

## N-Channel 200-V (D-S) MOSFET

PRODUCT SUMMARY			
$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
200	0.053 at $V_{GS} = 15$ V	36	57
	0.054 at $V_{GS} = 10$ V	36	

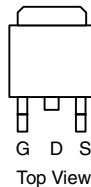
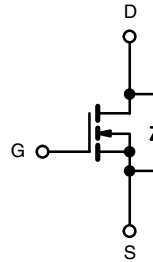
### FEATURES

- TrenchFET<sup>®</sup> Power MOSFETS
- 175 °C Junction Temperature
- 100 %  $R_g$  and UIS Tested


**RoHS  
COMPLIANT**

### APPLICATIONS

- Power Supply
- Lighting Systems

**TO-263**

**Ordering Information:** SUM36N20-54P-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	$V_{GS}$	$\pm 25$		
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	36	A
		$T_C = 100$ °C	22.6	
Pulsed Drain Current	$I_{DM}$	80		
Single Pulse Avalanche Current	$L = 0.1$ mH	$I_{AS}$	20	mJ
Single Pulse Avalanche Energy <sup>a</sup>		$E_{AS}$	20	
Maximum Power Dissipation <sup>a</sup>	$T_C = 25$ °C	$P_D$	166 <sup>b</sup>	W
			$T_A = 25$ °C <sup>c</sup>	
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)	$R_{thJC}$	0.75	

Notes:

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

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5		4.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			$\pm 300$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$			25	
		$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$	40			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.044	0.054	$\Omega$
		$V_{GS} = 15\text{ V}, I_D = 20\text{ A}$		0.0435	0.053	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 100\text{ }^\circ\text{C}$			0.098	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ }^\circ\text{C}$			0.130	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	25			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		3100		$\mu\text{F}$
Output Capacitance	$C_{oss}$			300		
Reverse Transfer Capacitance	$C_{rss}$			135		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 100\text{ V}, V_{GS} = 15\text{ V}, I_D = 50\text{ A}$		85	127	nC
				57	85	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$	$V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		14		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			20		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		1.2	1.8	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 100\text{ V}, R_L = 2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		16	25	ns
Rise Time <sup>c</sup>	$t_r$			170	260	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			27	42	
Fall Time <sup>c</sup>	$t_f$			9	18	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	$I_S$				36	A
Pulsed Current	$I_{SM}$				80	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		0.86	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 40\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		116	175	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			9	14	A
Reverse Recovery Charge	$Q_{rr}$			0.53	0.8	$\mu\text{C}$
Reverse Recovery Fall Time	$t_a$			84		nS
Reverse Recovery Rise Time	$t_b$			32		

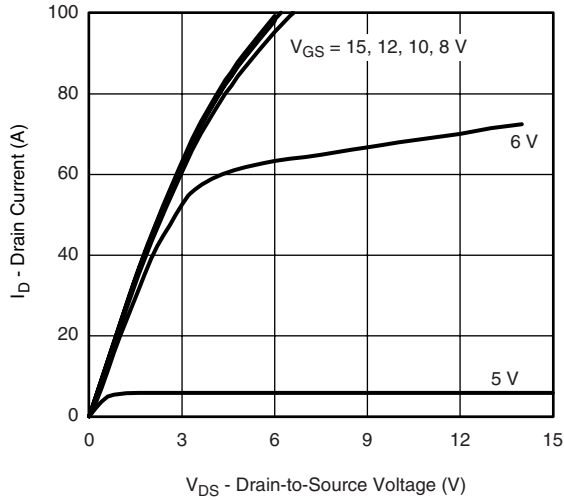
Notes:

- 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.

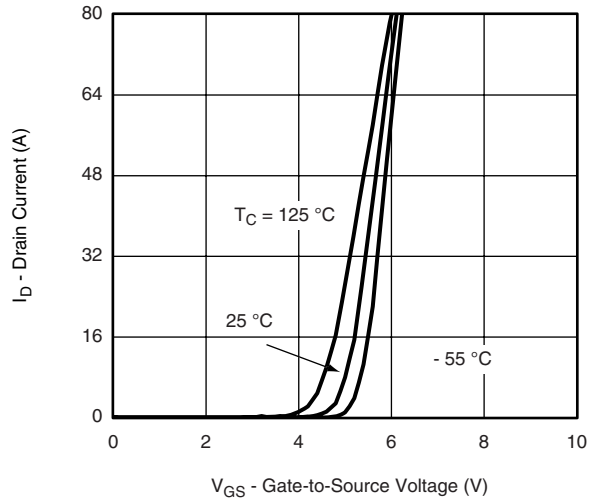
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



