

## Automotive N-Channel 60 V (D-S) 175 °C MOSFET

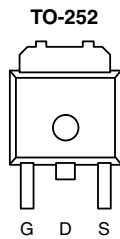
PRODUCT SUMMARY	
$V_{DS}$ (V)	60
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.022
$I_D$ (A)	30
Configuration	Single

**FEATURES**

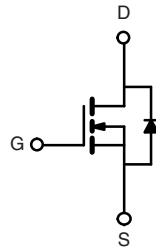
- Halogen-free
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance


**RoHS  
COMPLIANT**
**AEC-Q101 RELIABILITY**

- Passed all AEC-Q101 Reliability Testing
- Characterization Ongoing



Top View



N-Channel MOSFET

ORDERING INFORMATION	
Package	TO-252
Lead (Pb)-free and Halogen-free	SQD40N06-25L-GE3

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	-	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current <sup>a</sup>	$I_D$	$T_C = 25$ °C	30
		$T_C = 100$ °C	30
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	34	A
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	100	
Single Pulse Avalanche Energy	$E_{AS}$	-	
Single Pulse Avalanche Current	$I_{AS}$	-	A
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	75
		$T_A = 25$ °C	1.4
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	°C

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	60	°C/W
Junction-to-Case (Drain)	$R_{thJC}$	2.0	

