

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

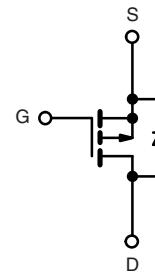
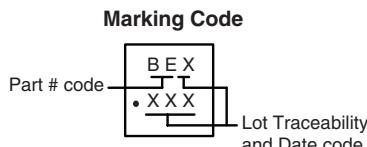
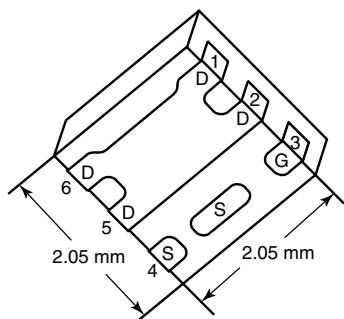
PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 20	0.030 at $V_{GS} = - 4.5$ V	- 12 ^a	15 nC
	0.041 at $V_{GS} = - 2.5$ V	- 12 ^a	
	0.056 at $V_{GS} = - 1.8$ V	- 12 ^a	
	0.150 at $V_{GS} = - 1.5$ V	- 2	

FEATURES

- Halogen-free
- TrenchFET® Power MOSFET
- New Thermally Enhanced PowerPAK® SC-70 Package
- Small Footprint Area
- Low On-Resistance


RoHS
COMPLIANT

PowerPAK SC-70-6L-Single



Ordering Information: SiA411DJ-T1-GE3 (Lead (Pb)-free and Halogen-free)

P-Channel MOSFET

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}	± 8		
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	- 12 ^a	A	
	$T_C = 70$ °C	- 12 ^a		
	$T_A = 25$ °C	- 8.8 ^{b, c}		
	$T_A = 70$ °C	- 7 ^{b, c}		
Pulsed Drain Current	I_{DM}	- 20		
Continuous Source-Drain Diode Current	$T_C = 25$ °C	- 12 ^a	A	
	$T_A = 25$ °C	- 2.9 ^{b, c}		
Maximum Power Dissipation	$T_C = 25$ °C	19	W	
	$T_C = 70$ °C	12		
	$T_A = 25$ °C	3.5 ^{b, c}		
	$T_A = 70$ °C	2.2 ^{b, c}		
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C	
Soldering Recommendations (Peak Temperature) ^{d, e}		260		

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, f}	$t \leq 5$ s	R_{thJA}	28	36
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	5.3	6.5

Notes:

- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- See Solder Profile (<http://www.vishay.com/ppg?73257>). The PowerPAK SC-70 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 80 °C/W.

SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted

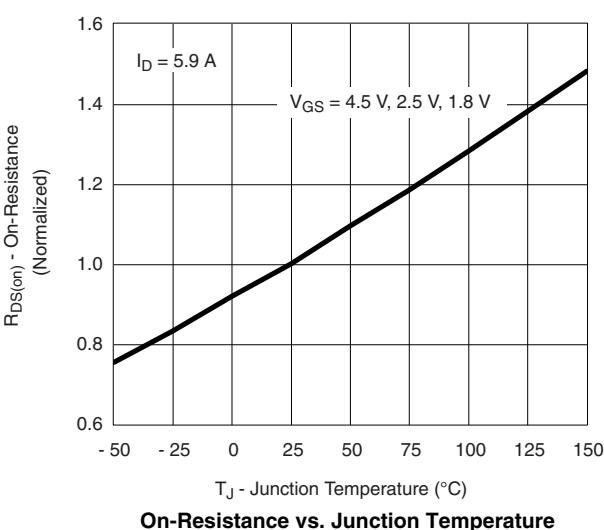
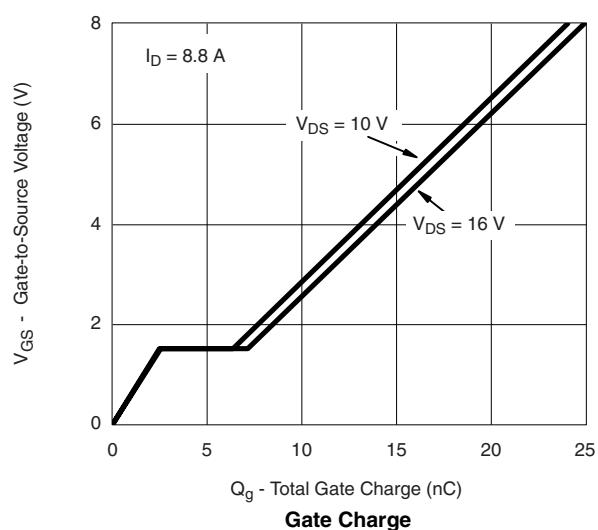
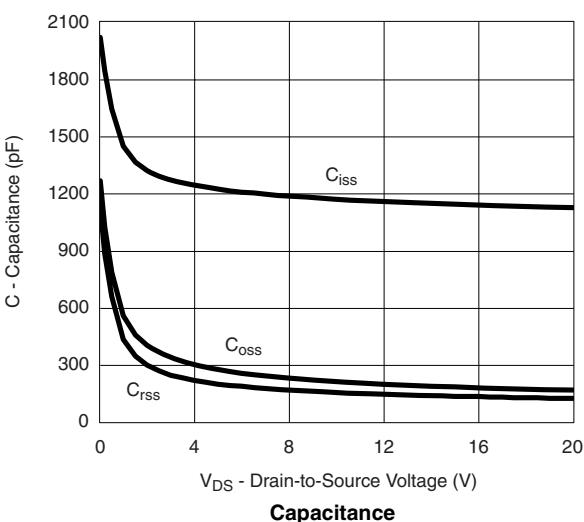
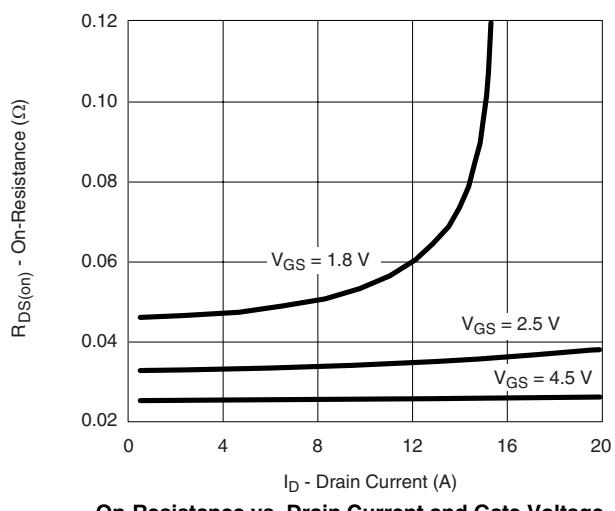
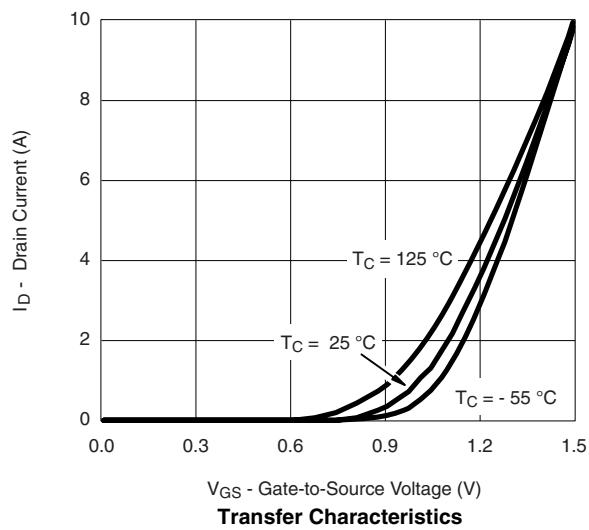
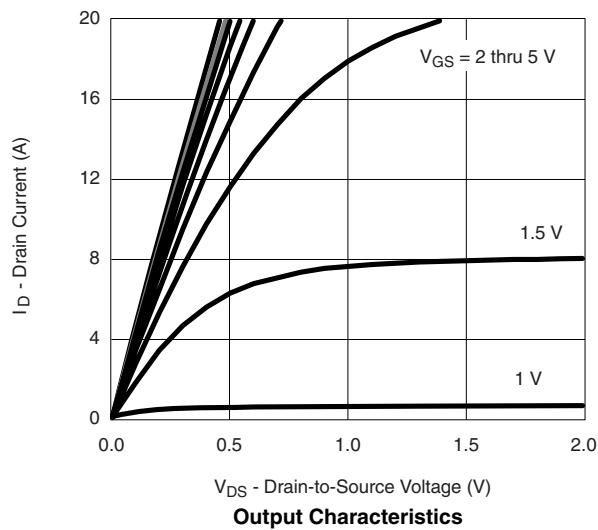
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 19.5		mV/°C
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			2.3		
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	- 0.4		- 1	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \leq -5\text{ V}$, $V_{GS} = -4.5\text{ V}$	- 20			A
Drain-Source On-State Resistance ^a	$R_{DS(\text{on})}$	$V_{GS} = -4.5\text{ V}$, $I_D = -5.9\text{ A}$		0.025	0.030	Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -5.0\text{ A}$		0.033	0.041	
		$V_{GS} = -1.8\text{ V}$, $I_D = -1.8\text{ A}$		0.045	0.056	
		$V_{GS} = -1.5\text{ V}$, $I_D = -0.7\text{ A}$		0.075	0.150	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}$, $I_D = -5.9\text{ A}$		21		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		1200		pF
Output Capacitance	C_{oss}			210		
Reverse Transfer Capacitance	C_{rss}			155		
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}$, $V_{GS} = -8\text{ V}$, $I_D = -8.8\text{ A}$		25	38	nC
Gate-Source Charge	Q_{gs}	$V_{DS} = -10\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -8.8\text{ A}$		15	23	
Gate-Drain Charge	Q_{gd}			2.5		
Gate Resistance	R_g			4		
Turn-On Delay Time	$t_{d(\text{on})}$			5		Ω
Rise Time	t_r	$V_{DD} = -10\text{ V}$, $R_L = 1.4\text{ }\Omega$ $I_D \equiv -7\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 1\text{ }\Omega$		12	20	ns
Turn-Off Delay Time	$t_{d(\text{off})}$			65	100	
Fall Time	t_f			40	60	
Turn-On Delay Time	$t_{d(\text{on})}$			100	150	
Rise Time	t_r			5	10	
Turn-Off Delay Time	$t_{d(\text{off})}$	$V_{DD} = -10\text{ V}$, $R_L = 1.4\text{ }\Omega$ $I_D \equiv -7\text{ A}$, $V_{GEN} = -8\text{ V}$, $R_g = 1\text{ }\Omega$		25	35	ns
Fall Time	t_f			40	60	
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			- 12	A
Pulse Diode Forward Current	I_{SM}				20	
Body Diode Voltage	V_{SD}	$I_S = -7\text{ A}$, $V_{GS} = 0\text{ V}$		- 0.85	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -7\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$		20	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			10	20	nC
Reverse Recovery Fall Time	t_a			13		ns
Reverse Recovery Rise Time	t_b			7		

