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

PRODUCT SUMMARY			
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ)
200	0.059 at V_{GS} = 15 V	33	53
	0.060 at V_{GS} = 10 V	33	

FEATURES

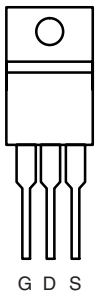
- TrenchFET® Power MOSFETS
- 175 °C Junction Temperature
- 100 % UIS and R_g Tested

RoHS COMPLIANT

APPLICATIONS

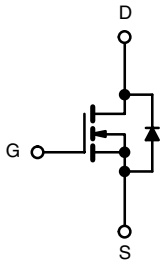
- Power Supply
- Lighting
- Industrial

TO-220AB



Top View

Ordering Information: SUP33N20-60P-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}	± 25	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	33	A
	T_C = 100 °C		20.8	
Pulsed Drain Current		I_{DM}	80	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	20	
Single Pulse Avalanche Energy[a]		E_{AS}	20	mJ
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	156[b]	W
	T_A = 25 °C[c]		3.12	
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)[c]	R_{thJA}	40	°C/W
Junction-to-Case (Drain)	R_{thJC}	0.8	

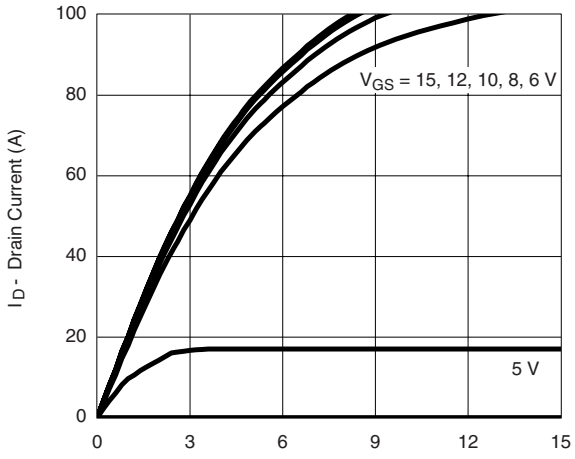
Notes:
a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When Mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min**	**Typ**	**Max**	**Unit**
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 µA	200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.5		4.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
		V_{DS} = 0 V, V_{GS} = ± 25 V			± 300	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 200 V, V_{GS} = 0 V			1	µA
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 100 °C			25	
		V_{DS} = 200 V, V_{GS} = 0 V, T_J = 150 °C			250	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 10 V, V_{GS} = 10 V	40			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.049	0.060	Ω
		V_{GS} = 15 V, I_D = 20 A		0.0485	0.059	
		V_{GS} = 10 V, I_D = 20 A, T_J = 100 °C			0.110	
		V_{GS} = 10 V, I_D = 20 A, T_J = 150 °C			0.144	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A	25			S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		2735		pF
Output Capacitance	C_{oss}			271		
Reverse Transfer Capacitance	C_{rss}			117		
Total Gate Charge[c]	Q_g	V_{DS} = 100 V, V_{GS} = 15 V, I_D = 50 A		75	113	nC
		V_{DS} = 100 V, V_{GS} = 10 V, I_D = 50 A		53	80	
Gate-Source Charge[c]	Q_{gs}			14		
Gate-Drain Charge[c]	Q_{gd}			17.5		
Gate Resistance	R_g	f = 1 MHz		1.2	1.8	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 100 V, R_L = 2 Ω I_D ≅ 50 A, V_{GEN} = 10 V, R_g = 1 Ω		16	25	ns
Rise Time[c]	t_r			170	260	
Turn-Off Delay Time[c]	$t_{d(off)}$			26	40	
Fall Time[c]	t_f			9	18	
Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)[b]						
Continuous Current	I_S				33	A
Pulsed Current	I_{SM}				80	
Forward Voltage[a]	V_{SD}	I_F = 20 A, V_{GS} = 0 V		0.86	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 40 A, di/dt = 100 A/µs		114	170	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			8	12	A
Reverse Recovery Charge	Q_{rr}			0.46	0.69	µC
Reverse Recovery Fall Time	t_a			82		nS
Reverse Recovery Rise Time	t_b			32		

