

N-Channel 200-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
200	0.033 at $V_{GS} = 10$ V	57

FEATURES

- TrenchFET® Power MOSFET
- 175 °C Junction Temperature

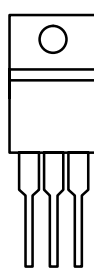
APPLICATIONS

- Isolated DC/DC converters
- Primary-Side Switch



Available
RoHS*
COMPLIANT

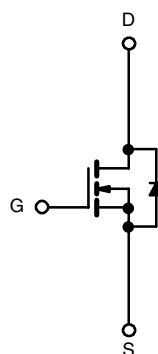
TO-220AB



G D S

Top View

DRAIN connected to TAB



N-Channel MOSFET

Ordering Information: SUP57N20-33
SUP57N20-33-E3 (Lead (Pb)-free)

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}	± 20	
Continuous Drain Current ($T_J = 175$ °C)	I_D	$T_C = 25$ °C	57
		$T_C = 125$ °C	33
Pulsed Drain Current	I_{DM}	140	A
Avalanche Current	I_{AS}	35	
Single Pulse Avalanche Energy ^a	E_{AS}	61	mJ
Maximum Power Dissipation ^a	P_D	$T_C = 25$ °C	300 ^b
		$T_A = 25$ °C ^c	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) ^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).

