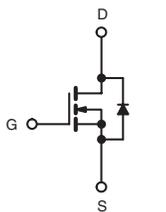
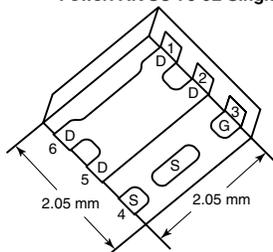




## N-Channel 20 V (D-S) MOSFET

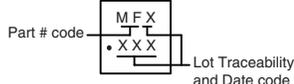
PRODUCT SUMMARY	
$V_{DS}$ (V)	20
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.0135
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.0185
$I_D$ (A) <sup>a, b, c</sup>	12
Configuration	Single

PowerPAK SC-70-6L-Single



N-Channel MOSFET

Marking Code



### FEATURES

- High Quality Manufacturing Process Using SMM Process Flow
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- New Thermally Enhanced PowerPAK<sup>®</sup> SC-70 Package
  - Small Footprint Area
- Compliant to RoHS Directive 2002/95/EC
- Find out more about Vishay's Medical Products at: [www.vishay.com/medical-mosfets](http://www.vishay.com/medical-mosfets)



RoHS  
COMPLIANT  
HALOGEN  
FREE

### APPLICATION EXAMPLES

- Medical Implantable Applications Including
  - Drug Delivery Systems
  - Defibrillators
  - Pacemakers
  - Hearing Aids
  - Other Implantable Devices
- Load Switch

ORDERING INFORMATION	
Package	PowerPAK SC-70
Lead (Pb)-free and Halogen-free	SMMA430DJ-T1-GE3

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C <sup>a</sup>	12
		$T_C = 70$ °C <sup>a</sup>	12
		$T_A = 25$ °C <sup>a, b, c</sup>	12
		$T_A = 70$ °C <sup>b, c</sup>	10.1
Pulsed Drain Current	$I_{DM}$	40	A
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25$ °C <sup>a</sup>	
		$T_A = 25$ °C <sup>b, c</sup>	2.9
Maximum Power Dissipation	$P_D$	$T_C = 25$ °C	19.2
		$T_C = 70$ °C	12.3
		$T_A = 25$ °C <sup>b, c</sup>	3.5
		$T_A = 70$ °C <sup>b, c</sup>	2.2
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260	



### THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Ambient <sup>b, f</sup>	$t \leq 5$ s	$R_{thJA}$	28	36	°C/W
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 ([www.vishay.com/ppg?73257](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 $T_J = 25$ °C, unless otherwise noted

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu$ A	20	-	-	V	
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250$ $\mu$ A	-	24	-	mV/°C	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-5.6	-		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250$ $\mu$ A	1	-	3	V	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V	-	-	$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V	$V_{DS} = 20$ V	-	-	1	$\mu$ A
		$V_{GS} = 0$ V	$V_{DS} = 20$ V, $T_J = 55$ °C	-	-	10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = 10$ V	$V_{DS} \geq 5$ V	20	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10$ V	$I_D = 7$ A	-	0.0108	0.0135	$\Omega$
		$V_{GS} = 4.5$ V	$I_D = 5$ A	-	0.0146	0.0185	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10$ V, $I_D = 7$ A	-	16	-	S	
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0$ V	$V_{DS} = 10$ V, $f = 1$ MHz	-	800	-	pF
Output Capacitance	$C_{oss}$			-	200	-	
Reverse Transfer Capacitance	$C_{rss}$			-	90	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10$ V	$V_{DS} = 10$ V, $I_D = 12$ A	-	12	18	nC
		$V_{GS} = 4.5$ V	$V_{DS} = 10$ V, $I_D = 12$ A	-	5.3	9	
Gate-Source Charge	$Q_{gs}$	$V_{GS} = 4.5$ V	$V_{DS} = 10$ V, $I_D = 12$ A	-	2	-	
Gate-Drain Charge	$Q_{gd}$			-	1.4	-	
Gate Resistance	$R_g$	$f = 1$ MHz		-	2.5	-	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10$ V, $R_L = 1.0$ $\Omega$ $I_D \cong 10$ A, $V_{GEN} = 4.5$ V, $R_g = 1$ $\Omega$		-	16	25	ns
Rise Time	$t_r$			-	10	15	
Turn-Off Delay Time	$t_{d(off)}$			-	15	25	
Fall Time	$t_f$			-	10	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10$ V, $R_L = 1.0$ $\Omega$ $I_D \cong 10$ A, $V_{GEN} = 10$ V, $R_g = 1$ $\Omega$		-	10	15	
Rise Time	$t_r$			-	8	15	
Turn-Off Delay Time	$t_{d(off)}$			-	17	30	
Fall Time	$t_f$			-	8	15	
<b>Source-Drain Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25$ °C		-	-	12	A
Pulse Diode Forward Current	$I_{SM}$			-	-	40	
Body Diode Voltage	$V_{SD}$	$I_S = 5$ A, $V_{GS} = 0$ V		-	0.8	1.2	V



