N-Channel 200 V (D-S) MOSFET

TO-220AB

Top View

FEATURES

- TrenchFET® power MOSFET
- Maximum 175 °C junction temperature
- Very low Q_{gd} reduces power loss from passing through $V_{plateau}$
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

- Switching power supply
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter
- Battery management
- OR-ing / e-fuse

N-Channel MOSFET

PRODUCT SUMMARY

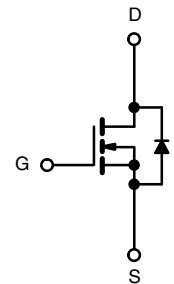|	
V_{DS} (V)	200
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.0109
$R_{DS(on)}$ max. (Ω) at V_{GS} = 7.5 V	0.0124
Q_g typ. (nC)	56.7
I_D (A)	150 [d]
Configuration	Single

ORDERING INFORMATION

Package	TO-220
Lead (Pb)-free and halogen-free	SUP90100E-GE3

ABSOLUTE MAXIMUM RATINGS (T_C = 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 (T_J = 150 °C)	T_C = 25 °C	I_D	150 [d]	A
	T_C = 70 °C		150 [d]	
Pulsed drain current (t = 100 µs)		I_{DM}	250	
Avalanche current		I_{AS}	70	
Single avalanche energy [a]	L = 0.1 mH	E_{AS}	245	mJ
Maximum power dissipation [a]	T_C = 25 °C	P_D	375 [b]	W
	T_C = 125 °C		125 [b]	
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}	0.4	

Notes

a. Duty cycle ≤ 1 %

b. See SOA curve for voltage derating

c. When mounted on 1" square PCB (FR4 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_{GS} = 0 V, I_D = 250 μA	200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 μA	2	-	4	
Gate-body 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]	$I_{D(on)}$	$V_{DS} \geq$ 10 V, V_{GS} = 10 V	120	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 16 A	-	0.0091	0.0109	Ω
		V_{GS} = 7.5 V, I_D = 13 A	-	0.0095	0.0124	
Forward transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 13 A	-	85	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 100 V, f = 1 MHz	-	3930	-	pF
Output capacitance	C_{oss}		-	450	-	
Reverse transfer capacitance	C_{rss}		-	12	-	
Total gate charge [c]	Q_g	V_{DS} = 100 V, V_{GS} = 10 V, I_D = 16 A	-	72.8	110	nC
Gate-source charge [c]	Q_{gs}		-	19.4	-	
Gate-drain charge [c]	Q_{gd}		-	19.0	-	
Gate resistance	R_g	f = 1 MHz	0.7	3.5	7.0	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = 80 V, R_L = 6.2 Ω $I_D \cong$ 13 A, V_{GEN} = 10 V, R_g = 1 Ω	-	20	40	ns
Rise time [c]	t_r		-	50	100	
Turn-off delay time [c]	$t_{d(off)}$		-	60	120	
Fall time [c]	t_f		-	18	36	
Drain-Source Body Diode Ratings and Characteristics [b] (T_C = 25 °C)						
Pulsed current (t = 100 μs)	I_{SM}		-	-	250	A
Forward voltage [a]	V_{SD}	I_F = 10 A, V_{GS} = 0 V	-	0.8	1.5	V
Reverse recovery time	t_{rr}	I_F = 13 A, di/dt = 100 A/μs	-	118	177	ns
Peak reverse recovery charge	$I_{RM(REC)}$		-	9.4	14.1	A
Reverse recovery charge	Q_{rr}		-	0.632	0.948	μC
Reverse recovery fall time	t_a		-	94	-	ns
Reverse recovery rise time	t_b		-	24	-	