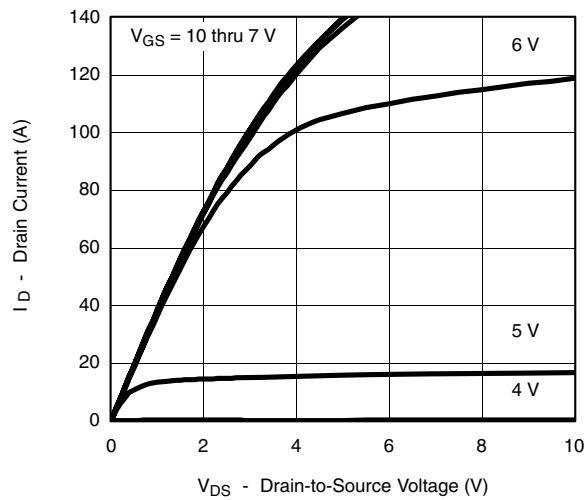
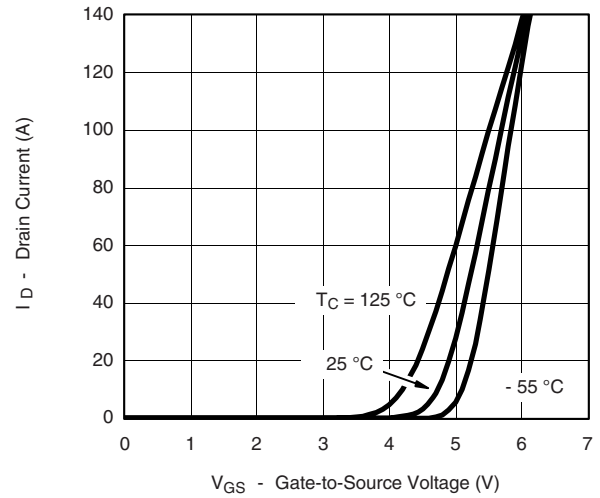
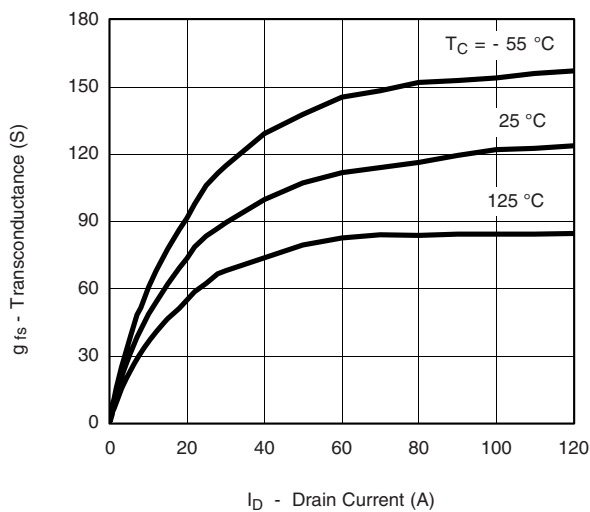
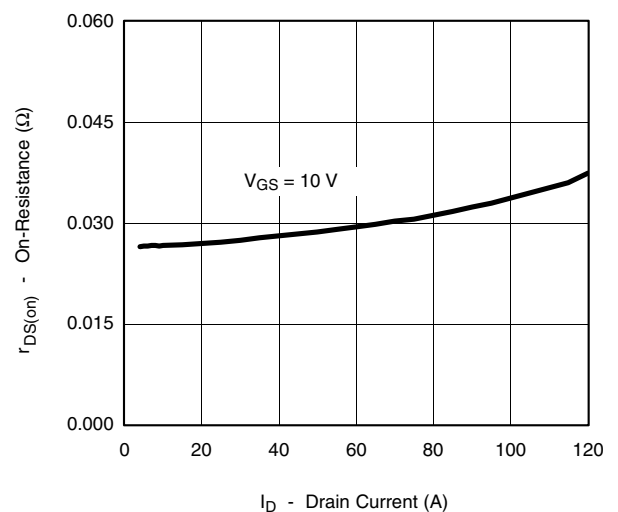
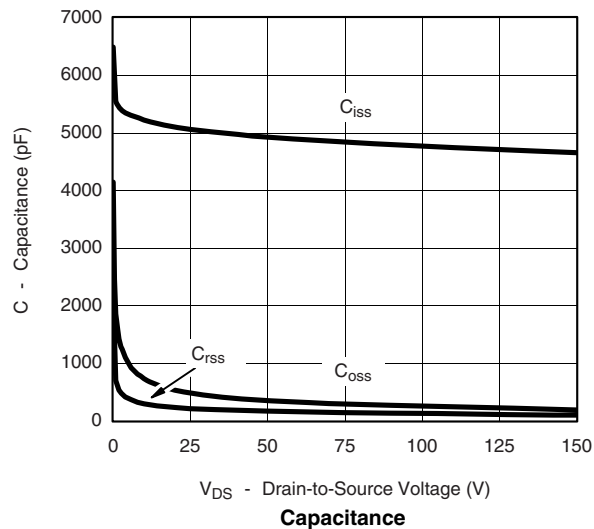
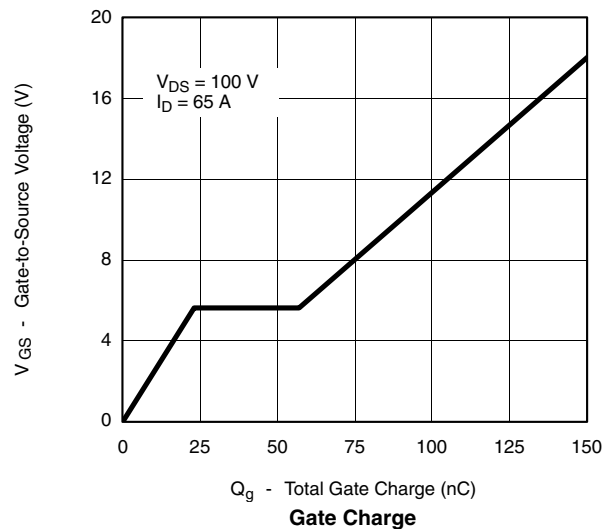
* Pb containing terminations are not RoHS compliant, exemptions may apply.

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		4	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 160\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 30\text{ A}$		0.027	0.033	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 30\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$			0.069	
		$V_{GS} = 10\text{ V}$, $I_D = 30\text{ A}$, $T_J = 175\text{ }^{\circ}\text{C}$			0.093	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 30\text{ A}$	25			S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$		5100		pF
Output Capacitance	C_{oss}			480		
Reverse Transfer Capacitance	C_{rss}			210		
Total Gate Charge ^c	Q_g	$V_{DS} = 100\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 85\text{ A}$		90	130	nC
Gate-Source Charge ^c	Q_{gs}			23		
Gate-Drain Charge ^c	Q_{gd}			34		
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 100\text{ V}$, $R_L = 1.5\text{ }\Omega$ $I_D \cong 65\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_G = 2.5\text{ }\Omega$		24	35	ns
Rise Time ^c	t_r			220	330	
Turn-Off Delay Time ^c	$t_{d(off)}$			45	70	
Fall Time ^c	t_f			200	300	
Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^{\circ}\text{C}$) ^b						
Continuous Current	I_S				65	A
Pulsed Current	I_{SM}				140	
Forward Voltage ^a	V_{SD}	$I_F = 65\text{ A}$, $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 50\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		130	200	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			8	12	A
Reverse Recovery Charge	Q_{rr}			0.52	1.2	μC

