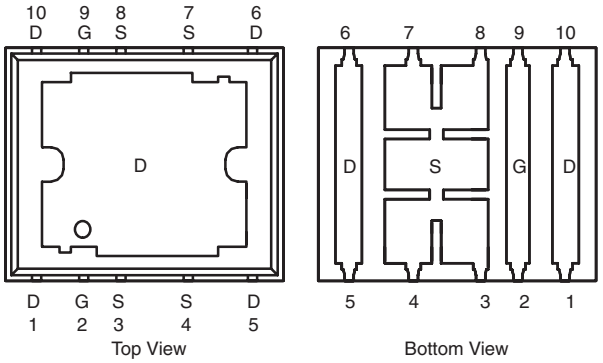
N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY				
V_{DS} (V)	$r_{DS(on)}$ (Ω)[e]	I_D (A)[a] Silicon Limit	I_D (A)[a] Package Limit	Q_g (Typ)
40	0.0026 at V_{GS} = 10 V	163	60	52 nC
	0.0034 at V_{GS} = 4.5 V	143	60	

Package Drawing
http://www.vishay.com/doc?72945

PolarPAK



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

Ordering Information: SiE812DF-T1-E3 (Lead (Pb)-free)

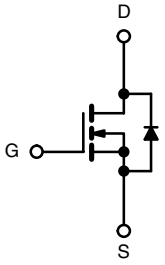
FEATURES

- TrenchFET® Gen II 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

RoHS COMPLIANT

APPLICATIONS

- VRM
- DC/DC Conversion: Low-Side
- Synchronous Rectification



N-Channel MOSFET

For Related Documents
http://www.vishay.com/ppg?74337

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	163 (Silicon Limit)	A
			60[a] (Package Limit)	
	T_C = 70 °C		60[a]	
	T_A = 25 °C		33[b, c]	
	T_A = 70 °C		27[b, c]	
Pulsed Drain Current		I_{DM}	100	
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	
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}	- 50 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 sec.
d. See Solder Profile (http://www.vishay.com/doc?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.

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[a, b]	t ≤ 10 sec	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).

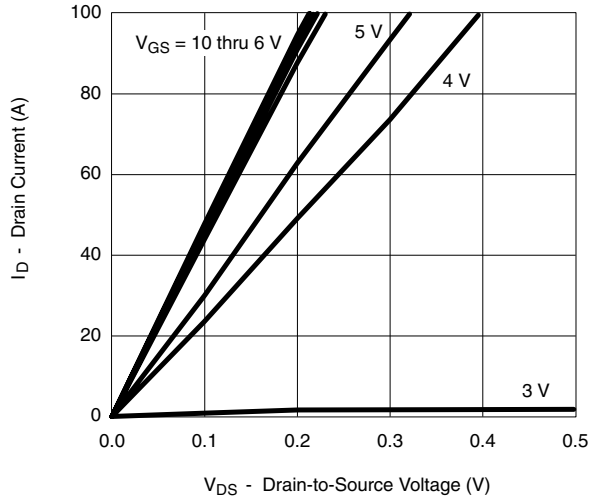
SPECIFICATIONS T_J = 25 °C, unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		45.5		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 7.1		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = 250 µA	1.5	2.3	3	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 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 = 25 A		0.0022	0.0026	Ω
		V_{GS} = 4.5 V, I_D = 25 A		0.0028	0.0034	
Forward Transconductance[a]	g_{fs}	V_{DS} = 20 V, I_D = 25 A		154		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		8300		pF
Output Capacitance	C_{oss}			800		
Reverse Transfer Capacitance	C_{rss}			360		
Total Gate Charge	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 25 A		111	170	nC
		V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 20 A		52	80	
Gate-Source Charge	Q_{gs}			25		
Gate-Drain Charge	Q_{gd}			15		
Gate Resistance	R_g	f = 1 MHz		1.15	1.7	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 2 Ω $I_D \cong$ 10 A, V_{GEN} = 4.5 V, R_g = 1 Ω		50	75	ns
Rise Time	t_r			265	400	
Turn-Off Delay Time	$t_{d(off)}$			50	75	
Fall Time	t_f			10	15	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 2 Ω $I_D \cong$ 10 A, V_{GEN} = 10 V, R_g = 1 Ω		20	30	
Rise Time	t_r			15	25	
Turn-Off Delay Time	$t_{d(off)}$			60	90	
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}				100	
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		50	75	ns
Body Diode Reverse Recovery Charge	Q_{rr}			65	100	nC
Reverse Recovery Fall Time	t_a			27		ns
Reverse Recovery Rise Time	t_b			23		

