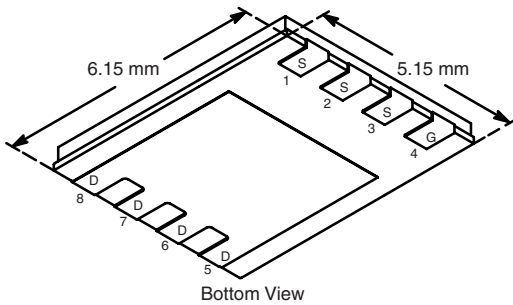


## N-Channel 30-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)
30	0.0087 at V <sub>GS</sub> = 10 V	20	21
	0.010 at V <sub>GS</sub> = 4.5 V	20	

PowerPAK SO-8



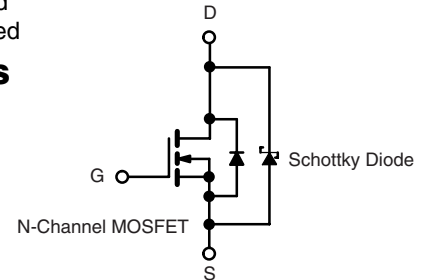
Ordering Information: Si7160DP-T1-E3 (Lead (Pb)-free)  
Si7160DP-T1-GE3 (Lead (Pb)-free and Halogen-free)

### FEATURES

- Halogen-free According to IEC 61249-2-21 Available
- Ultra-Low On-Resistance Using High Density TrenchFET<sup>®</sup> Gen II Power MOSFET Technology
- Q<sub>g</sub> Optimized
- New Low Thermal Resistance PowerPAK<sup>®</sup> Package with Low 1.07 mm Profile
- 100 % R<sub>g</sub> Tested
- 100 % UIS Tested

### APPLICATIONS

- Notebook
- Logic DC/DC



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

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	30	V	
Gate-Source Voltage	V <sub>GS</sub>	± 16		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	20 <sup>a</sup>	A
		T <sub>C</sub> = 70 °C	20 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	17.8 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	14.2 <sup>b, c</sup>	
Pulsed Drain Current	I <sub>DM</sub>	60		
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	20 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	4.5 <sup>b, c</sup>	
Avalanche Current	I <sub>AS</sub>	20		
Single Pulse Avalanche Energy	E <sub>AS</sub>	20	mJ	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	27.7	W
		T <sub>C</sub> = 70 °C	17.7	
		T <sub>A</sub> = 25 °C	5 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	3.2 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C	
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260		

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>b, f</sup>	R <sub>thJA</sub>	20	25	°C/W	
Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	3.4	4.5		

Notes:

- Package Limited.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- See Solder Profile ([www.vishay.com/doc?73461](http://www.vishay.com/doc?73461)). The PowerPAK SO-8 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.
- Maximum under Steady State conditions is 70 °C/W.

