N-Channel 60-V (D-S) 175°C MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
60	0.0049 @ V_{GS} = 10 V	90 [a]
	0.0055 @ V_{GS} = 4.5 V	

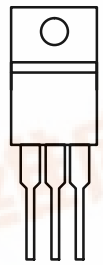
FEATURES

- TrenchFET® Power MOSFET
- 175°C Maximum Junction Temperature

APPLICATIONS

- Automotive Such As
  - High-Side Switch
  - Motor Drives
  - 12-V Battery
- Synchronous Rectification

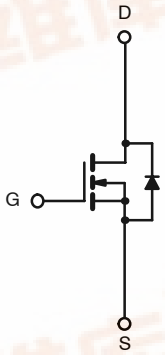
TO-220AB



DRAIN connected to TAB

Top View

Ordering Information: SUP90N06-05L—E3



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current (T_J = 175°C)	T_C = 25°C	I_D	90[a]	A
	T_C = 125°C		90[a]	
Pulsed Drain Current		I_{DM}	240	
Avalanche Current, Single Pulse		I_{AS}	75	
Repetitive Avalanche Energy, Single Pulse	L = 0.1 mH	E_{AS}	280	mJ
Maximum Power Dissipation	T_C = 25°C	P_D	300[b]	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 175	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient (Free Air)	R_{thJA}	62.5	°C/W
Junction-to-Case	R_{thJC}	0.5	

Notes
a. Package limited.
b. See SOA curve for voltage derating.

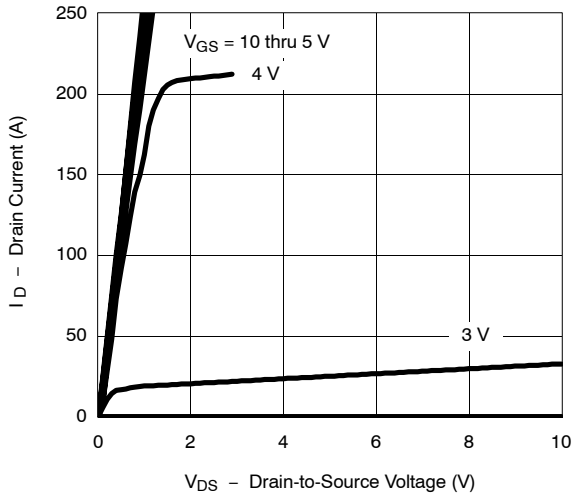
SPECIFICATIONS (T_J =25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{DS} = 0 V, I_D = 250 μA	60			V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1		3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			1	μA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 125°C			50	
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 175°C			250	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 10 V	120			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A		0.0039	0.0049	Ω
		V_{GS} = 4.5 V, I_D = 20 A		0.0044	0.0055	
		V_{GS} = 10 V, I_D = 30 A, T_J = 125°C			0.0083	
		V_{GS} = 10 V, I_D = 30 A, T_J = 175°C			0.0103	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 30 A	30			S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		12900		pF
Output Capacitance	C_{oss}			1060		
Reverse Transfer Capacitance	C_{rss}			700		
Gate Resistance	R_g	f = 1.0 MHz		1.3		Ω
Total Gate Charge[c]	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 90 A		200	300	nC
Gate-Source Charge[c]	Q_{gs}			50		
Gate-Drain Charge[c]	Q_{gd}			33		
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 0.33 Ω I_D ≅ 90 A, V_{GEN} = 10 V, R_g = 2.5 Ω		22	35	ns
Rise Time[c]	t_r			130	200	
Turn-Off Delay Time[c]	$t_{d(off)}$			110	165	
Fall Time[c]	t_f			280	420	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[b]						
Continuous Current	I_S				90	A
Pulsed Current	I_{SM}				240	
Forward Voltage[a]	V_{SD}	I_F = 90 A, V_{GS} = 0 V		1.1	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 90 A, di/dt = 100 A/μs		55	82	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			3.6	5.4	A
Reverse Recovery Charge	Q_{rr}			0.1	0.22	μC

