

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

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ)
200	0.038 at $V_{GS} = 15$ V	52	81
	0.039 at $V_{GS} = 10$ V	52	

FEATURES

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

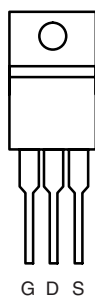


RoHS
COMPLIANT

APPLICATIONS

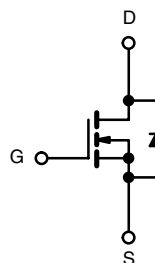
- Power Supply
- Primary Side
- Lighting
- Industrial

TO-220AB



Top View

Ordering Information: SUP52N20-39P-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	52	A
		32.5	
Pulsed Drain Current	I_{DM}	100	
Single Pulse Avalanche Current	I_{AS}	25	
Single Pulse Avalanche Energy ^a	E_{AS}	31	mJ
Maximum Power Dissipation ^a	P_D	250 ^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}	0.5	

Notes:

a. Duty cycle ≤ 1 %.

b. See SOA curve for voltage derating.

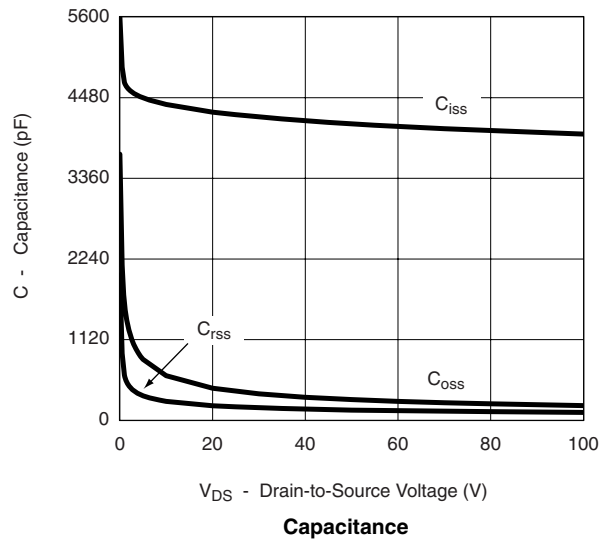
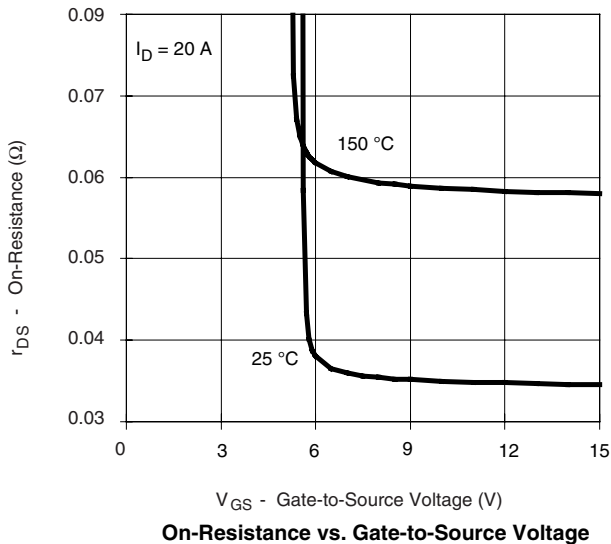
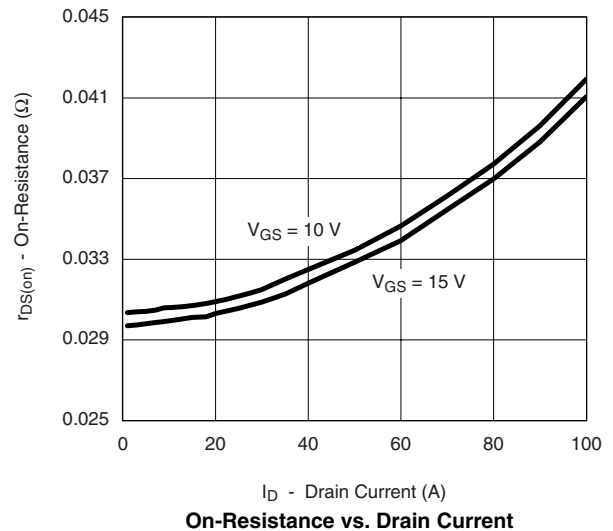
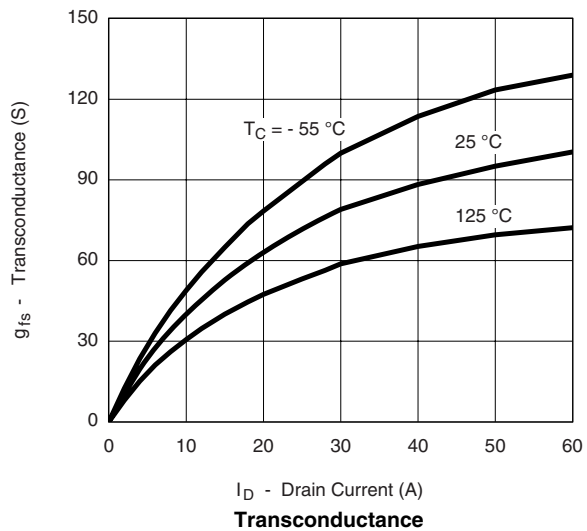
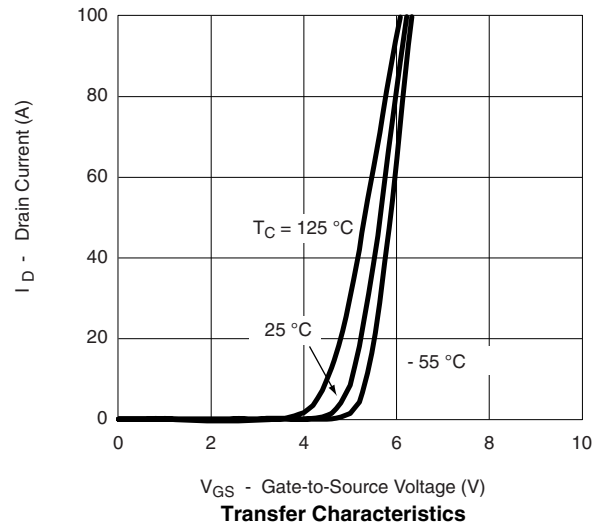
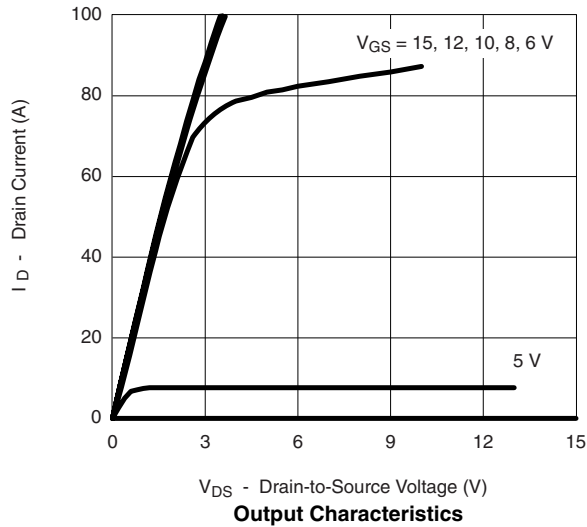
c. When Mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	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}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
		$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$			± 300	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 100\text{ }^{\circ}\text{C}$			25	
		$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 10\text{ V}$, $V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$		0.031	0.039	Ω
		$V_{GS} = 15\text{ V}$, $I_D = 20\text{ A}$		0.0305	0.038	
