

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

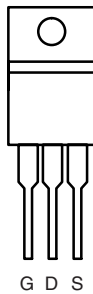


RoHS
COMPLIANT

APPLICATIONS

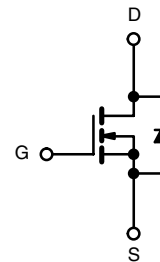
- Power Supply
- Lighting
- Industrial

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)	I_D	33	A
		20.8	
Pulsed Drain Current	I_{DM}	80	
Single Pulse Avalanche Current	I_{AS}	20	
Single Pulse Avalanche Energy ^a	E_{AS}	20	mJ
Maximum Power Dissipation ^a	P_D	156 ^b	W
		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.

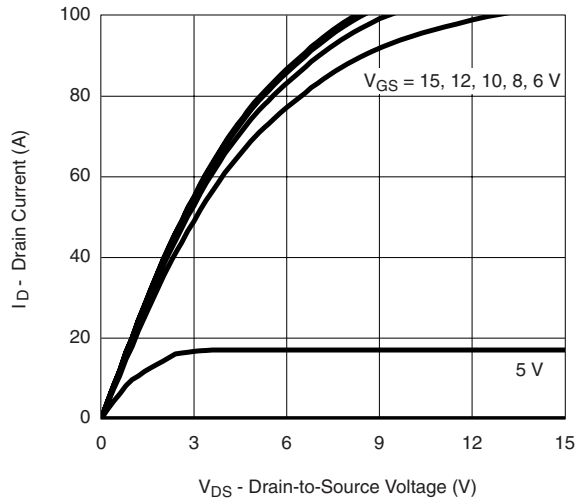
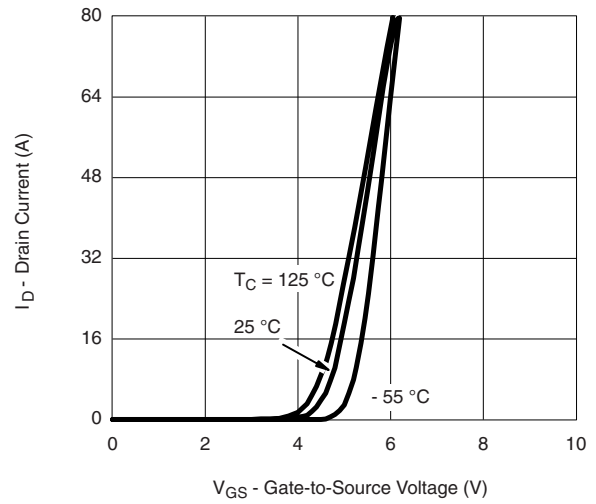
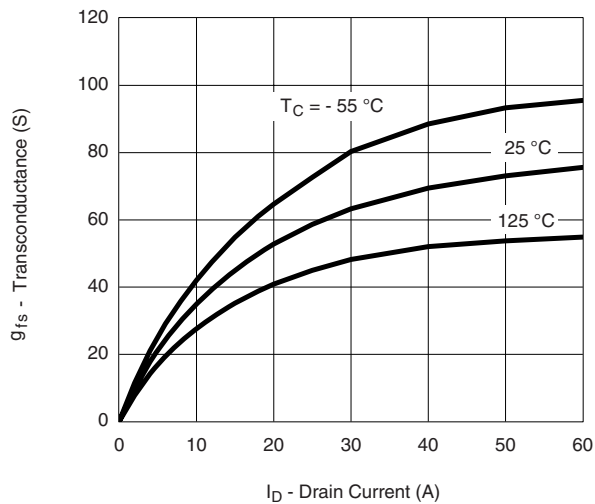
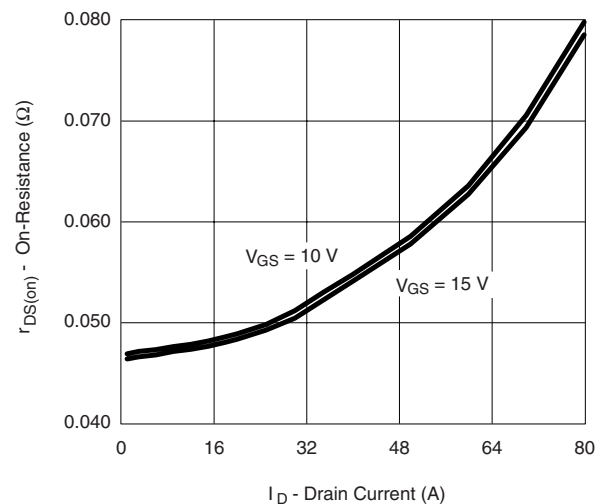
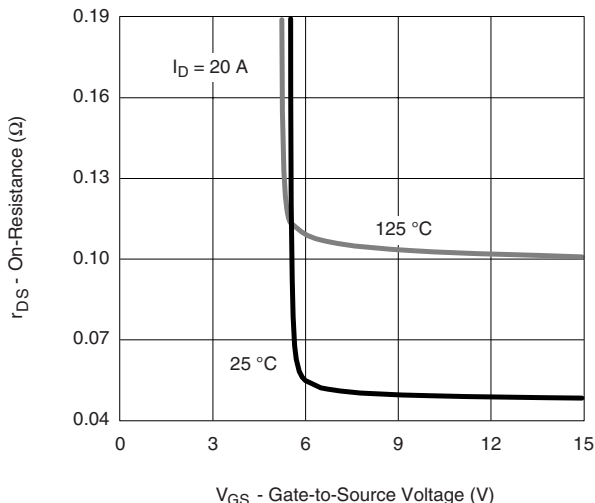
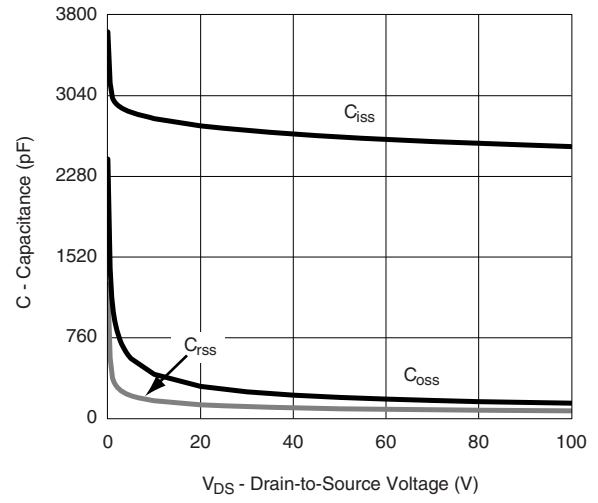
c. When Mounted on 1" square PCB (FR-4 material).