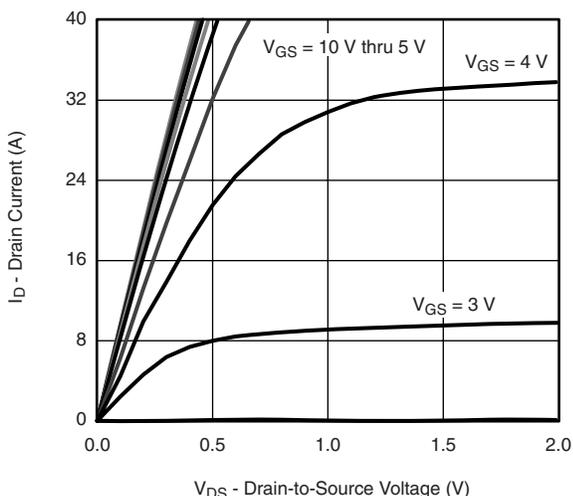
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Source-Drain Body Diode Characteristics</b>						
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 10\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^\circ\text{C}$	-	18	30	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	7	15	nC
Reverse Recovery Fall Time	$t_a$		-	8	-	ns
Reverse Recovery Rise Time	$t_b$		-	10	-	

**Notes**

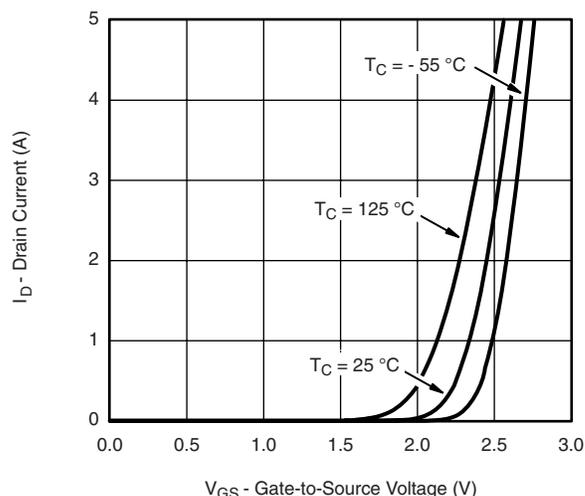
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

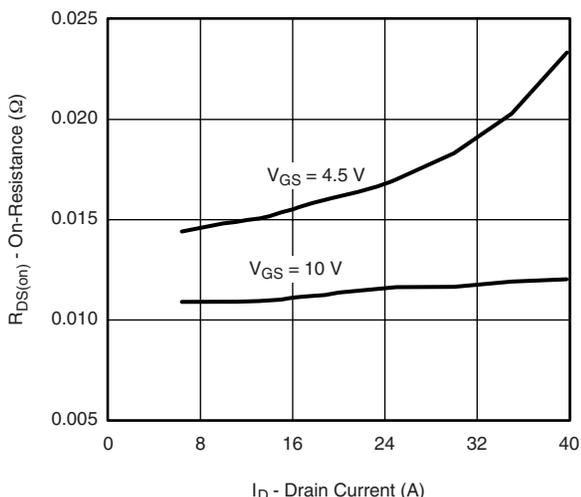
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



