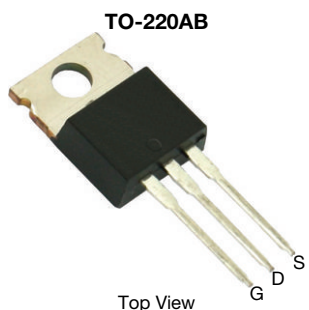


N-Channel 200 V (D-S) 175 °C MOSFET



Top View

FEATURES

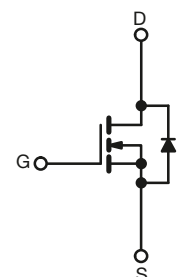
- ThunderFET® power MOSFET
- Low $R_{DS(on)}$ - Q_g figure-of-merit (FOM)
- Maximum 175 °C junction temperature
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- Power supplies
- DC/AC inverter
- DC/DC converter
- Solar micro inverter
- Motor drive switch



N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	200
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0216
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 7.5$ V	0.0235
Q_g typ. (nC)	31.6
I_D (A)	64
Configuration	Single

ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free and halogen-free	SUP90220E-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	200	V
Gate-source voltage	V_{GS}	± 20	
Continuous drain current	I_D	64	A
		37	
Pulsed drain current ($t = 100$ μ s)	I_{DM}	100	
Continuous source-drain diode current	I_S	64.7	
Single pulse avalanche current ^a	I_{AS}	45	mJ
Single pulse avalanche energy ^a	E_{AS}	101	
Maximum power dissipation	P_D	230 ^b	W
		77 ^b	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) ^c		260	

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	MAXIMUM	UNIT
Maximum junction-to-ambient (PCB mount) ^c	R_{thJA}	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	0.65	

Notes

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).



SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	200	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2	-	4	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	250	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 200 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 200 V, V _{GS} = 0 V, T _J = 125 °C	-	-	150	
		V _{DS} = 200 V, V _{GS} = 0 V, T _J = 175 °C	-	-	5	mA
On-state drain current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 10 V	30	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A	-	0.0180	0.0216	Ω
		V _{GS} = 7.5 V, I _D = 10 A	-	0.0188	0.0235	
Forward transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A	-	37	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = 100 V, V _{GS} = 0 V, f = 1 MHz	-	1950	-	pF
Output capacitance	C _{oss}		-	170	-	
Reverse transfer capacitance	C _{rss}		-	15	-	
Total gate charge	Q _g	V _{DS} = 100 V, V _{GS} = 10 V, I _D = 15 A	-	31.6	48	nC
Gate-source charge	Q _{gs}		-	8.6	-	
Gate-drain charge	Q _{gd}		-	7.6	-	
Gate resistance	R _g	f = 1 MHz	0.6	3	6	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = 100 V, R _L = 8.3 Ω, I _D ≅ 12 A, V _{GEN} = 10 V, R _g = 1 Ω	-	15	30	ns
Rise time	t _r		-	35	53	
Turn-off delay time	t _{d(off)}		-	28	42	
Fall time	t _f		-	38	57	
Drain-Source Body Diode Characteristics						
Pulse diode forward current (t = 100 μs)	I _{SM}		-	-	100	A
Body diode voltage	V _{SD}	I _F = 12 A, V _{GS} = 0 V	-	0.85	1.5	V
Body diode reverse recovery time	t _{rr}	I _F = 12 A, di/dt = 100 A/μs	-	120	180	ns
Body diode reverse recovery charge	Q _{rr}		-	0.91	1.37	μC
Reverse recovery fall time	t _a		-	95	-	ns
Reverse recovery rise time	t _b		-	25	-	
Body diode peak reverse recovery charge	I _{RM(REC)}		-	12	18	A

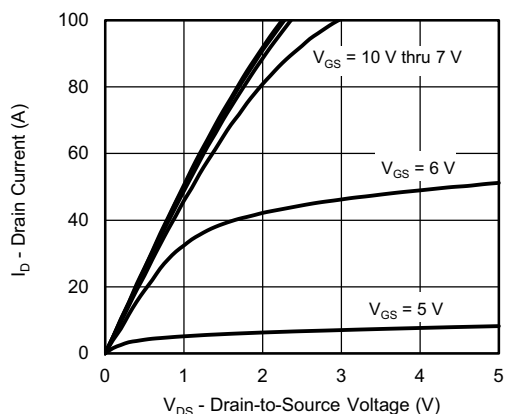
Notes

- 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.

