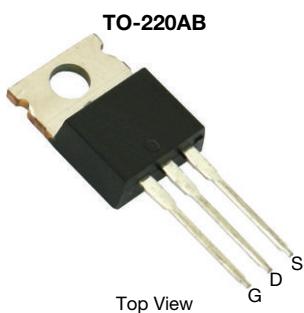


## N-Channel 100 V (D-S) MOSFET

<b>PRODUCT SUMMARY</b>			
<b><math>V_{DS}</math> (V)</b>	<b><math>R_{DS(on)}</math> (Ω) MAX.</b>	<b><math>I_D</math> (A) <sup>c</sup></b>	<b><math>Q_g</math> (TYP.)</b>
100	0.0089 at $V_{GS} = 10$ V	50	33 nC
	0.0093 at $V_{GS} = 7.5$ V	50	


**Ordering Information:**

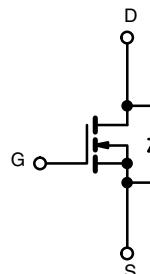
SUP70090E-GE3 (lead (Pb)-free and halogen-free)

**FEATURES**

- ThunderFET® power MOSFET
- Maximum 175 °C junction temperature
- $Q_{gd} / Q_{gs}$  ratio < 1 optimizes switching characteristics
- 100 %  $R_g$  and UIS tested
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**APPLICATIONS**

- Power supply
  - Secondary synchronous rectification
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter



N-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_C = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150$ °C)	$T_C = 25$ °C	$I_D$	A
	$T_C = 70$ °C	50 °c	
Pulsed Drain Current ( $t = 100$ µs)	$I_{DM}$	120	A
Avalanche Current	$I_{AS}$	40	
Single Avalanche Energy <sup>a</sup>	$E_{AS}$	80	mJ
Maximum Power Dissipation <sup>a</sup>	$T_C = 25$ °C	$P_D$	W
	$T_C = 70$ °C <sup>b</sup>	125	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	°C

<b>THERMAL RESISTANCE RATINGS</b>			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) <sup>b</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)	$R_{thJC}$	1.2	