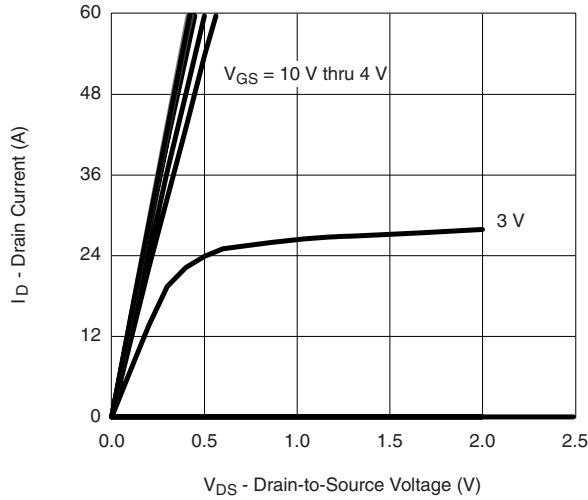
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		2.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$		0.26	1	mA
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$		12	100	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$		0.0072	0.0087	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		0.0083	0.010	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		60		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		2970		pF
Output Capacitance	$C_{oss}$			475		
Reverse Transfer Capacitance	$C_{rss}$			180		
Total Gate Charge	$Q_g$	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		44	66	nC
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		21	32	
Gate-Source Charge	$Q_{gs}$			6.9		
Gate-Drain Charge	$Q_{gd}$		5.8			
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		1.0	1.5	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		29	45	ns
Rise Time	$t_r$			115	175	
Turn-Off Delay Time	$t_{d(off)}$			43	65	
Fall Time	$t_f$			21	35	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong 10\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		15	25	
Rise Time	$t_r$			12	20	
Turn-Off Delay Time	$t_{d(off)}$			33	50	
Fall Time	$t_f$			8	15	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			20	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				60	
Body Diode Voltage	$V_{SD}$	$I_S = 2\text{ A}$		0.36	0.42	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 4\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		29	45	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			21	35	nC
Reverse Recovery Fall Time	$t_a$			15		ns
Reverse Recovery Rise Time	$t_b$			14		

## Notes:

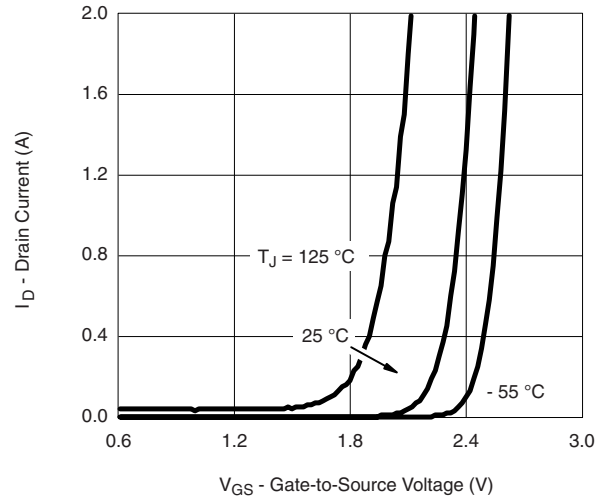
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.

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.

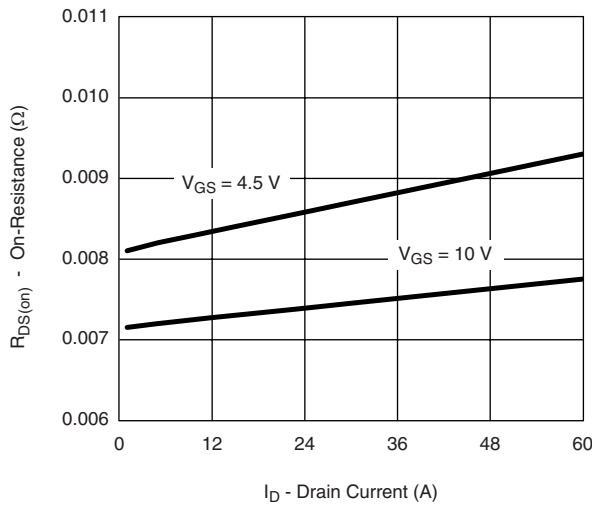
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



