

## N-Channel 60-V (D-S), 150 °C 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)
60	0.036 at V <sub>GS</sub> = 10 V	12	10.5 nC
	0.042 at V <sub>GS</sub> = 4.5 V	12	

### FEATURES

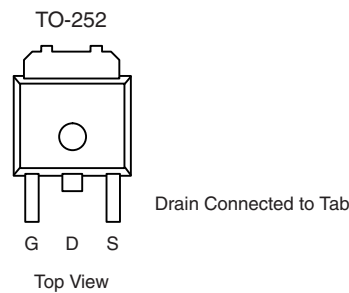
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> & UIS Tested



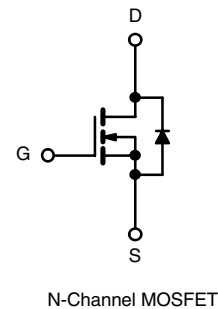
RoHS  
COMPLIANT

### APPLICATIONS

- LCD TV Inverter
- Push Pull Converter



Order Number:  
SUD50N06-36-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>	60	V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	12 <sup>a</sup>	A
		T <sub>C</sub> = 70 °C	12 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	5.9 <sup>b</sup>	
		T <sub>A</sub> = 70 °C	4.7 <sup>b</sup>	
Pulsed Drain Current	I <sub>DM</sub>	50		
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	12 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	2.0 <sup>b</sup>	
Single Pulse Avalanche Current	I <sub>AS</sub>	15		
Avalanche Energy	E <sub>AS</sub>	11.2	mJ	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	24	W
		T <sub>C</sub> = 70 °C	15.3	
		T <sub>A</sub> = 25 °C	2.4 <sup>b</sup>	
		T <sub>A</sub> = 70 °C	1.5 <sup>b</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</sup>	R <sub>thJA</sub>	43	52	°C/W	
Maximum Junction-to-Case	R <sub>thJC</sub>	4.3	5.2		

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

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	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	60			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		55		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 6.3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		3.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$			20	
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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		0.028	0.036	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 8\text{ A}$		0.033	0.042	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 10\text{ A}$		20		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1100		pF
Output Capacitance	$C_{oss}$			90		
Reverse Transfer Capacitance	$C_{rss}$			55		
Total Gate Charge	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		21	32	nC
				10.5	16	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		3.5		nC
Gate-Drain Charge	$Q_{gd}$			4.2		
Gate Resistance	$R_g$		$f = 1\text{ MHz}$		3.3	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong 30\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		18	30	ns
Rise Time	$t_r$			250	400	
Turn-Off Delay Time	$t_{d(off)}$			35	55	
Fall Time	$t_f$			68	110	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong 30\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		6	12	ns
Rise Time	$t_r$			9	18	
Turn-Off Delay Time	$t_{d(off)}$			19	30	
Fall Time	$t_f$			7	14	
<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>	$I_{SM}$				50	
Body Diode Voltage	$V_{SD}$	$I_S = 5.5\text{ A}$		0.85	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 5.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		25	50	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			25	50	nC
Reverse Recovery Fall Time	$t_a$			19		ns
Reverse Recovery Rise Time	$t_b$			6		

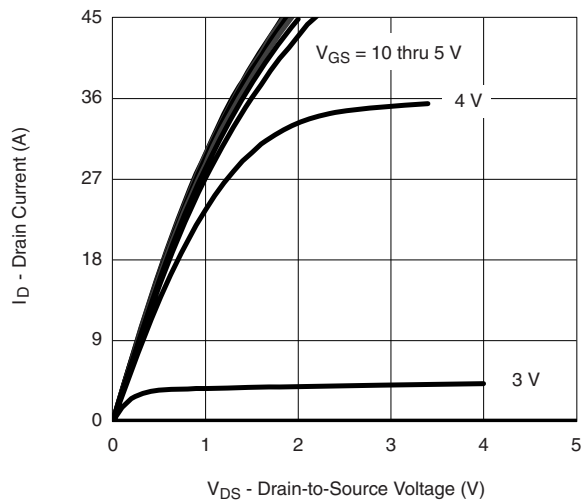
Notes:

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

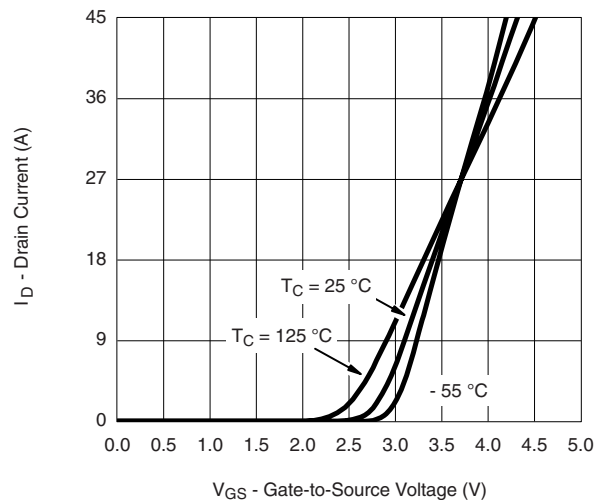
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



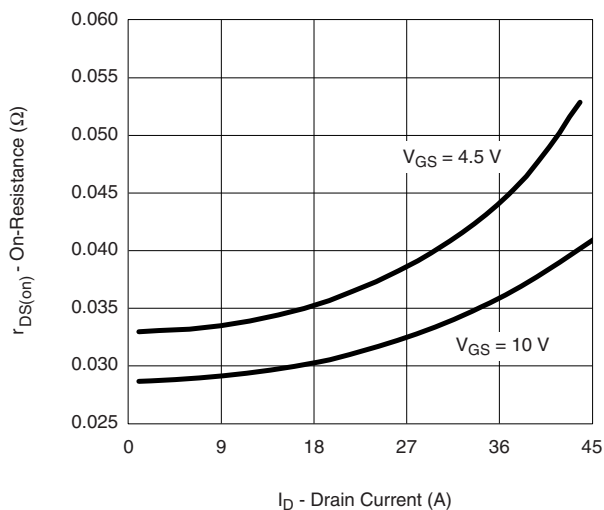
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