**Notes**

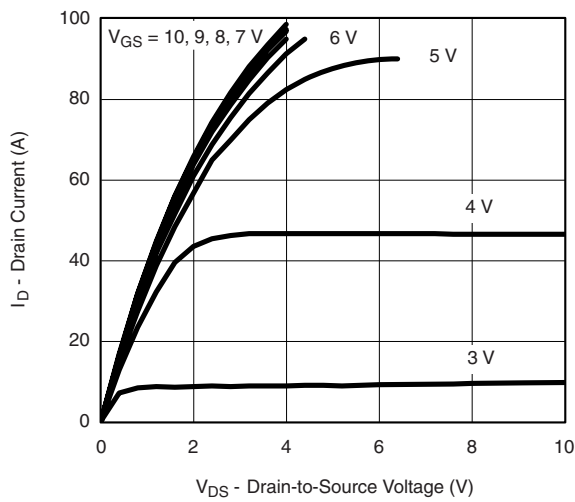
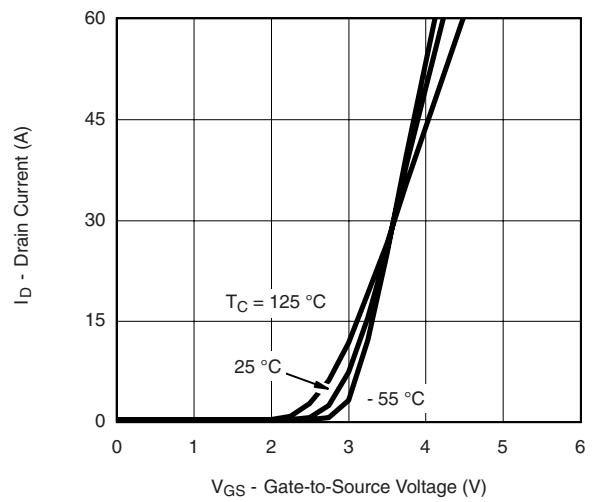
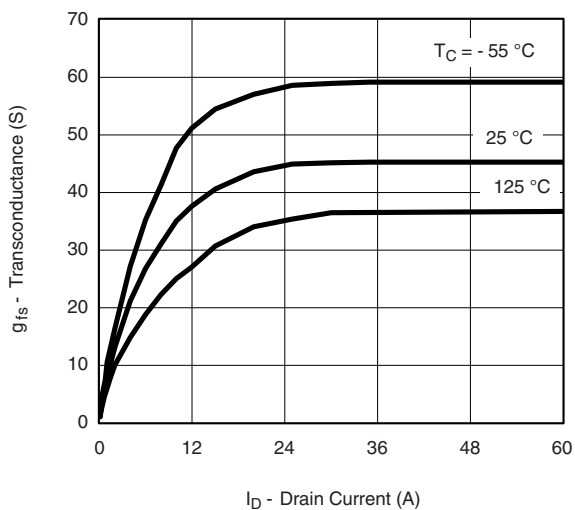
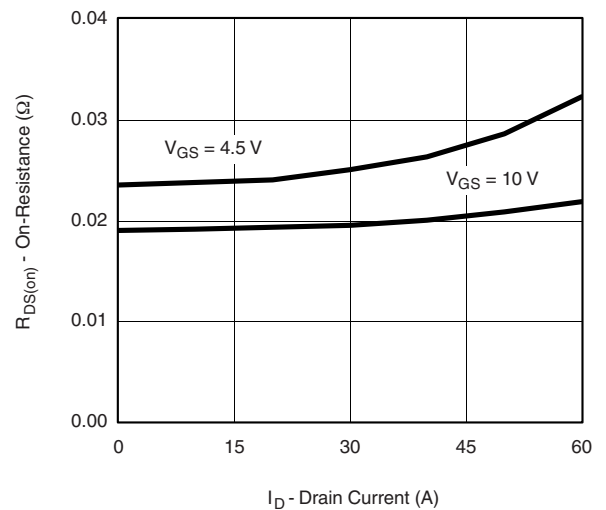
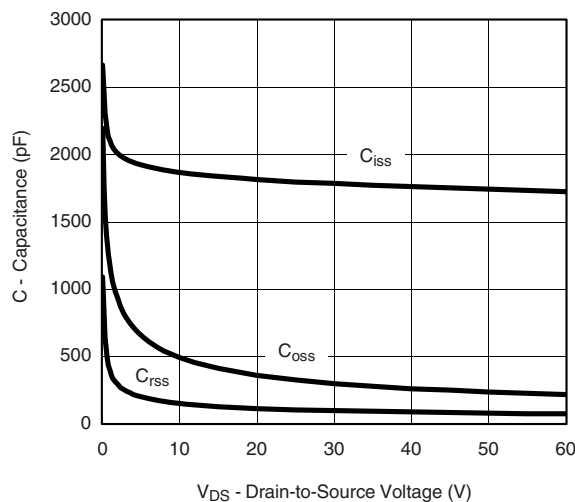
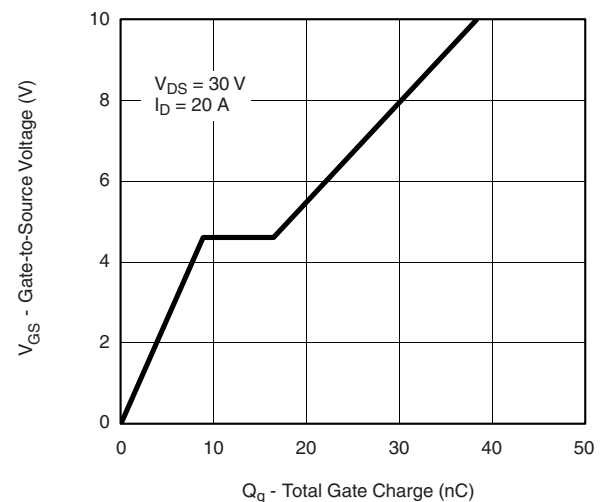
- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR-4 material).

