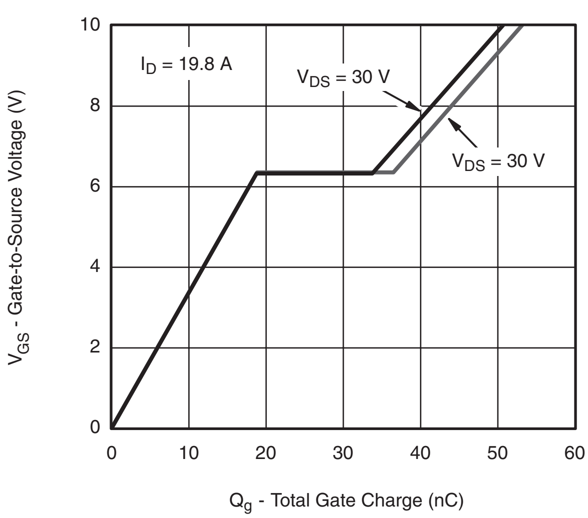
Transfer Characteristics



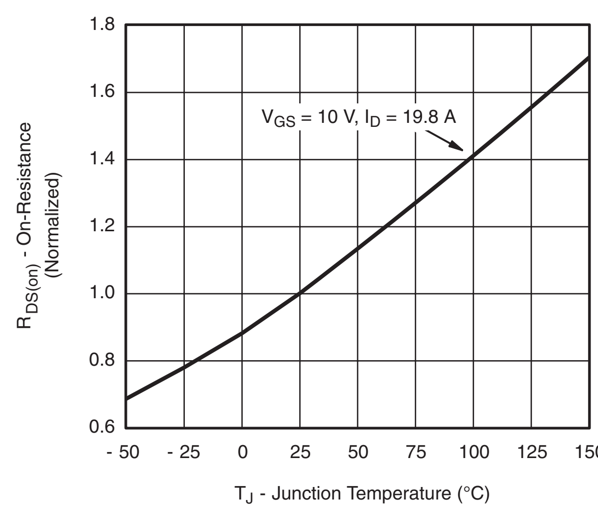
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