		$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$, $T_J = 100\text{ }^{\circ}\text{C}$			0.071	
		$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$, $T_J = 150\text{ }^{\circ}\text{C}$			0.094	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 20\text{ A}$	25			S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$		4220		pF
Output Capacitance	C_{oss}			400		
Reverse Transfer Capacitance	C_{rss}			185		
Total Gate Charge ^c	Q_g	$V_{DS} = 100\text{ V}$, $V_{GS} = 15\text{ V}$, $I_D = 50\text{ A}$		123	185	nC
		$V_{DS} = 100\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 50\text{ A}$		81	122	
Gate-Source Charge ^c	Q_{gs}			21		
Gate-Drain Charge ^c	Q_{gd}			27		
Gate Resistance	R_g	$f = 1\text{ MHz}$		1.2	1.8	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 100\text{ V}$, $R_L = 2\text{ }\Omega$ $I_D \cong 50\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$		18	30	ns
Rise Time ^c	t_r			170	260	
Turn-Off Delay Time ^c	$t_{d(off)}$			34	51	
Fall Time ^c	t_f			9	18	
Source-Drain Diode Ratings and Characteristics $(T_C = 25\text{ }^{\circ}\text{C})^b$						
Continuous Current	I_S				52	A
Pulsed Current	I_{SM}				100	
Forward Voltage ^a	V_{SD}	$I_F = 20\text{ A}$, $V_{GS} = 0\text{ V}$		0.86	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 40\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		133	200	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			8	12	A
Reverse Recovery Charge	Q_{rr}			0.54	0.81	μC
Reverse Recovery Fall Time	t_a			94		nS
Reverse Recovery Rise Time	t_b			39		