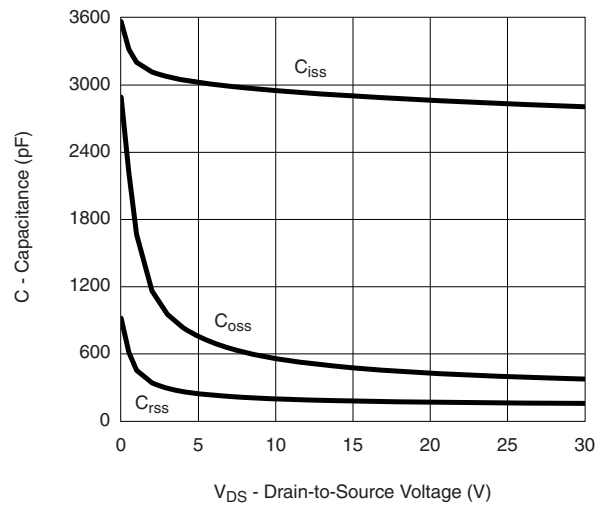
**Output Characteristics**



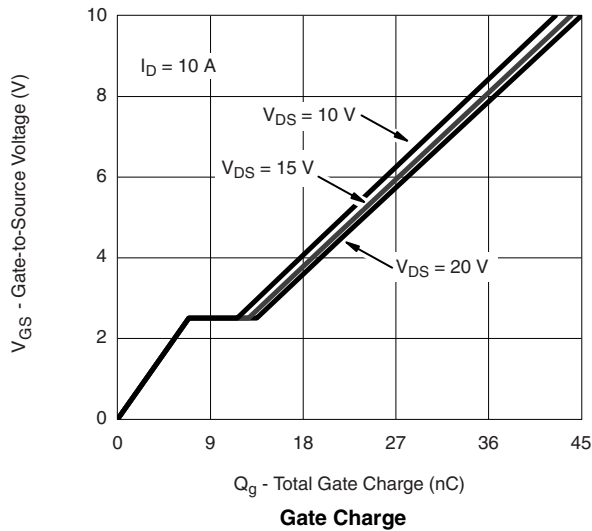
**Transfer Characteristics**



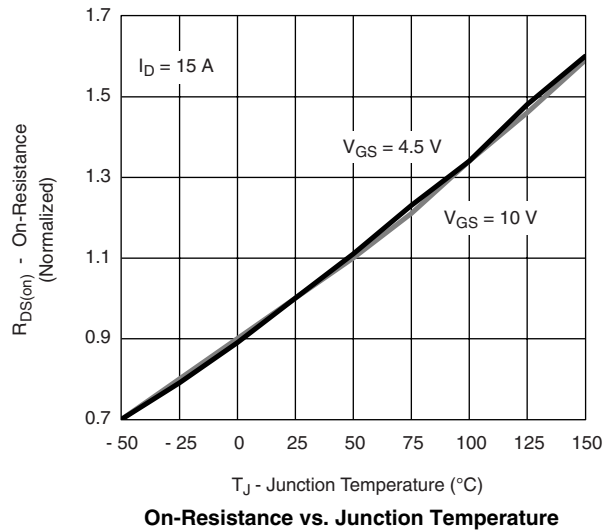
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**

