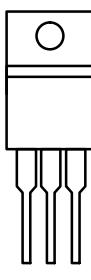


N-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^d	Q_g (Typ.)
40	0.0033 at $V_{GS} = 10$ V	90	87
	0.0041 at $V_{GS} = 4.5$ V	90	

TO-220AB



Top View

Ordering Information:

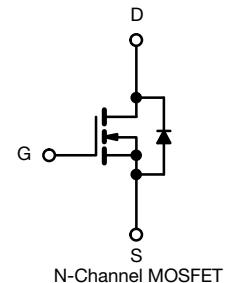
SUP90N04-3m3P-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC


APPLICATIONS

- Power Supply
 - Secondary Synchronous Rectification
- DC/DC Converter



ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	90 ^d	A
$T_C = 70$ °C		90 ^d	
Pulsed Drain Current	I_{DM}	160	
Avalanche Current	I_{AS}	60	
Single Avalanche Energy ^a	E_{AS}	180	mJ
Maximum Power Dissipation ^a	P_D	125 ^b	W
$T_A = 25$ °C ^c		3.1	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°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}	1	

Notes:

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

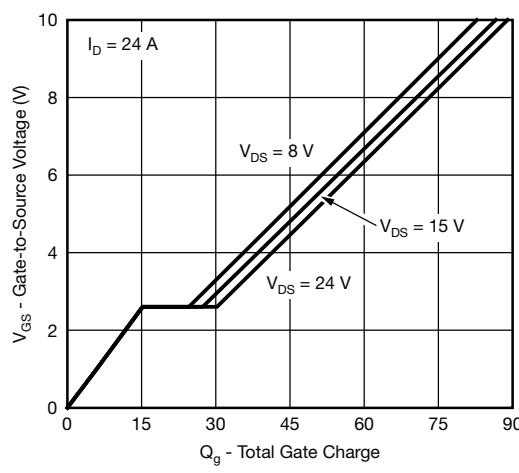
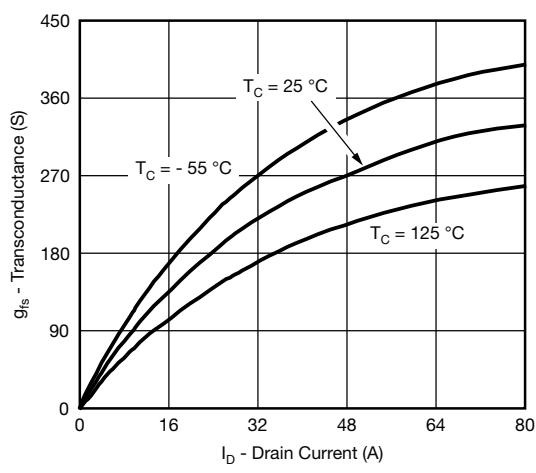
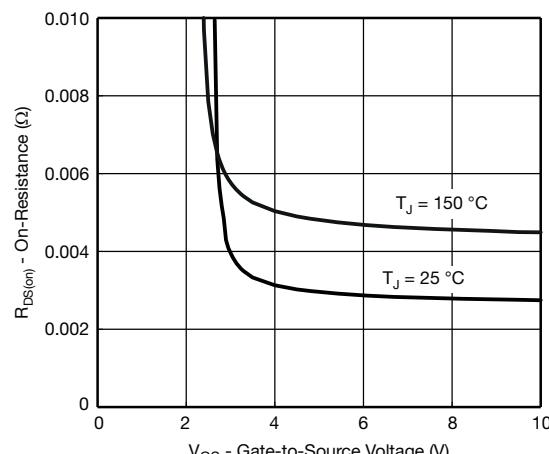
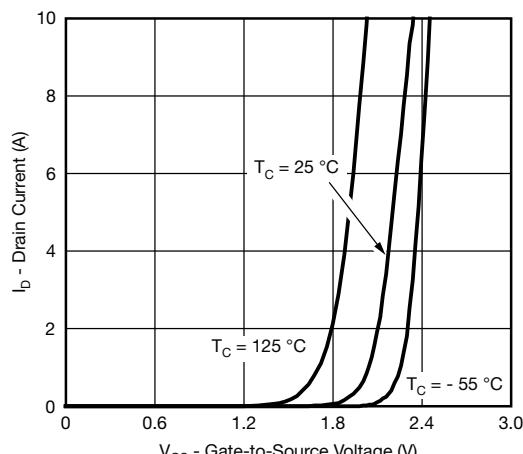
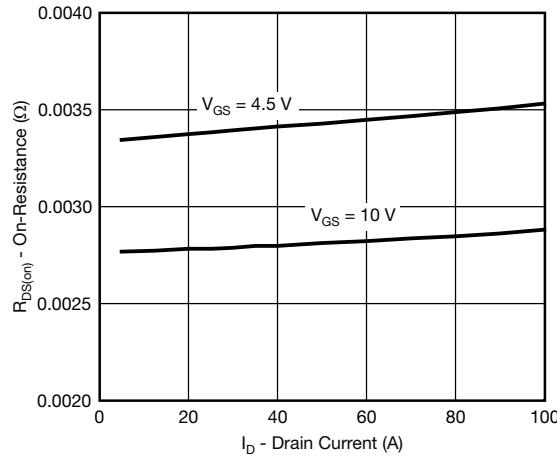
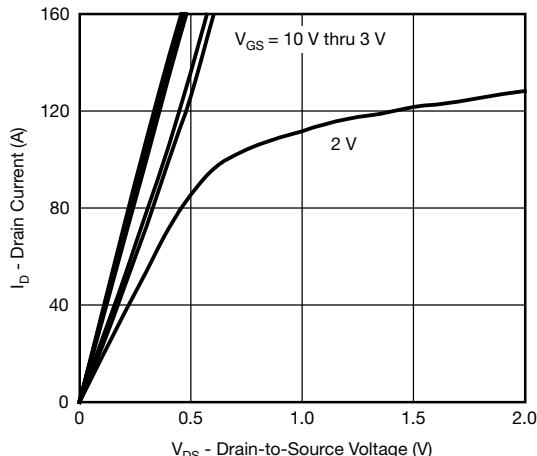
SPECIFICATIONS ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{DS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	40			V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	1		2.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = \pm 20 \text{ V}$			± 250	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40 \text{ V}$, $V_{GS} = 0 \text{ V}$			1	μA
		$V_{DS} = 40 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125^\circ\text{C}$			50	