**Notes**

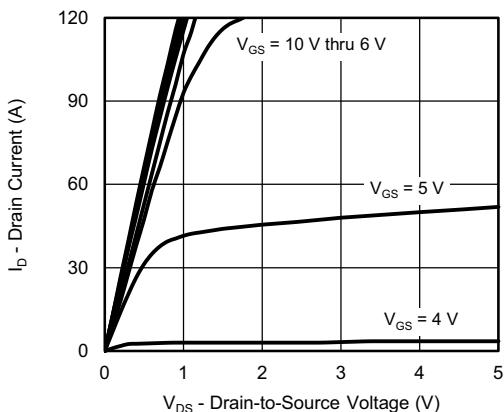
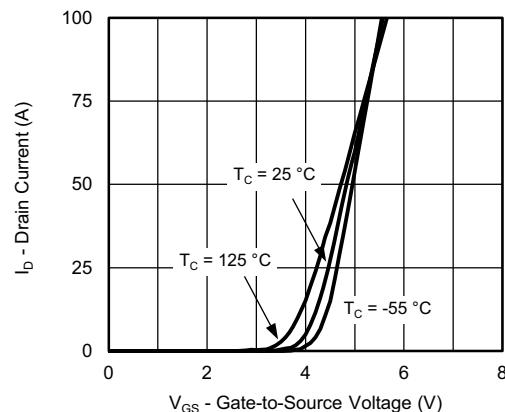
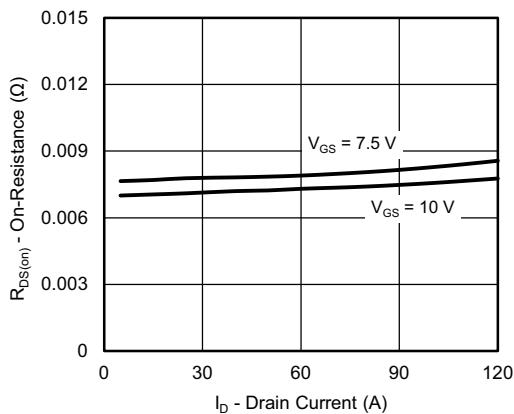
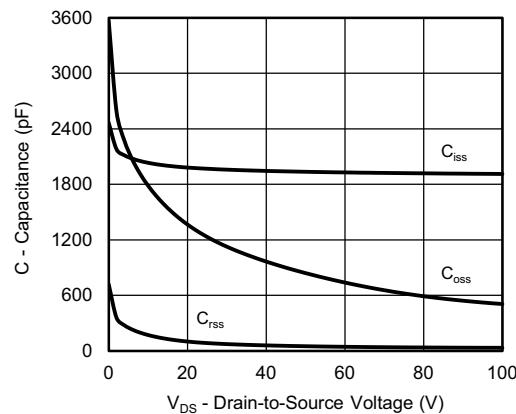
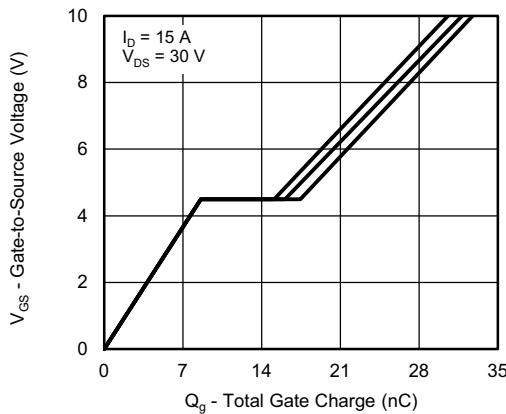
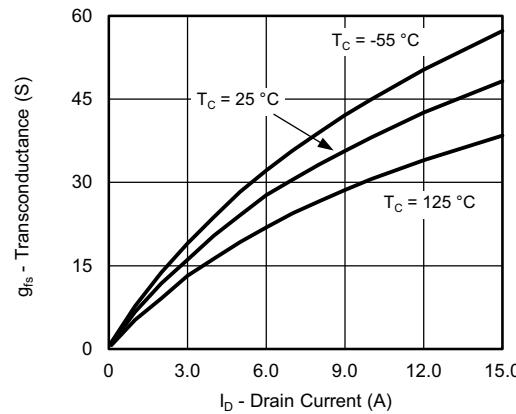
- Duty cycle  $\leq 1$  %.
- When mounted on 1" square PCB (FR4 material).
- Package limited.