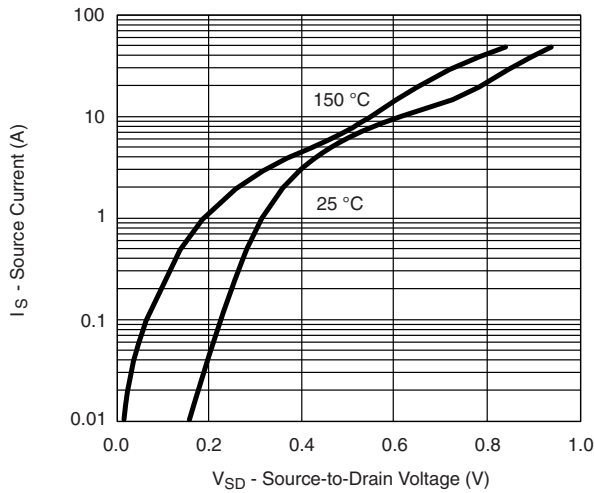


**Gate Charge**

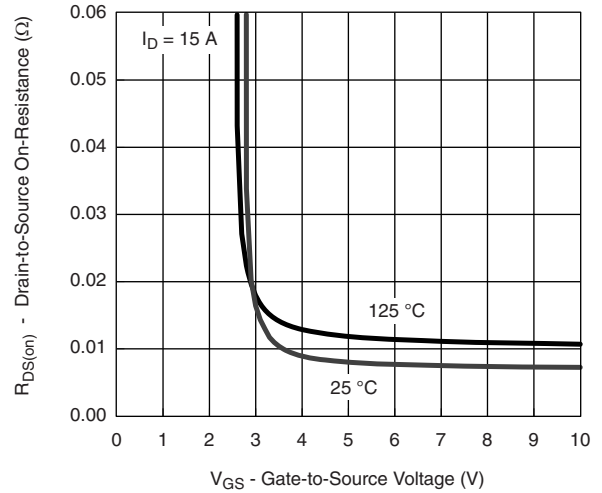


**On-Resistance vs. Junction Temperature**

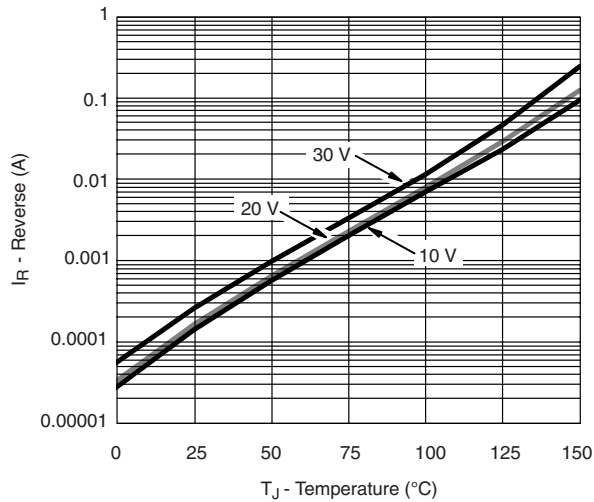
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



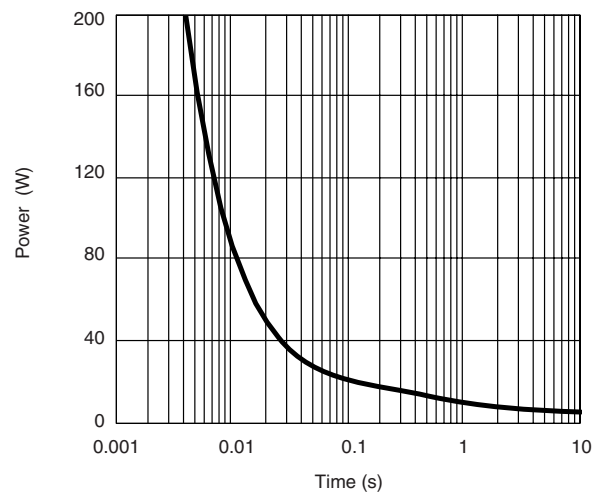
**Source-Drain Diode Forward Voltage**



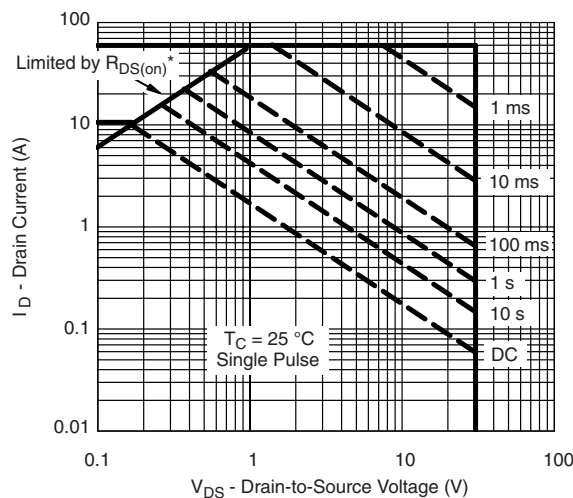
**On-Resistance vs. Gate-to-Source Voltage**