<b>SPECIFICATIONS</b> $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60	-	-	V	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	2	3		
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$	-	-	1.0	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	20	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}$	-	-	0.022	$\Omega$
		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.043	
		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	-	0.053	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		-	-	-	S
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	1800	-	pF
Output Capacitance	$C_{oss}$			-	350	-	
Reverse Transfer Capacitance	$C_{rss}$			-	100	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 10\text{ V}$	$V_{DS} = 30\text{ V}, I_D = 40\text{ A}$	-	40	-	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	9	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	10	-	
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.9\text{ }\Omega$ $I_D \cong 20\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		-	10	-	ns
Rise Time <sup>c</sup>	$t_r$			-	9	-	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	28	-	
Fall Time <sup>c</sup>	$t_f$			-	7	-	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	20	A
Forward Voltage	$V_{SD}$	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		-	1	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		-	48	100	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			-	-	-	A
Reverse Recovery Charge	$Q_{rr}$			-	-	-	$\mu\text{C}$

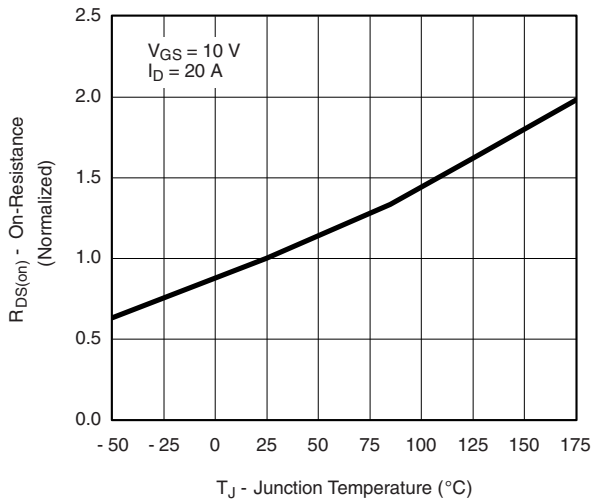
### Notes

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

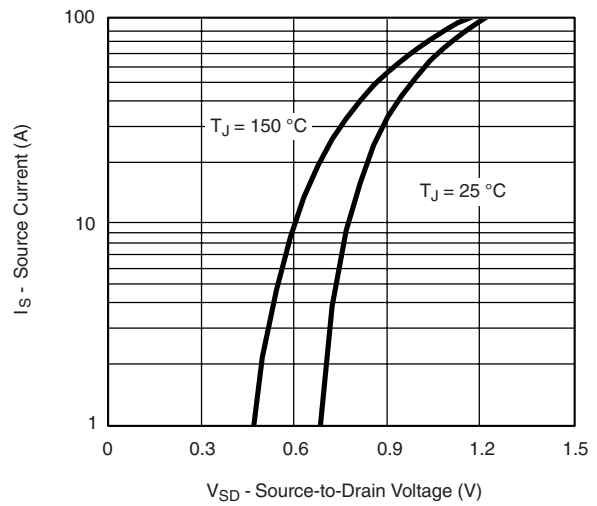
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**Transconductance**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

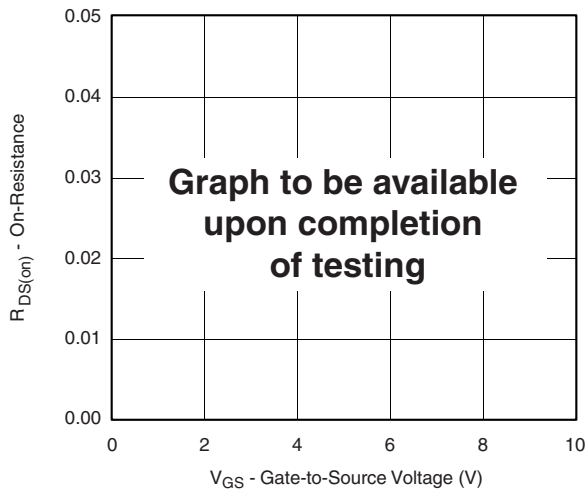
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