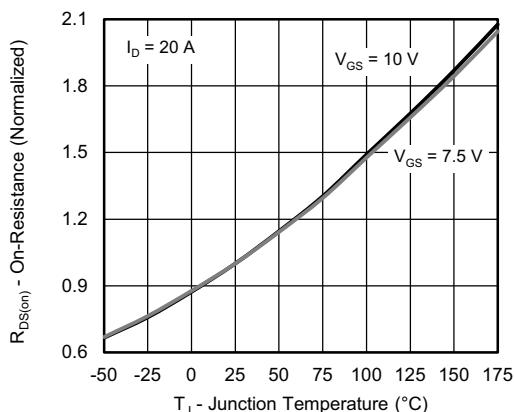
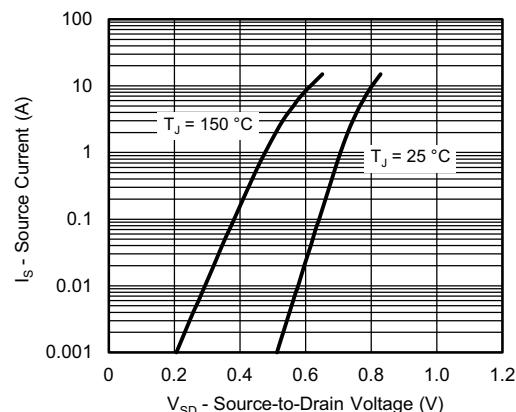
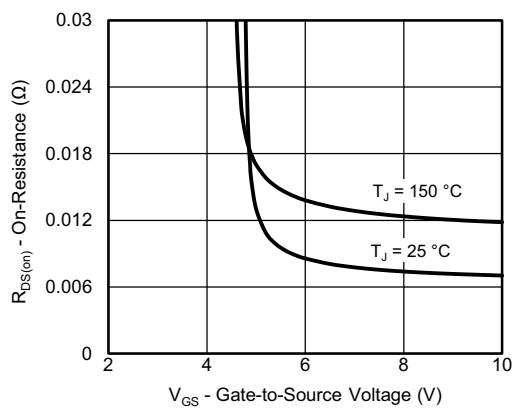
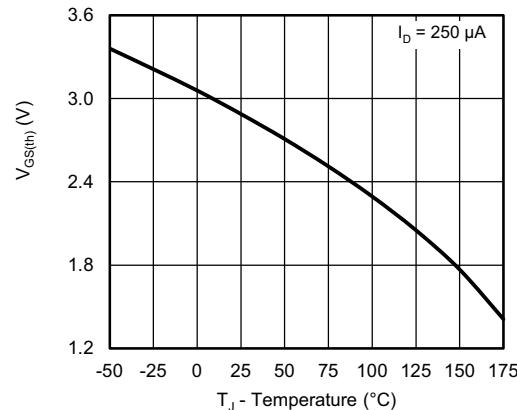
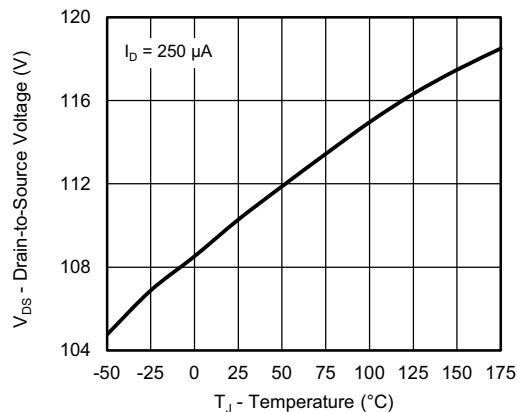
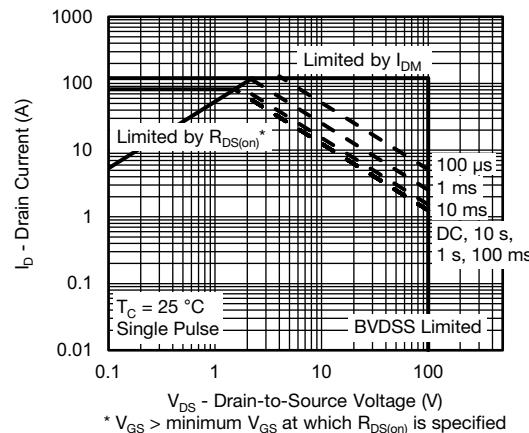
<b>SPECIFICATIONS</b> ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	100	-	-	V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2	-	4	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$	-	-	$\pm 250$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100 \text{ V}$ , $V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 100 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$	-	-	150	
		$V_{DS} = 100 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 175^\circ\text{C}$	-	-	5	mA
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 10 \text{ V}$ , $V_{GS} = 10 \text{ V}$	50	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$	-	0.0074	0.0089	$\Omega$
		$V_{GS} = 7.5 \text{ V}$ , $I_D = 15 \text{ A}$	-	0.0077	0.0093	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 10 \text{ A}$	-	38	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 50 \text{ V}$ , $f = 1 \text{ MHz}$	-	1950	-	$\text{pF}$
Output Capacitance	$C_{oss}$		-	845	-	
Reverse Transfer Capacitance	$C_{rss}$		-	54	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 50 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$	-	33	50	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$		-	8.8	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$		-	7.5	-	
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$	0.7	3.5	7	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = 50 \text{ V}$ , $R_L = 5 \Omega$ $I_D \equiv 10 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$	-	15	30	$\text{ns}$
Rise Time <sup>c</sup>	$t_r$		-	27	54	
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$		-	36	72	
Fall Time <sup>c</sup>	$t_f$		-	45	90	
<b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (<math>T_C = 25^\circ\text{C}</math>)</b>						
Pulsed Current ( $t = 100 \mu\text{s}$ )	$I_{SM}$		-	-	120	A
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 10 \text{ A}$ , $V_{GS} = 0 \text{ V}$	-	0.8	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = -10 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$	-	77	116	ns
Peak Reverse Recovery Charge	$I_{RM(\text{REC})}$		-	4.2	6.3	A
Reverse Recovery Charge	$Q_{rr}$		-	145	365	nC