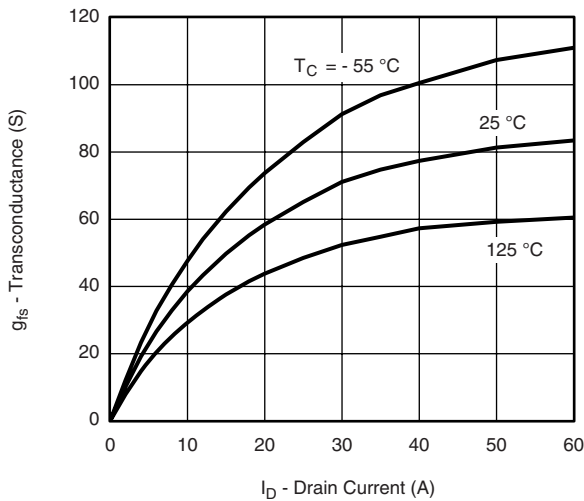
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



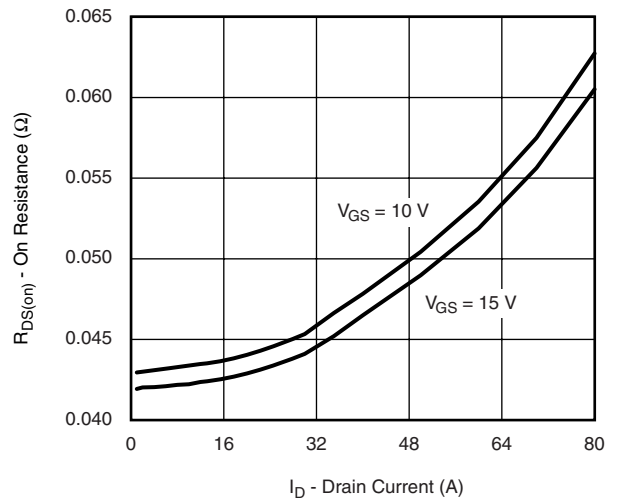
**Output Characteristics**



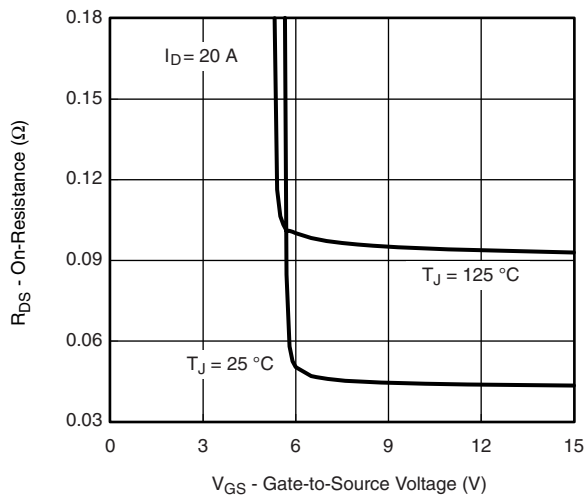
**Transfer Characteristics**



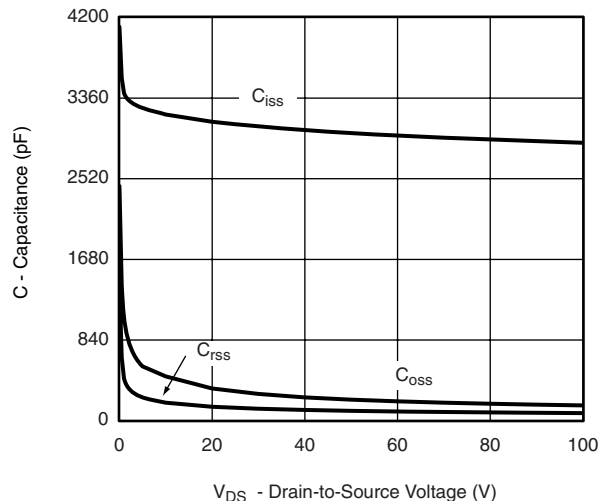
**Transconductance**



**On-Resistance vs. Drain Current**

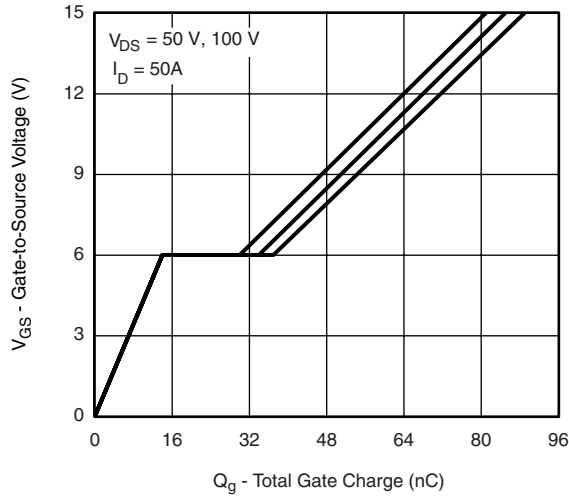


