



# N-Channel 200-V (D-S) 175°C MOSFET

## PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
200	0.033 @ $V_{GS} = 10$ V	57

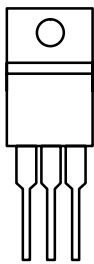
## FEATURES

- TrenchFET® Power MOSFETS
- 175°C Junction Temperature

## APPLICATIONS

- Automotive
  - 42-V EPS and ABS
  - DC/DC Conversion
  - Motor Drives
- Isolated DC/DC converters
  - Primary-Side Switch

TO-220AB

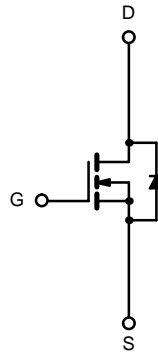


G D S

Top View

SUP57N20-33

DRAIN connected to TAB



N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	200	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	57	A
		$T_C = 125^\circ\text{C}$	33	
Pulsed Drain Current	$I_{DM}$	140		
Avalanche Current	$I_{AR}$	35		
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	61	mJ	
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	200			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> = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 160 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 160 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50	
		V <sub>DS</sub> = 160 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	120			A
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A		0.027	0.033	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125 °C			0.069	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175 °C			0.093	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A	25			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		5100		pF
Output Capacitance	C <sub>oss</sub>			480		
Reverse Transfer Capacitance	C <sub>rss</sub>			210		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 85 A		90	130	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			23		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			34		
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 100 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 65 A, V <sub>GEN</sub> = 10 V, R <sub>G</sub> = 2.5 Ω		24	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>			45	70	
Fall Time <sup>c</sup>	t <sub>f</sub>			200	300	
<b>Source-Drain Diode Ratings and Characteristics (T<sub>C</sub> = 25 °C)<sup>b</sup></b>						
Continuous Current	I <sub>S</sub>				65	A
Pulsed Current	I <sub>SM</sub>				140	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 65 A, V <sub>GS</sub> = 0 V		1.0	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs		130	200	ns
Peak Reverse Recovery Current	I <sub>RM(REC)</sub>			8	12	A
Reverse Recovery Charge	Q <sub>rr</sub>			0.52	1.2	μC