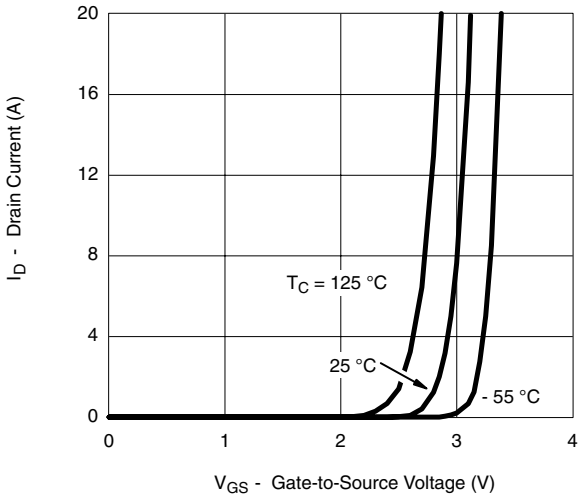
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing.

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.

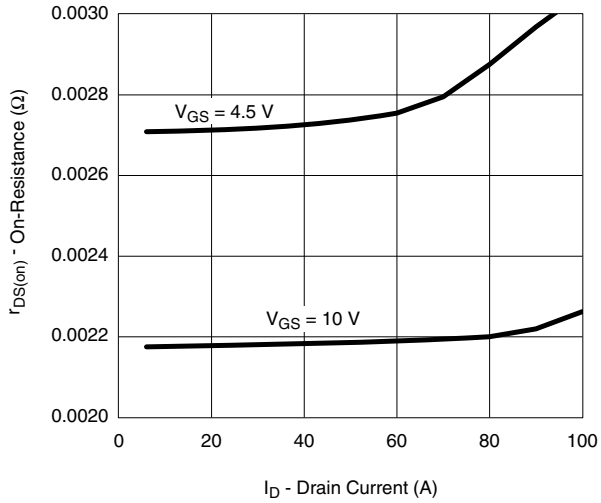
TYPICAL CHARACTERISTICS 25 °C, unless noted