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

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.
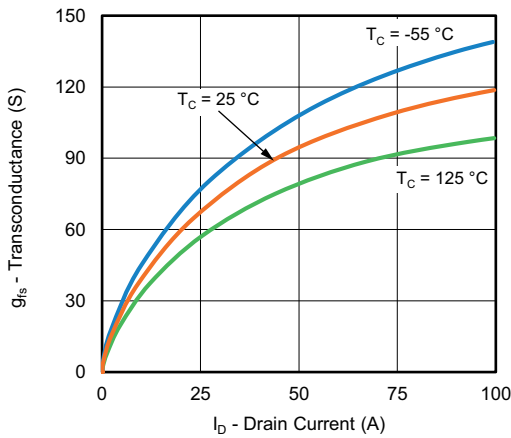
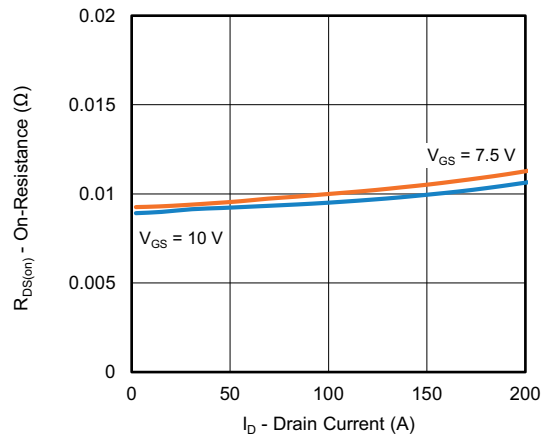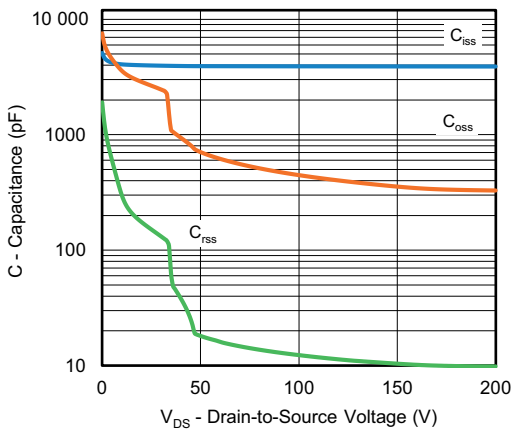## TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)
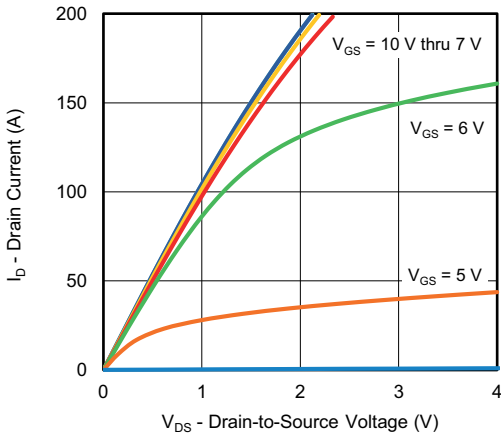
Output Characteristics
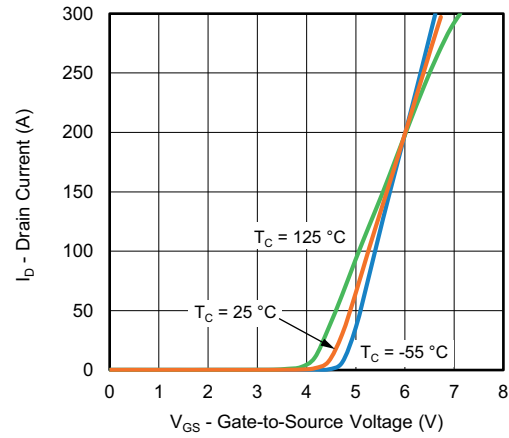
Transfer Characteristics

