

N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
60	0.006 at $V_{GS} = 10$ V	90 ^d	78.5

FEATURES

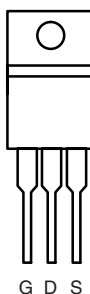
- TrenchFET[®] Power MOSFET
- 175 °C Junction Temperature
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



APPLICATIONS

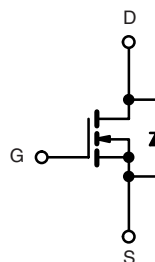
- Power Supply
 - Secondary Synchronous Rectification
- Industrial

TO-220AB



Top View

Ordering Information: SUP90N06-6m0P-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}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175$ °C)	I_D	90 ^d	A
		90 ^d	
Pulsed Drain Current	I_{DM}	240	
Avalanche Current	I_{AS}	50	
Single Avalanche Energy ^a	E_{AS}	125	mJ
Maximum Power Dissipation ^a	P_D	272 ^b	W
		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}	0.55	

Notes:

a. Duty cycle ≤ 1 %.

b. See SOA curve for voltage derating.

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

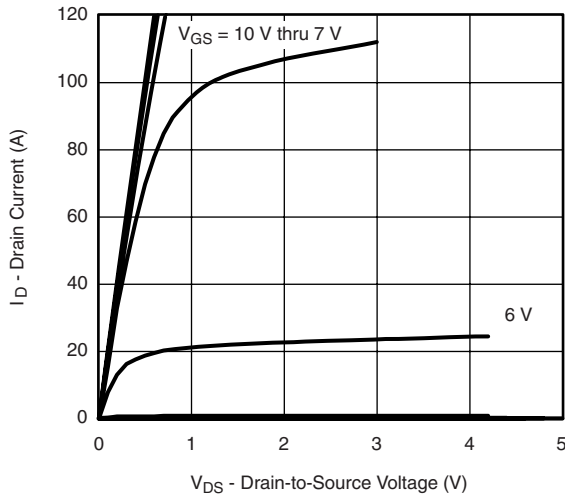
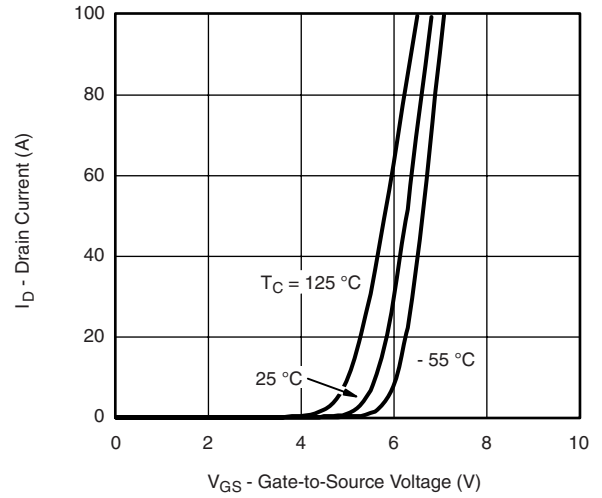
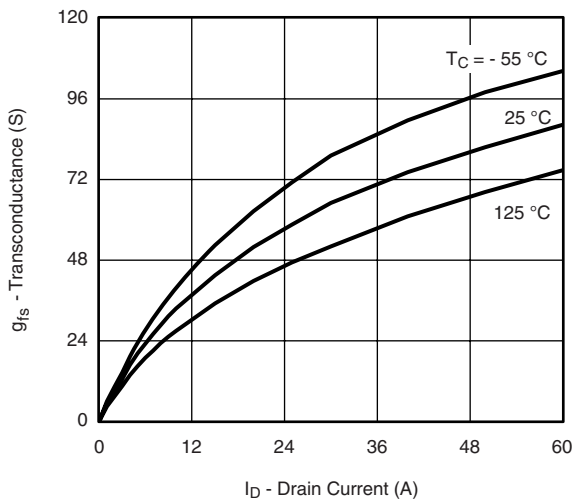
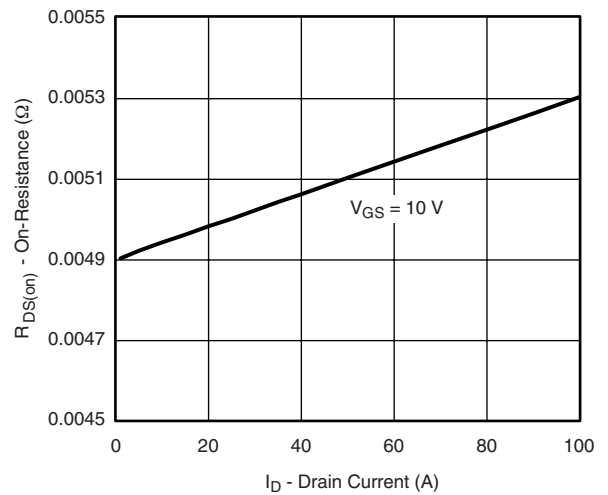
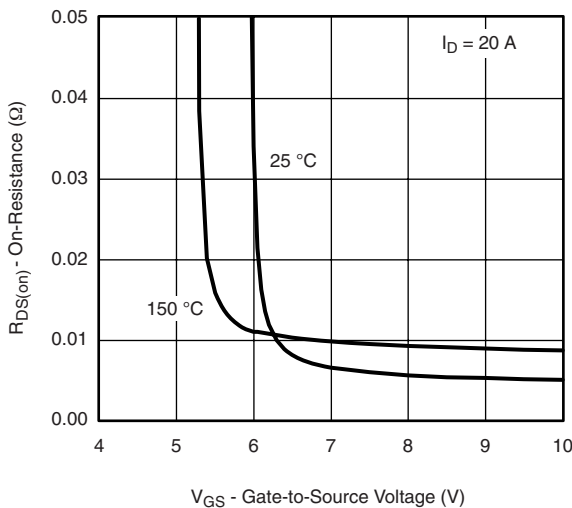
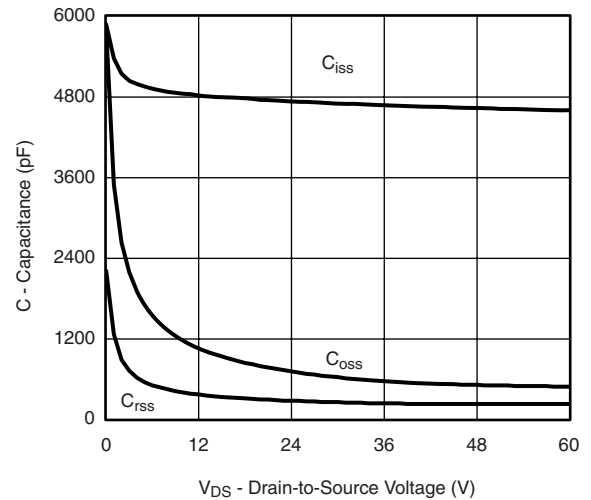
d. Package limited.

SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{DS} = 0 V, I _D = 250 μA	60			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			± 250	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 = 150 °C			250	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	70			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		0.005	0.006	Ω
		V _{GS} = 10 V, I _D = 20 A, T _J = 125 °C		0.008	0.010	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 20 A		58		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 30 V, f = 1 MHz		4700		pF
Output Capacitance	C _{oss}			620		
Reverse Transfer Capacitance	C _{rss}			250		
Total Gate Charge ^c	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 50 A		78.5	120	nC
Gate-Source Charge ^c	Q _{gs}			28		
Gate-Drain Charge ^c	Q _{gd}			20.6		
Gate Resistance	R _g	f = 1 MHz		1.2	2.4	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 0.6 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 1 Ω		16	30	ns
Rise Time ^c	t _r			10	20	
Turn-Off Delay Time ^c	t _{d(off)}			25	40	
Fall Time ^c	t _f			8	15	
Source-Drain Diode Ratings and Characteristics T _C = 25 °C ^b						
Continuous Current	I _S				85	A
Pulsed Current	I _{SM}				240	
Forward Voltage ^a	V _{SD}	I _F = 20 A, V _{GS} = 0 V		0.83	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 75 A, dI/dt = 100 A/μs		62	100	ns
Peak Reverse Recovery Current	I _{RM(REC)}			3.8	5.7	A
Reverse Recovery Charge	Q _{rr}				118	180

