

N-Channel 20-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a
20	0.0045 at $V_{GS} = 10$ V	60
	0.0065 at $V_{GS} = 4.5$ V	60

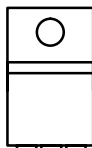
FEATURES

- TrenchFET[®] Power MOSFET
- 175 °C Junction Temperature
- 100 % R_g Tested
- 100 % UIS Tested


RoHS
COMPLIANT

APPLICATIONS

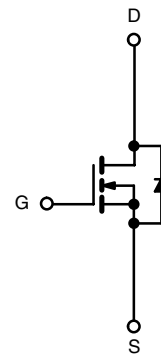
- OR-ing

TO-220AB


G D S

Top View

DRAIN connected to TAB



N-Channel MOSFET

Ordering Information: SUP60N02-4m5P-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V_{DS}	20	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current ($T_J = 175$ °C)	I_D	$T_C = 25$ °C	60 ^a	A
		$T_C = 100$ °C	60 ^a	
Pulsed Drain Current	I_{DM}	120		
Single Pulse Avalanche Current	I_{AS}	50	mJ	
Single Pulse Avalanche Energy	E_{AS}	125		
Maximum Power Dissipation ^b	P_D	$T_C = 25$ °C	120 ^c	W
		$T_A = 25$ °C ^d	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) ^d	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.25	

Notes:

- Package limited.
- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).



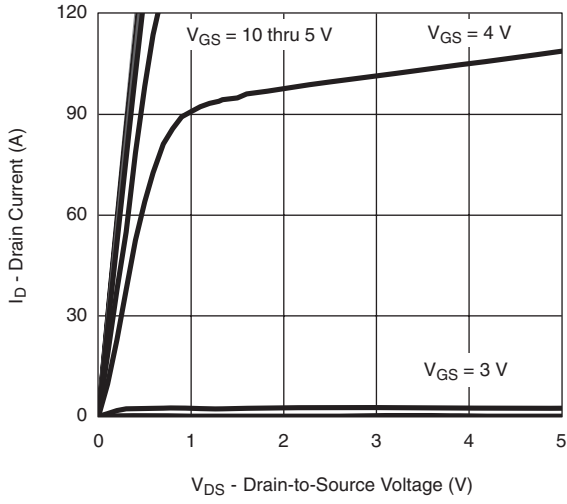
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		3	
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}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	100			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0036	0.0045	Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0068	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.008	
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0052	0.0065	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$		95		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 10\text{ V}, f = 1\text{ MHz}$		5950		pF
Output Capacitance	C_{oss}			985		
Reverse Transfer Capacitance	C_{rss}			365		
Total Gate Charge ^b	Q_g	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$		33	50	nC
Gate-Source Charge ^b	Q_{gs}			18		
Gate-Drain Charge ^b	Q_{gd}			7		
Gate Resistance	R_g		0.75	1.5	2.3	Ω
Turn-On Delay Time ^b	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 0.2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1.0\text{ }\Omega$		15	25	ns
Rise Time ^b	t_r			7	11	
Turn-Off Delay Time ^b	$t_{d(off)}$			35	55	
Fall Time ^b	t_f			8	12	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^\circ\text{C}$ ^c						
Continuous Current	I_S				60	A
Pulsed Current	I_{SM}				100	
Forward Voltage ^a	V_{SD}	$I_F = 20\text{ A}, V_{GS} = 0\text{ V}$		0.85	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		45	90	ns
Peak Reverse Recovery Current	I_{RM}			1.7	3.4	A
Reverse Recovery Charge	Q_{rr}			0.039	0.155	μC

Notes:

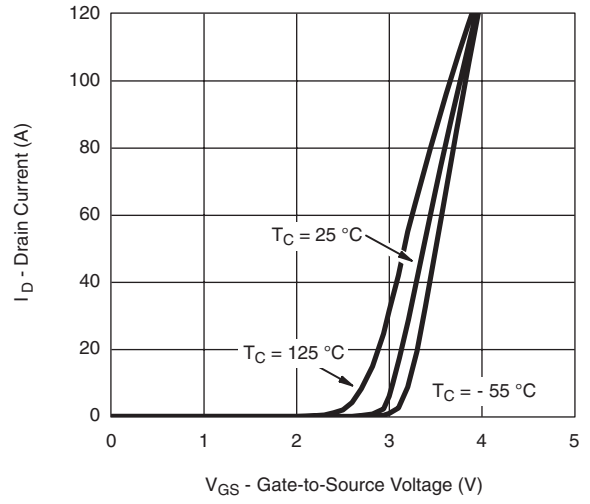
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
- b. Independent of operating temperature.
- c. Guaranteed by design, not subject to production testing.

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.