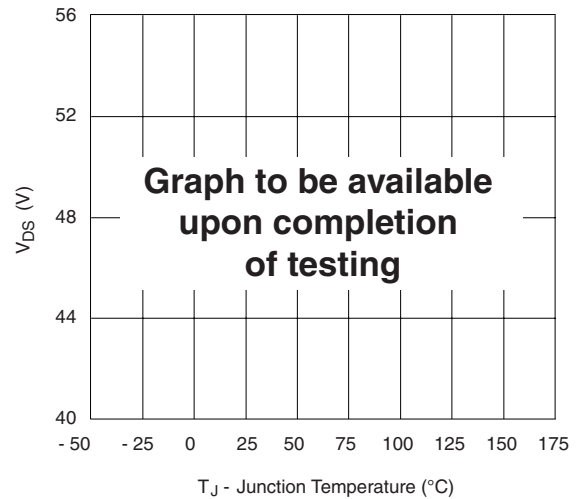
**On-Resistance vs. Junction Temperature**



**Source Drain Diode Forward Voltage**

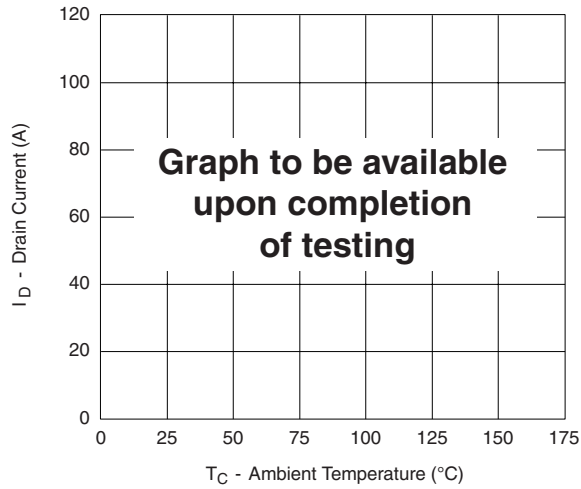


**On-Resistance vs. Gate-to-Source Voltage**

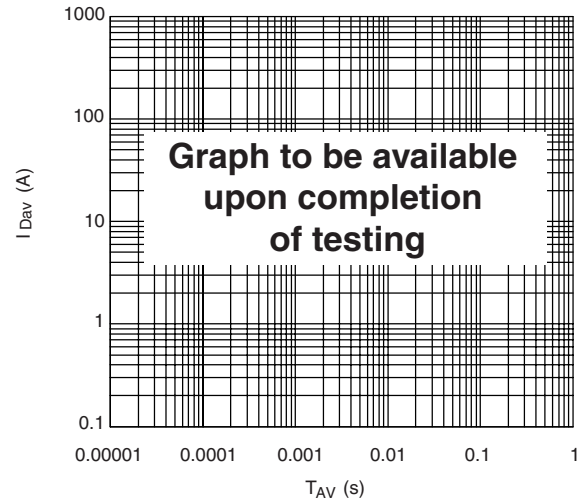


**Drain Source Breakdown vs. Junction Temperature**

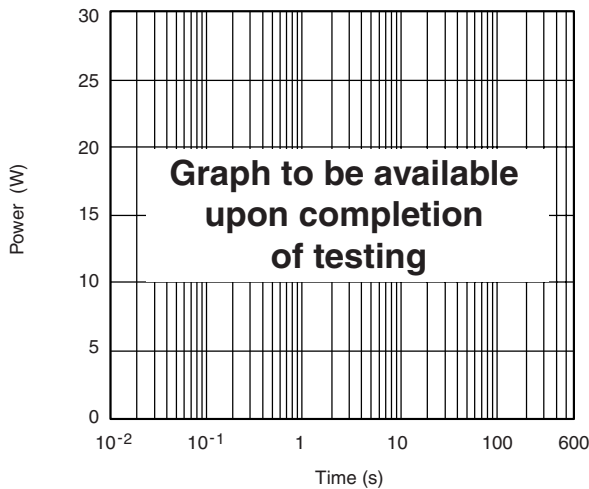
**THERMAL RATINGS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



