



## N-Channel 250-V (D-S) 175°C MOSFET

### PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ)
250	0.060 @ $V_{GS} = 10$ V	40	95
	0.064 @ $V_{GS} = 6$ V	38.7	

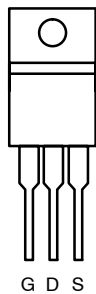
### FEATURES

- TrenchFET® Power MOSFETS
- 175°C Junction Temperature
- New Low Thermal Resistance Package

### APPLICATIONS

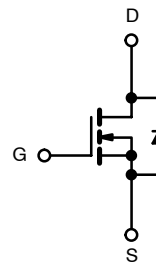
- Industrial

TO-220AB



Top View

Ordering Information: SUP40N25-60—E3



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	250	V	
Gate-Source Voltage	$V_{GS}$	$\pm 30$		
Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	40	A
		$T_C = 125^\circ\text{C}$	23	
Pulsed Drain Current	$I_{DM}$	70		
Avalanche Current	$I_{AR}$	35	mJ	
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	61		
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_C = 25^\circ\text{C}$	300 <sup>b</sup>	W
		$T_A = 25^\circ\text{C}$	3.75	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) <sup>c</sup>	$R_{thJA}$	40	$^\circ\text{C/W}$
Junction-to-Case (Drain)	$R_{thJC}$	0.5	

Notes

- Duty cycle  $\leq 1\%$ .
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>DS</sub> = 0 V, I <sub>D</sub> = 250 μA	250			V
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±30 V			±250	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50	
		V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C			250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V	70			A
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.049	0.060	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C			0.121	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 175 °C			0.163	
		V <sub>GS</sub> = 6 V, I <sub>D</sub> = 15 A,		0.051	0.064	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A		70		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz		5000		pF
Output Capacitance	C <sub>oss</sub>			300		
Reverse Transfer Capacitance	C <sub>rss</sub>			170		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 125 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 45 A		95	140	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			28		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			34		
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.6		Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 100 V, R <sub>L</sub> = 2.78 Ω I <sub>D</sub> ≅ 45 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω		22	35	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			220	330	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			40	60	
Fall Time <sup>c</sup>	t <sub>f</sub>			145	220	
<b>Source-Drain Diode Ratings and Characteristics (T<sub>C</sub> = 25 °C)<sup>b</sup></b>						
Continuous Current	I <sub>S</sub>				45	A
Pulsed Current	I <sub>SM</sub>				70	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 45 A, V <sub>GS</sub> = 0 V		1.0	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 45 A, di/dt = 100 A/μs		150	225	ns
Peak Reverse Recovery Current	I <sub>RM(REC)</sub>			12	18	A
Reverse Recovery Charge	Q <sub>rr</sub>			0.9	2	μC

Notes

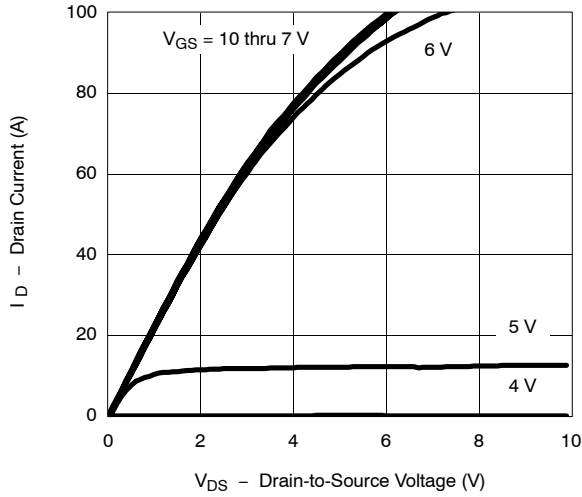
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