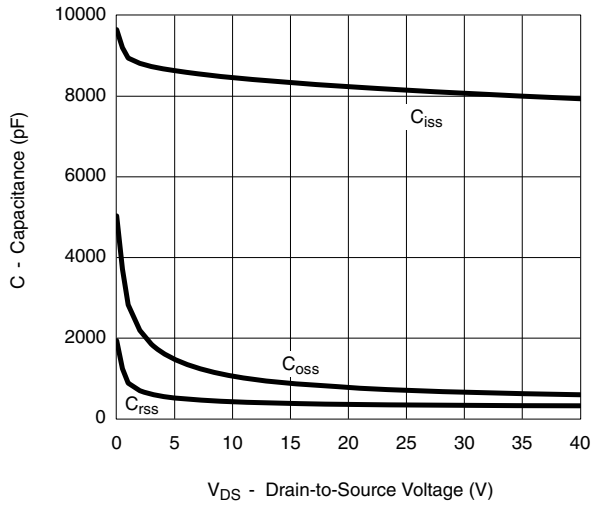
Output Characteristics



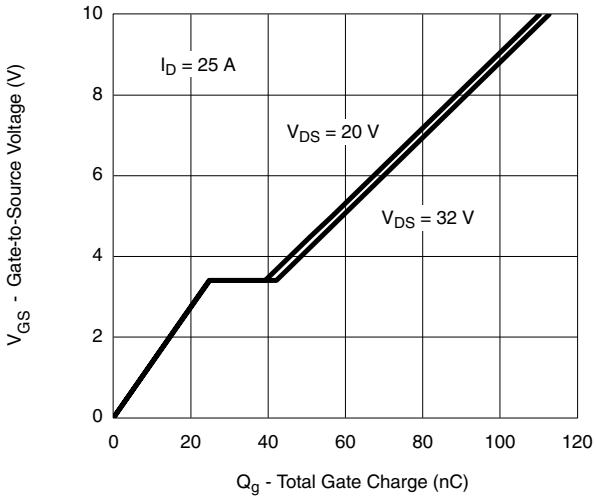
Transfer Characteristics



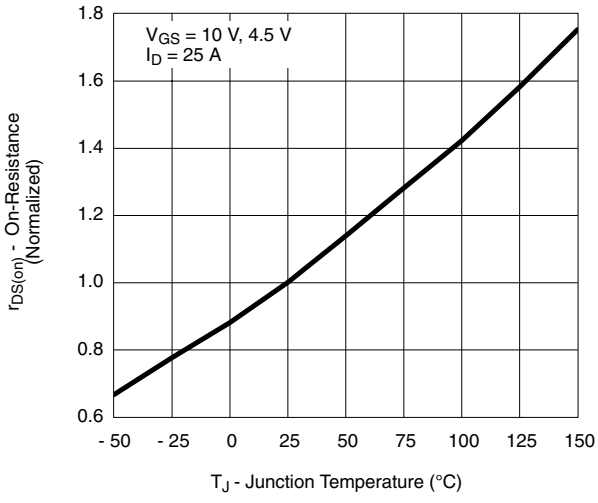
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