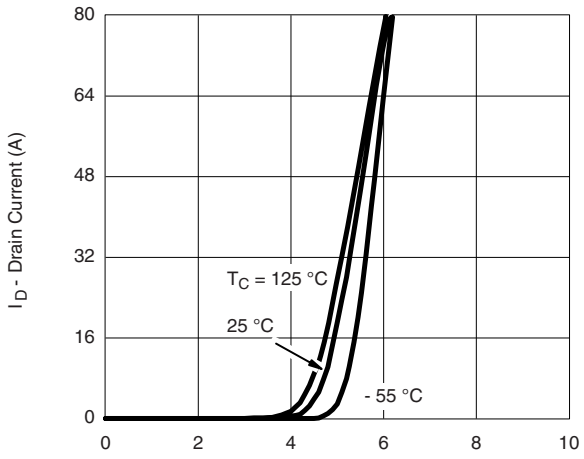
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

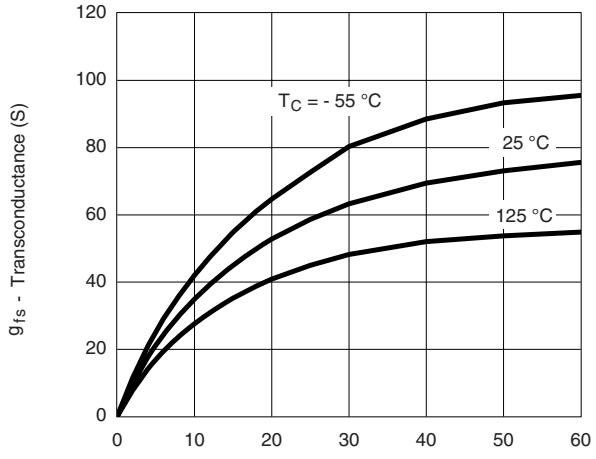
TYPICAL CHARACTERISTICS 25 °C, unless noted