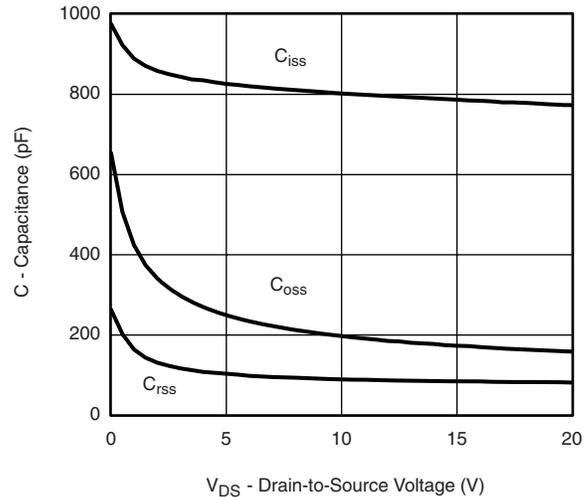
**Output Characteristics**



**Transfer Characteristics**

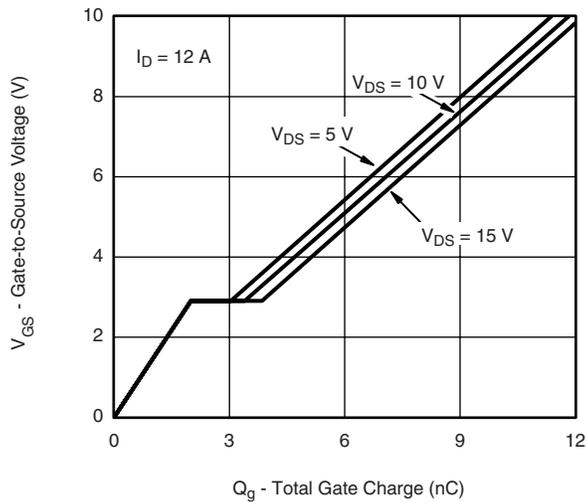


**On-Resistance vs. Drain Current and Gate Voltage**

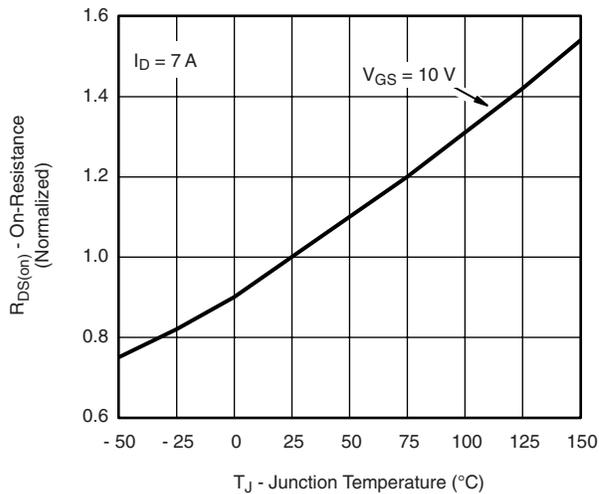


**Capacitance**

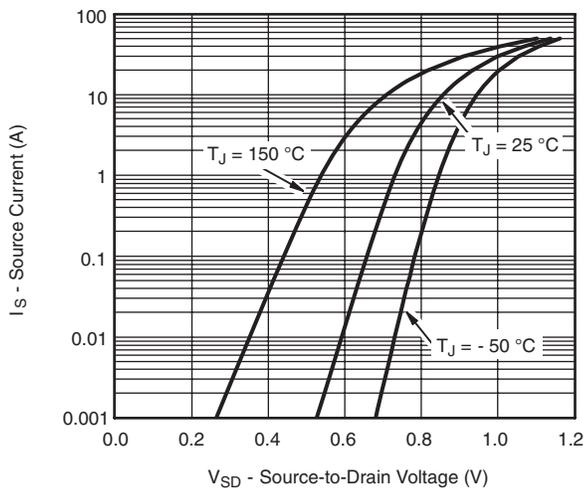
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



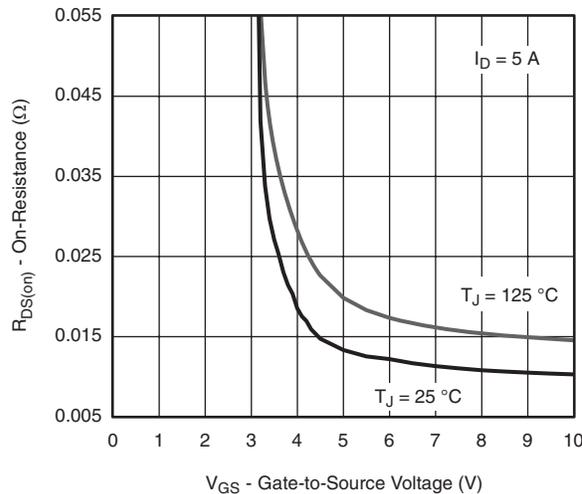
**Gate Charge**



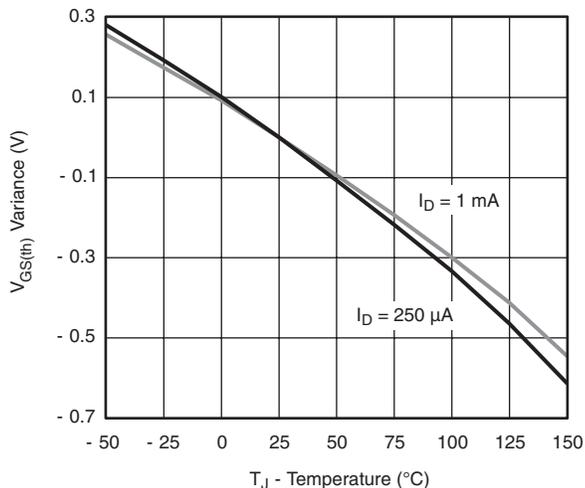
**On-Resistance vs. Junction Temperature**