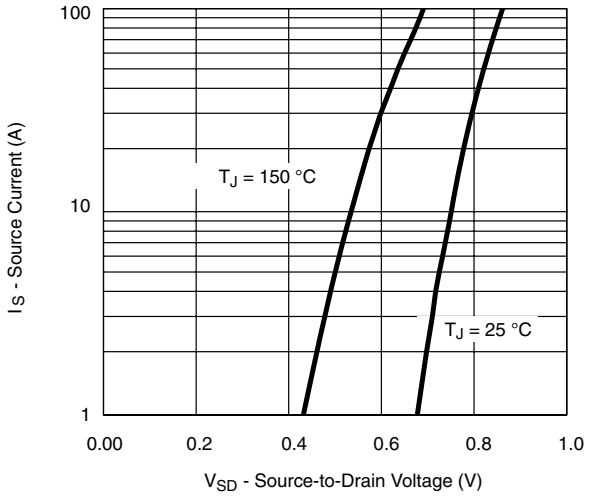


Gate Charge

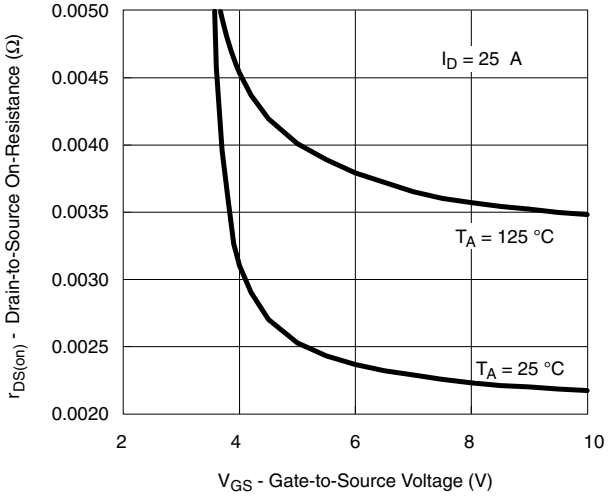


On-Resistance vs. Junction Temperature

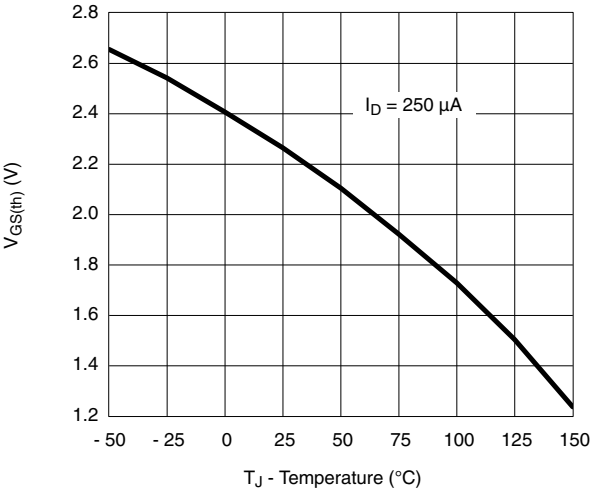
TYPICAL CHARACTERISTICS 25 °C, unless noted



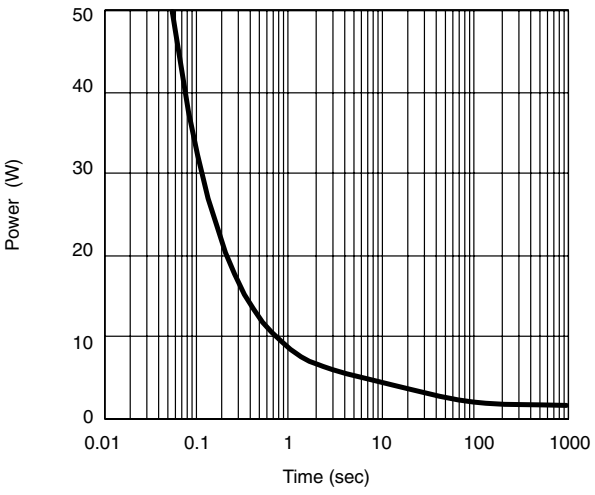
Source-Drain Diode Forward Voltage



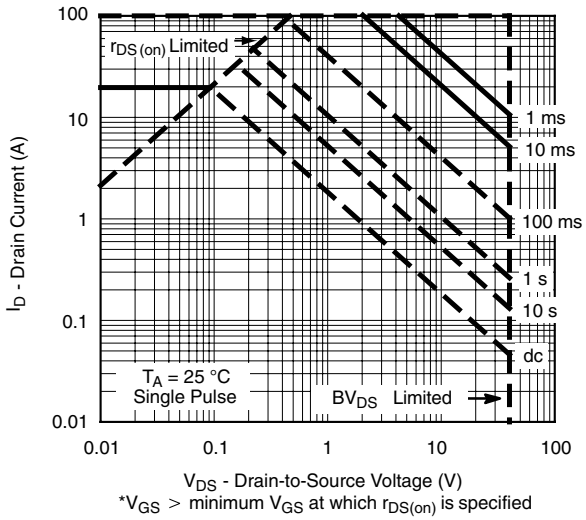
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