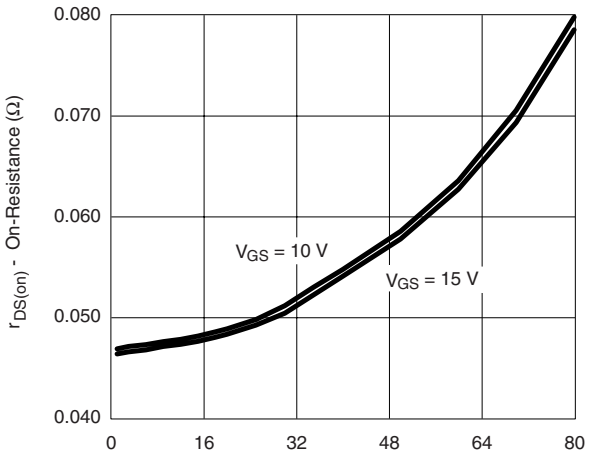
Output Characteristics



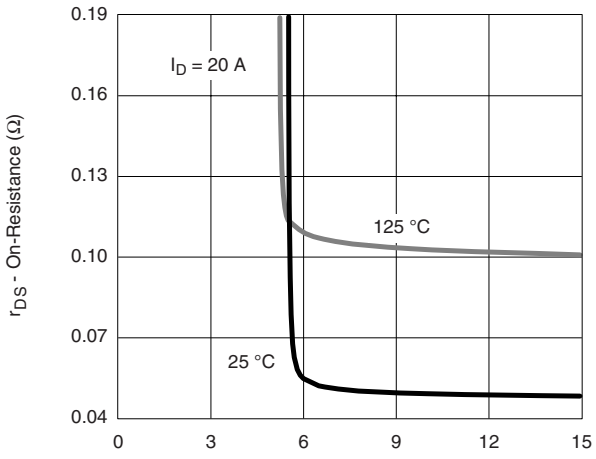
Transfer Characteristics



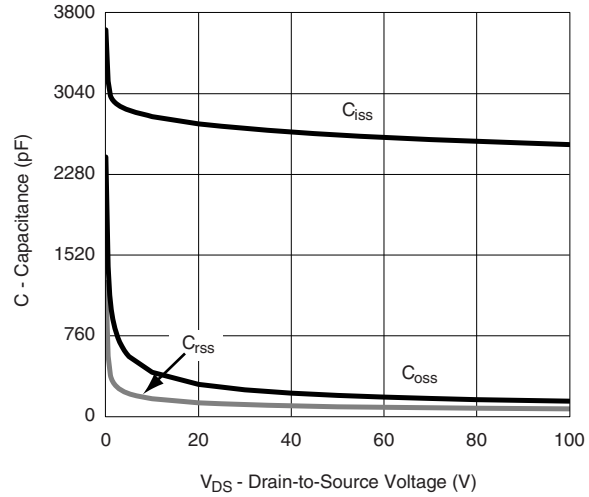
Transconductance



On-Resistance vs. Drain Current

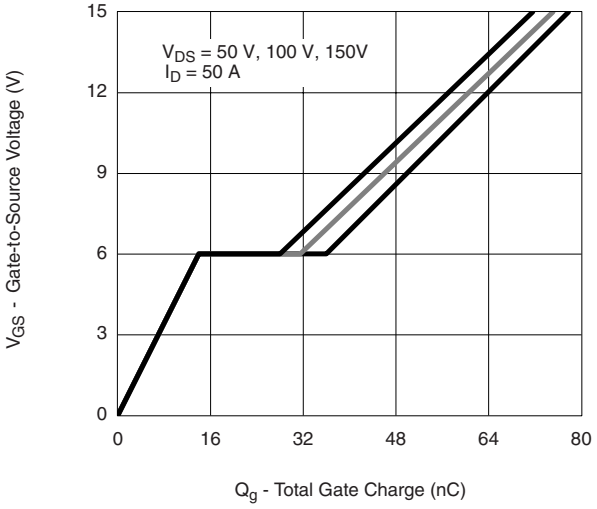


On-Resistance vs. Gate-to-Source Voltage

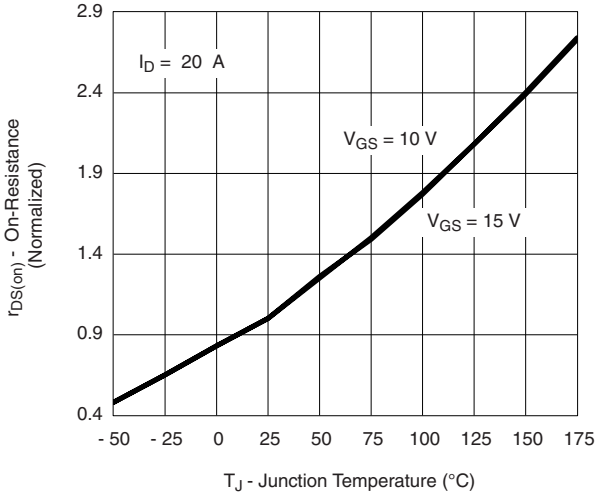


Capacitance

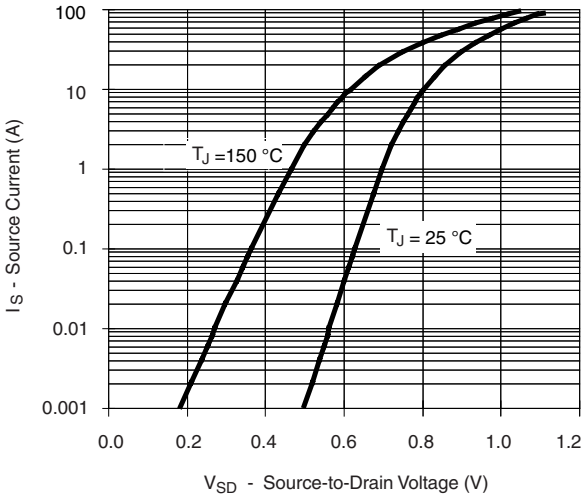
TYPICAL CHARACTERISTICS 25 °C, unless noted



