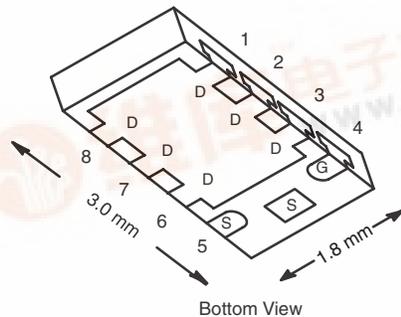


P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
- 20	0.052 at V _{GS} = - 4.5 V	- 8 ^e	8
	0.082 at V _{GS} = - 2.5 V	- 7.5	

PowerPAK[®] ChipFET Single

Bottom View

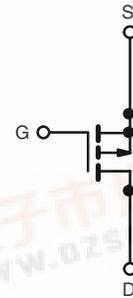
FEATURES

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


RoHS
 COMPLIANT
 HALOGEN
FREE

APPLICATIONS

- Load Switch
- HDD DC/DC



P-Channel MOSFET

Ordering Information: Si5459DU-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	- 20	V	
Gate-Source Voltage	V _{GS}	± 12		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 8 ^e	A
		T _C = 70 °C	- 8 ^e	
		T _A = 25 °C	- 6.7 ^{b, c}	
		T _A = 70 °C	- 5.3 ^{b, c}	
Pulsed Drain Current (10 μs Pulse Width)	I _{DM}	- 20		
Source-Drain Current Diode Current	I _S	T _C = 25 °C	- 8 ^e	
		T _A = 25 °C	- 2.9 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	10.9	W
		T _C = 70 °C	7	
		T _A = 25 °C	3.5 ^{b, c}	
		T _A = 70 °C	2.2 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 50 to 150	°C	
Soldering Recommendations (Peak Temperature) ^{d, e}		260		

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Limit	Unit	
			Typical	Maximum
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	30	36	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	9.5	11.5	

Notes:

- Based on T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under Steady State conditions is 72 °C/W.
- Package Limited.
- See Solder Profile (www.vishay.com/ppg?73257). The PowerPAK ChipFET 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.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.



Si5459DU

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SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	-20			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	$\Delta V_{GS(th)}/T_J$		3.1			
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	-0.6		-1.4	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 12\text{ V}$			-100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}$, $V_{GS} = -10\text{ V}$	-20			A
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}$, $I_D = -6.7\text{ A}$		0.043	0.052	Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -1\text{ A}$		0.068	0.082	
Forward Transconductance ^b	g_{fs}	$V_{DS} = -10\text{ V}$, $I_D = -6.7\text{ A}$		11		S
Dynamic^a						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		665		pF
Output Capacitance	C_{oss}		140			
Reverse Transfer Capacitance	C_{rss}		115			
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -6.7\text{ A}$		17	26	nC
		$V_{DS} = -10\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -6.7\text{ A}$		8	12	
Gate-Source Charge	Q_{gs}	$V_{DS} = -10\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -6.7\text{ A}$		2		nC
Gate-Drain Charge	Q_{gd}		3			
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.2	6	12	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}$, $R_L = 1.9\text{ }\Omega$ $I_D \cong -5.3\text{ A}$, $V_{GEN} = -10\text{ V}$, $R_g = 1\text{ }\Omega$		6	12	ns
Rise Time	t_r		15	23		
Turn-Off Delay Time	$t_{d(off)}$		26	39		
Fall Time	t_f		9	18		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}$, $R_L = 1.9\text{ }\Omega$ $I_D \cong -5.3\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 1\text{ }\Omega$		21	32	ns
Rise Time	t_r		50	75		
Turn-Off Delay Time	$t_{d(off)}$		29	44		
Fall Time	t_f		13	20		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-8	A
Pulse Diode Forward Current ^a	I_{SM}				-20	
Body Diode Voltage	V_{SD}	$I_S = -5.3\text{ A}$		-0.77	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -5.3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$		30	45	ns
Body Diode Reverse Recovery Charge	Q_{rr}			17	26	nC
Reverse Recovery Fall Time	t_a			16		ns
Reverse Recovery Rise Time	t_b			14		

