



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

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.)
- 20	0.038 at V <sub>GS</sub> = - 4.5 V	- 6	18 nC
	0.046 at V <sub>GS</sub> = - 2.5 V	- 6	
	0.060 at V <sub>GS</sub> = - 1.8 V	- 6	

### FEATURES

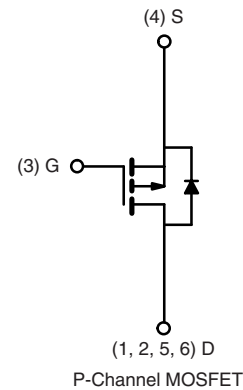
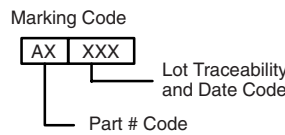
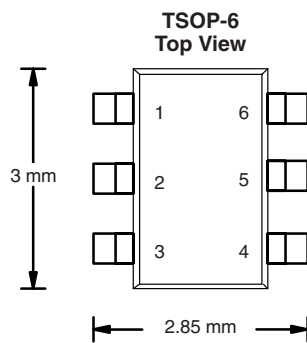
- TrenchFET<sup>®</sup> Power MOSFET

### APPLICATIONS

- Load Switch
- Notebook



**RoHS**  
COMPLIANT



Ordering Information: Si3433CDV-T1-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	- 20	V	
Gate-Source Voltage	V <sub>GS</sub>	± 8.0		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	- 6.0 <sup>a</sup>	A
		T <sub>C</sub> = 70 °C	- 6.0 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	- 5.2 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	- 4.2 <sup>b, c</sup>	
Pulsed Drain Current	I <sub>DM</sub>	- 20		
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	- 2.7	
		T <sub>A</sub> = 25 °C	- 1.3 <sup>b, c</sup>	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	3.3	W
		T <sub>C</sub> = 70 °C	2.1	
		T <sub>A</sub> = 25 °C	1.6 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	1.0 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>b, d</sup>	R <sub>thJA</sub>	60	80	°C/W	
Maximum Junction-to-Foot (Drain)	R <sub>thJF</sub>	25	38		

Notes:

- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under Steady State conditions is 110 °C/W.



SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-18		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4		-1.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			-10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -5.2\text{ A}$		0.031	0.038	$\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -4.8\text{ A}$		0.037	0.046	
		$V_{GS} = -1.8\text{ V}, I_D = -2\text{ A}$		0.046	0.060	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -6\text{ V}, I_D = -5.2\text{ A}$		20		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1300		$\mu\text{F}$
Output Capacitance	$C_{oss}$			210		
Reverse Transfer Capacitance	$C_{rss}$			180		
Total Gate Charge	$Q_g$	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -5.2\text{ A}$		30	45	nC
				18	27	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -5.2\text{ A}$		2.1		
Gate-Drain Charge	$Q_{gd}$			4.8		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		6		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 2.4\text{ }\Omega$ $I_D \cong -4.2\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		20	30	ns
Rise Time	$t_r$			22	35	
Turn-Off Delay Time	$t_{d(off)}$			50	75	
Fall Time	$t_f$			20	30	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 2.4\text{ }\Omega$ $I_D \cong -4.2\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$		10	15	
Rise Time	$t_r$			12	25	
Turn-Off Delay Time	$t_{d(off)}$			50	75	
Fall Time	$t_f$			15	25	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			-2.7	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				-20	
Body Diode Voltage	$V_{SD}$	$I_S = -4.2\text{ A}$		-0.8	-1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = -4.2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		45	70	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			40	60	nC
Reverse Recovery Fall Time	$t_a$			23		ns
Reverse Recovery Rise Time	$t_b$			22		

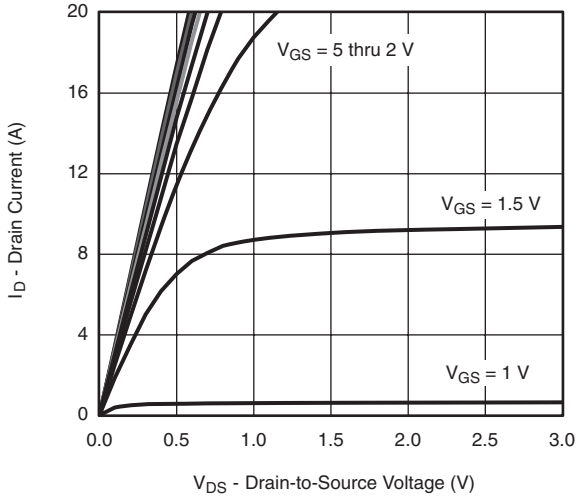
## Notes:

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

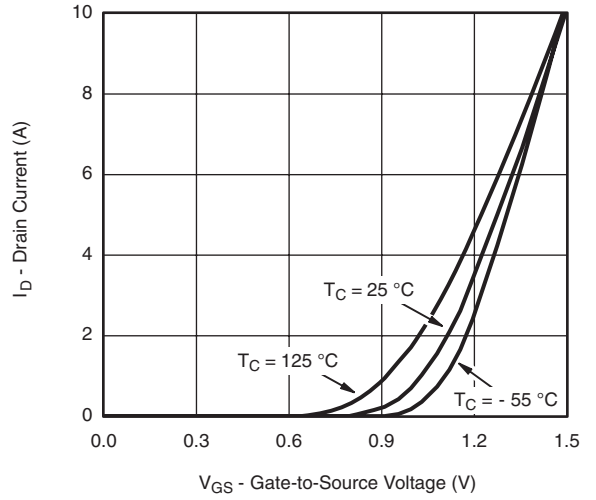
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



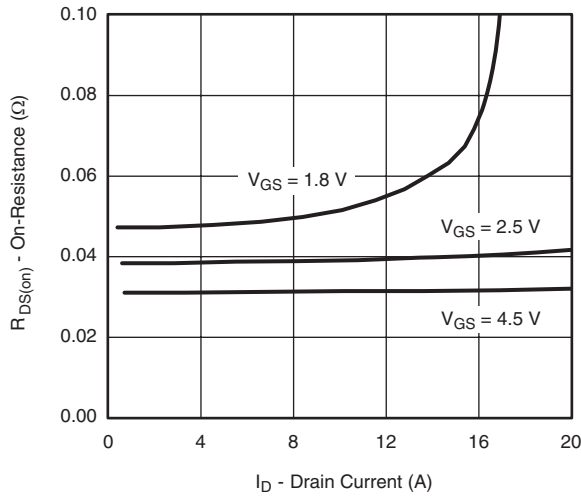
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