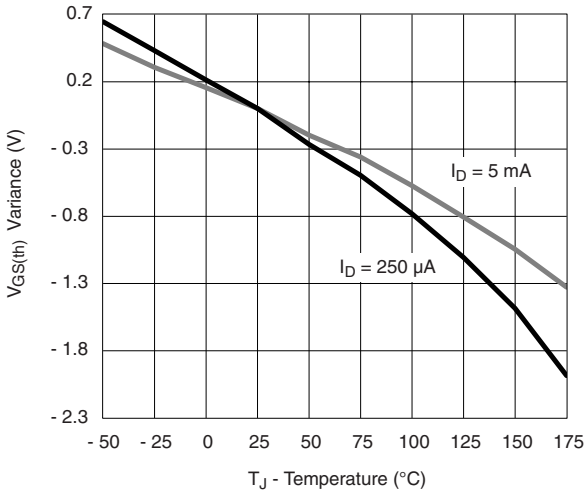
Gate Charge



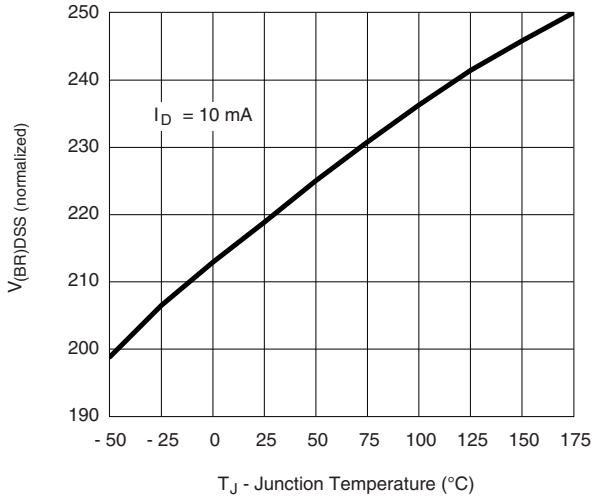
On-Resistance vs. Junction Temperature



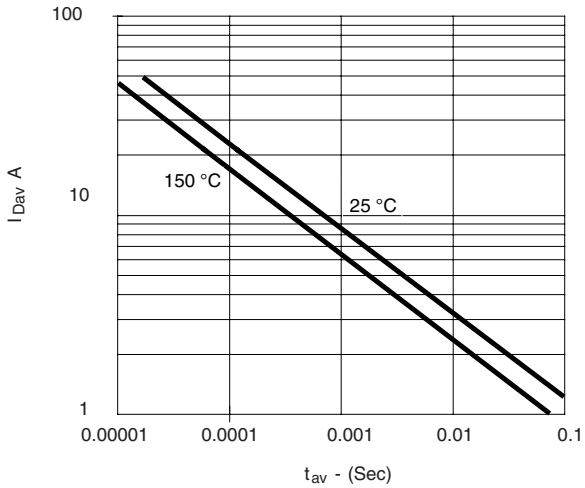
Source-Drain Diode Forward Voltage



Threshold Voltage

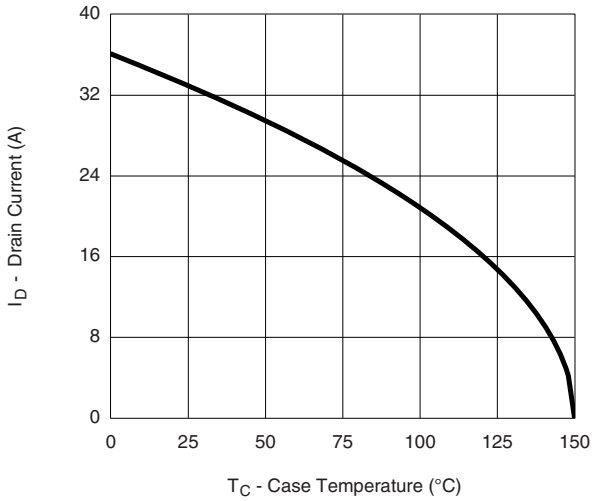


Drain Source Breakdown vs. Junction Temperature