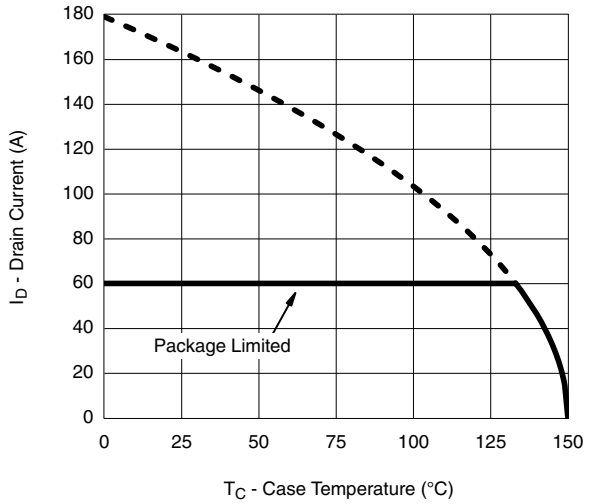
Single Pulse Power, Junction-to-Ambient



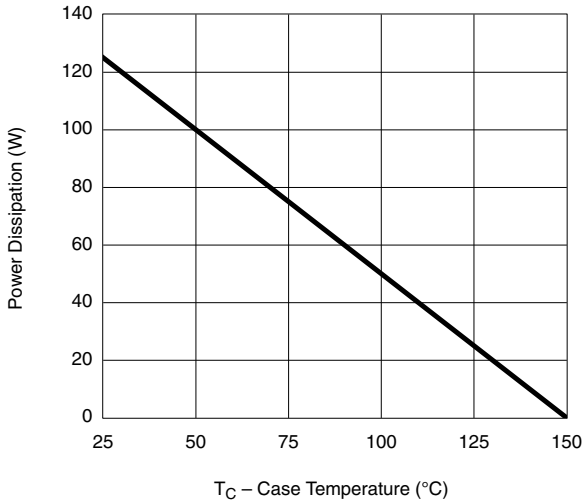
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless noted