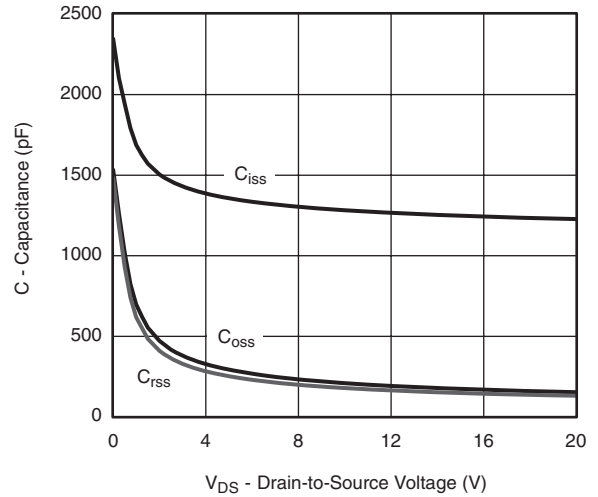
**Output Characteristics**



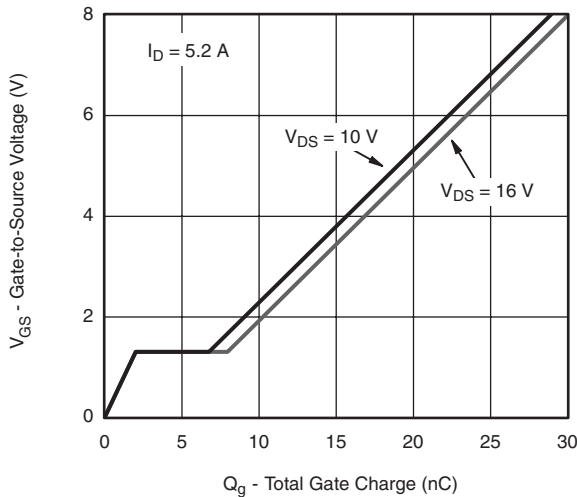
**Transfer Characteristics**



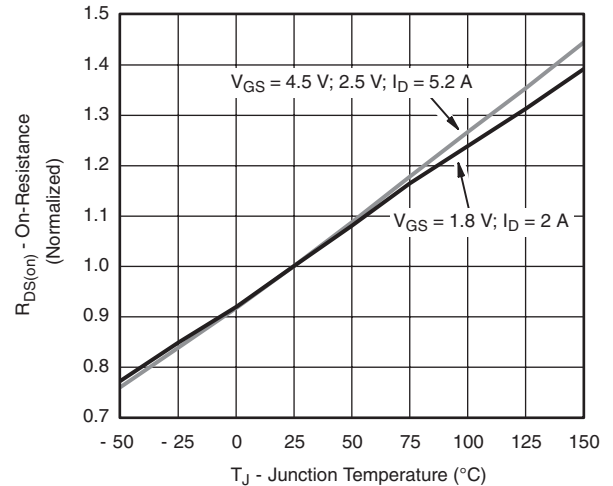
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**



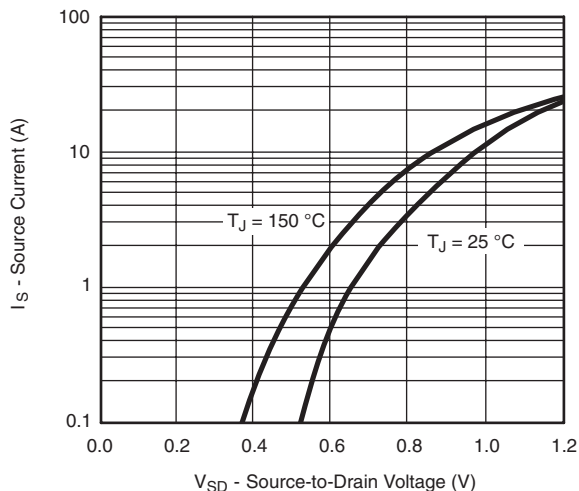
**Gate Charge**



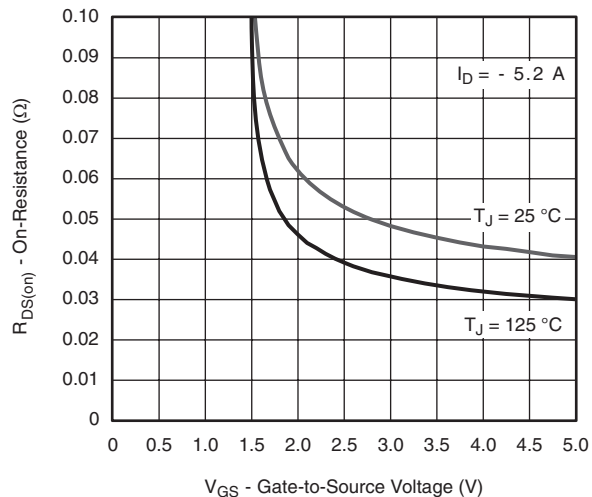
**On-Resistance vs. Junction Temperature**



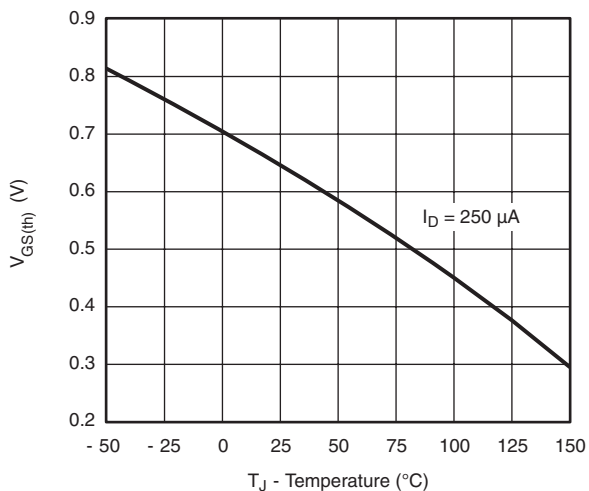
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