		$V_{DS} = 40 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 150^\circ\text{C}$			250	
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \geq 10 \text{ V}$, $V_{GS} = 10 \text{ V}$	50			A
Drain-Source On-State Resistance ^a	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$, $I_D = 22 \text{ A}$		0.0027	0.0033	Ω
		$V_{GS} = 4.5 \text{ V}$, $I_D = 20 \text{ A}$		0.0034	0.0041	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15 \text{ V}$, $I_D = 20 \text{ A}$		169		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 20 \text{ V}$, $f = 1 \text{ MHz}$		5286		pF
Output Capacitance	C_{oss}			705		
Reverse Transfer Capacitance	C_{rss}			283		
Total Gate Charge ^c	Q_g	$V_{DS} = 20 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 20 \text{ A}$		87	131	nC
Gate-Source Charge ^c	Q_{gs}			15.3		
Gate-Drain Charge ^c	Q_{gd}			12.2		
Gate Resistance	R_g	$f = 1 \text{ MHz}$	0.5	2.7	5.4	Ω
Turn-On Delay Time ^c	$t_{d(\text{on})}$	$V_{DD} = 20 \text{ V}$, $R_L = 2 \Omega$ $I_D \geq 10 \text{ A}$, $V_{GEN} = 10 \text{ V}$, $R_g = 1 \Omega$		11	20	ns
Rise Time ^c	t_r			7	14	
Turn-Off Delay Time ^c	$t_{d(\text{off})}$			45	68	
Fall Time ^c	t_f			7	14	
Drain-Source Body Diode Ratings and Characteristics $T_C = 25^\circ\text{C}^b$						
Continuous Current	I_S				90	A
Pulsed Current	I_{SM}				160	
Forward Voltage ^a	V_{SD}	$I_F = 10 \text{ A}$, $V_{GS} = 0 \text{ V}$		0.72	1.2	V
Reverse Recovery Time	t_{rr}	$I_F = 10 \text{ A}$, $dl/dt = 100 \text{ A}/\mu\text{s}$		42	63	ns
Peak Reverse Recovery Current	$I_{RM(\text{REC})}$			2.5	3.8	A
Reverse Recovery Charge	Q_{rr}			52	78	nC