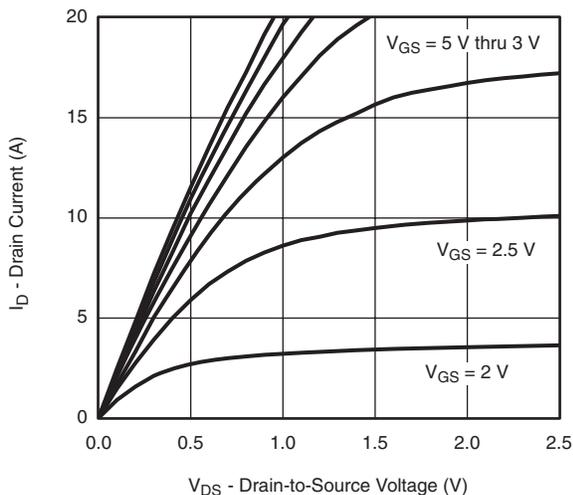
Notes:

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

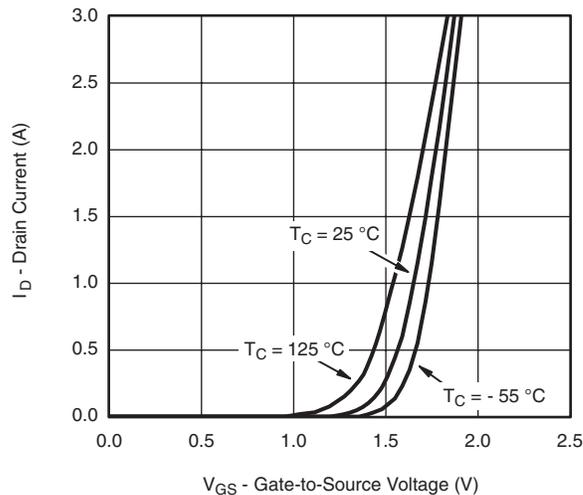
b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

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.

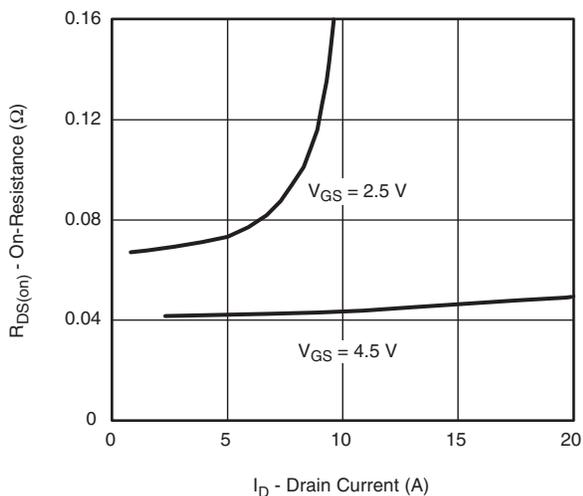
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