**Reverse Current (Schottky)**



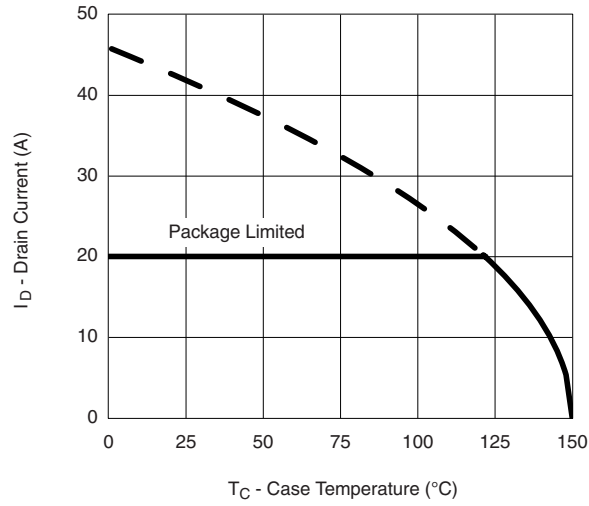
**Single Pulse Power, Junction-to-Ambient**



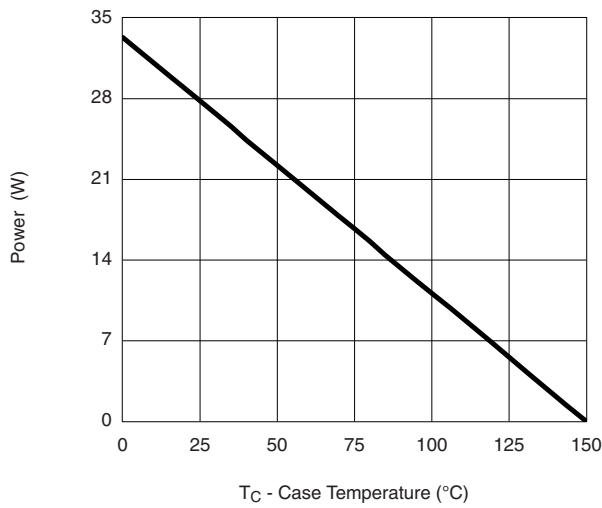
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area, Junction-to-Ambient**

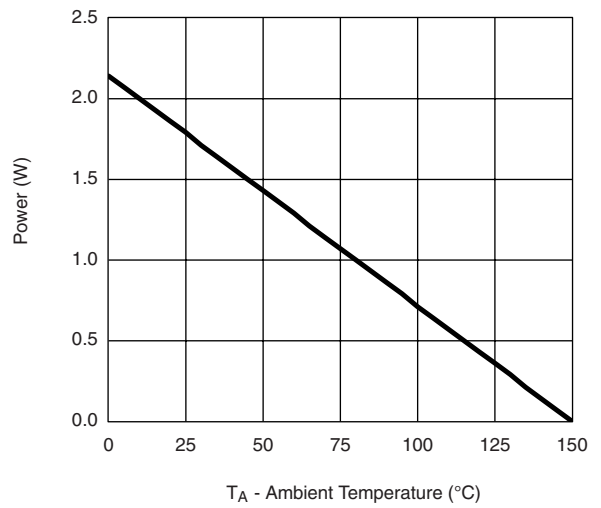
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Current Derating\***