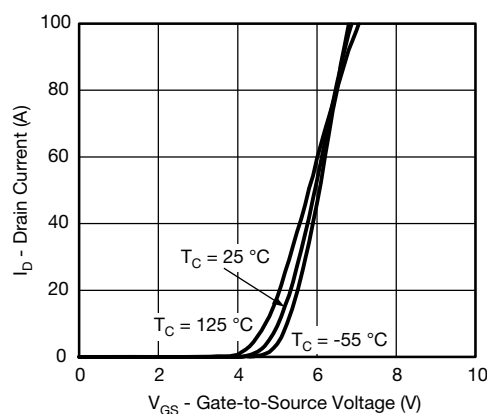
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



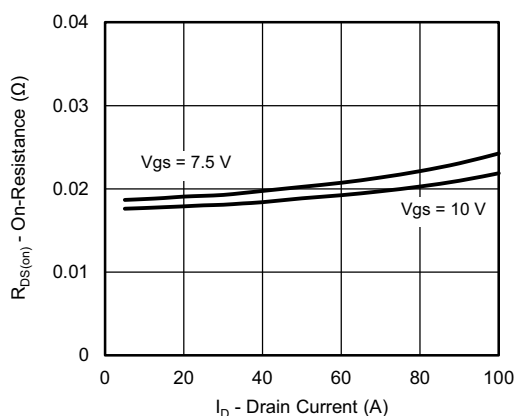
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



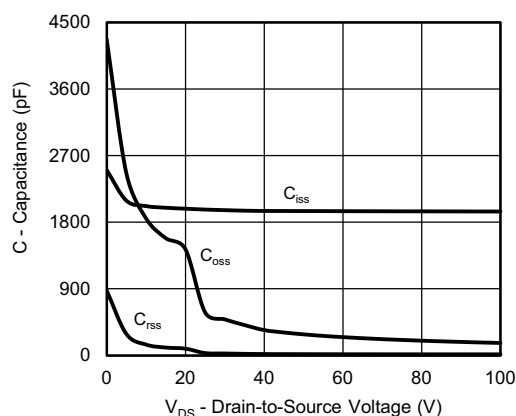
Output Characteristics



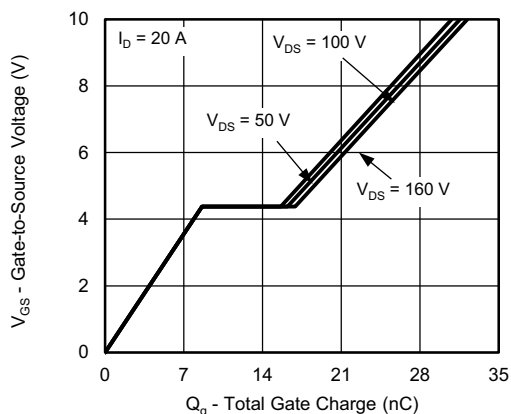
Transfer Characteristics



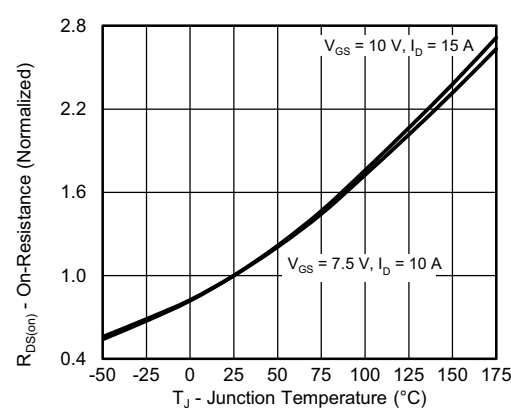
On-Resistance vs. Drain Current and Gate Voltage