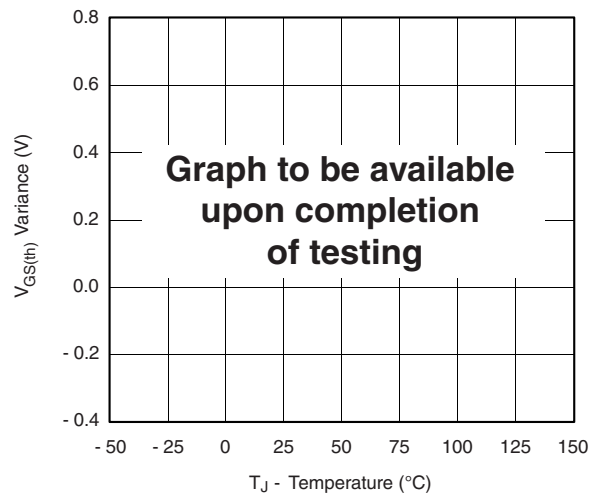
**Maximum Drain Current vs. Ambient Temperature**



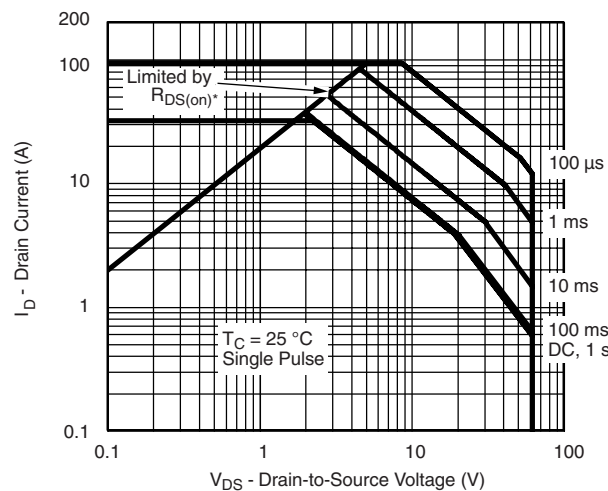
**Avalanche Current vs. Time**



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



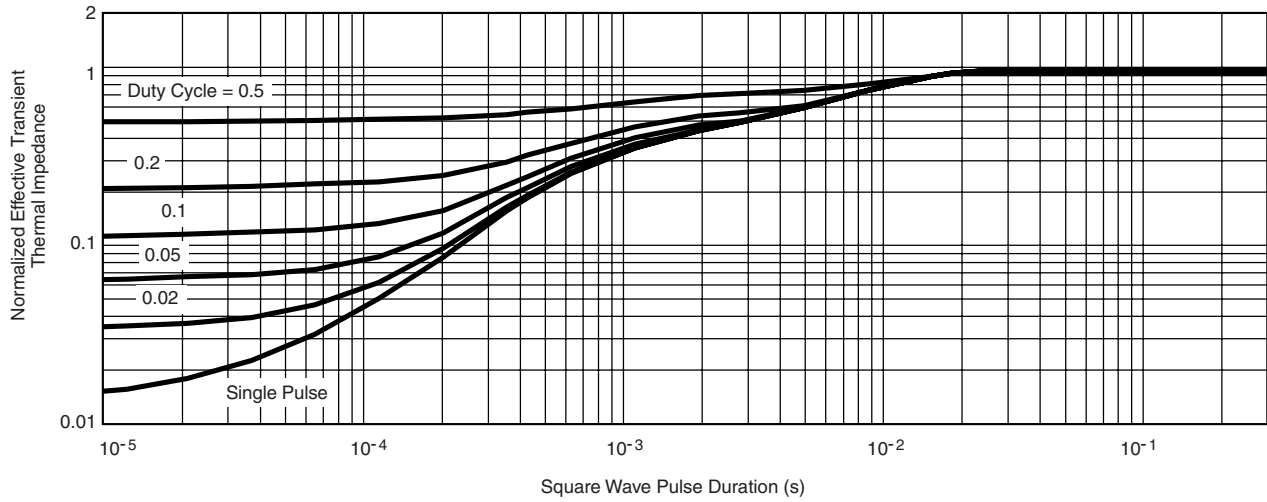