Transconductance

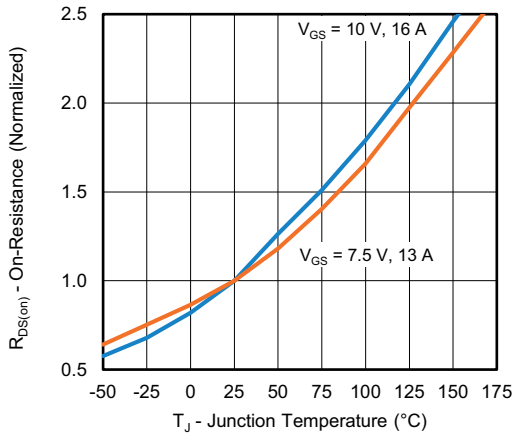

On-Resistance vs. Drain Current
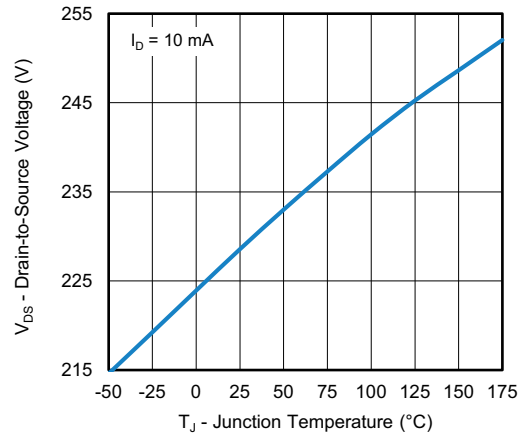

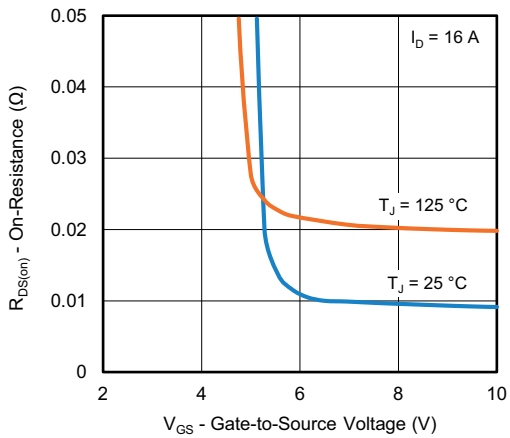**Capacitance**
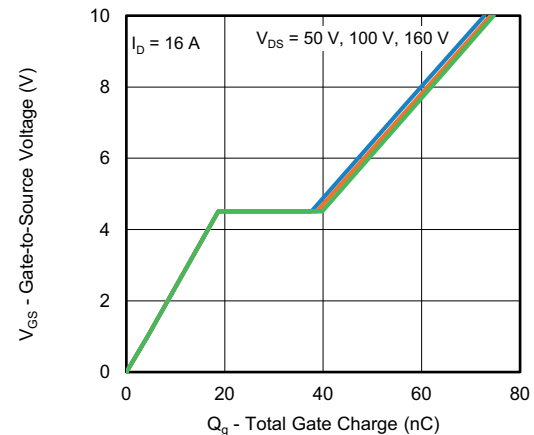
Gate Charge

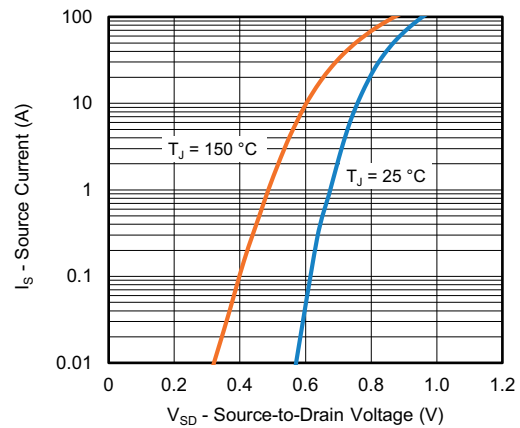**TYPICAL CHARACTERISTICS** (T_A = 25 °C, unless otherwise noted)