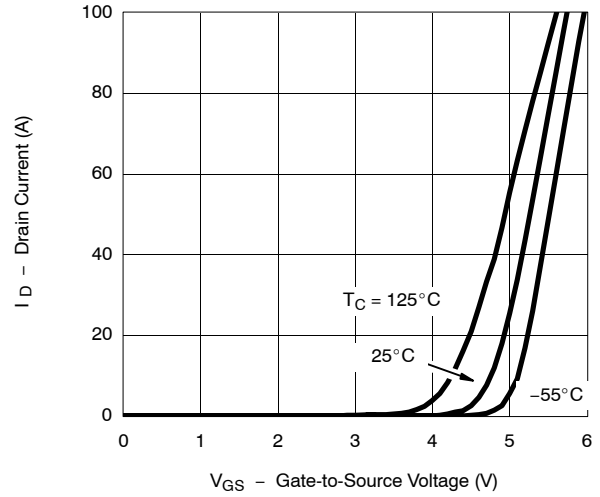


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

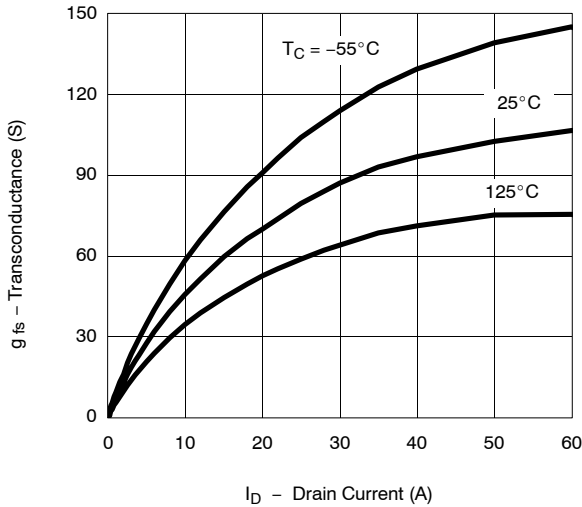
**Output Characteristics**



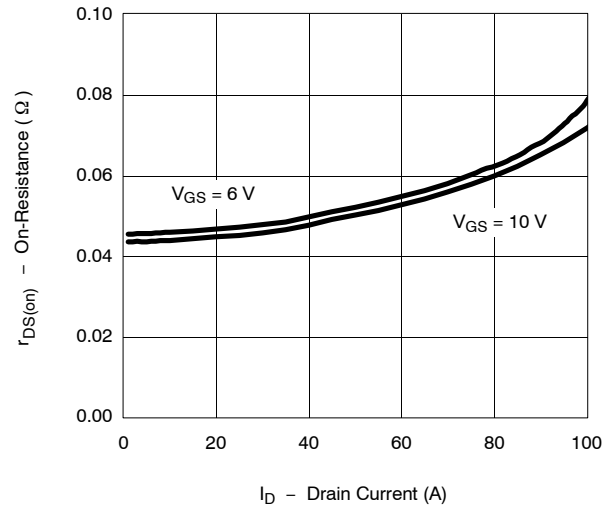
**Transfer Characteristics**



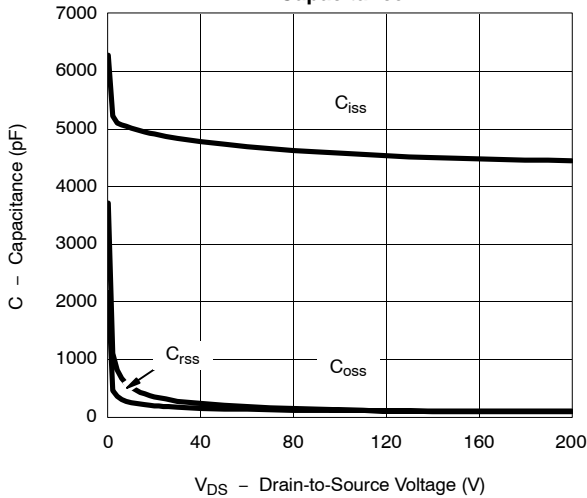