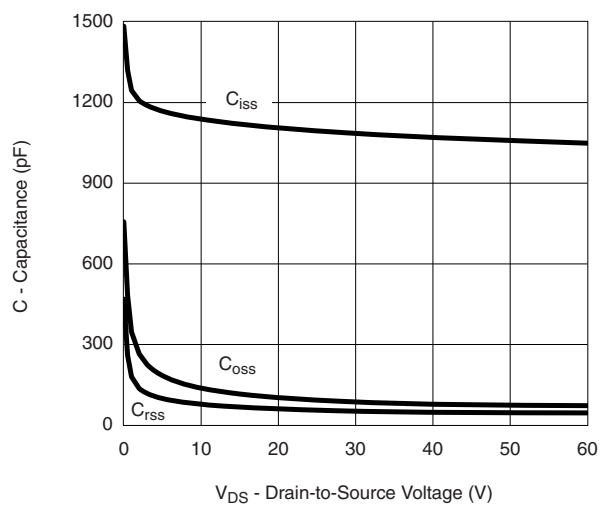
**Output Characteristics**



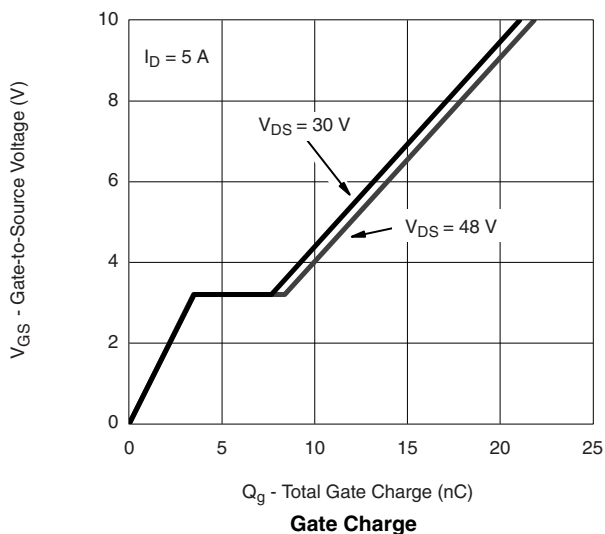
**Transfer Characteristics**



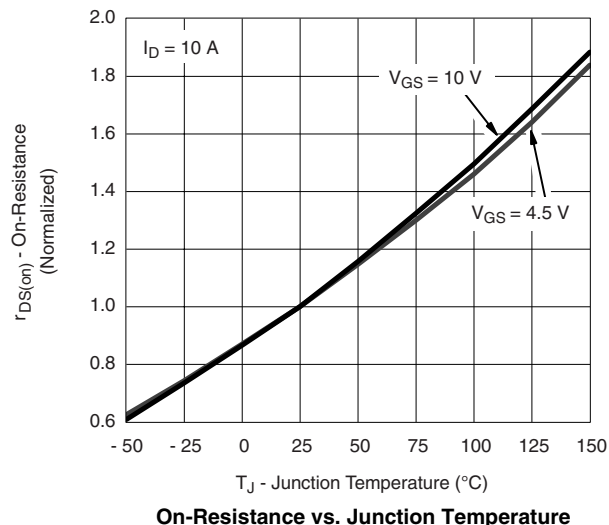
**On-Resistance vs. Drain Current**



**Capacitance**