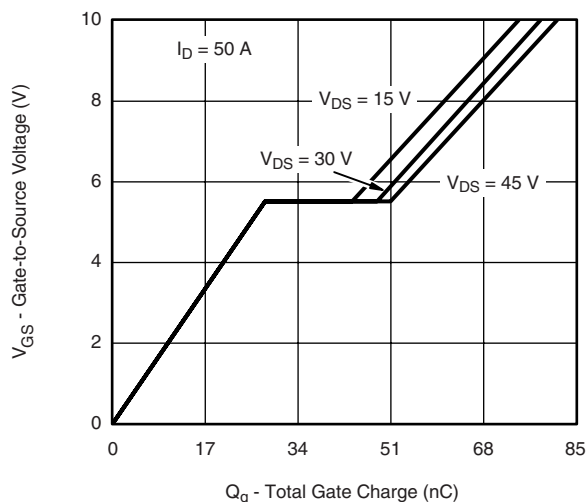
Notes:

- 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.

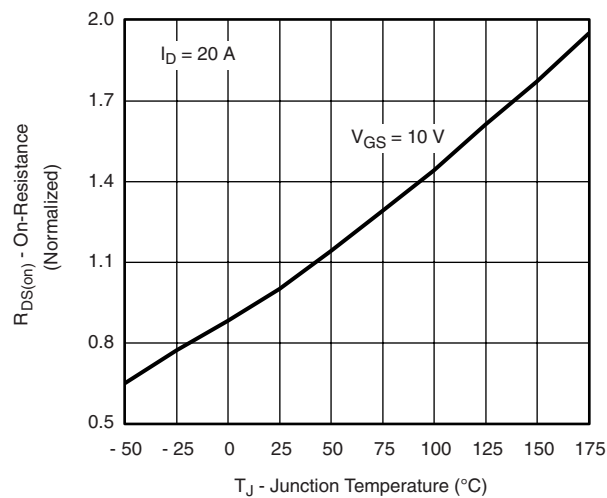
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

On-Resistance vs. Gate-to-Source Voltage

Capacitance

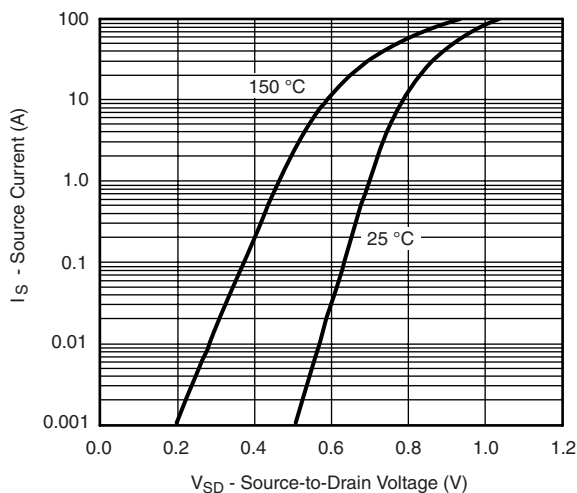
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