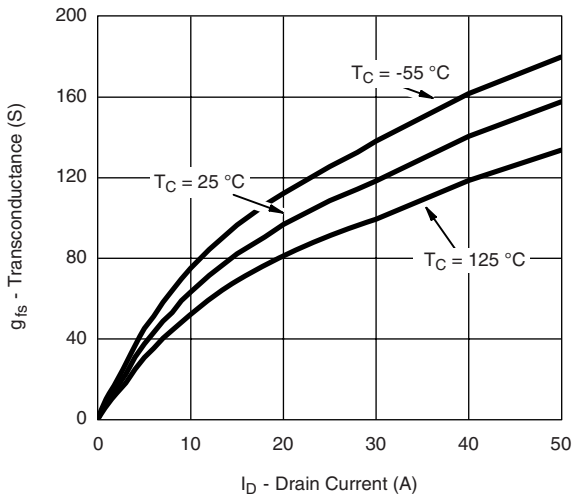
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



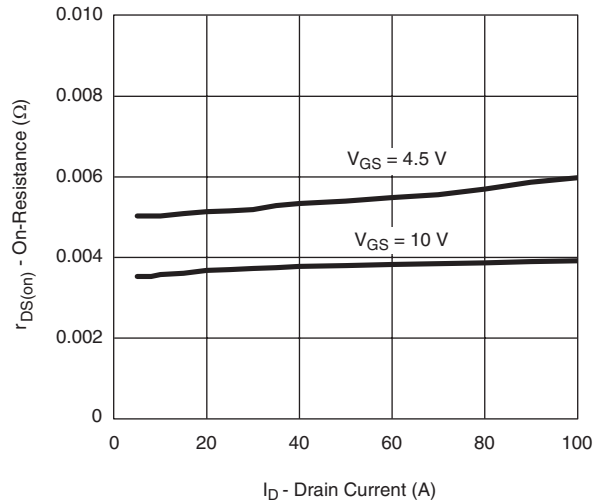
Output Characteristics



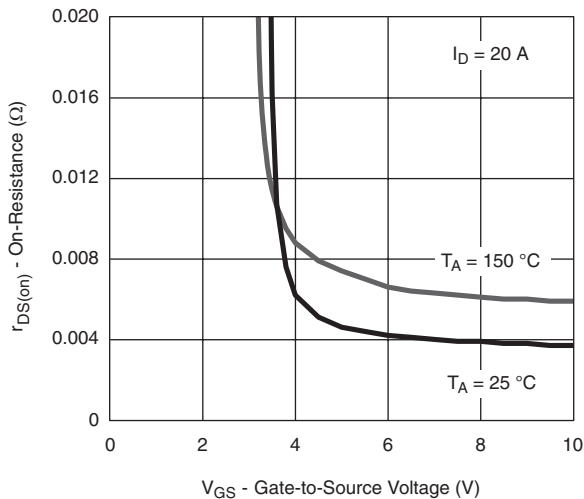
Transfer Characteristics



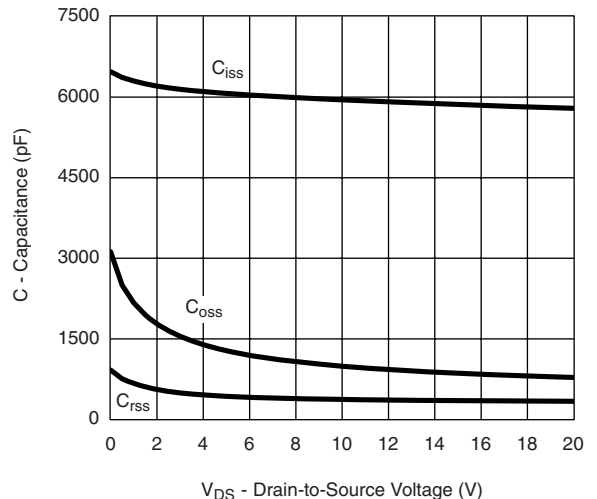
Transconductance