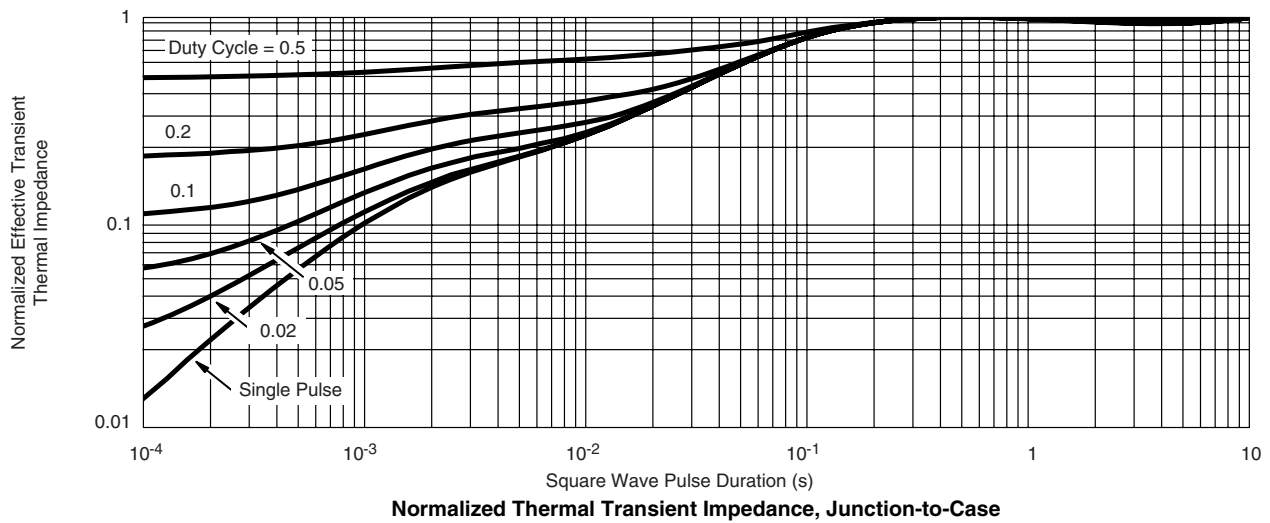
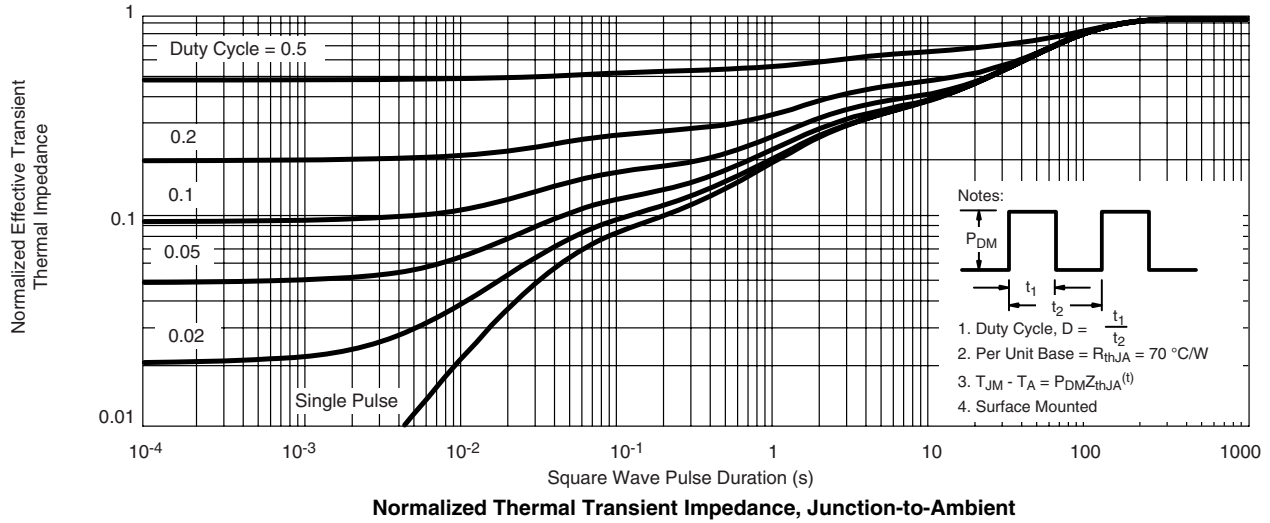
**Power, Junction-to-Case**



**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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