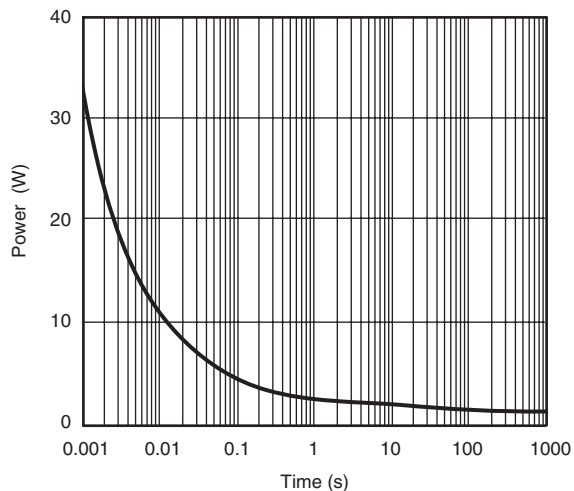
**Source-Drain Diode Forward Voltage**



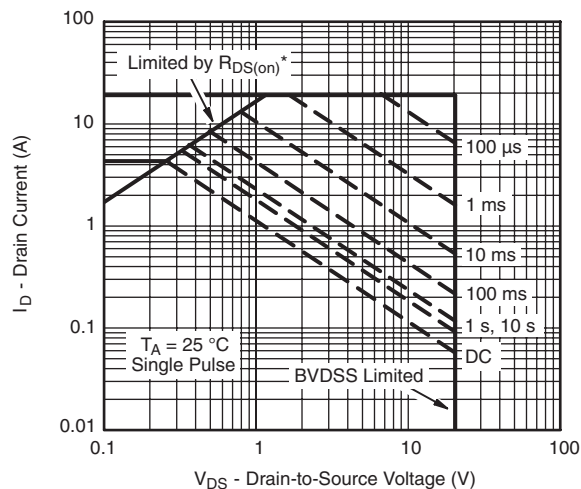
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



**Single Pulse Power**



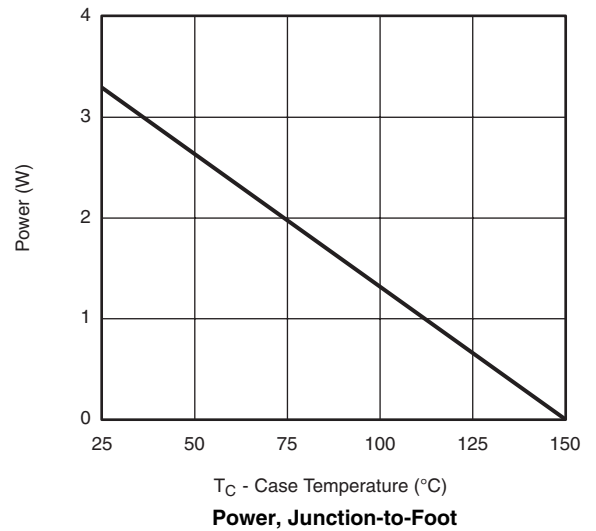
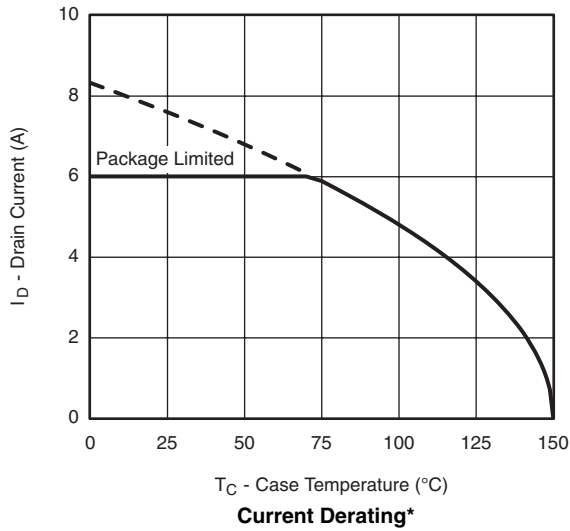
$V_{DS}$  - Drain-to-Source Voltage (V)