**On-Resistance vs. Gate-to-Source Voltage**

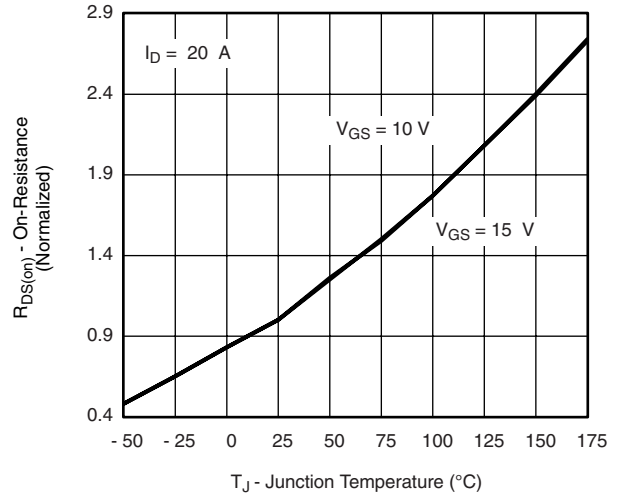


**Capacitance**

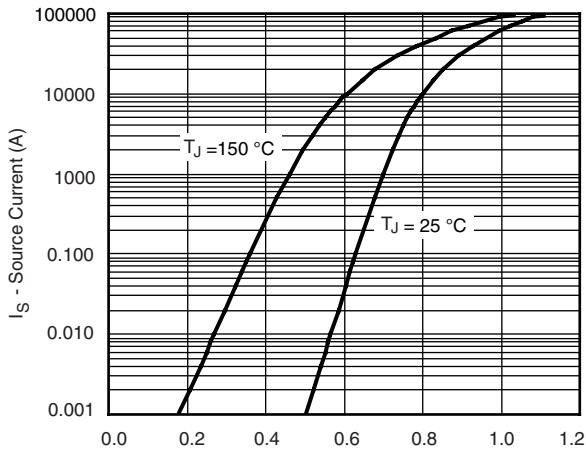
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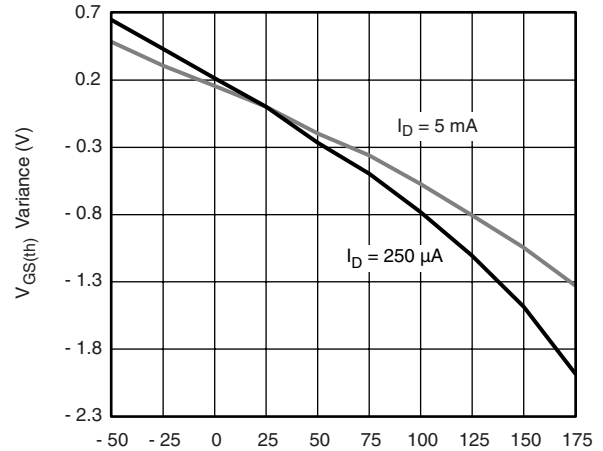
**Gate Charge**



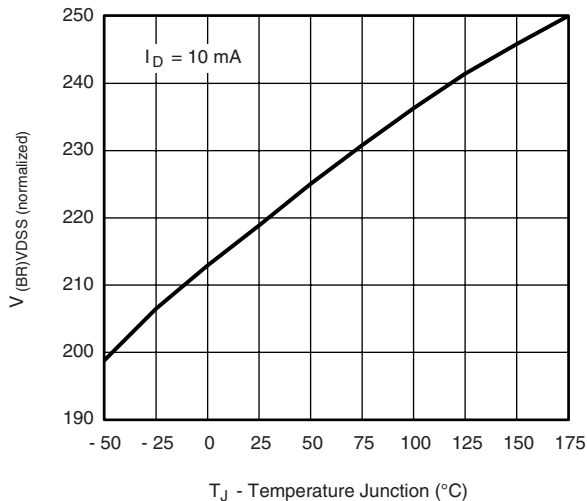
**On-Resistance vs. Junction Temperature**