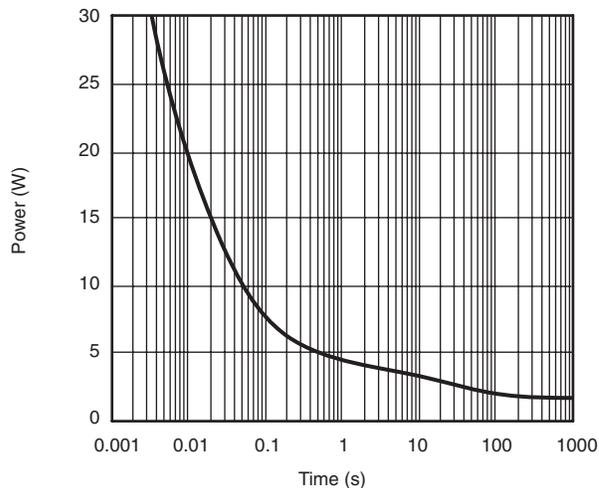
**Source-Drain Diode Forward Voltage**



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

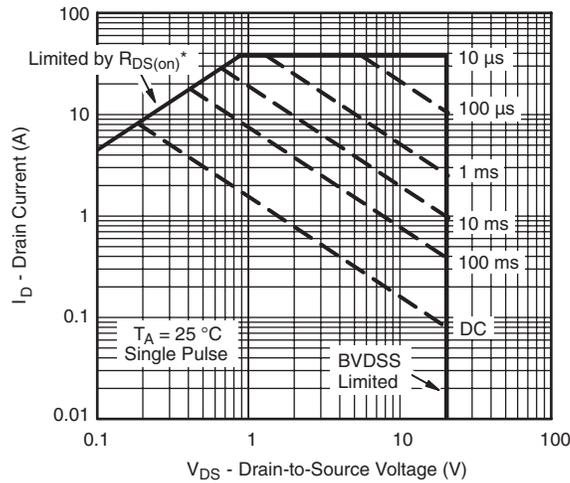


**Threshold Voltage**



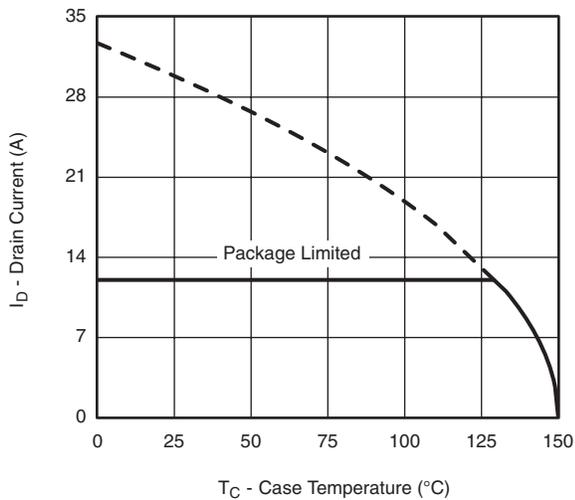
**Single Pulse Power, Junction-to-Ambient**