Notes:

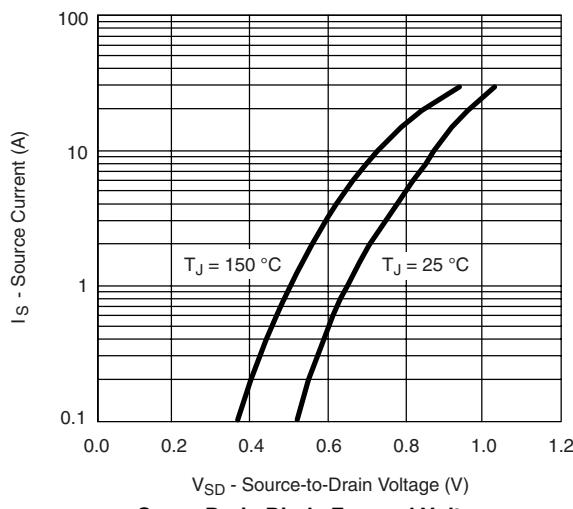
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

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

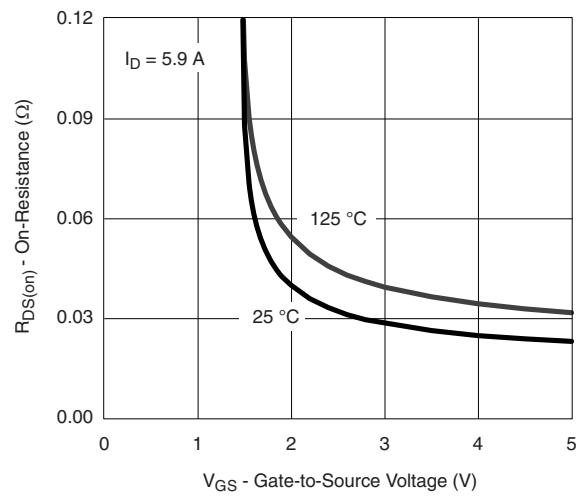
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