**Threshold Voltage**



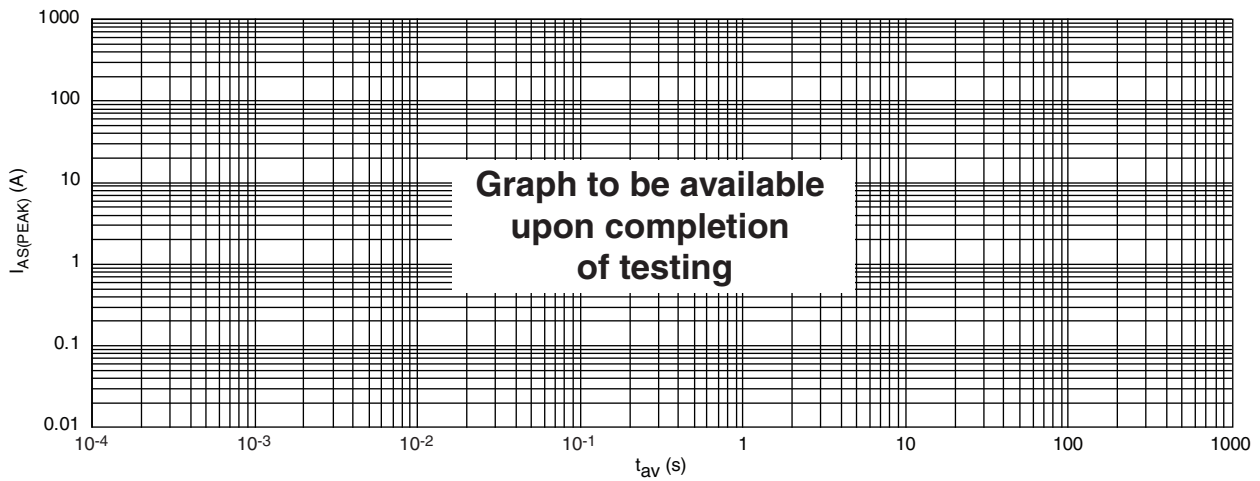
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area**

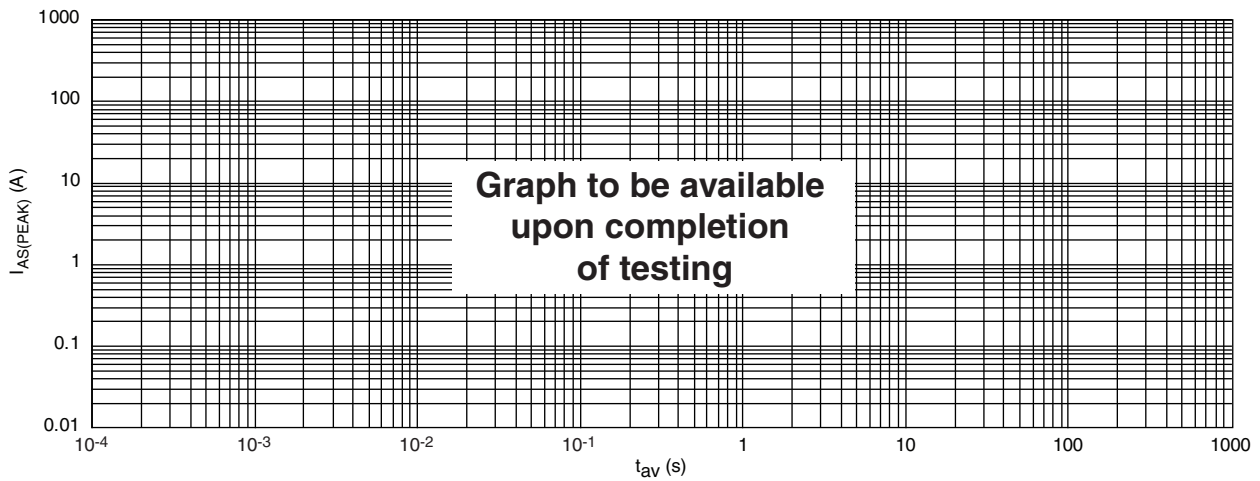
## THERMAL RATINGS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Case