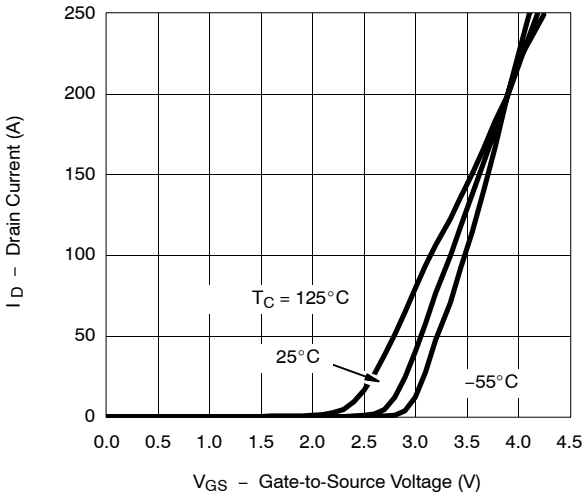
Notes
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

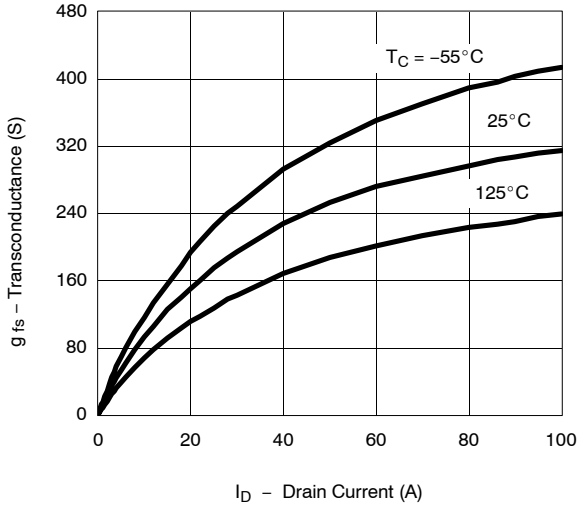
Output Characteristics



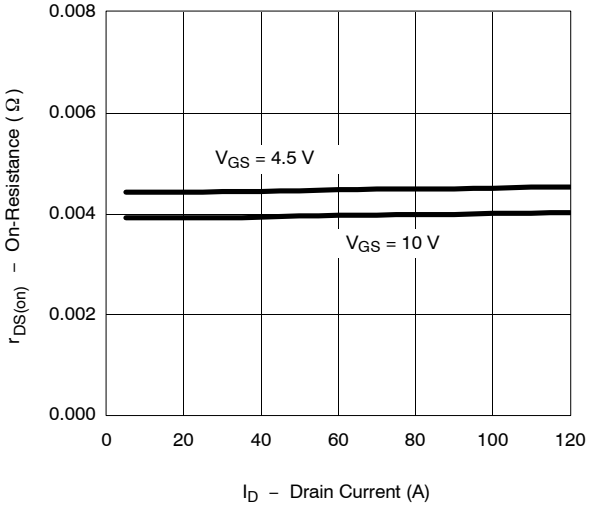
Transfer Characteristics



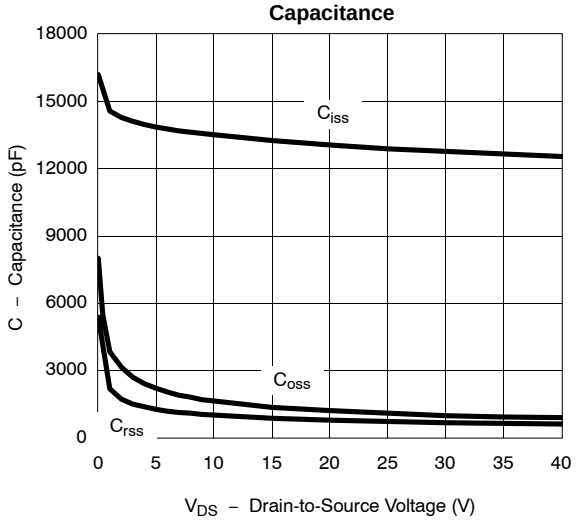
Transconductance