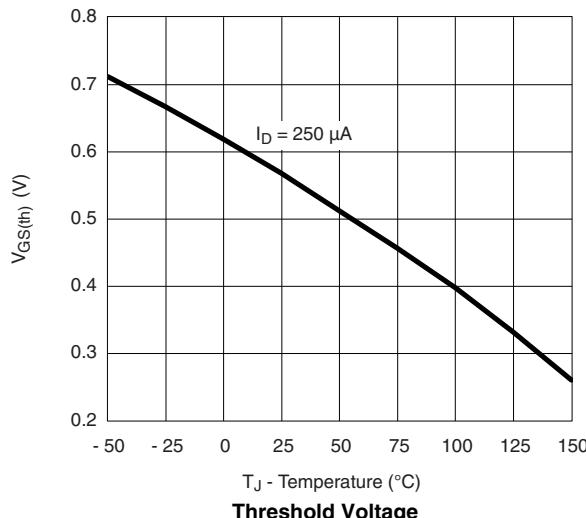
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



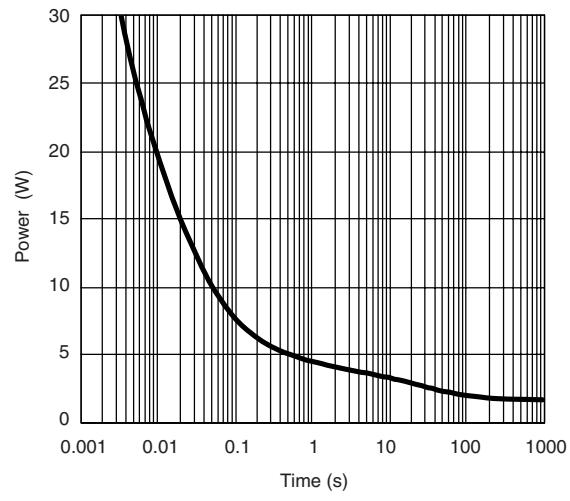
Source-Drain Diode Forward Voltage



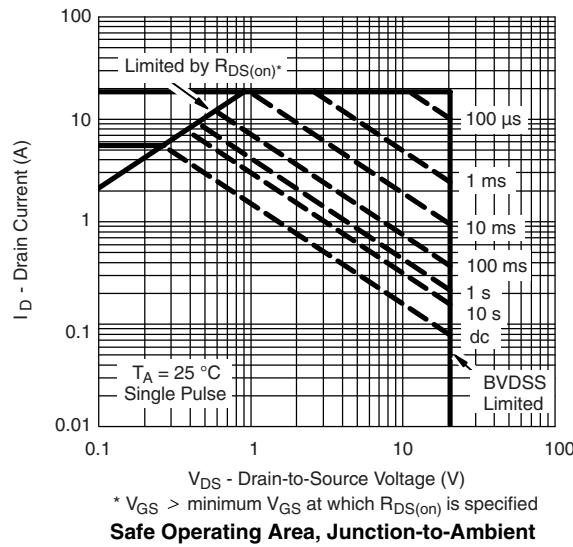
On-Resistance vs. Gate-to-Source Voltage



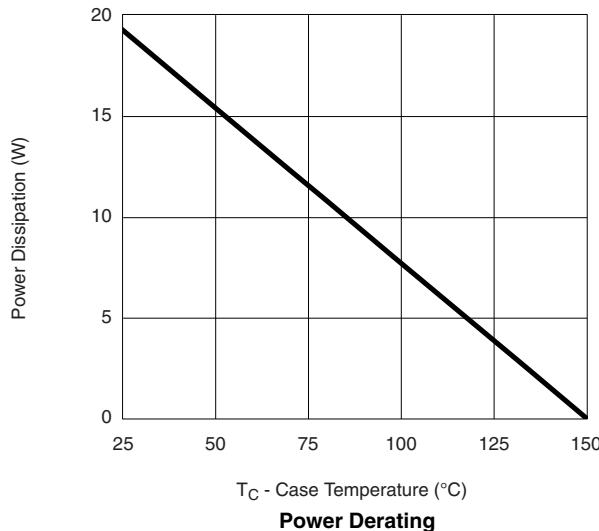
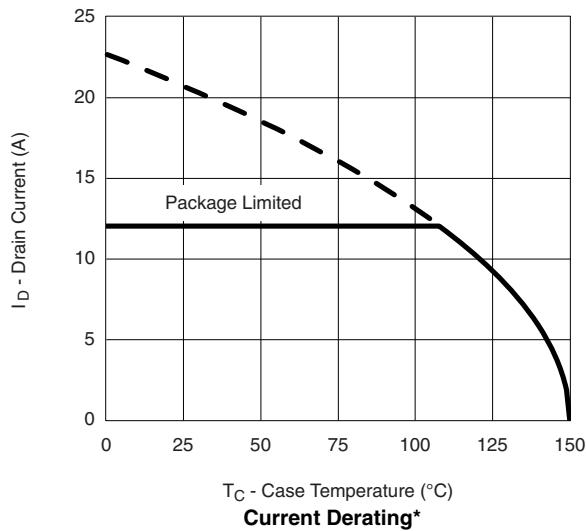
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