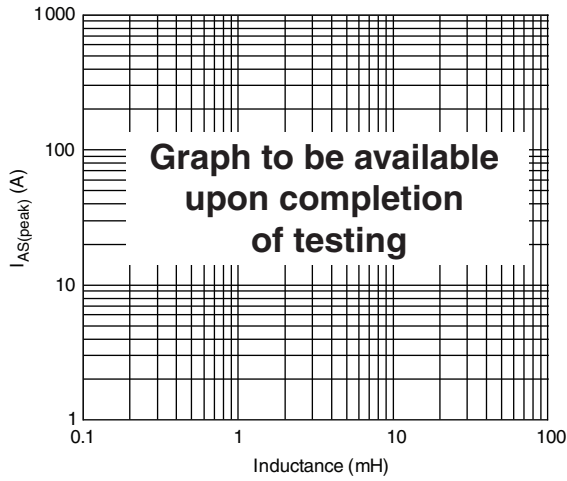


Normalized Thermal Transient Impedance, Junction-to-Ambient

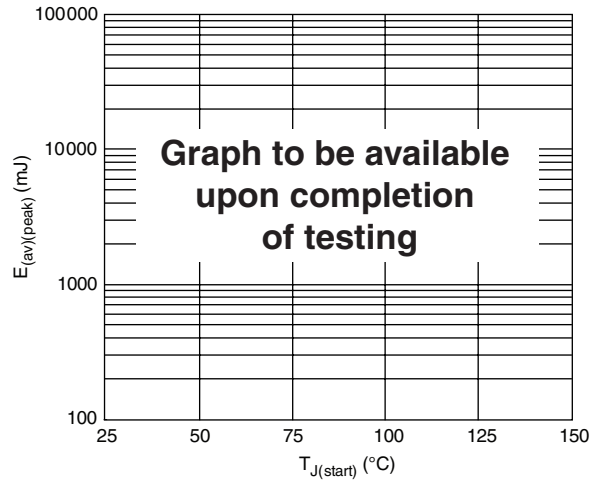


Single Pulse Avalanche Current (Peak) vs. Time in Avalanche

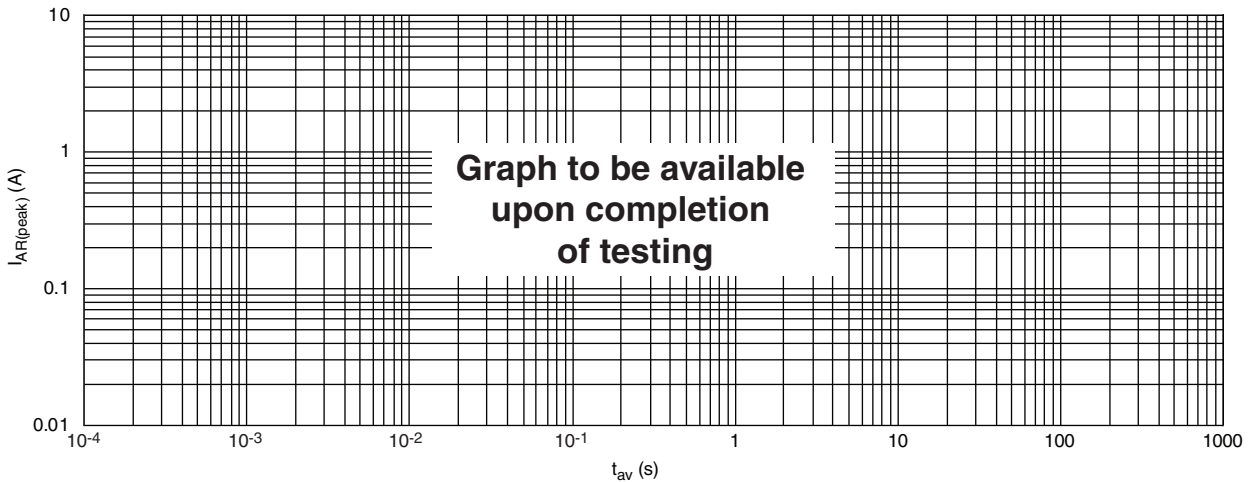
**THERMAL RATINGS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