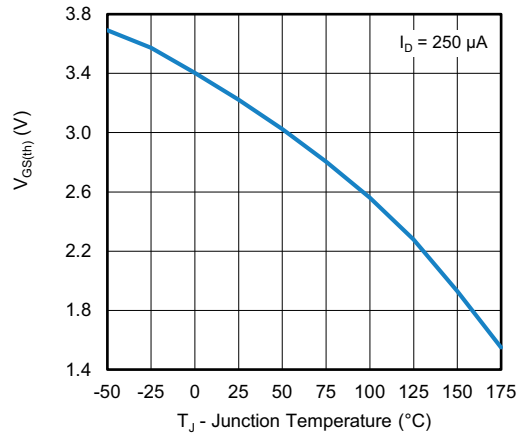On-Resistance vs. Junction Temperature

Drain Source Breakdown vs. Junction Temperature

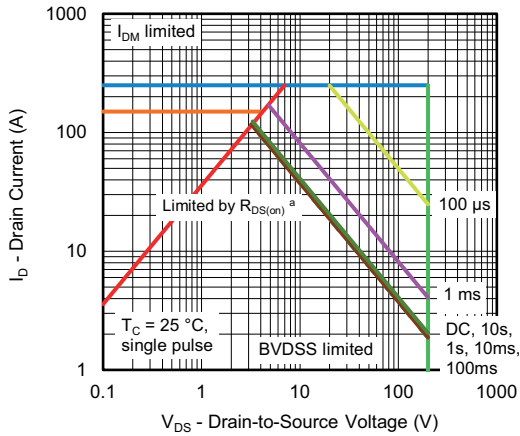On-Resistance vs. Gate-to-Source Voltage
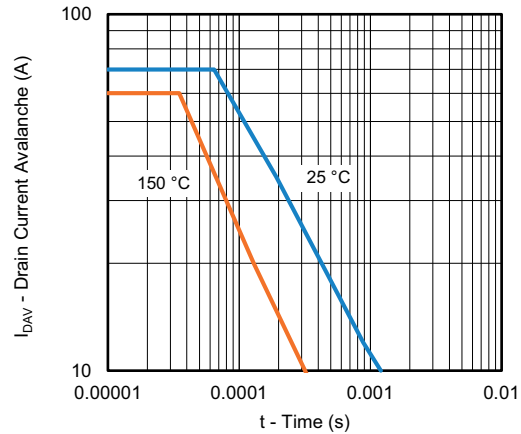

Source Drain Diode Forward Voltage

Threshold Voltage

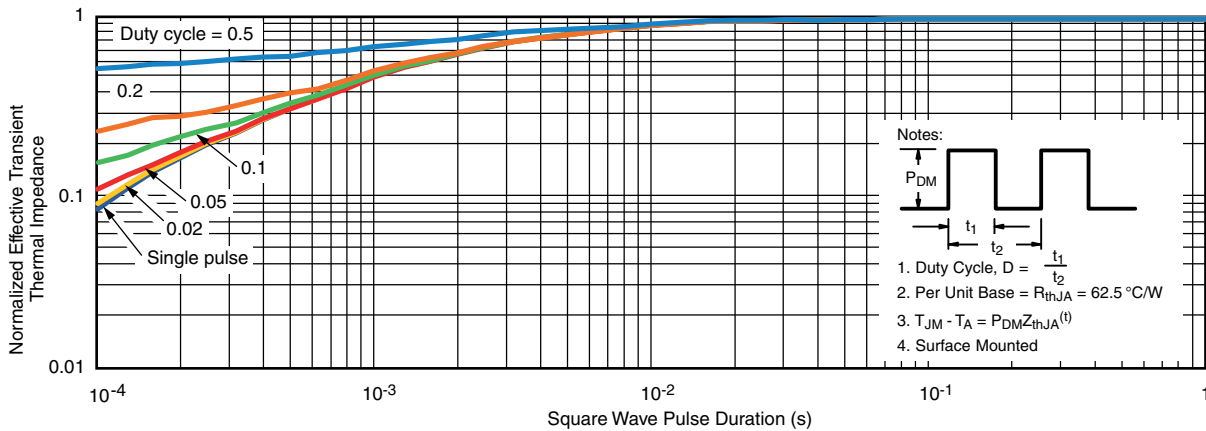**THERMAL RATINGS** (T_A = 25 °C, unless otherwise noted)

Safe Operating Area

Note

a. V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Single Pulse Avalanche Current Capability vs. Time

Notes:

1. Duty Cycle, D = $\dfrac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 62.5 °C/W
3. T_{JM} - T_A = $P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Case

For technical questions, contact: pmostechsupport@vishay.com

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