

# N-Channel 200 V (D-S) 175 °C MOSFET

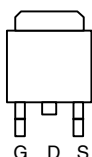
## PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
200	0.270 at $V_{GS} = 10$ V	9
	0.300 at $V_{GS} = 6$ V	8.5

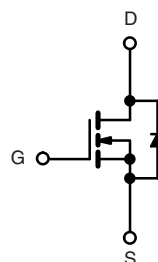
## FEATURES

- TrenchFET® Power MOSFETS
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- Compliant to RoHS Directive 2002/95/EC


**RoHS**  
COMPLIANT

**TO-263**


Top View

**Ordering Information:** SUM09N20-270-E3 (Lead (Pb) free)


N-Channel MOSFET

## ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °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 ( $T_J = 175$ °C)	$I_D$	9	A
		5.2	
Pulsed Drain Current	$I_{DM}$	10	
Avalanche Current	$I_{AR}$	7	mJ
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	2.45	
Maximum Power Dissipation <sup>a</sup>	$P_D$	60 <sup>b</sup>	W
		3.75	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient (PCB Mount) <sup>c</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)	$R_{thJC}$	2.5	

Notes:

a. Duty cycle  $\leq 1$  %.

b. See SOA curve for voltage derating.

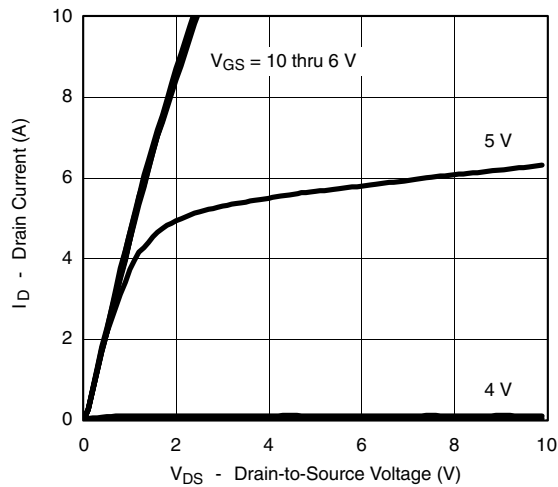
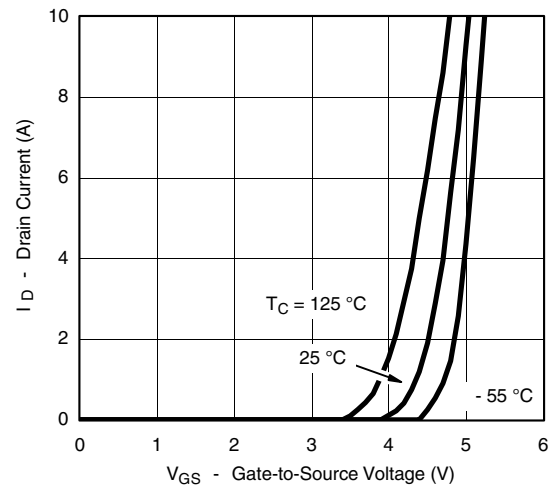
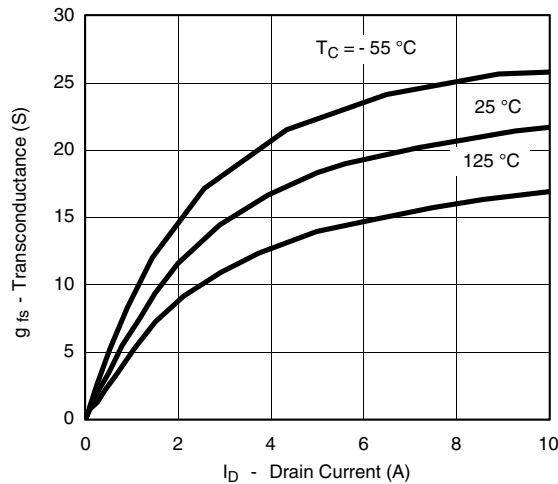
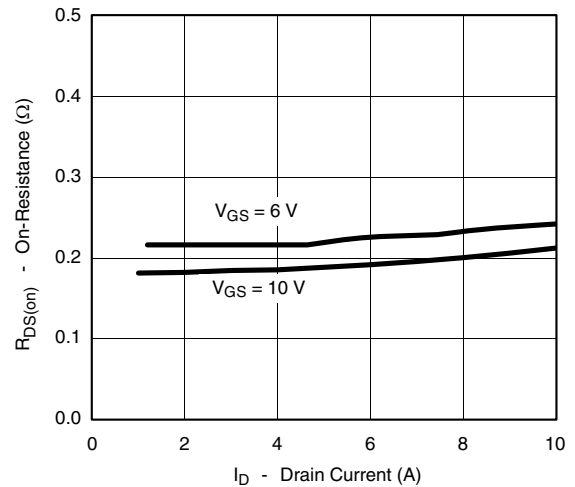
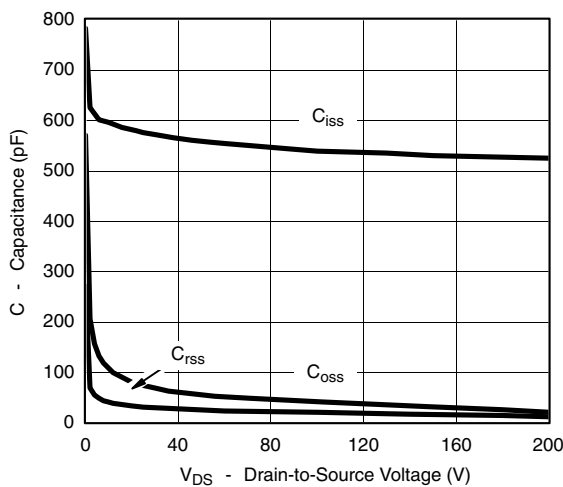
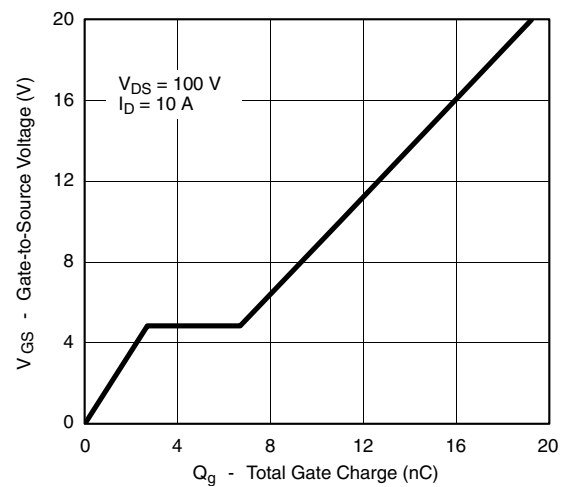
c. When mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</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	10			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5 A		0.216	0.270	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5 A, T <sub>J</sub> = 125 °C			0.54	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5 A, T <sub>J</sub> = 175 °C			0.71	
		V <sub>GS</sub> = 6 V, I <sub>D</sub> = 5 A		0.240	0.300	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 5 A		15		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz		580		pF
Output Capacitance	C <sub>oss</sub>			75		
Reverse Transfer Capacitance	C <sub>rss</sub>			30		
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> = 10 A		11	17	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			2.7		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			4		
Gate Resistance	R <sub>G</sub>			4		Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 100 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 10 V, R <sub>G</sub> = 2.5 Ω		10	15	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			35	55	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			25	40	
Fall Time <sup>c</sup>	t <sub>f</sub>			40	60	
Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25 °C) <sup>b</sup>						
Continuous Current	I <sub>S</sub>				9	A
Pulsed Current	I <sub>SM</sub>				10	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 10 A, V <sub>GS</sub> = 0 V		0.9	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 10 A, di/dt = 100 A/μs		100	150	ns
Peak Reverse Recovery Charge	I <sub>RM(REC)</sub>			5	8	A
Reverse Recovery Charge	Q <sub>rr</sub>				0.25	0.6