**Single Pulse Avalanche Current (Peak) vs. Inductance**

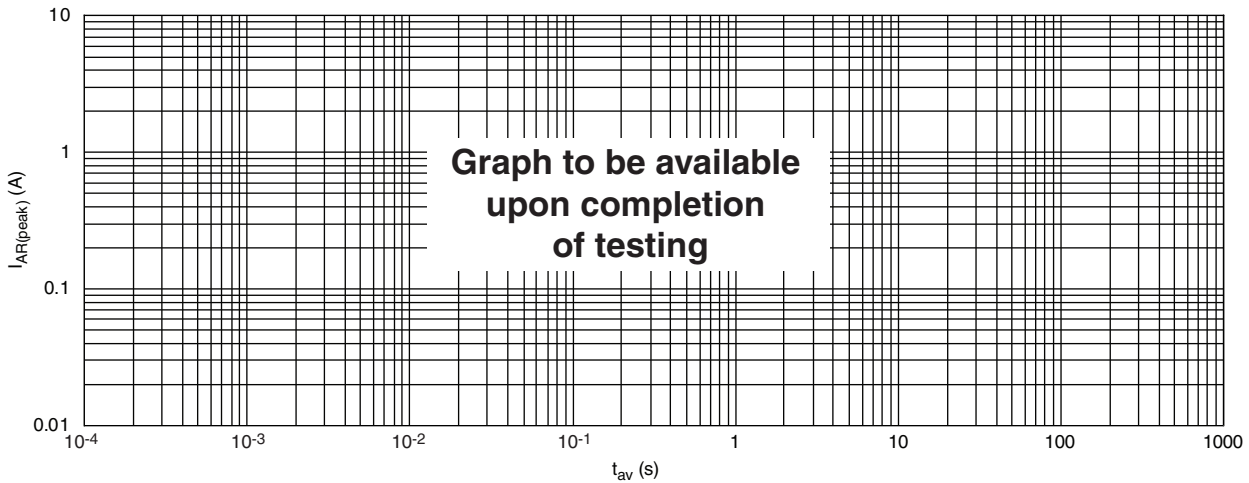


**Single Pulse Avalanche Energy (Peak) vs.  $T_{J(\text{start})}$**



**Repetitive Avalanche Current (Peak) vs. Time in Avalanche at  $T_A = 25\text{ }^\circ\text{C}$**

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



**Repetitive Avalanche Current (Peak) vs. Time in Avalanche at  $T_A = 150\text{ }^\circ\text{C}$**

**Note**

The characteristics shown in the six graphs

- Normalized Transient Thermal Impedance Junction to Ambient ( $25\text{ }^\circ\text{C}$ )
- Single Pulse Avalanche Current (Peak) vs. Time in Avalanche
- Single Pulse Avalanche Current (Peak) vs. Inductance
- Single Pulse Avalanche Energy (Peak) vs.  $T_{J(\text{start})}$
- Repetitive Avalanche Current (Peak) vs. Time in Avalanche at  $T_A = 25\text{ }^\circ\text{C}$
- Repetitive Avalanche Current (Peak) vs. Time in Avalanche at  $T_A = 150\text{ }^\circ\text{C}$

are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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