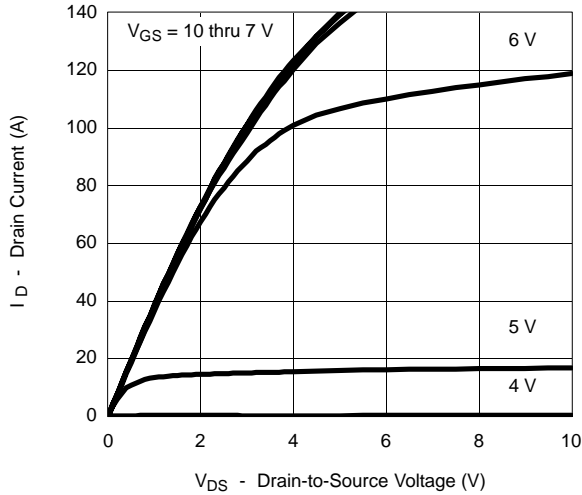
Notes

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

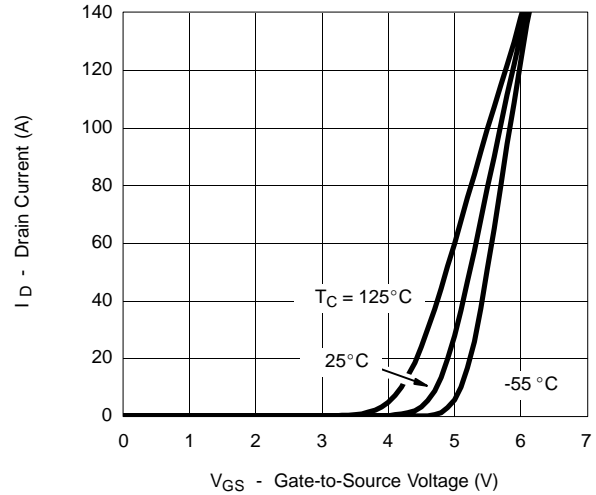


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

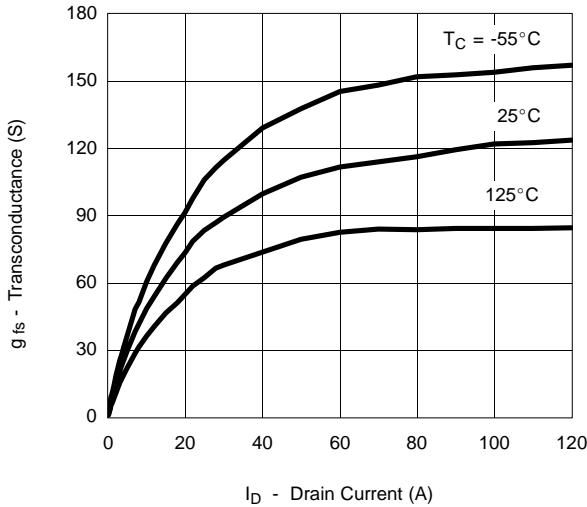
**Output Characteristics**



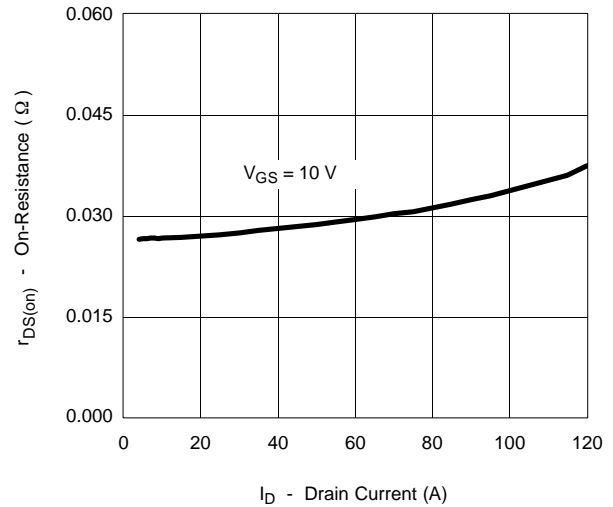
**Transfer Characteristics**



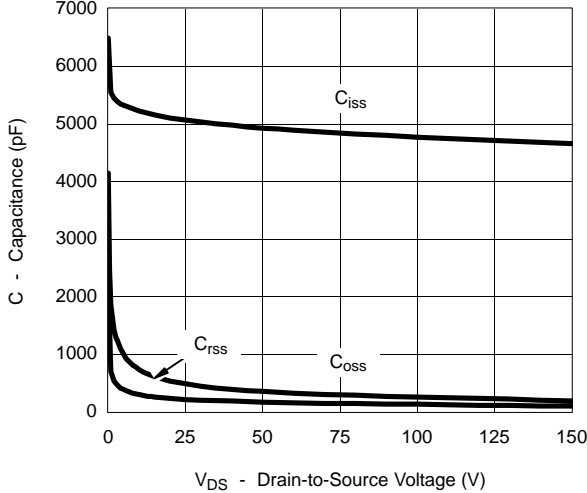
**Transconductance**



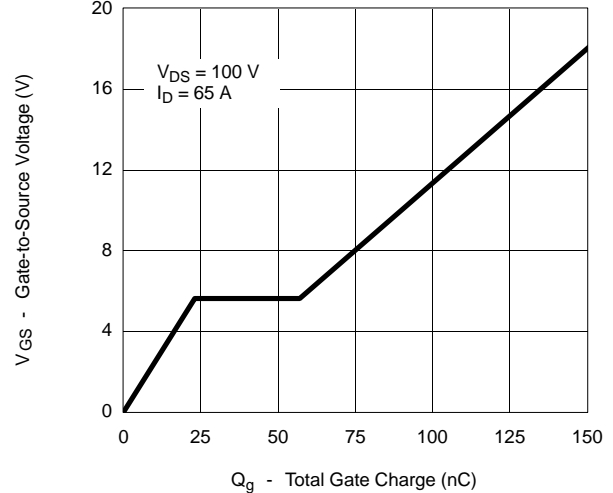