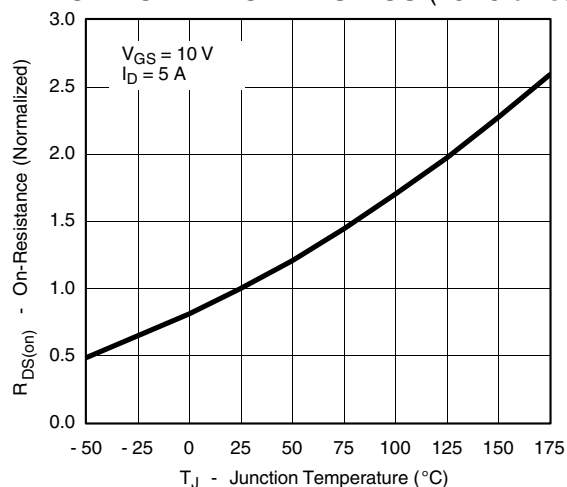
## Notes:

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

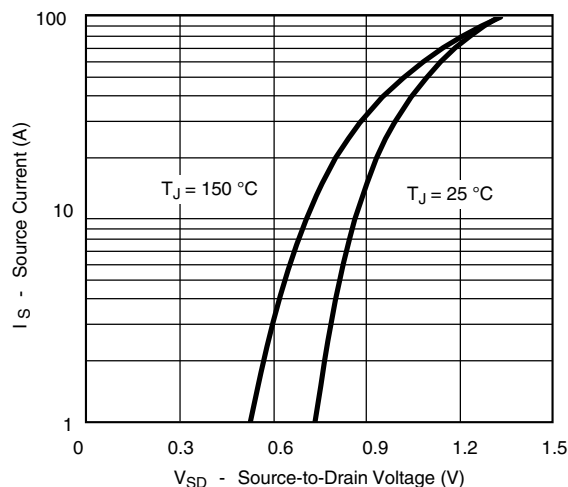
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

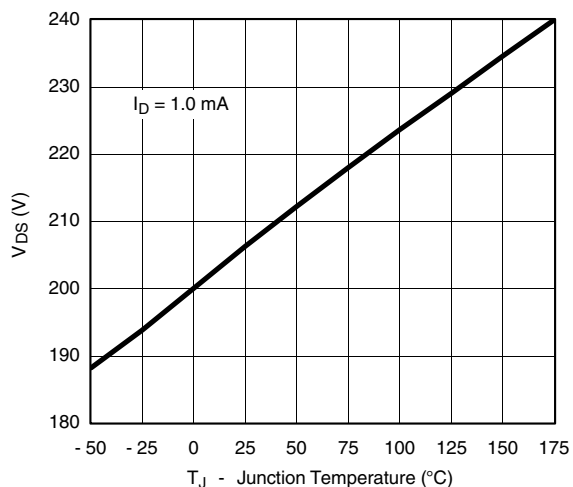
## TYPICAL CHARACTERISTICS (25 °C unless noted)