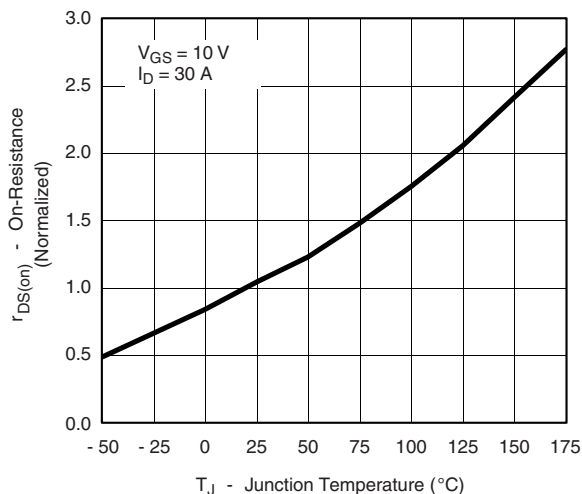
Notes:

- 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.

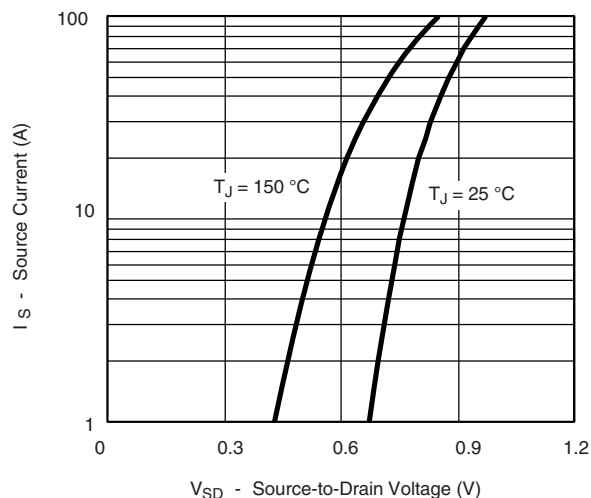
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

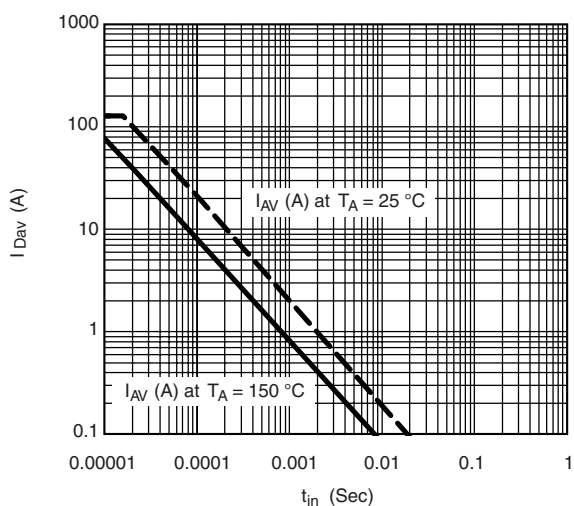
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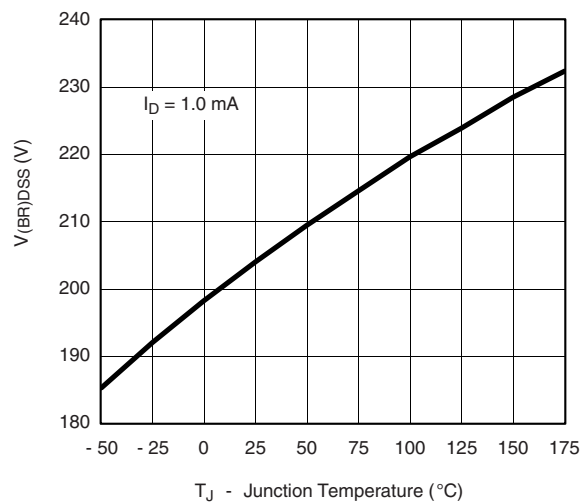
On-Resistance vs. Junction Temperature