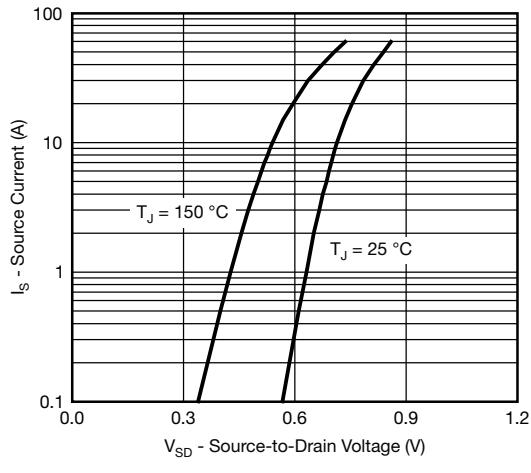
Notes:

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

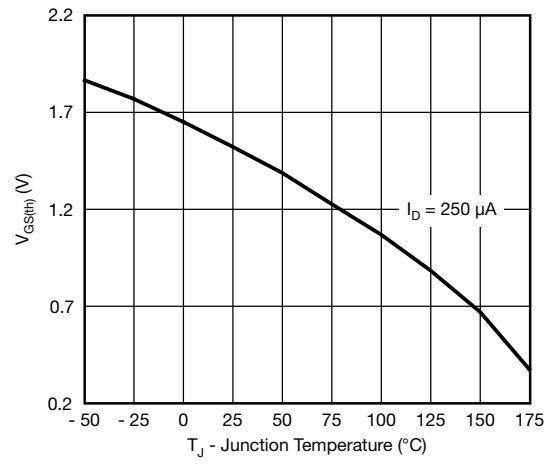
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


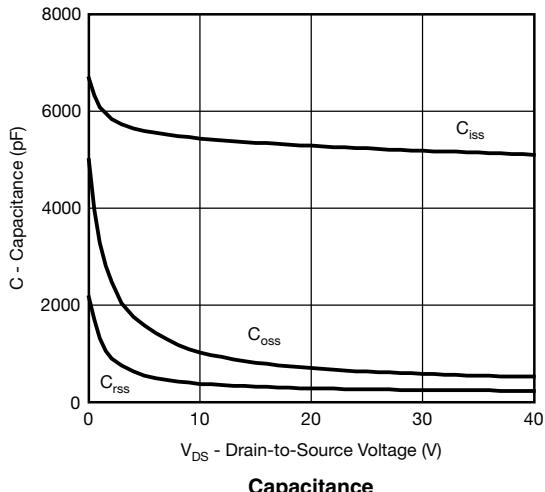
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