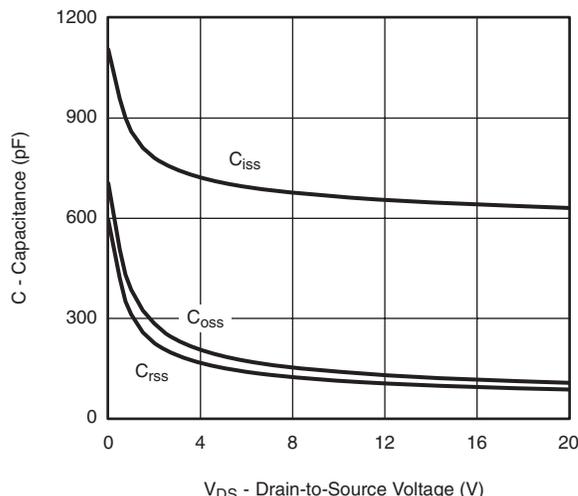
Output Characteristics



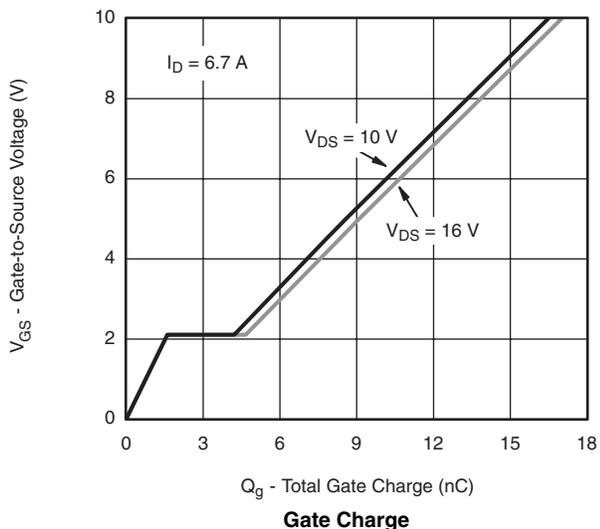
Transfer Characteristics



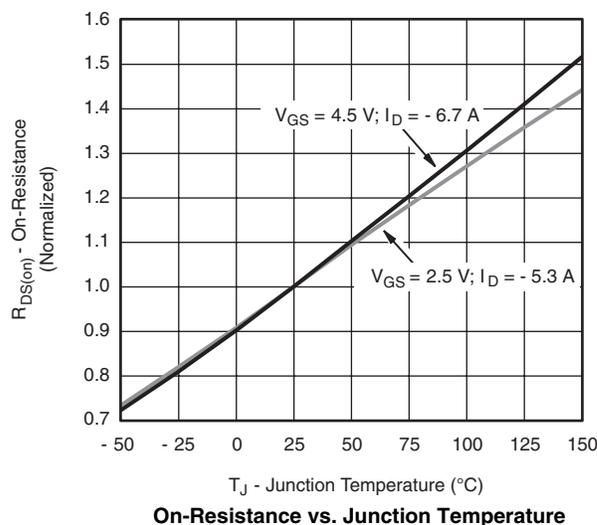
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



Gate Charge



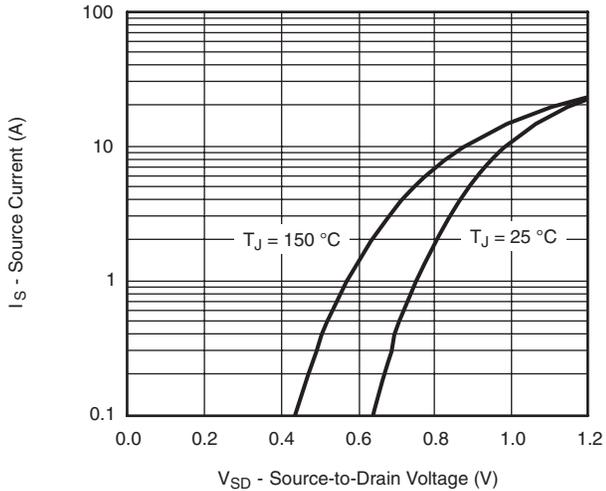
On-Resistance vs. Junction Temperature

Si5459DU

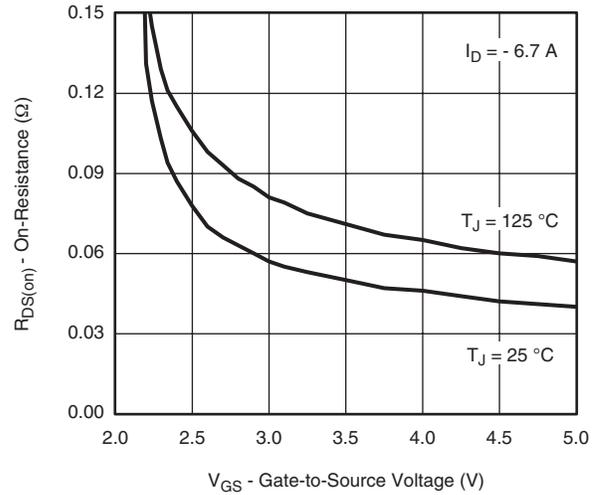


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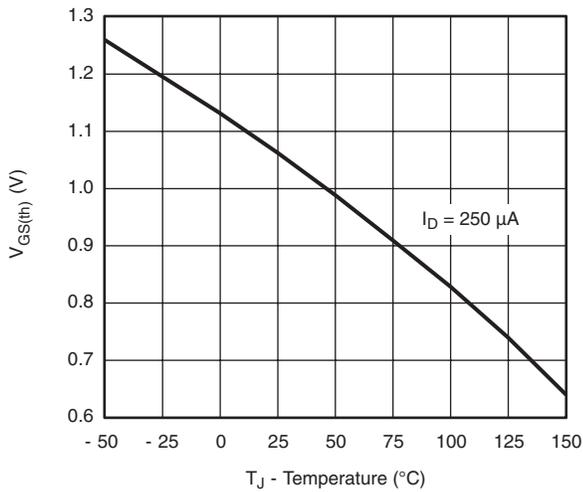
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