**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted

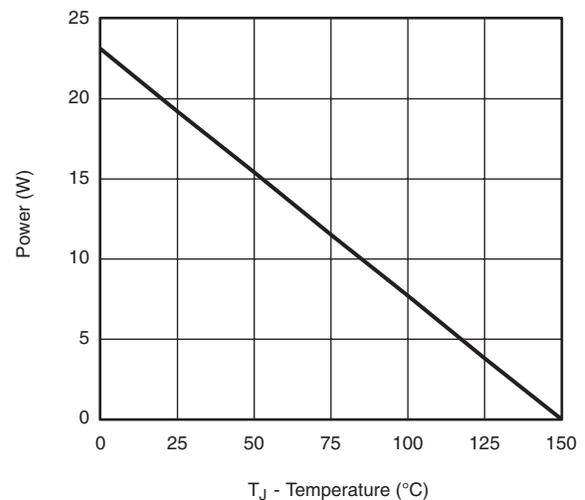


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

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



**Current Derating\***



**Power Derating**

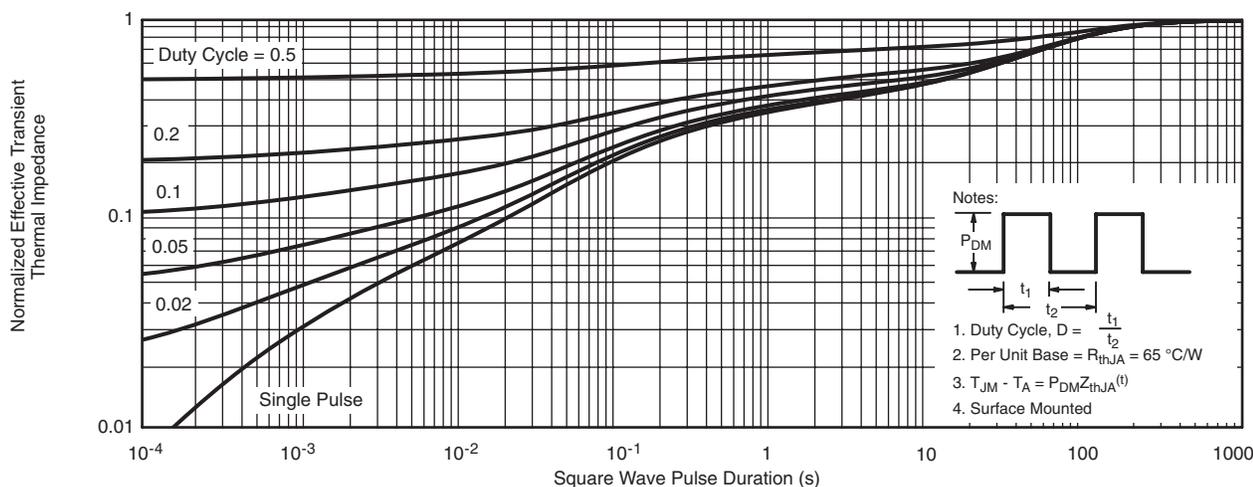
\* The power dissipation  $P_D$  is based on  $T_{J(max.)} = 150\text{ }^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating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

# SMMA430DJ

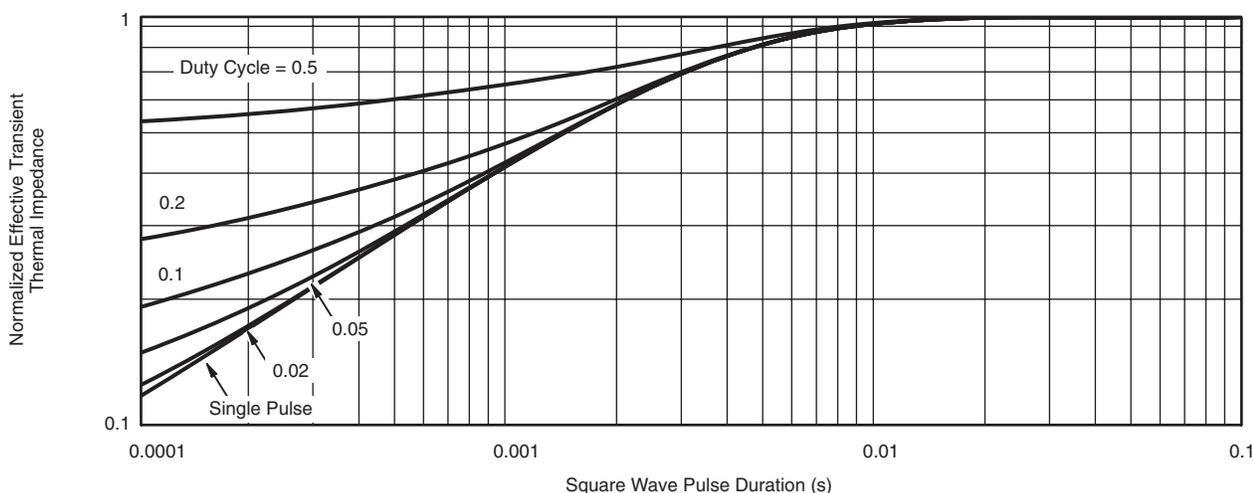
Vishay Siliconix



## TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?65584](http://www.vishay.com/ppg?65584).



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