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		

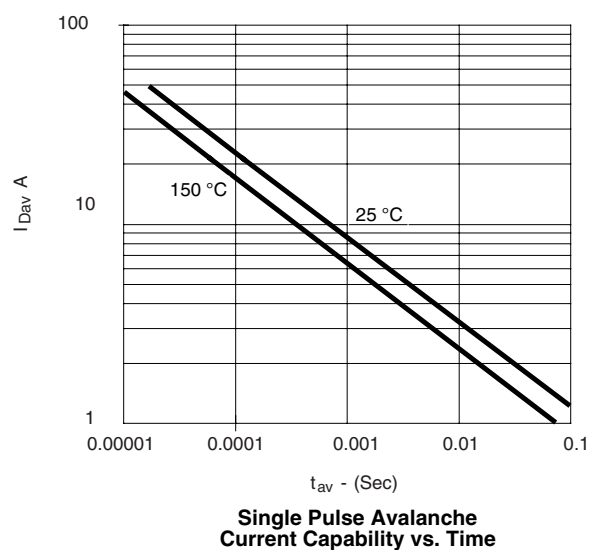
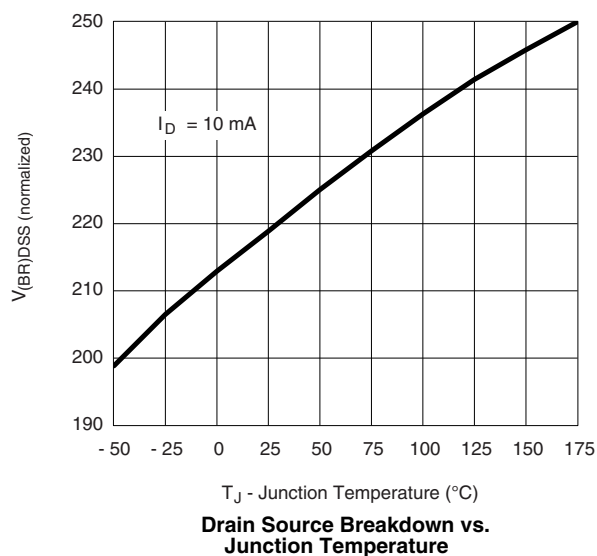
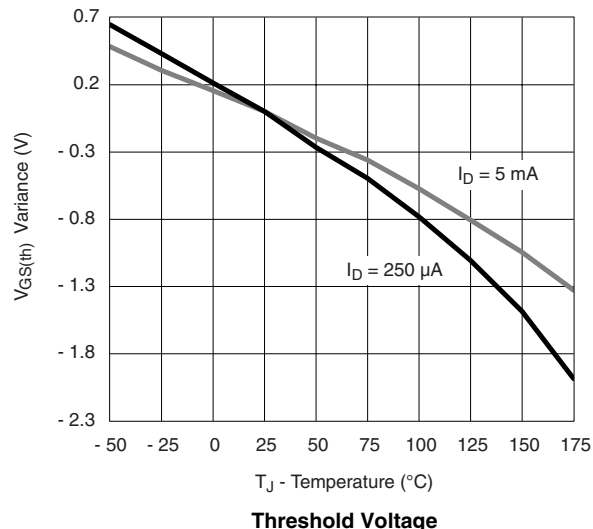
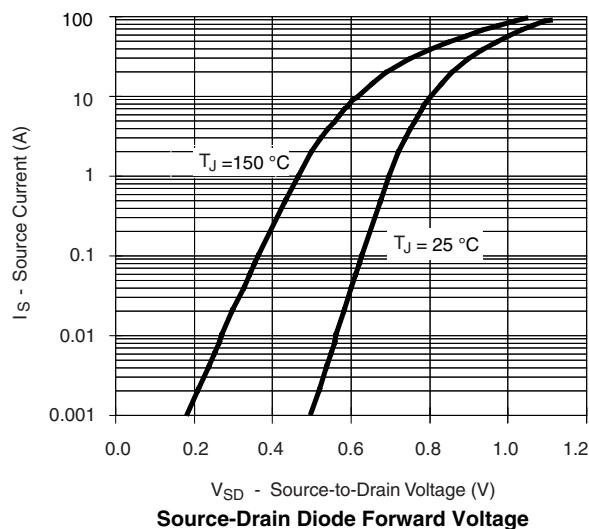
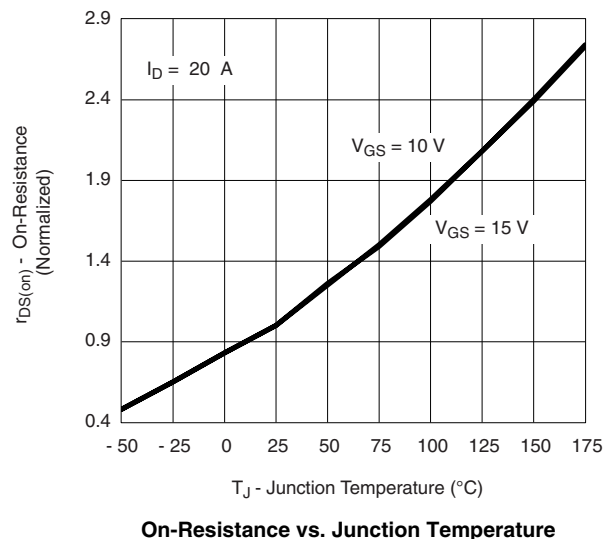
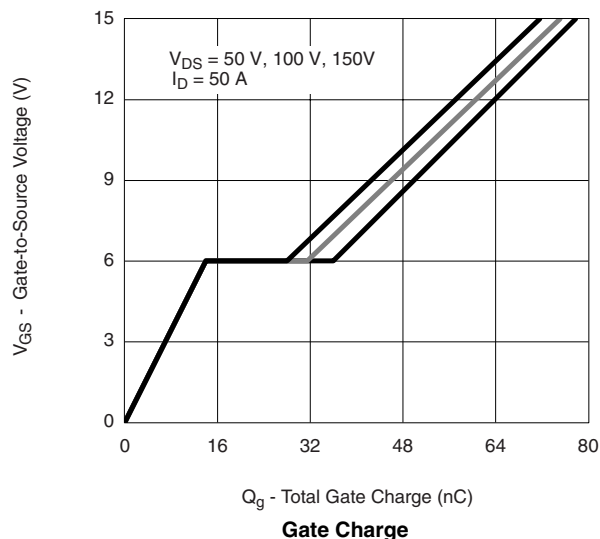
Notes:

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

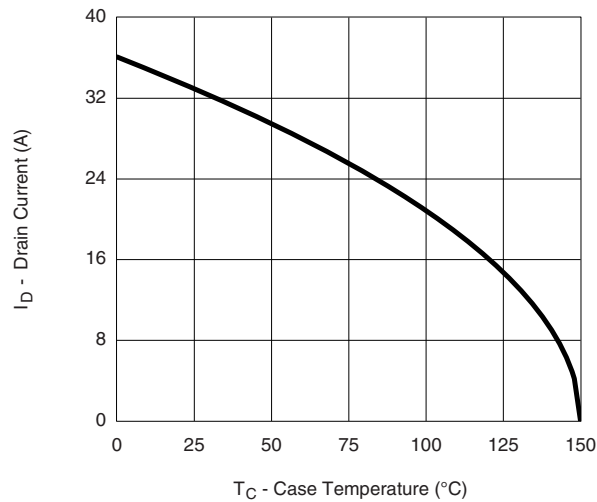
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

On-Resistance vs. Gate-to-Source Voltage

Capacitance

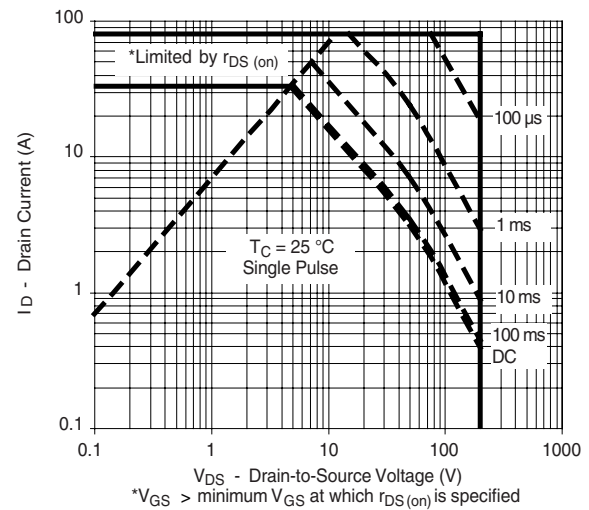
TYPICAL CHARACTERISTICS 25 °C, unless noted



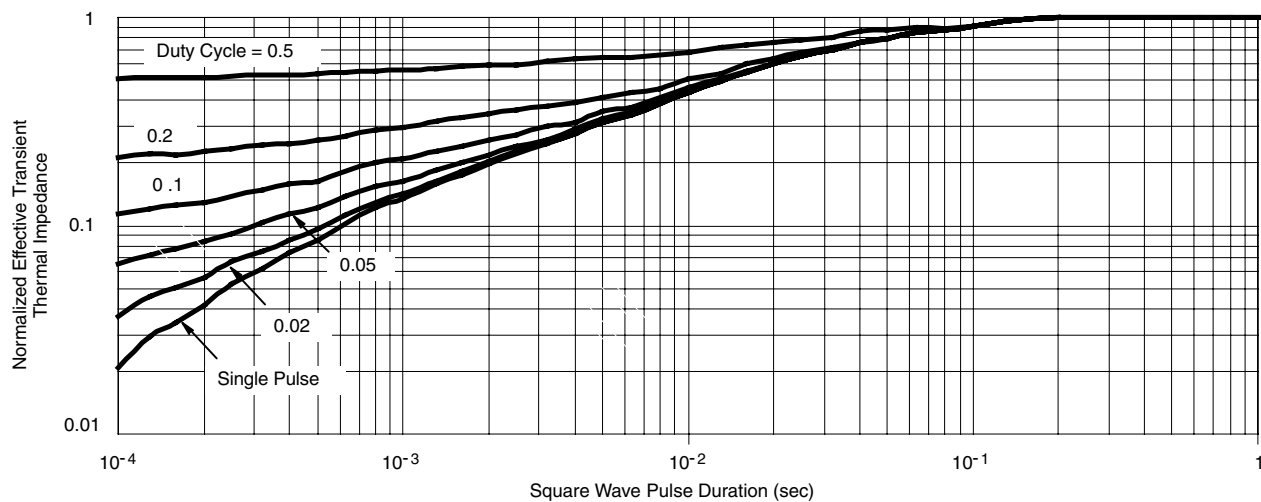
THERMAL RATINGS



Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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