On-Resistance vs. Drain Current

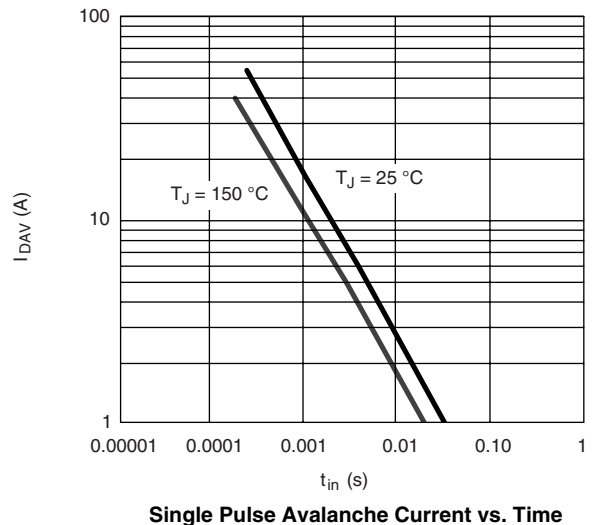
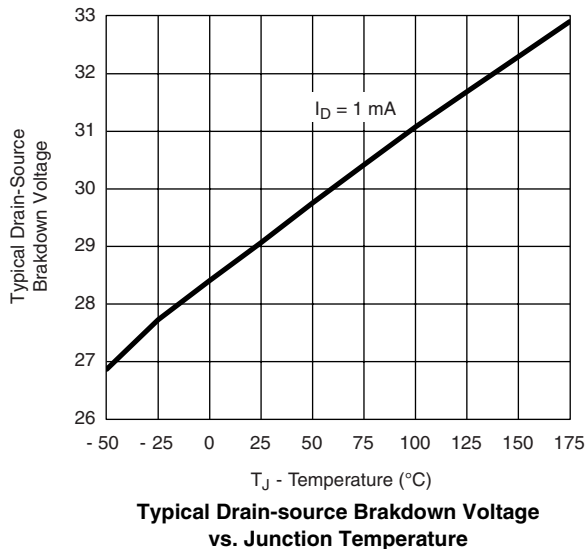
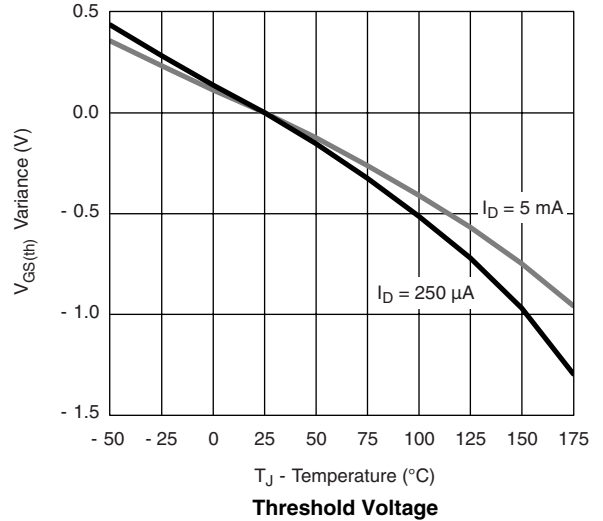
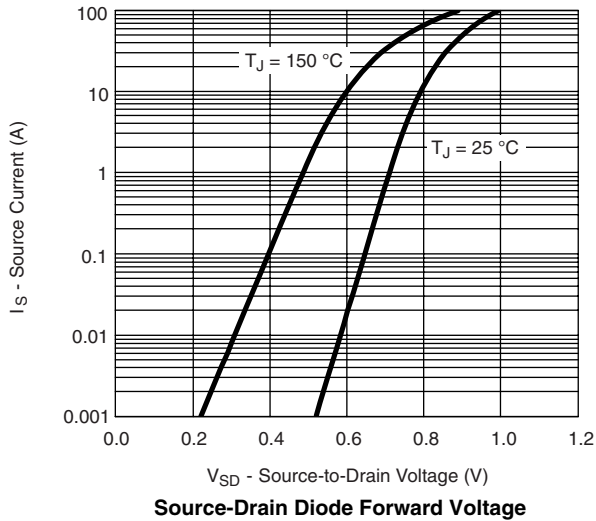
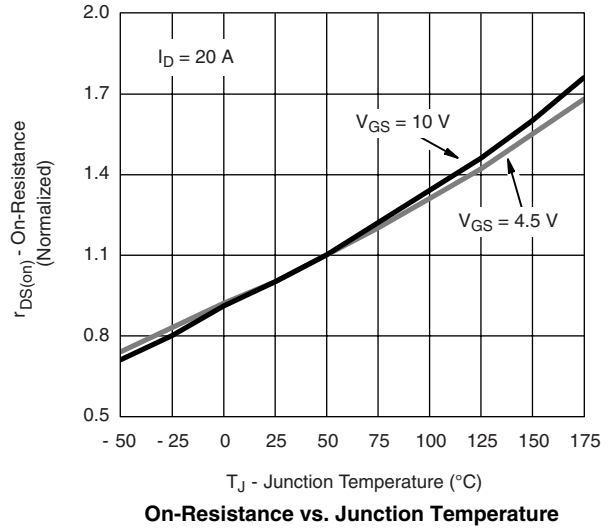
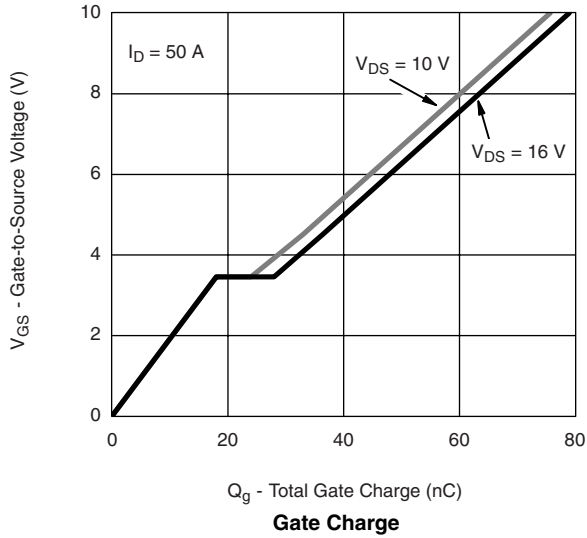