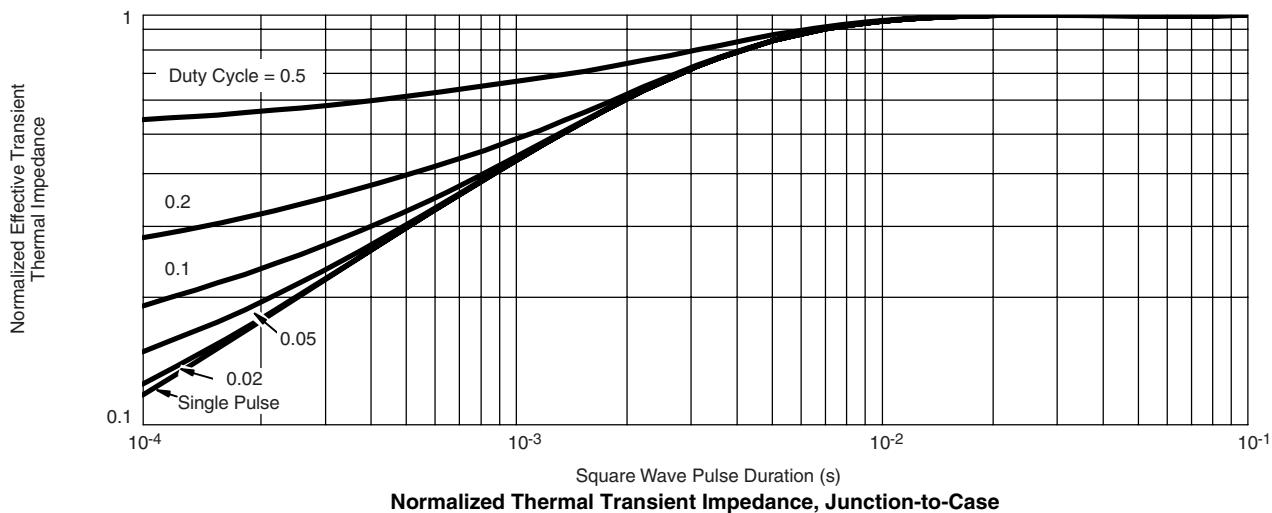
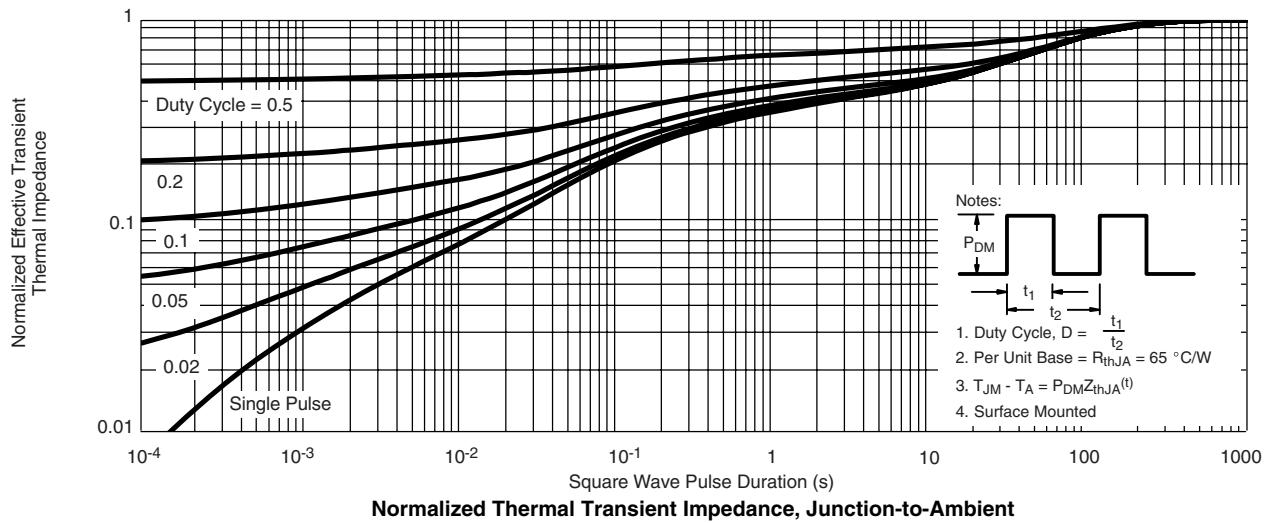
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

SiA411DJ

Vishay Siliconix



TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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