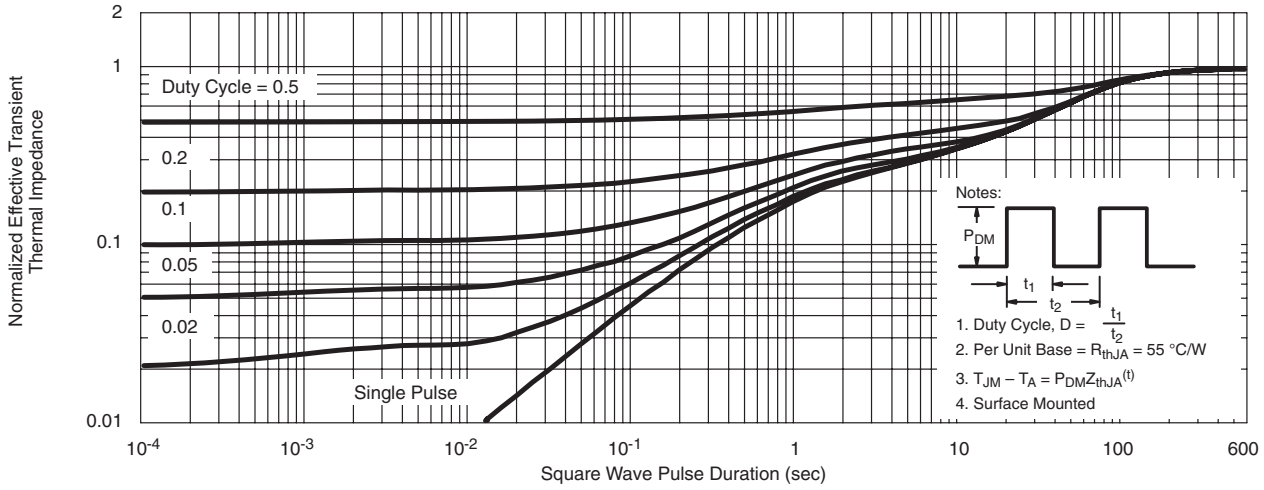
Current Derating*



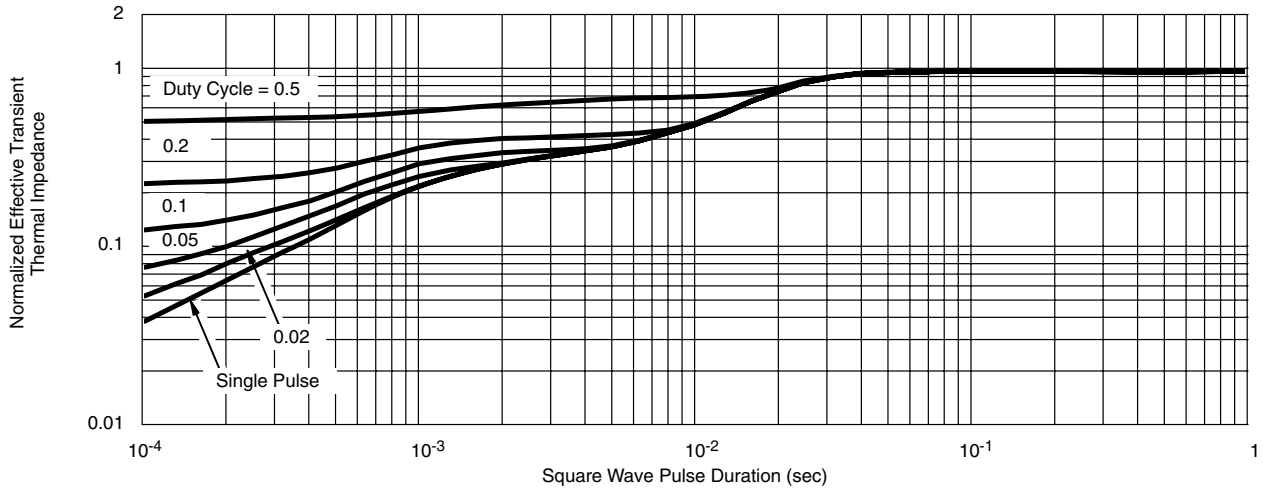
Power Derating, Junction-to-Case

* 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.

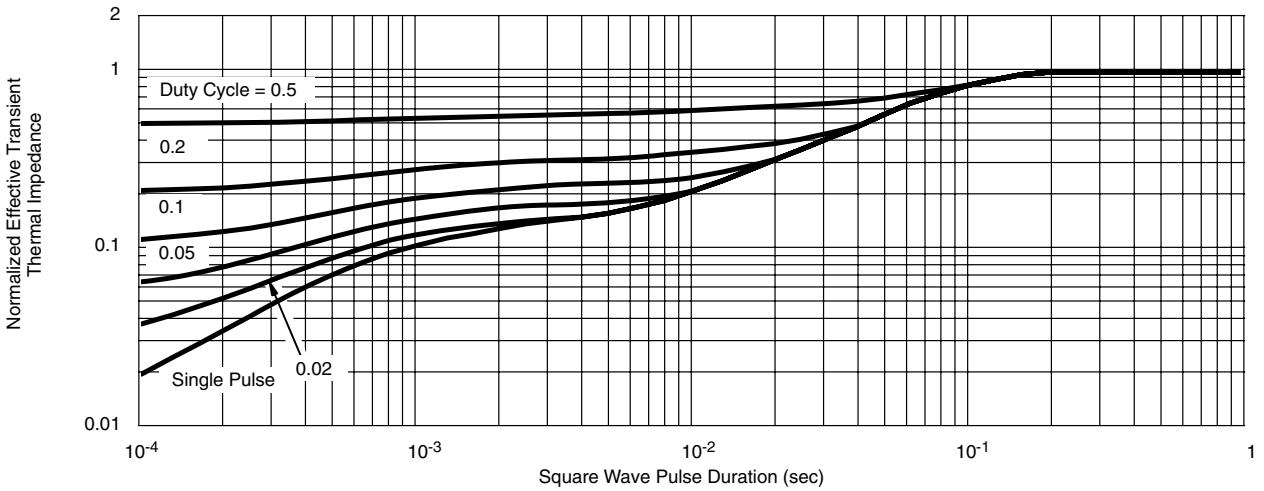
TYPICAL CHARACTERISTICS 25 °C, unless noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case (Drain Top)



Normalized Thermal Transient Impedance, Junction-to-Source

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