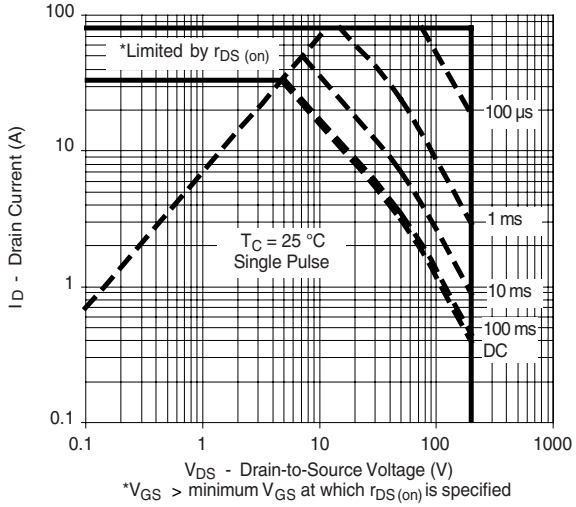


Single Pulse Avalanche Current Capability vs. Time

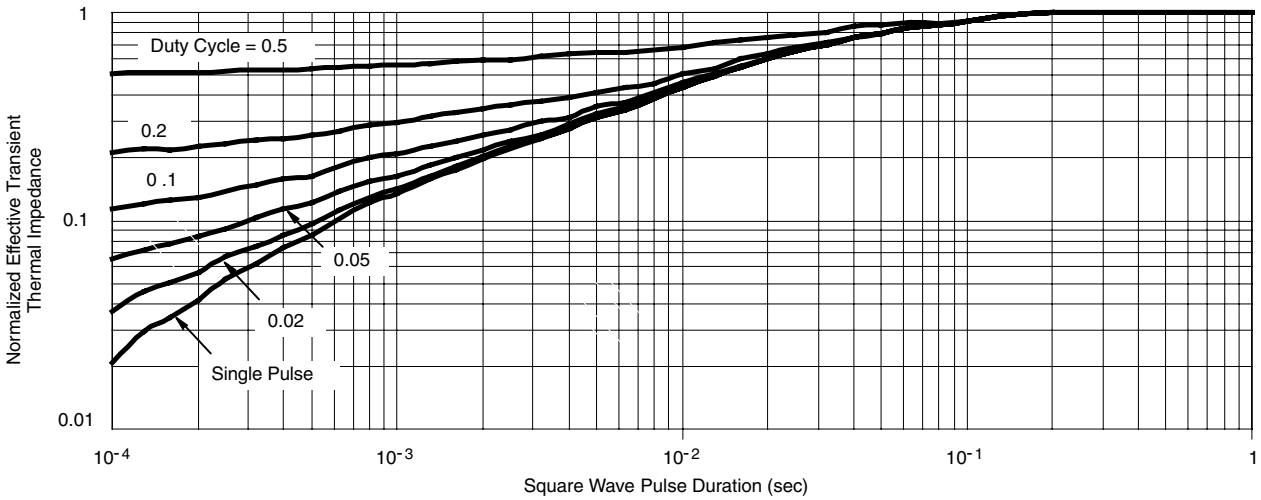
THERMAL RATINGS



Maximum Drain Curent vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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