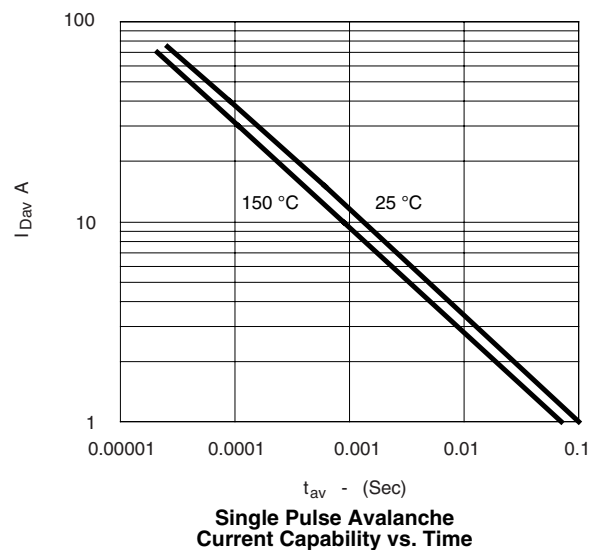
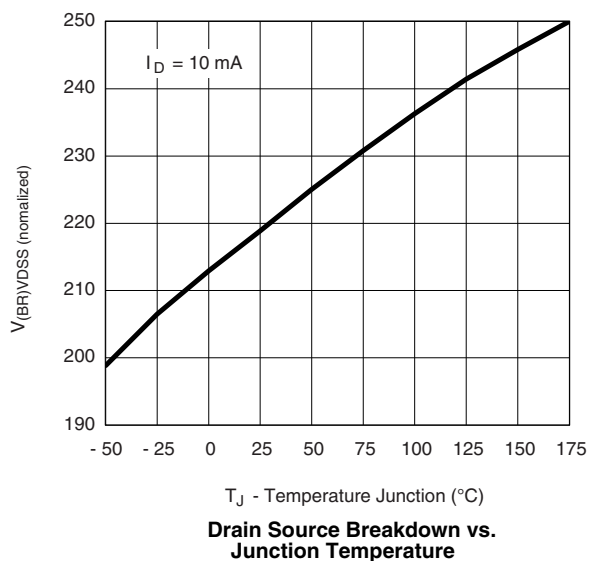
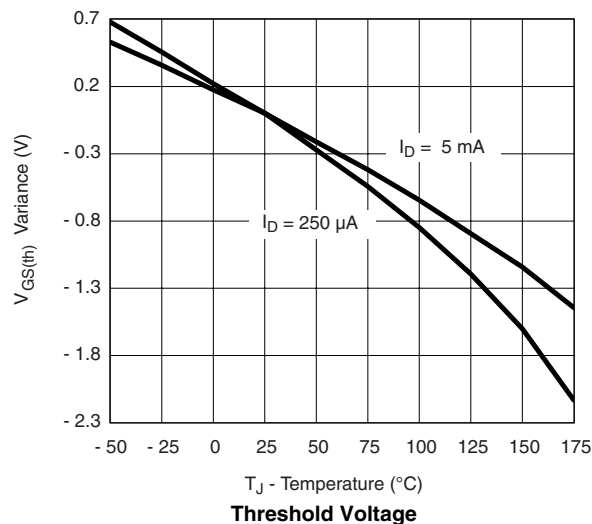