On-Resistance vs. Junction Temperature

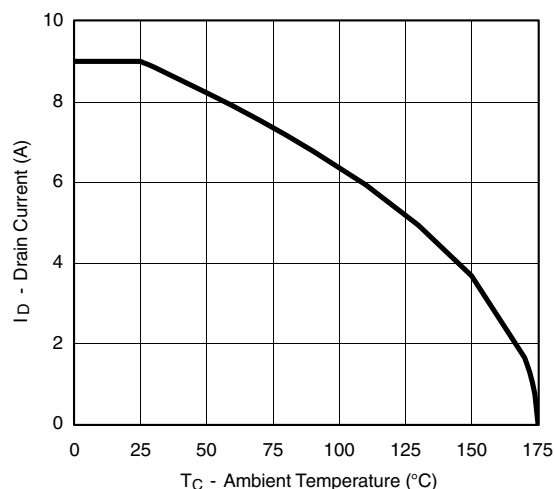


Source-Drain Diode Forward Voltage

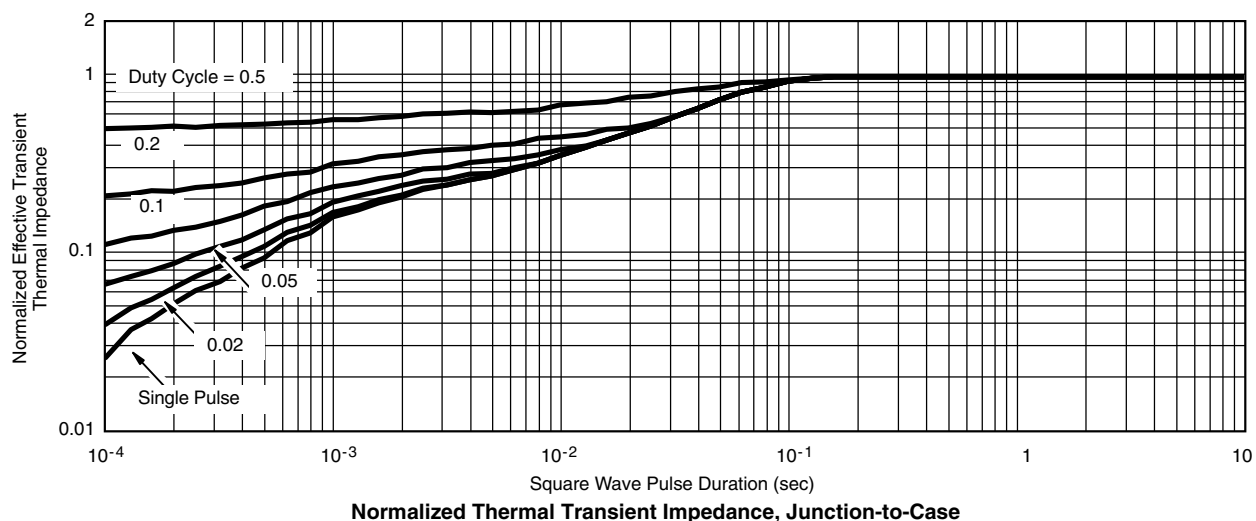
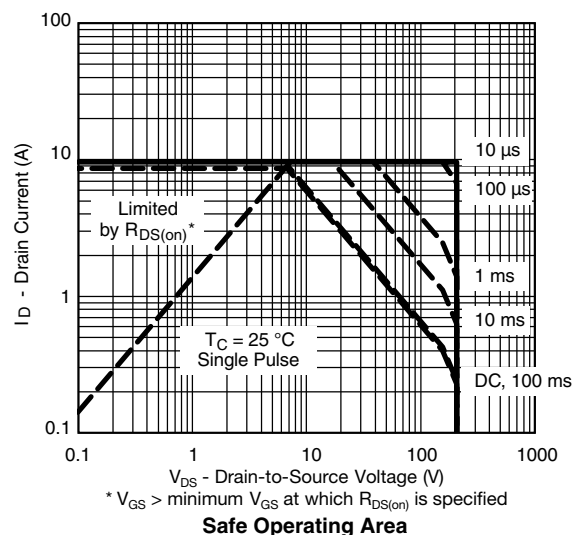


Drain Source Breakdown vs. Junction Temperature

# THERMAL RATINGS



Maximum Avalanche and Drain Current  
vs. Case Temperature



Normalized Thermal Transient Impedance, Junction-to-Case

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