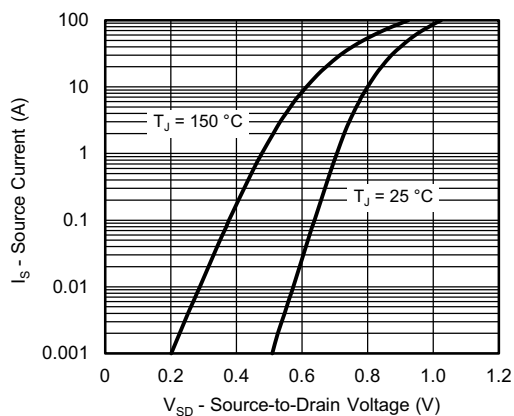
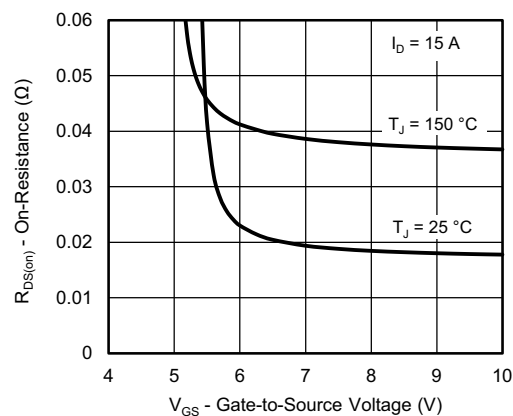
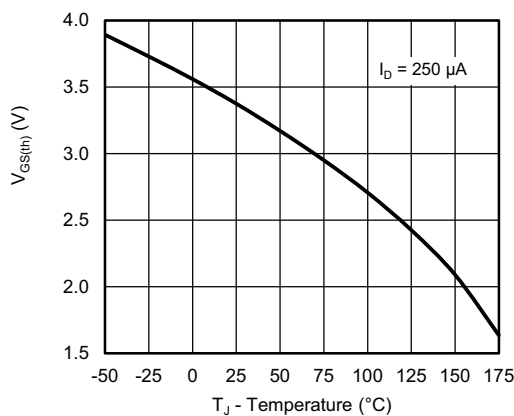
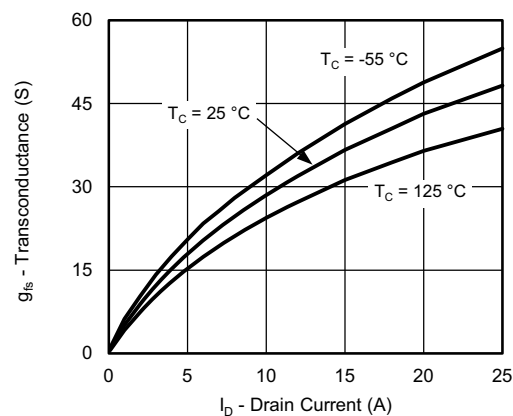
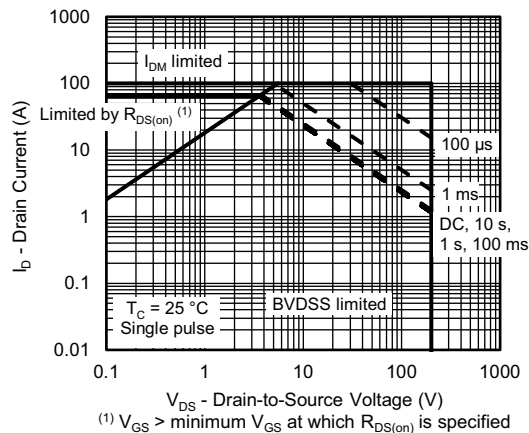
Capacitance



Gate Charge

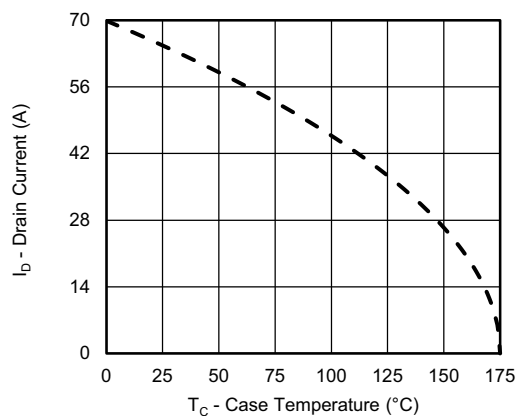


On-Resistance vs. Junction Temperature

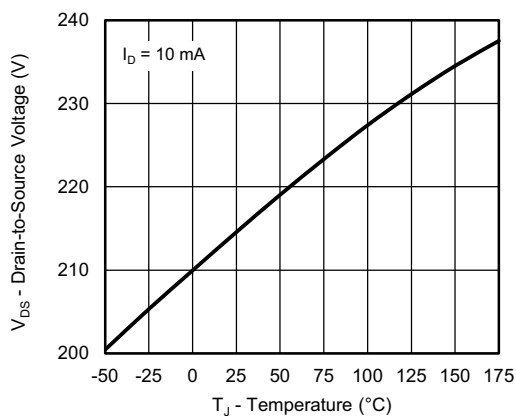
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Transconductance