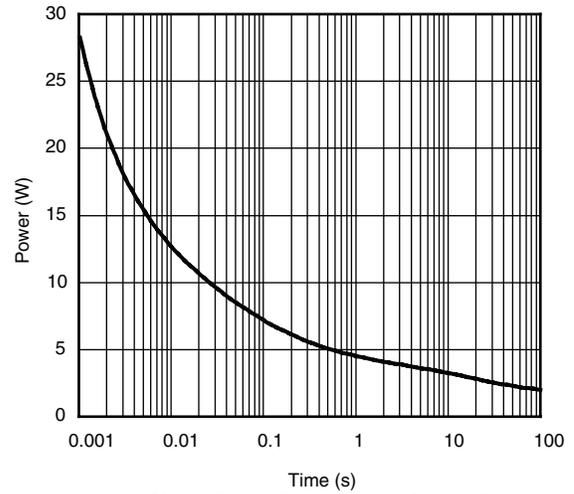
Source-Drain Diode Forward Voltage



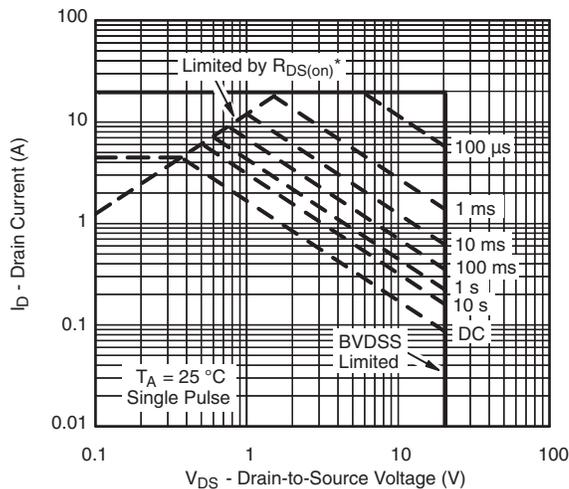
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

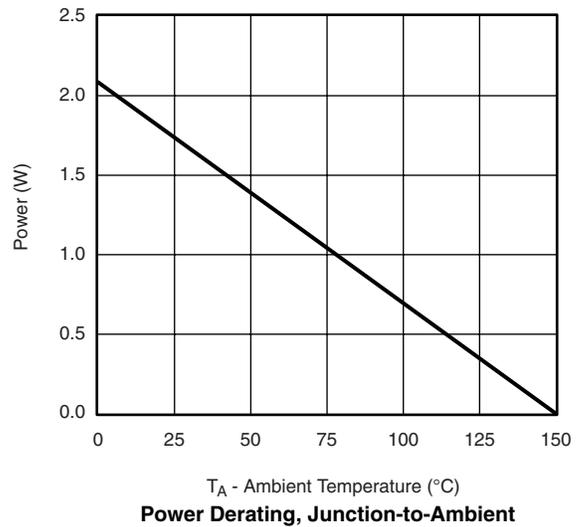
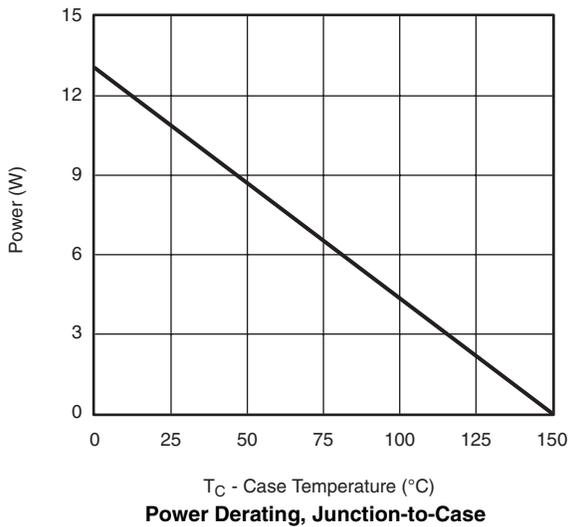
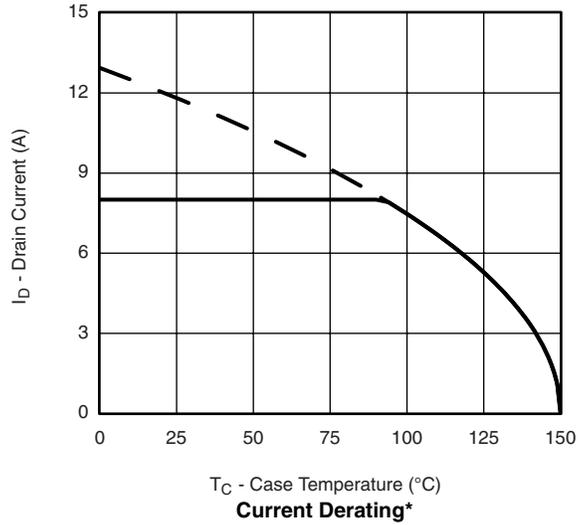