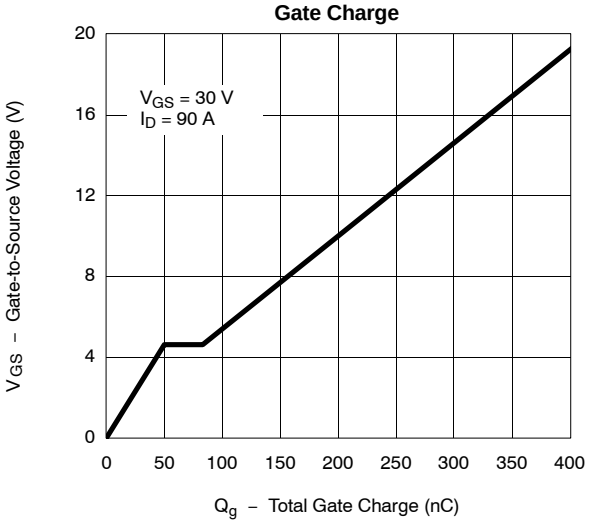
On-Resistance vs. Drain Current



Capacitance

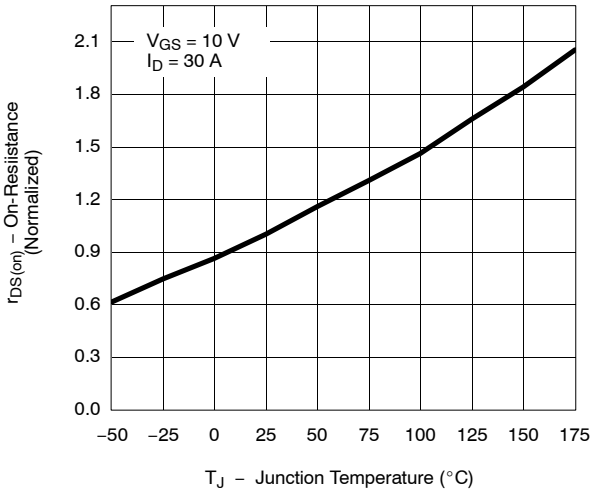


Gate Charge

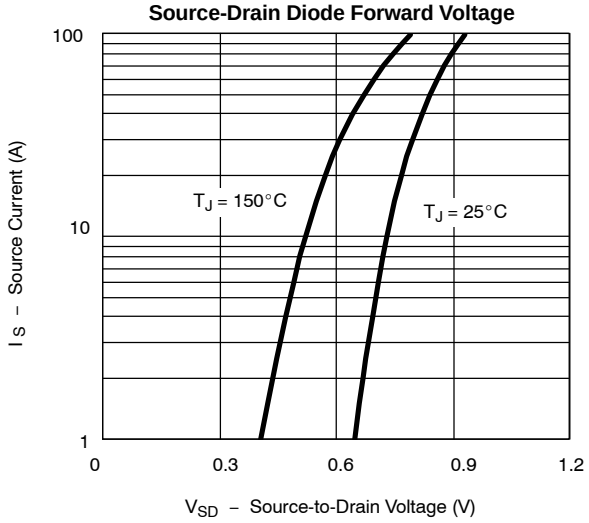


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

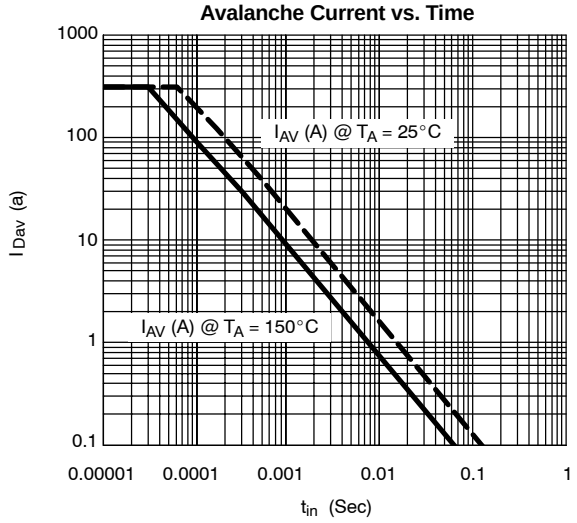
On-Resistance vs. Junction Temperature