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

**Safe Operating Area**



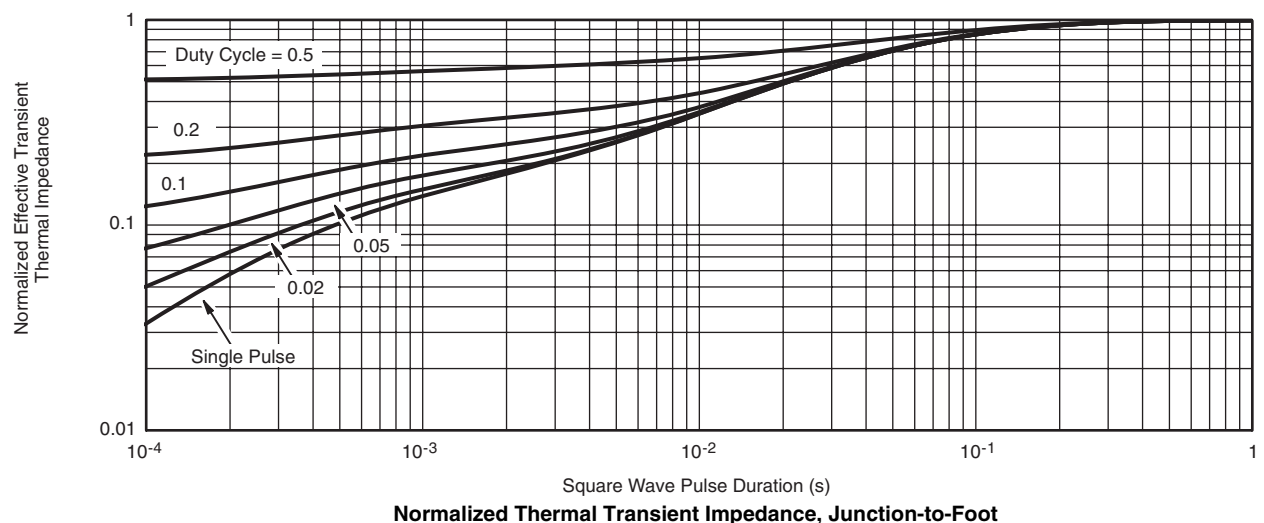
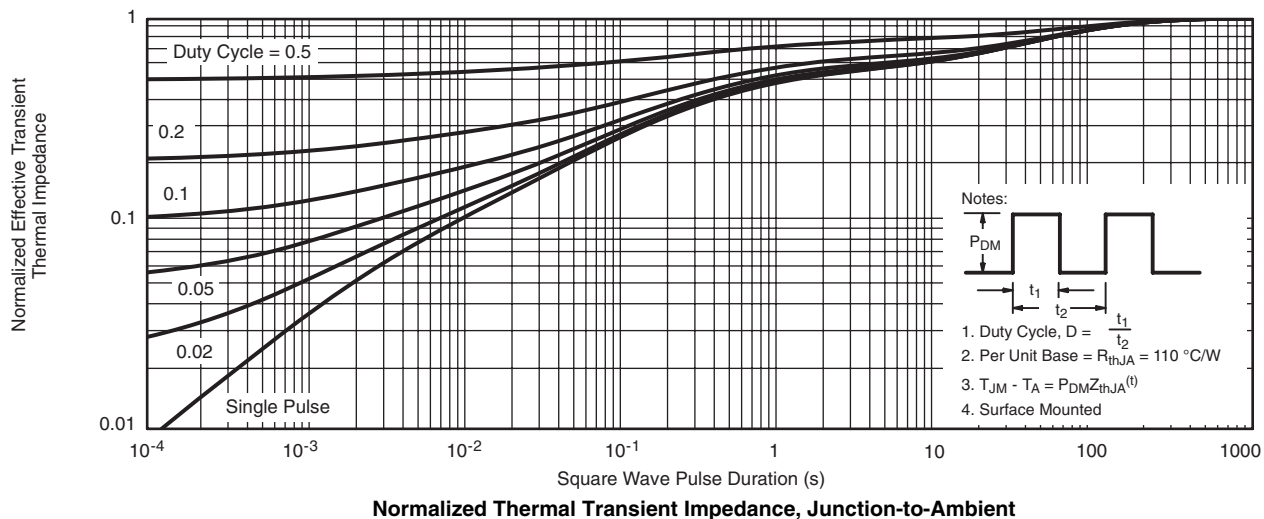
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



\* 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.



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



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