Single Pulse Power, Junction-to-Ambient



Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



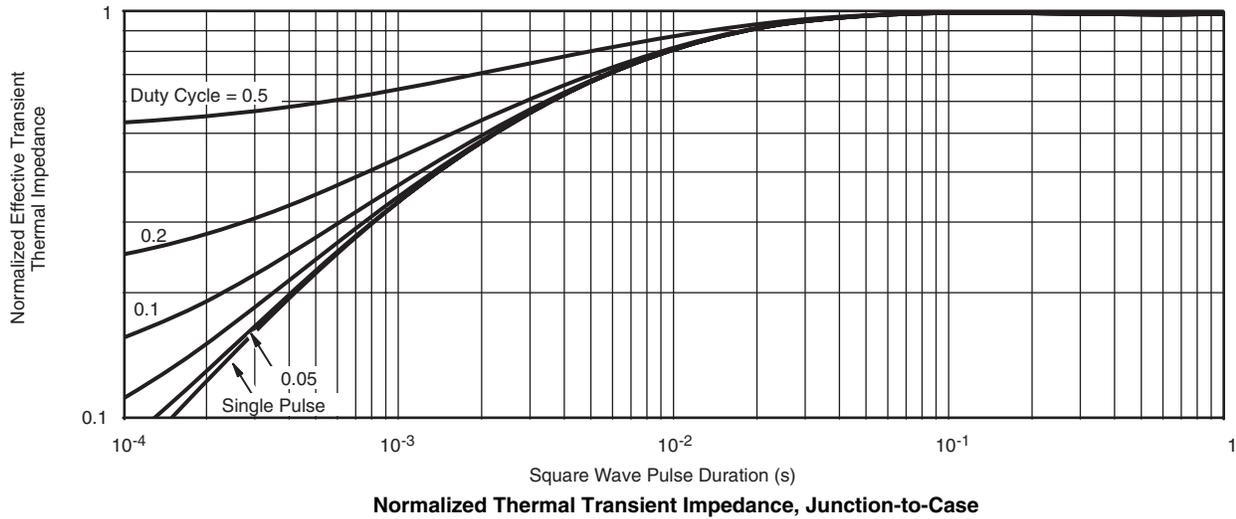
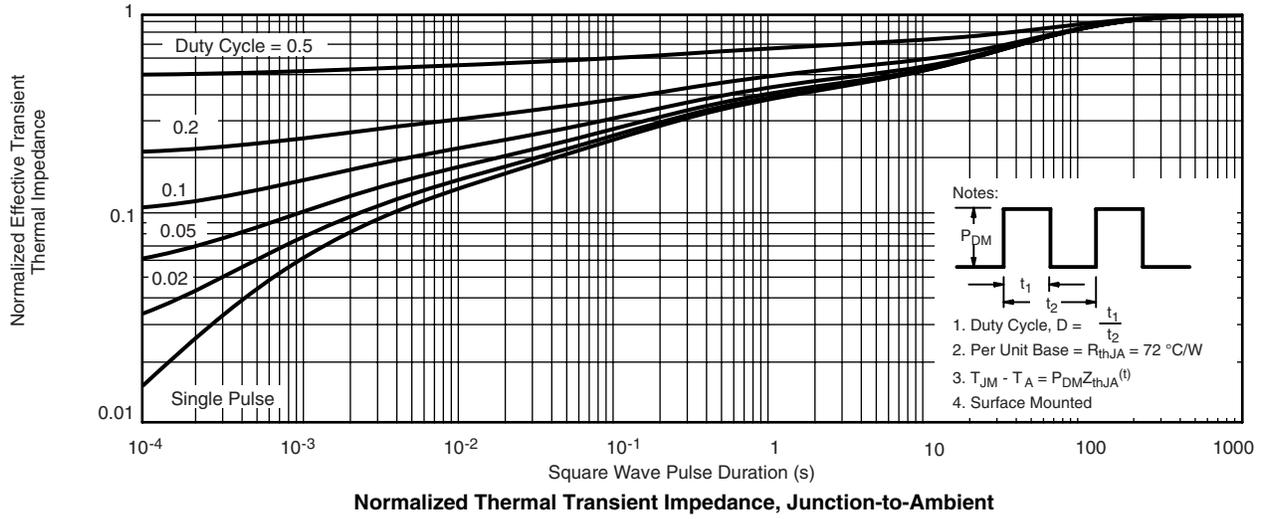
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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