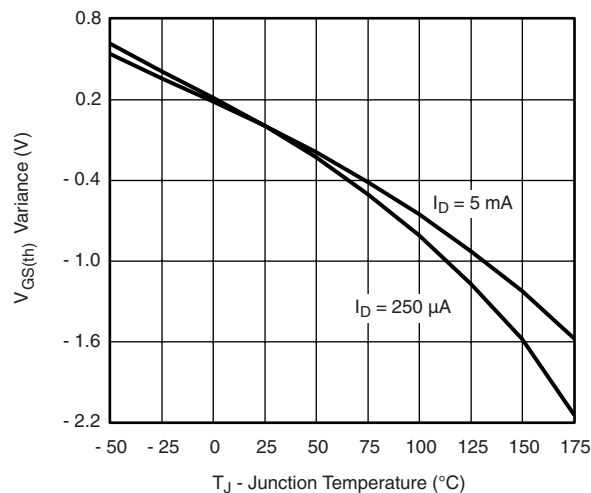
On-Resistance vs. Junction Temperature



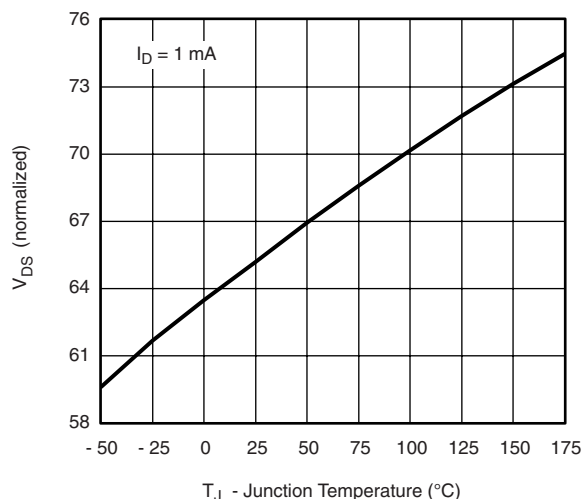
Threshold Voltage



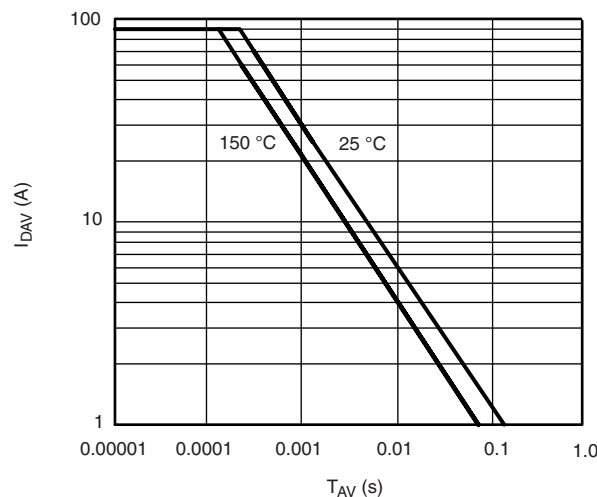
Gate Charge



On-Resistance vs. Junction Temperature

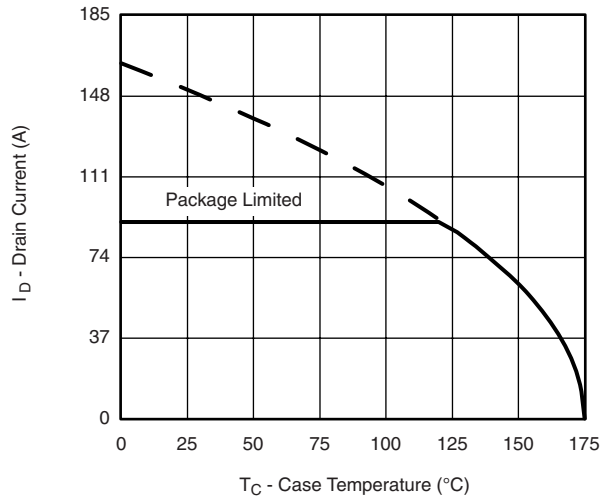


Source-Drain Diode Forward Voltage

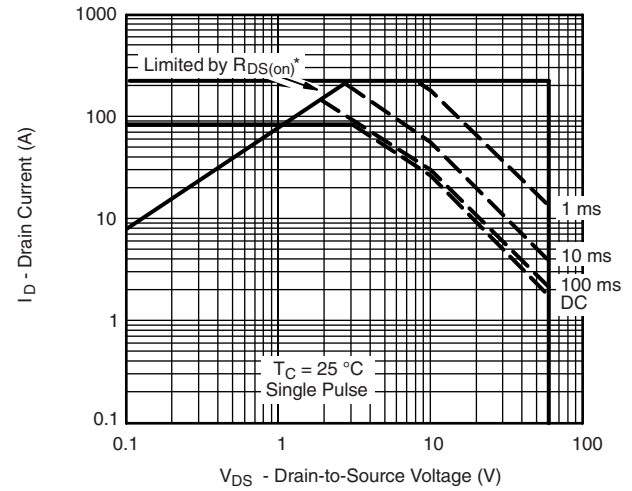


Maximum Drain Current vs. Case Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

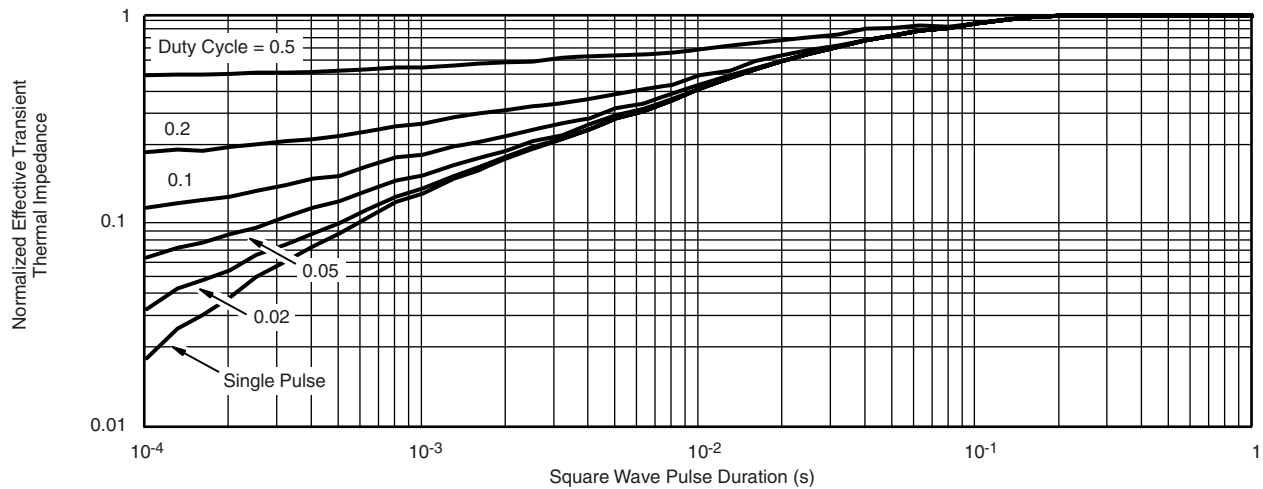


Single Pulse Avalanche Current Capability vs. Time



* $V_{GS} > \text{minimum } V_{GS} \text{ at which } R_{DS(on)} \text{ is specified}$

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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TO-220AB



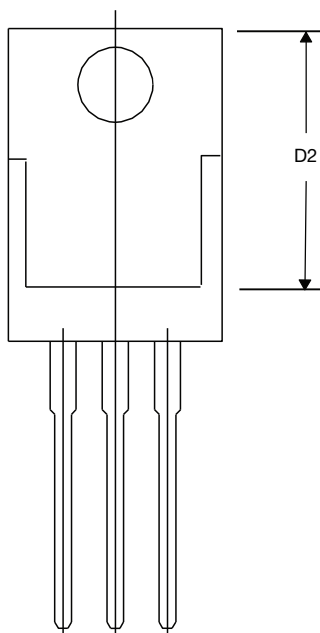
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

ECN: T14-0413-Rev. P, 16-Jun-14

DWG: 5471

Note

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM





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