On-Resistance vs. Gate-to-Source Voltage

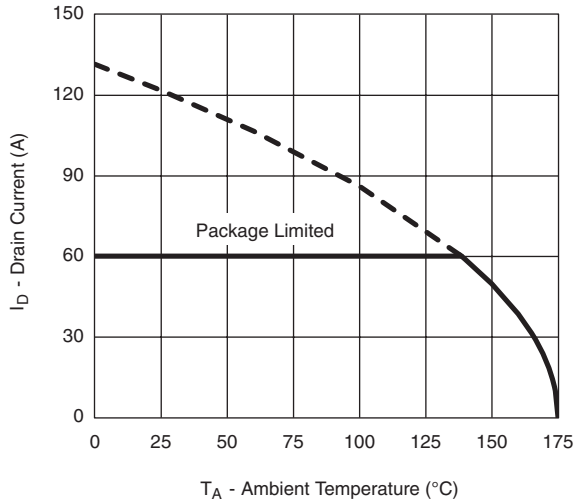


Capacitance

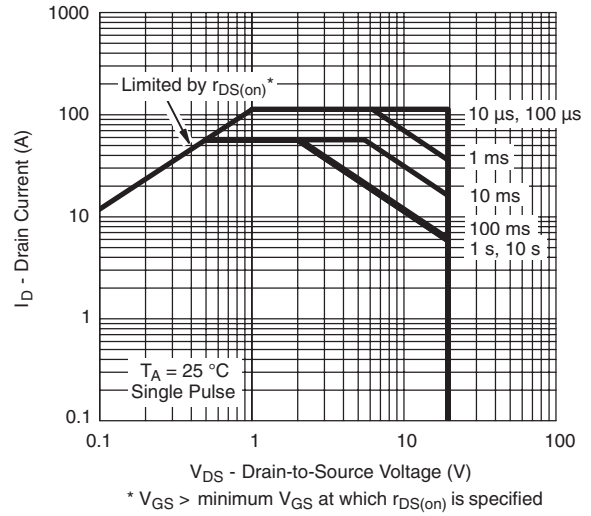
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



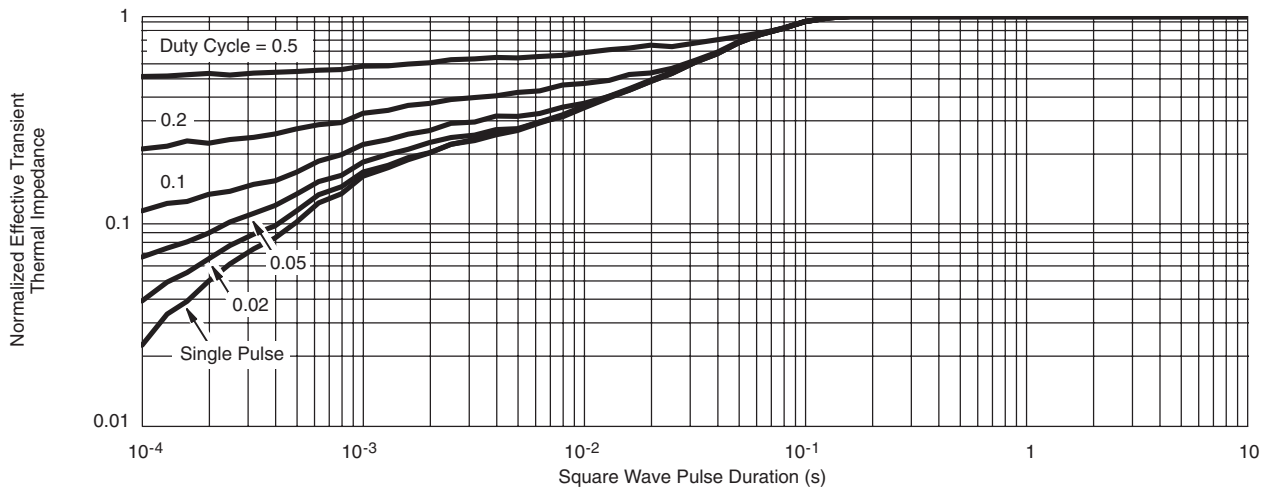
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Drain Current vs. Ambient Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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