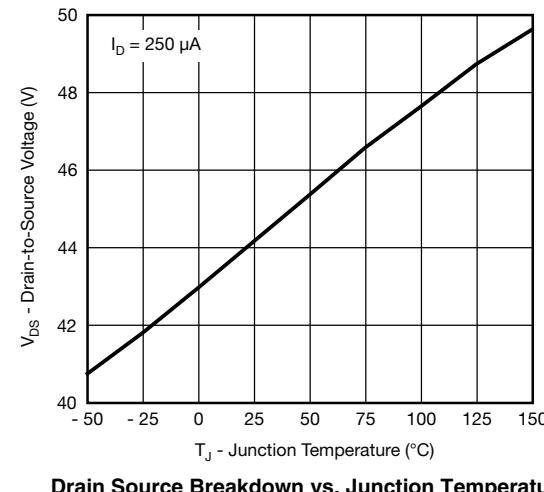
Source-Drain Diode Forward Voltage



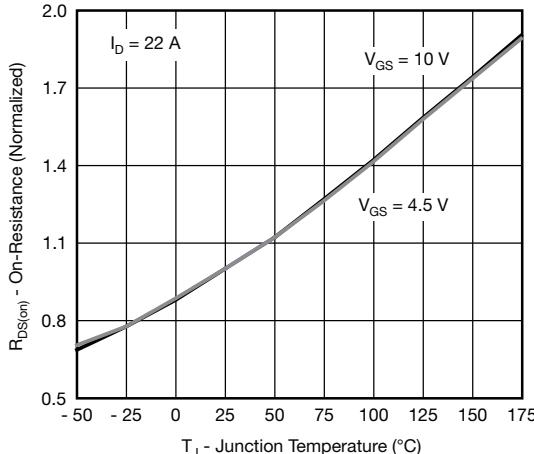
Threshold Voltage



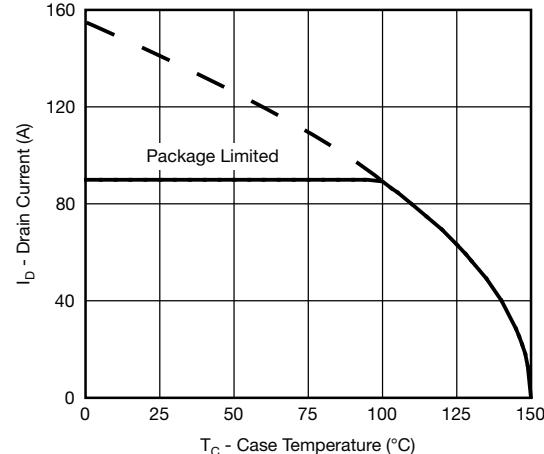
Capacitance



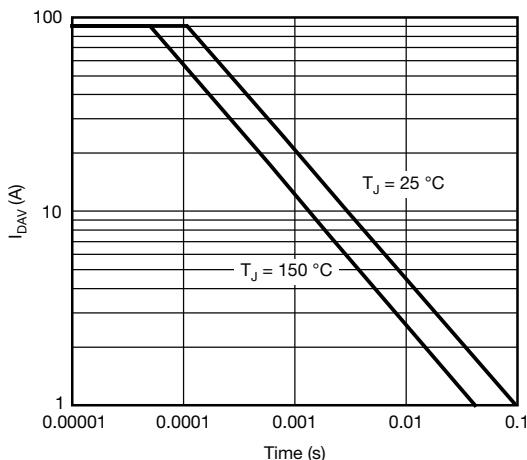
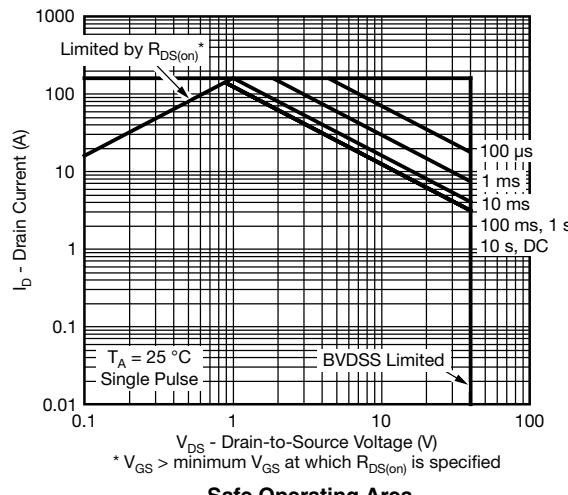
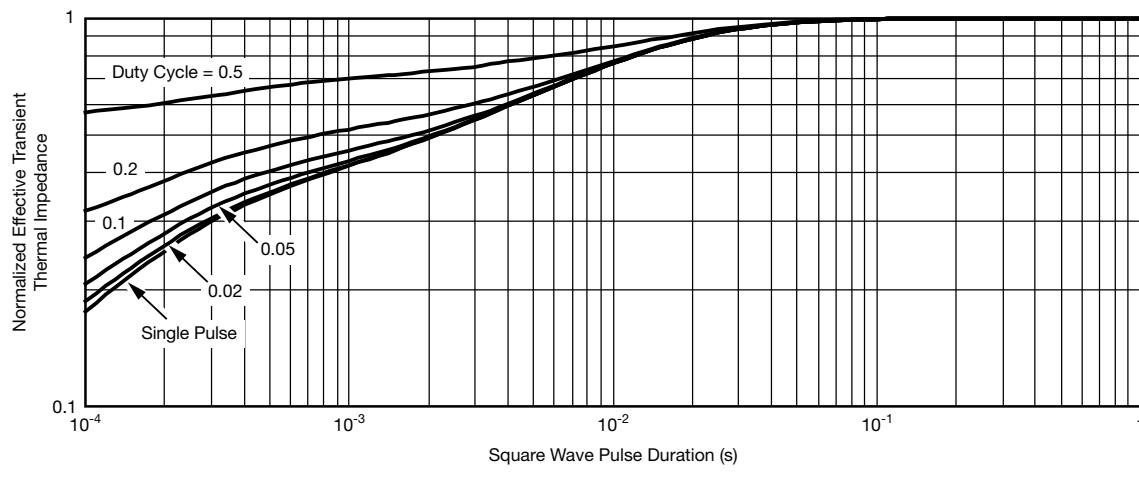
Drain Source Breakdown vs. Junction Temperature