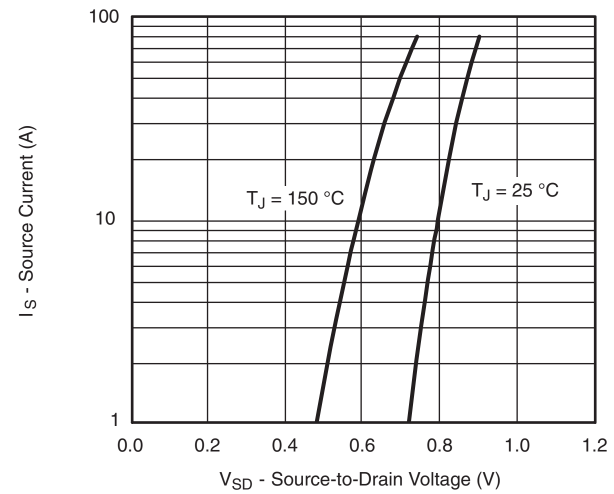


Gate Charge

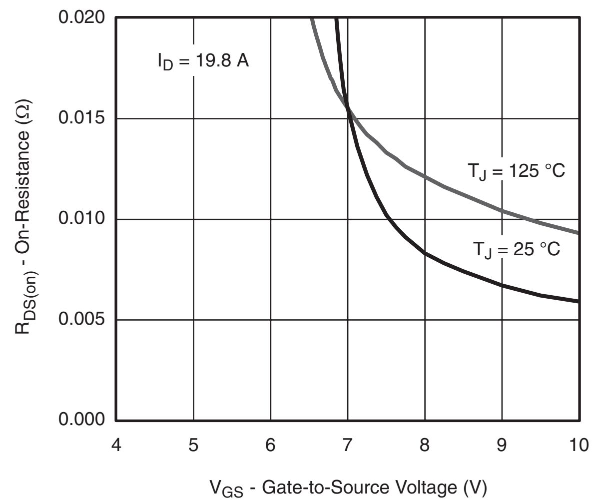


On-Resistance vs. Junction Temperature

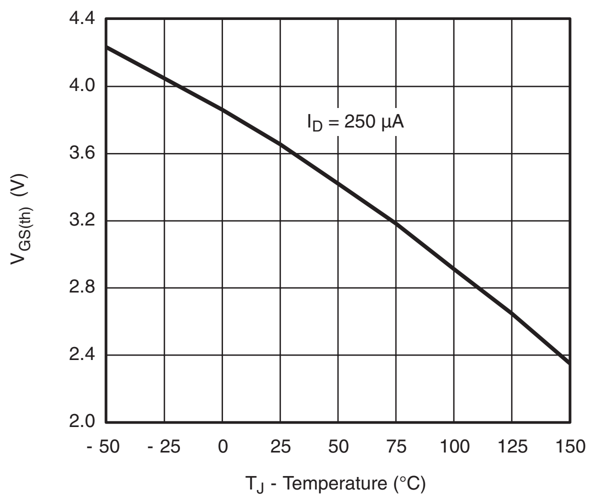
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



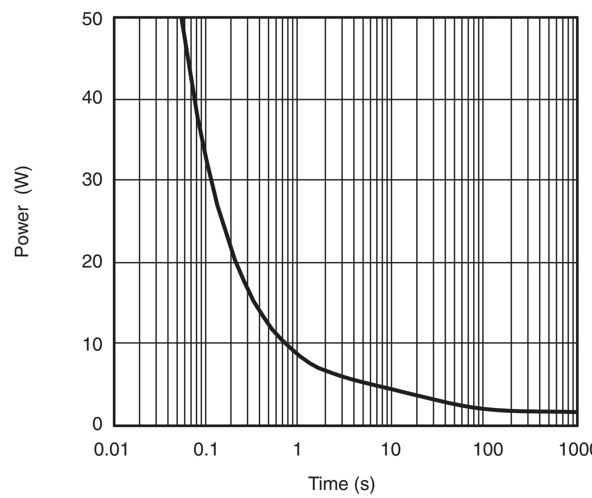
Source-Drain Diode Forward Voltage



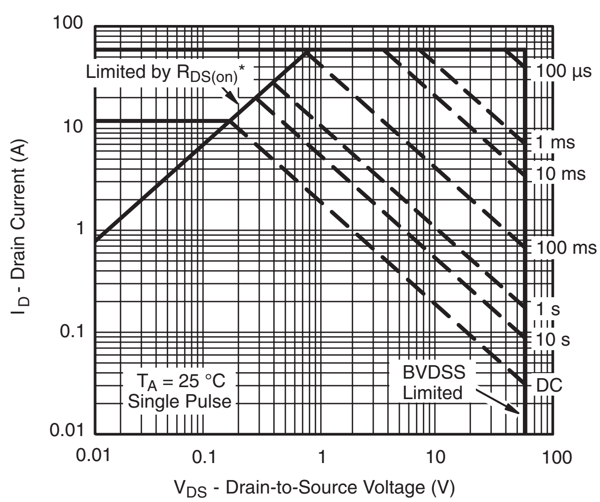
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



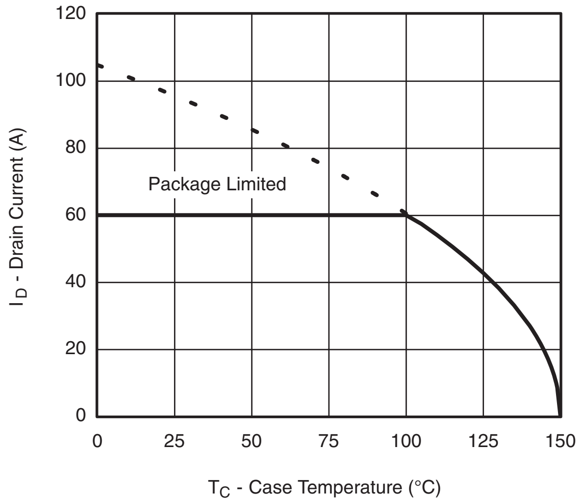
Single Pulse Power, Junction-to-Ambient



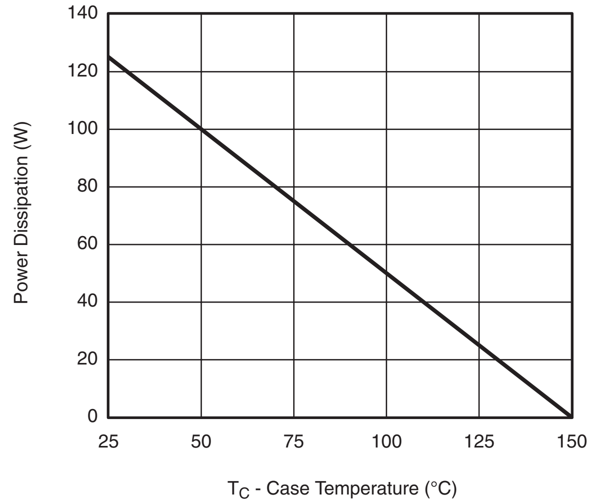
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