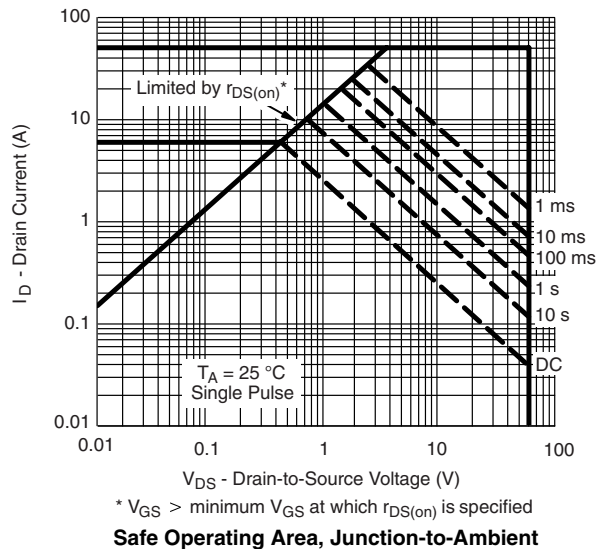
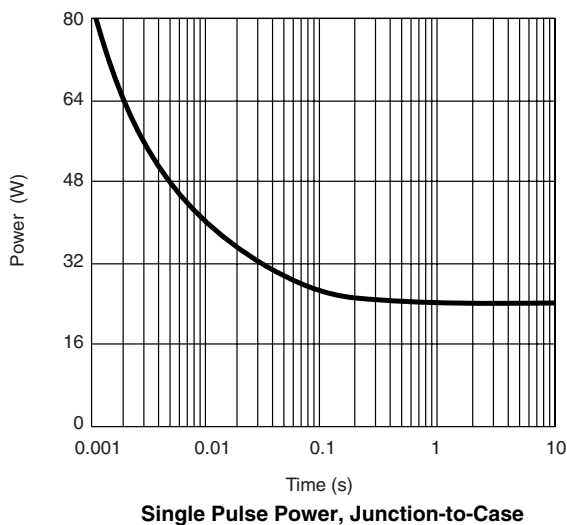
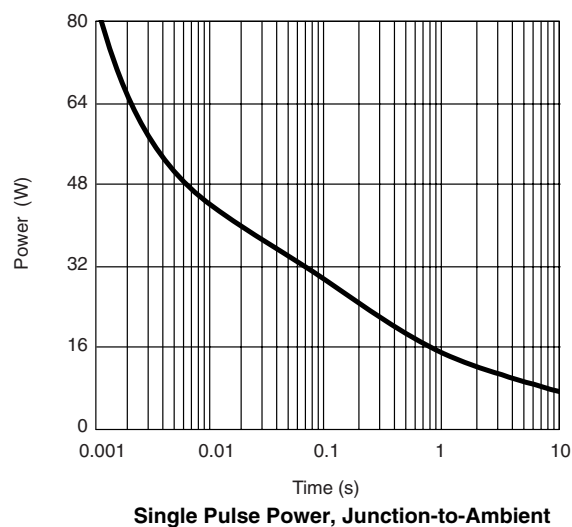
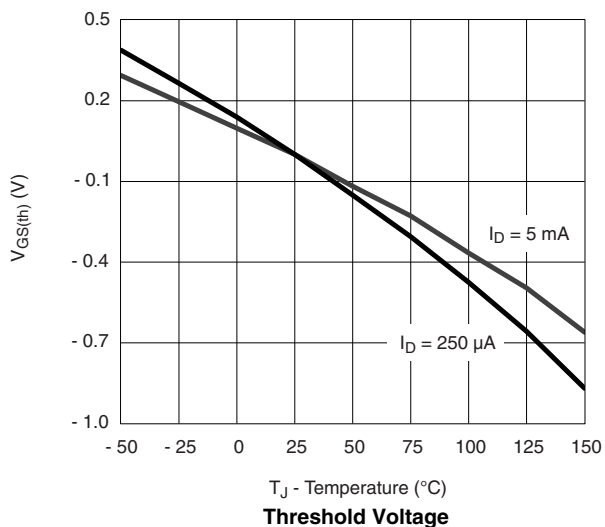
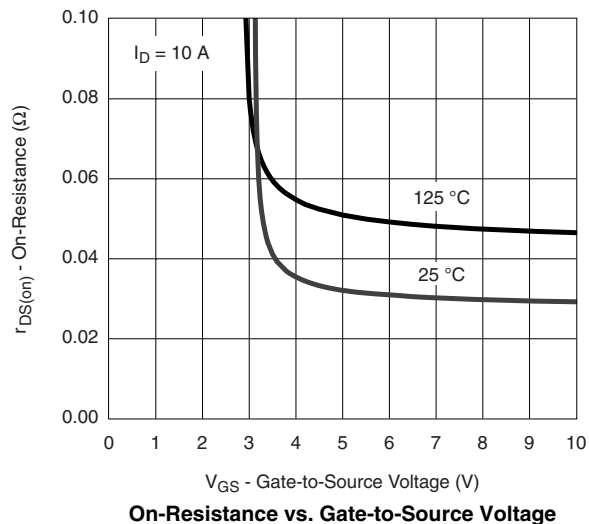
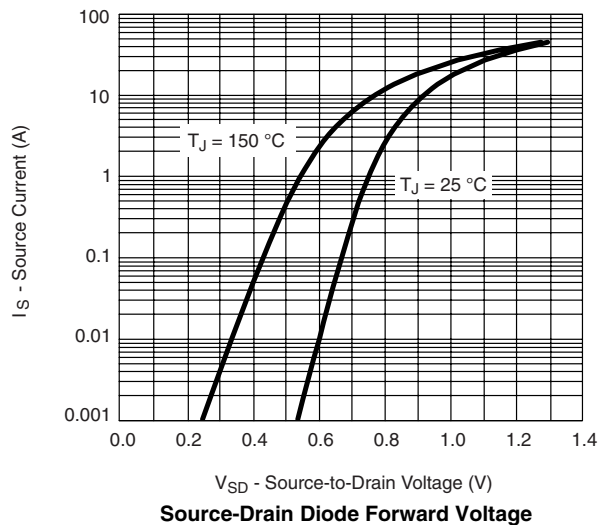