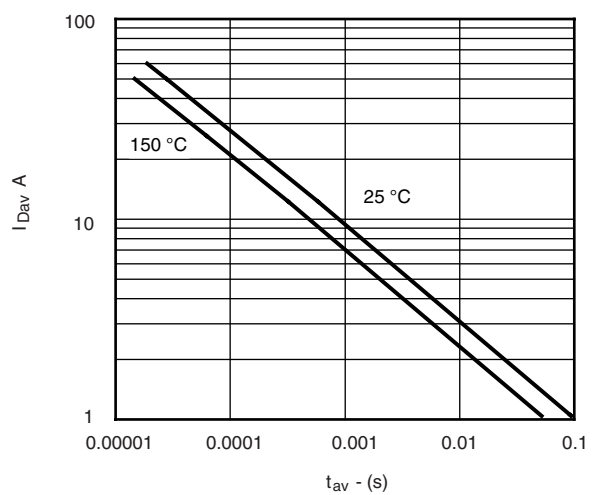
**Source-Drain Diode Forward Voltage**



**Threshold Voltage**

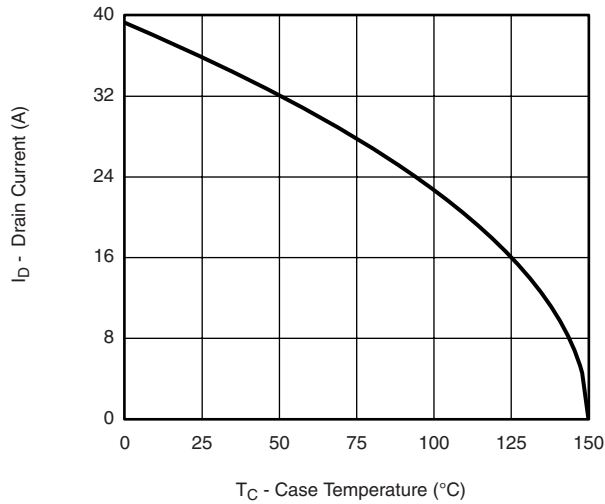


**Drain Source Breakdown vs. Junction Temperature**

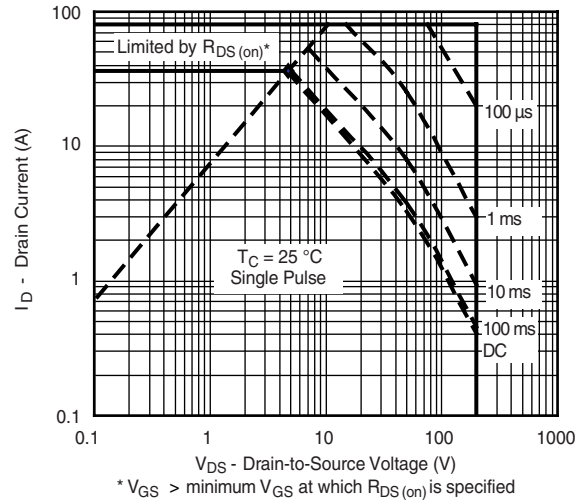


**Single Pulse Avalanche Current Capability vs. Time**

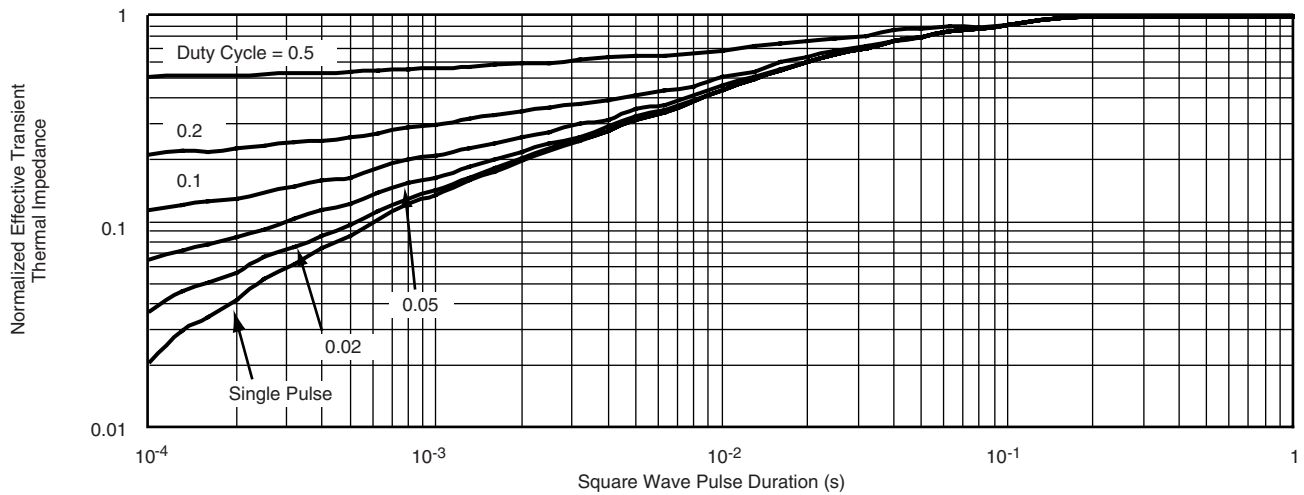
**THERMAL RATINGS**



**Maximum Drain Current vs. Case Temperature**



**Safe Operating Area**



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

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