**Transconductance**



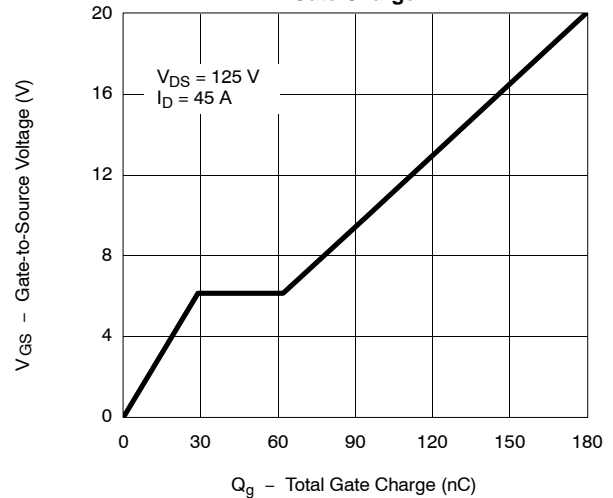
**On-Resistance vs. Drain Current**



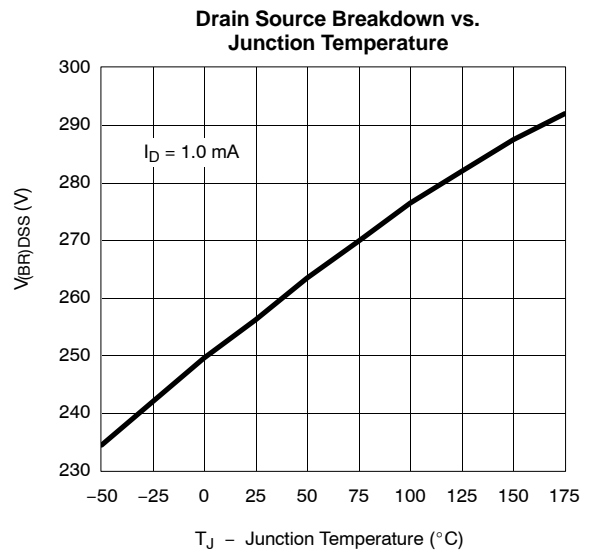
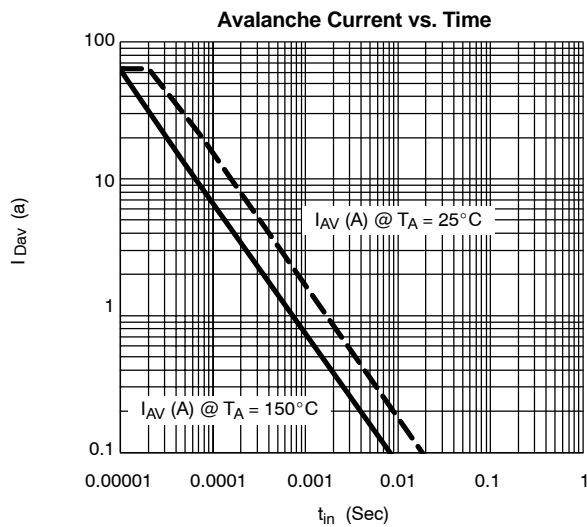
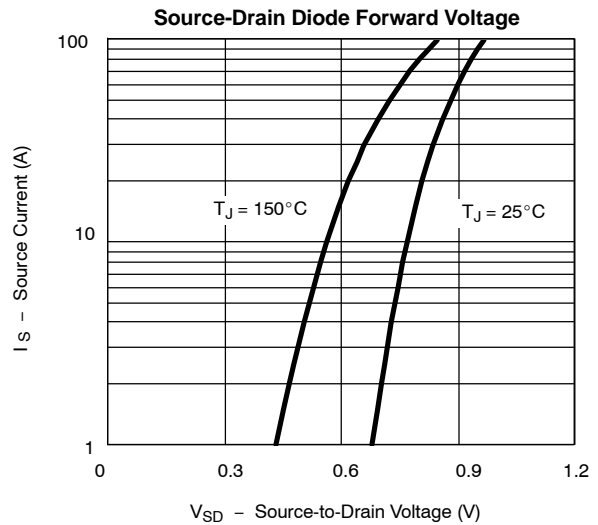
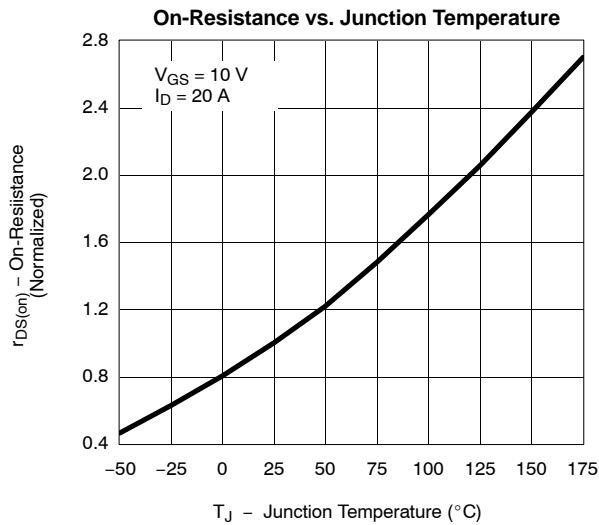
**Capacitance**