**Gate Charge**



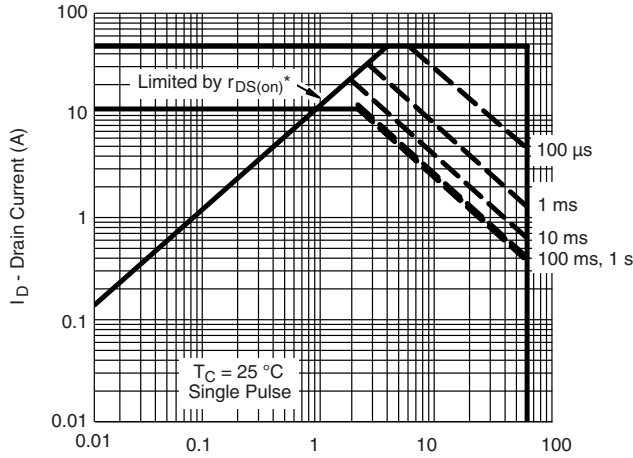
**On-Resistance vs. Junction Temperature**

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

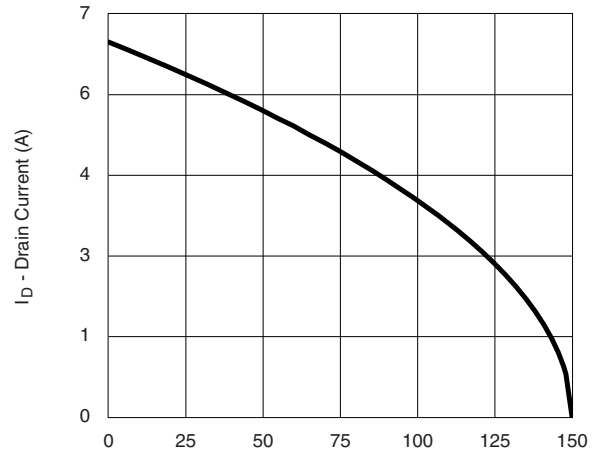




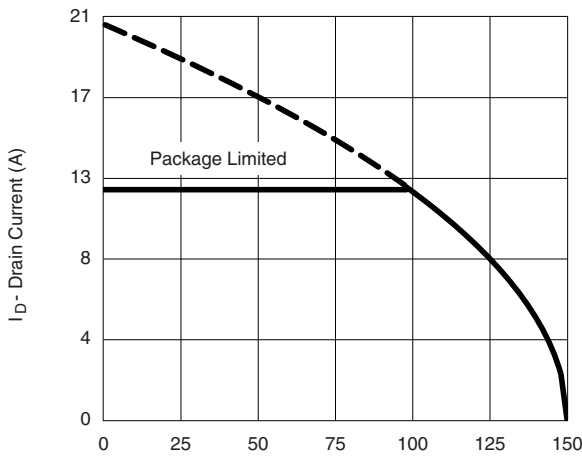
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



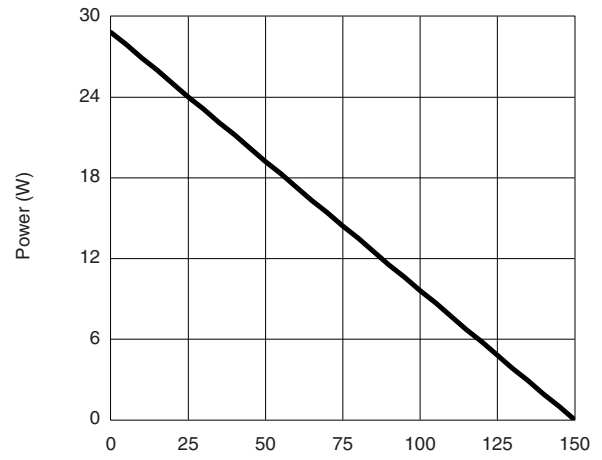
$V_{DS}$  - Drain-to-Source Voltage (V)  
 \*  $V_{GS} >$  minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified  
**Safe Operating Area, Junction-to-Case**



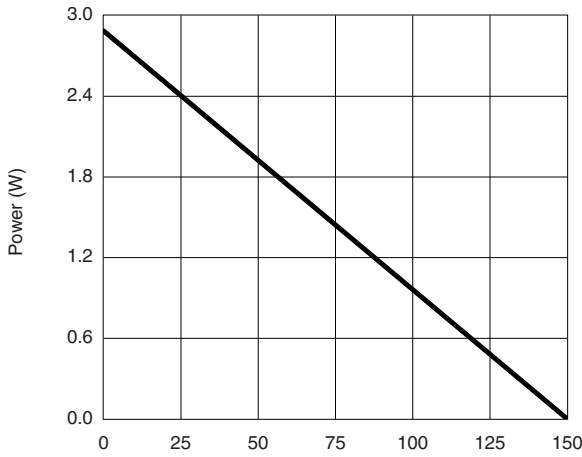
$T_A$  - Ambient Temperature ( $^\circ\text{C}$ )  
**Current Derating\*, Junction-to-Ambient**



$T_C$  - Case Temperature ( $^\circ\text{C}$ )  
**Current Derating\*, Junction-to-Case**