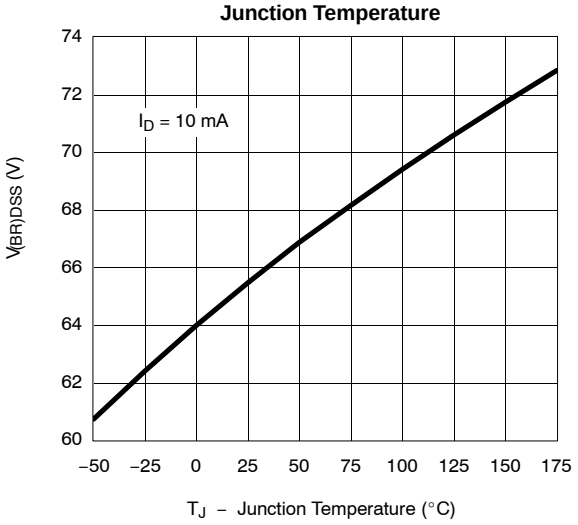
Source-Drain Diode Forward Voltage



Avalanche Current vs. Time

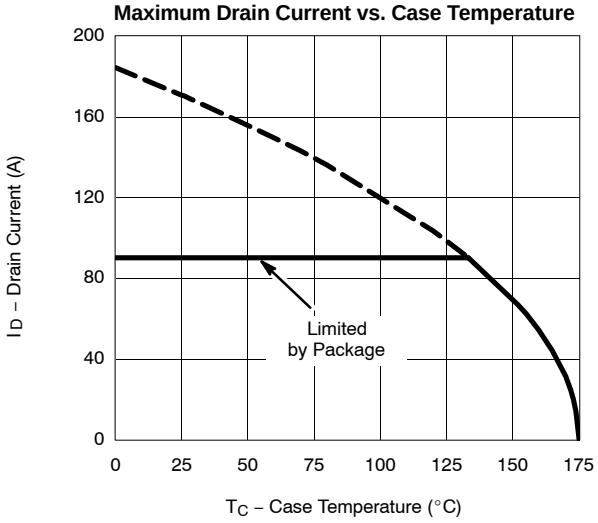


Drain Source Breakdown vs. Junction Temperature

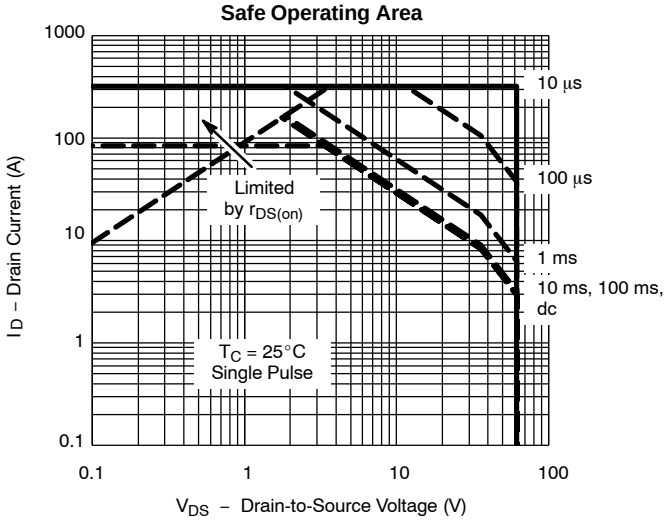


THERMAL RATINGS

Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case