**Gate Charge**



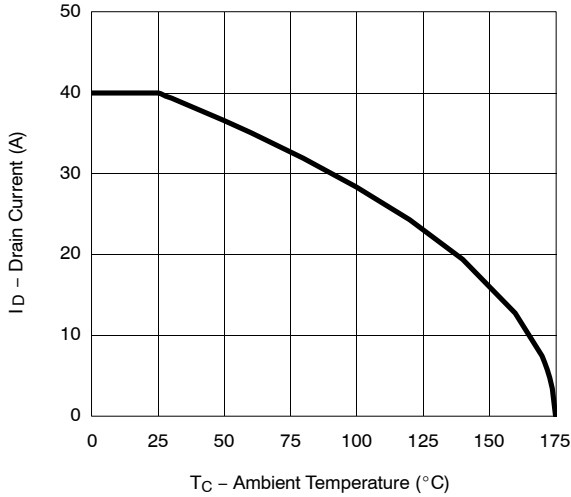
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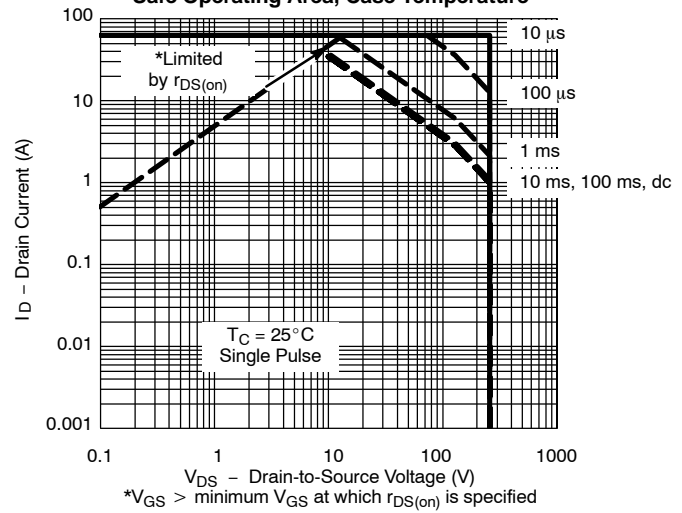


**THERMAL RATINGS**

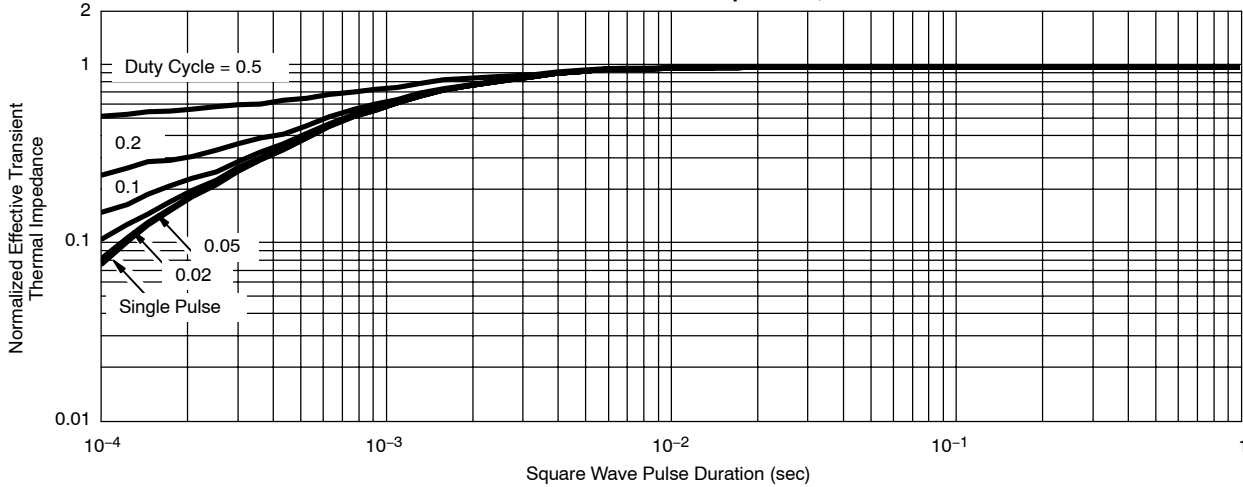
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area, Case Temperature



Normalized Thermal Transient Impedance, Junction-to-Case



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