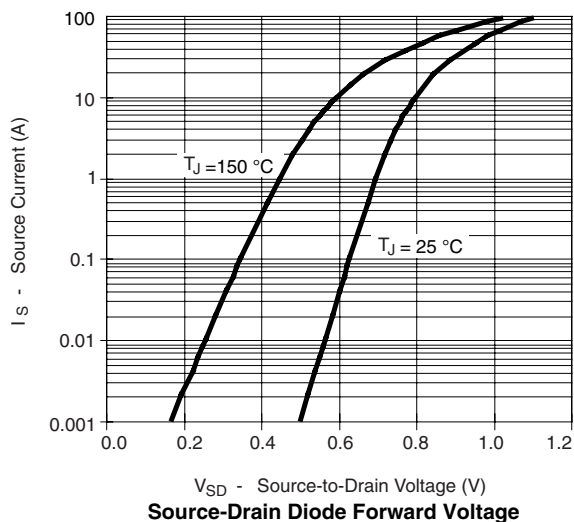
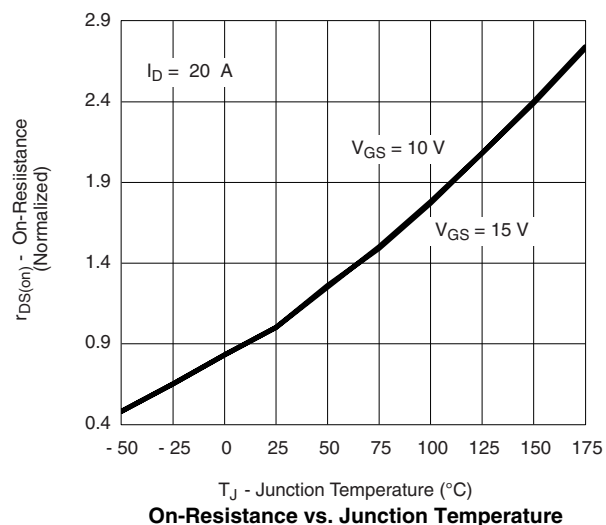
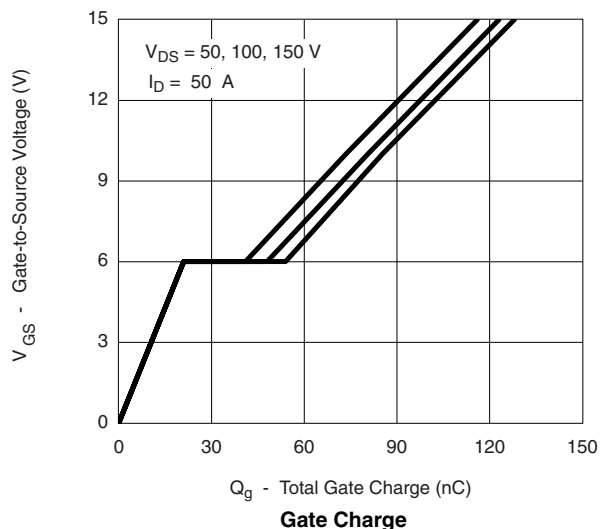
Notes:

- 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.

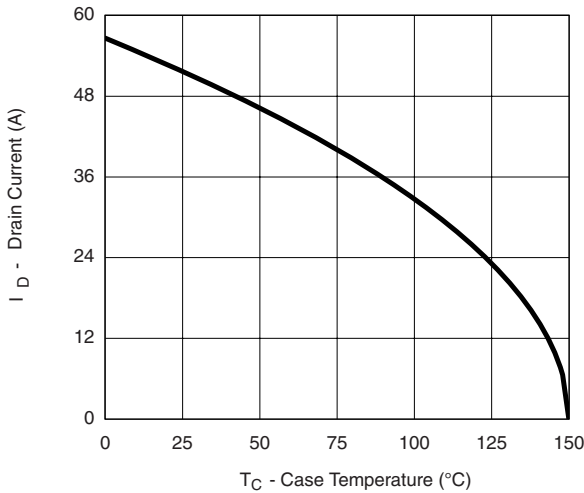
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

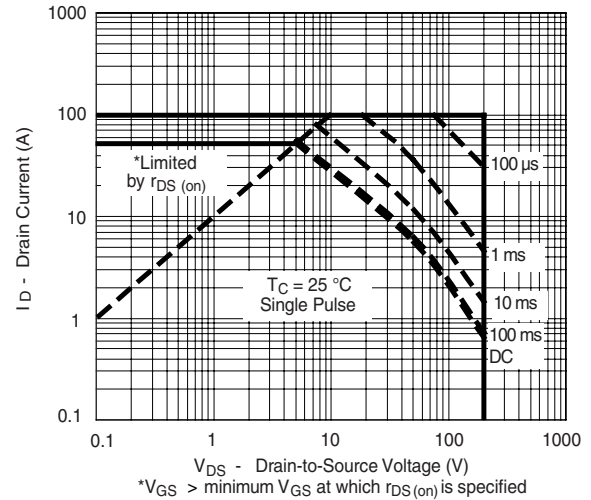
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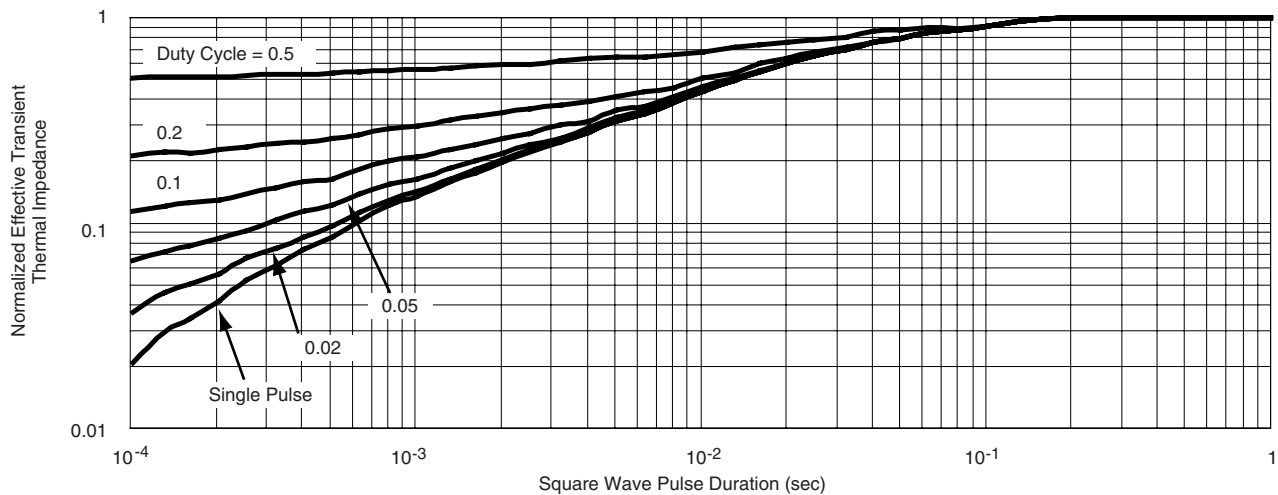
THERMAL RATINGS



Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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