On-Resistance vs. Junction Temperature

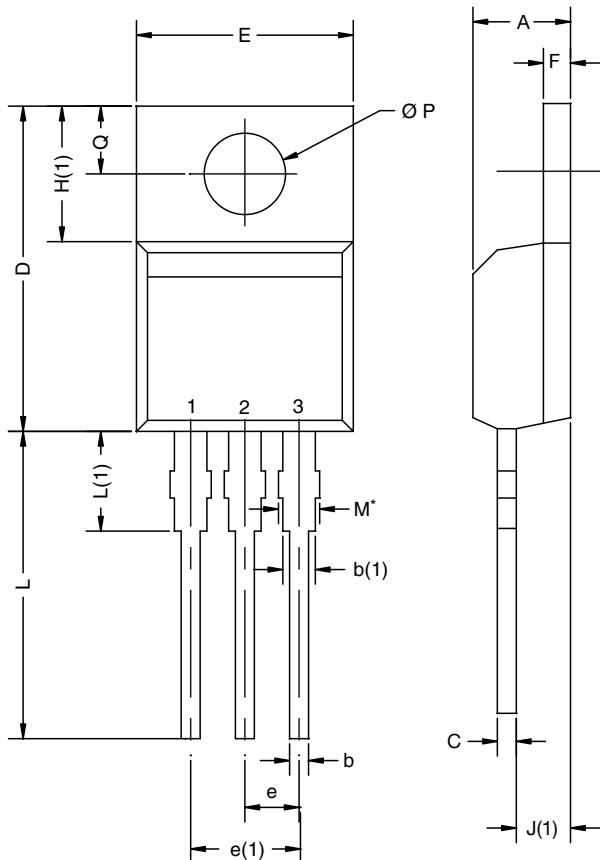


Current Derating

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Single Pulse Avalanche Current Capability vs. Time

Safe Operating Area

Normalized Thermal Transient Impedance, Junction-to-Case

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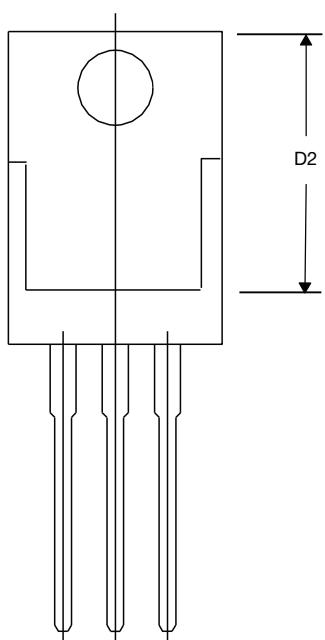


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	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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