**On-Resistance vs. Drain Current**



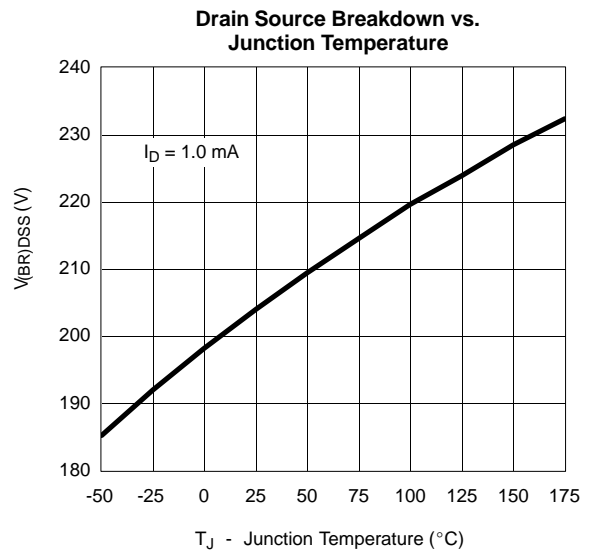
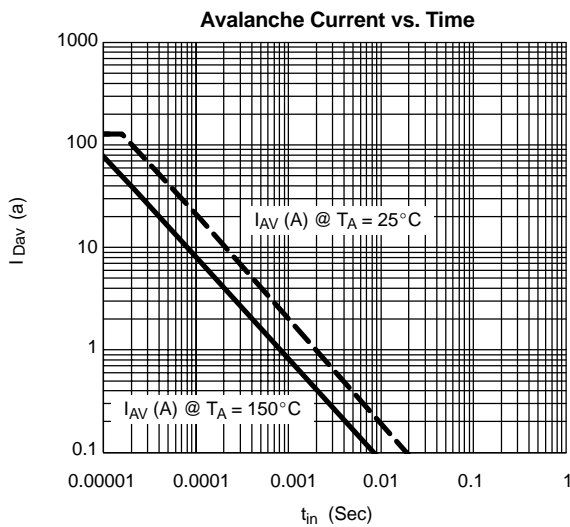
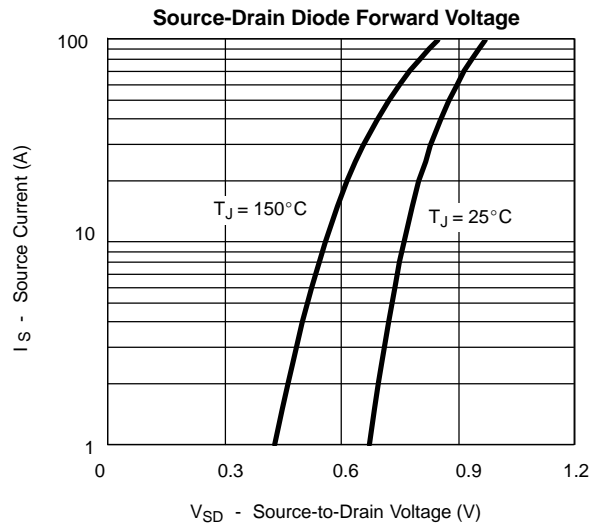
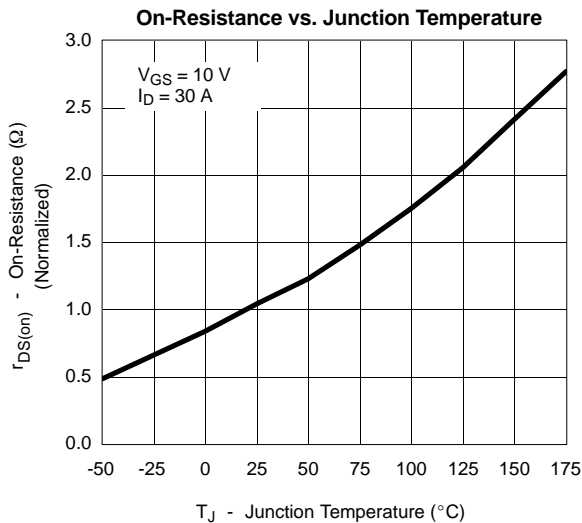
**Capacitance**



**Gate Charge**



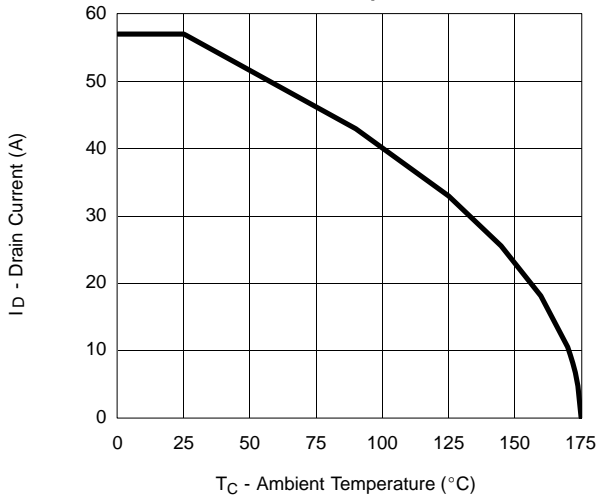
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



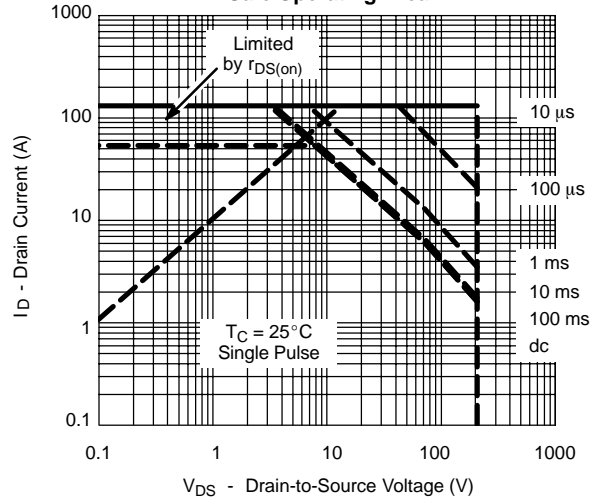


**THERMAL RATINGS**

Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