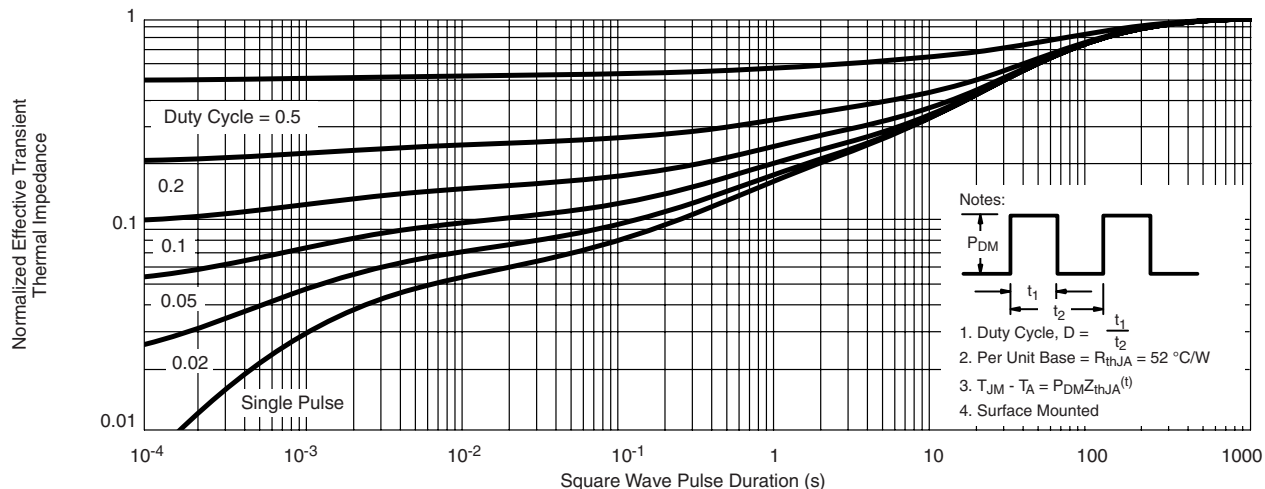
$T_C$  - Case Temperature ( $^\circ\text{C}$ )  
**Power Derating\*, Junction-to-Case**



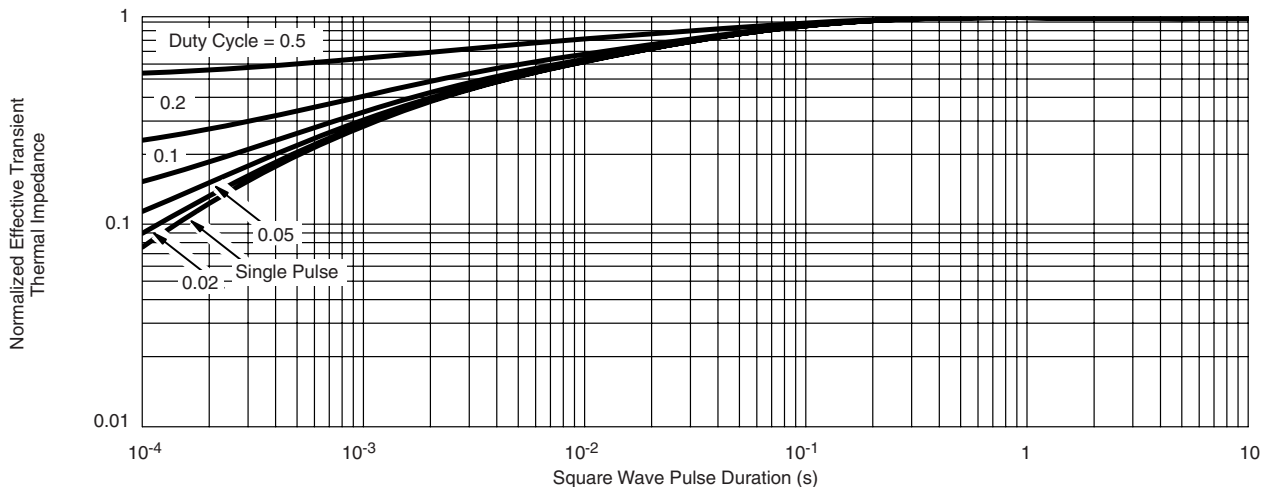
$T_C$  - Case Temperature ( $^\circ\text{C}$ )  
**Power Derating\*, Junction-to-Ambient**

\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 175^\circ\text{C}$ , 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.

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



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

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