Safe Operating Area, Junction-to-Ambient



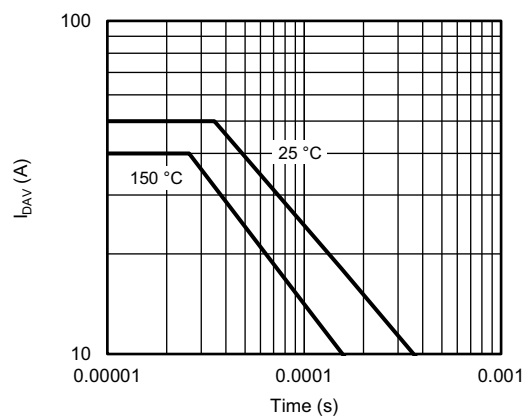
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Drain Source Breakdown vs. Junction Temperature



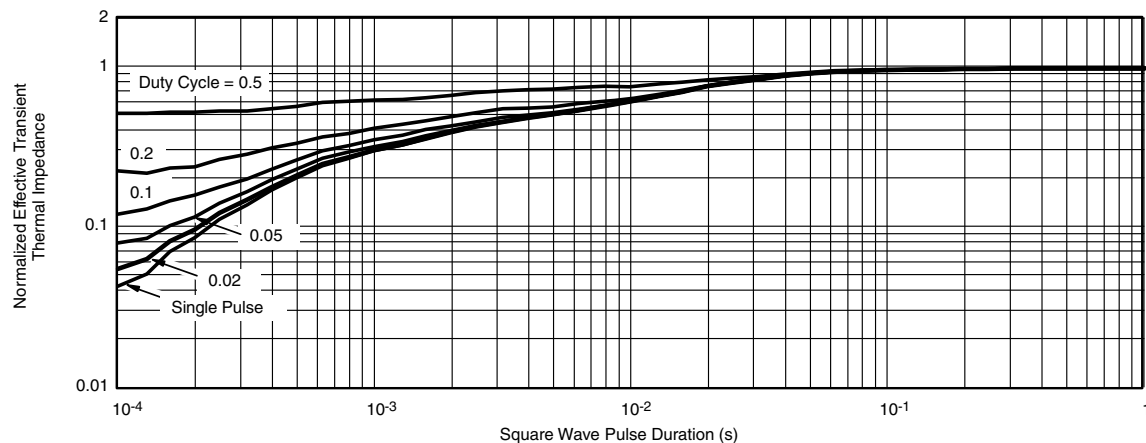
I_{DAV} vs. Time

Note

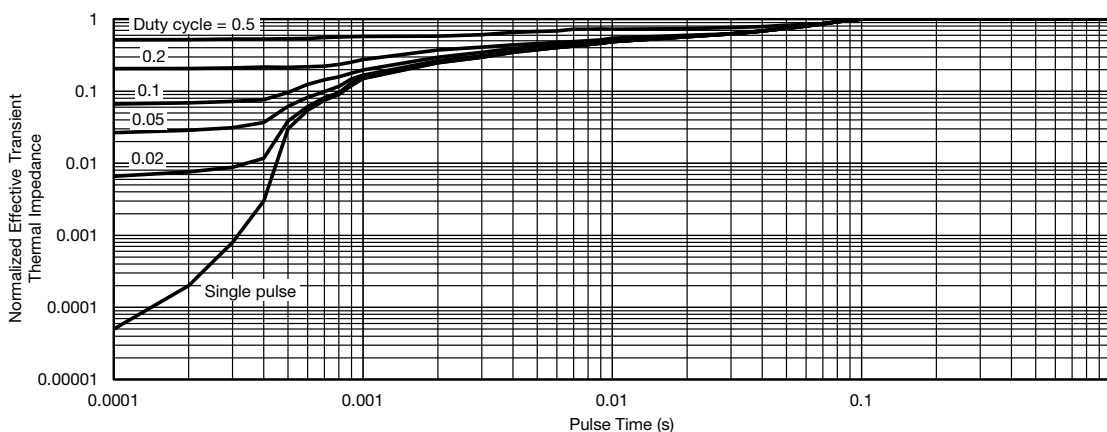
- a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



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
$\varnothing P$	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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