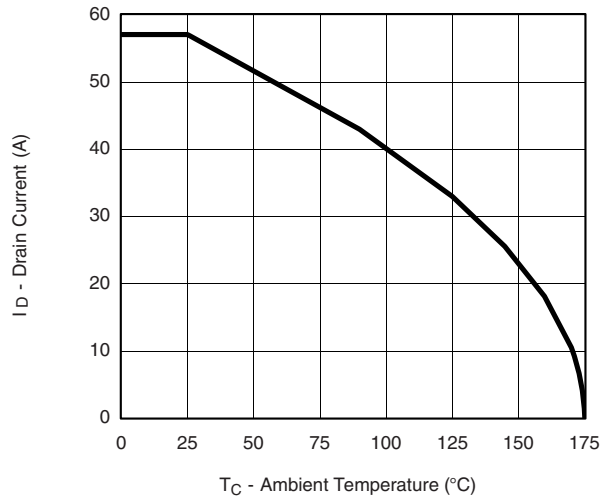
Source-Drain Diode Forward Voltage



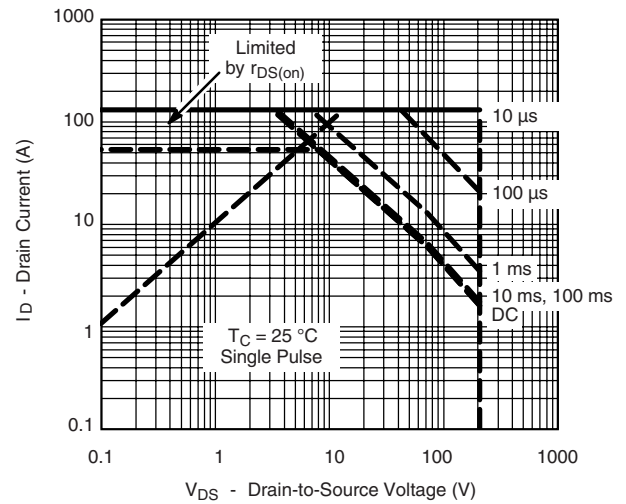
Avalanche Current vs. Time



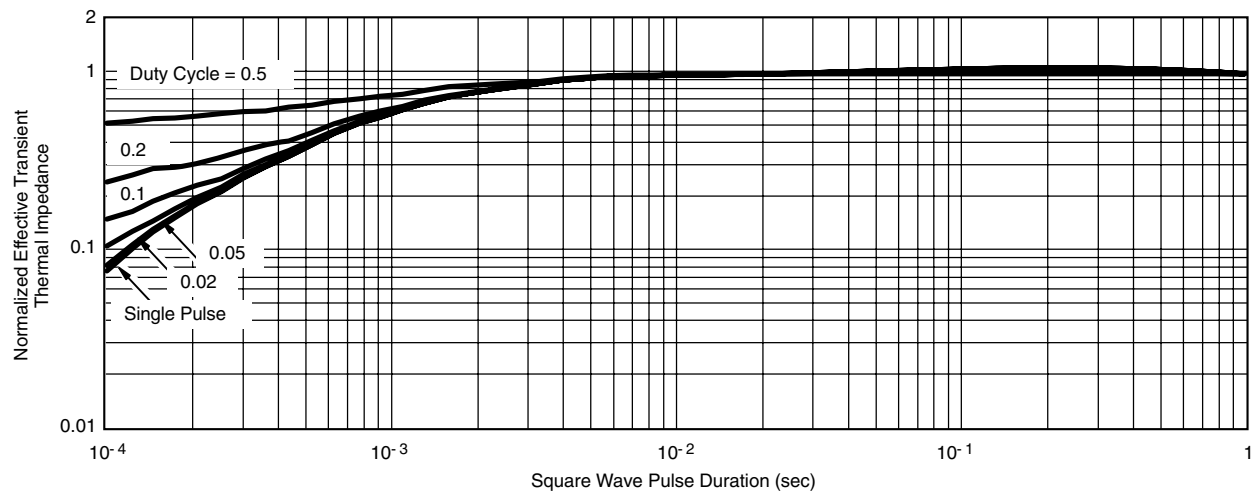
Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS


**Maximum Avalanche and Drain Current
vs. Case Temperature**



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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