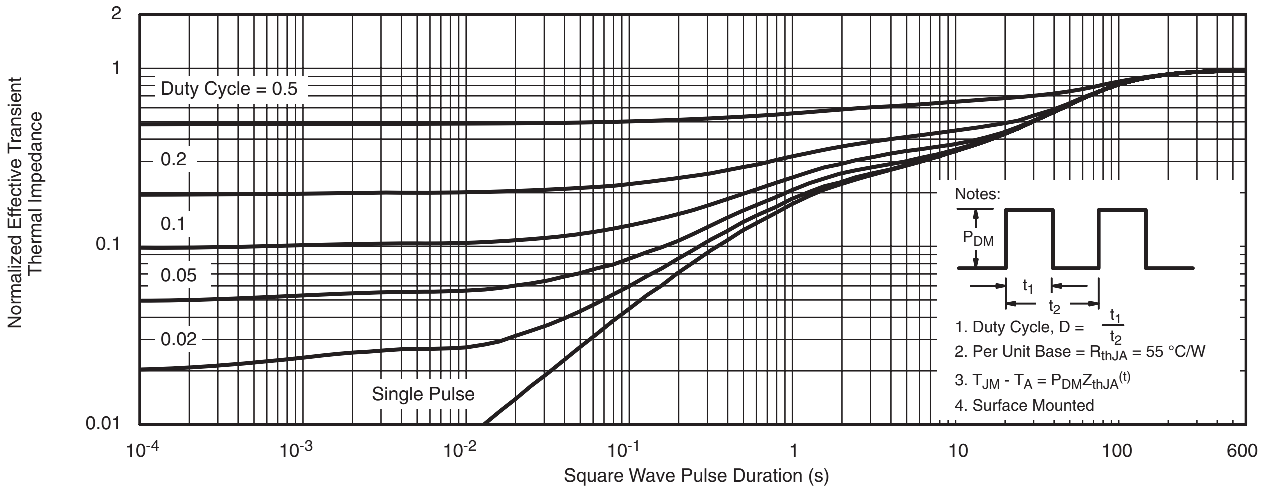
Current Derating*



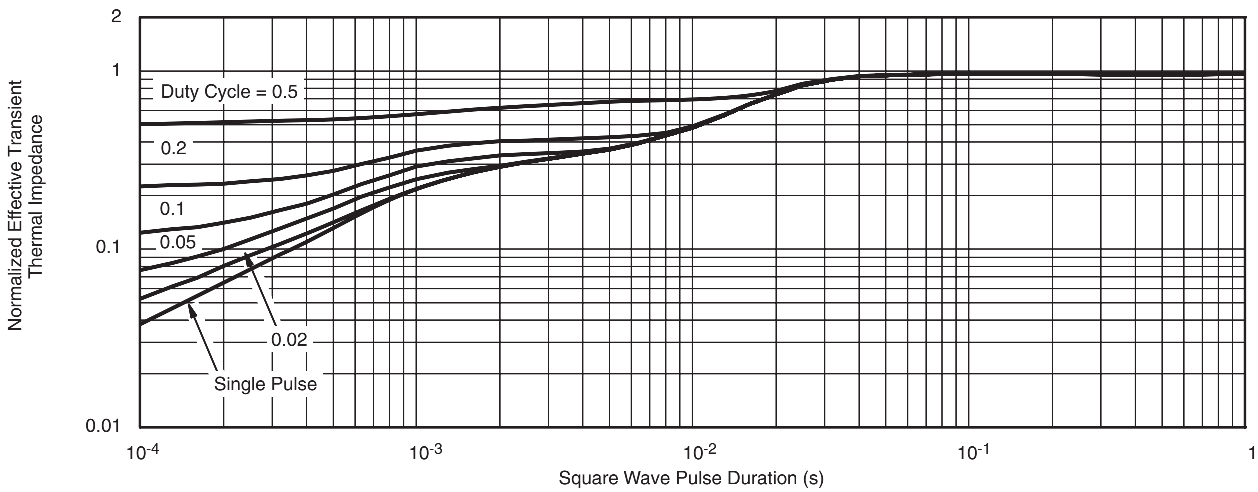
Power Derating, Junction-to-Case

* 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-Case (Drain Top)

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