**Notes**

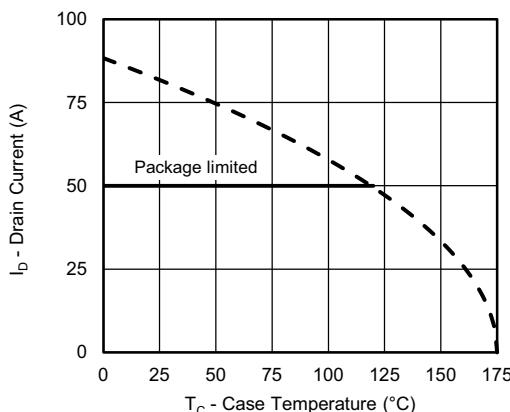
- a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2 \%$ .
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

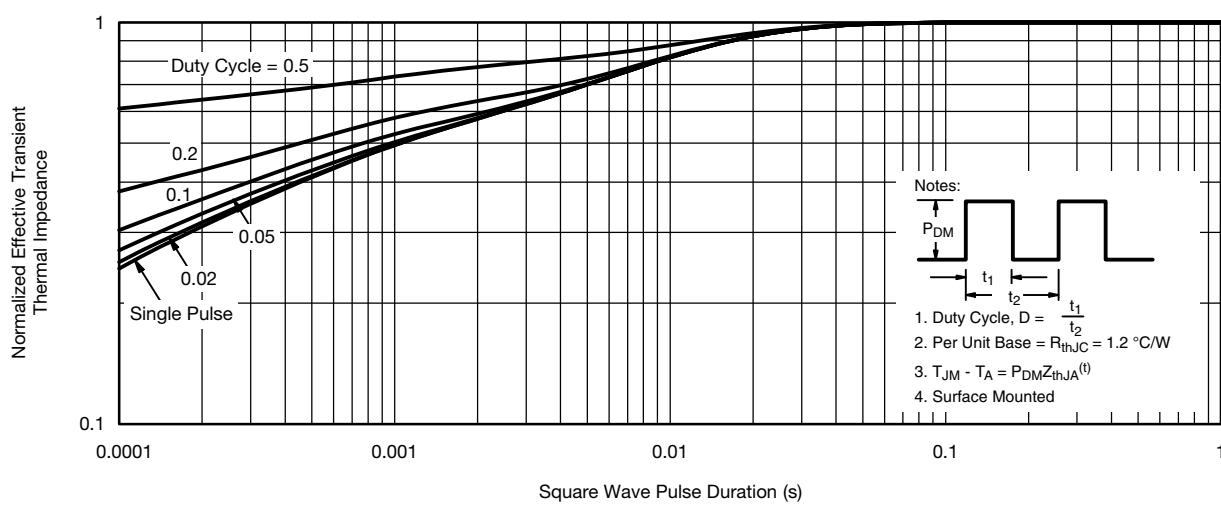
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**Transconductance**

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

**On-Resistance vs. Junction Temperature**

**Source Drain Diode Forward Voltage**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

**Drain Source Voltage vs. Junction Temperature**

**Safe Operating Area**

**THERMAL RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



## Current De-Rating

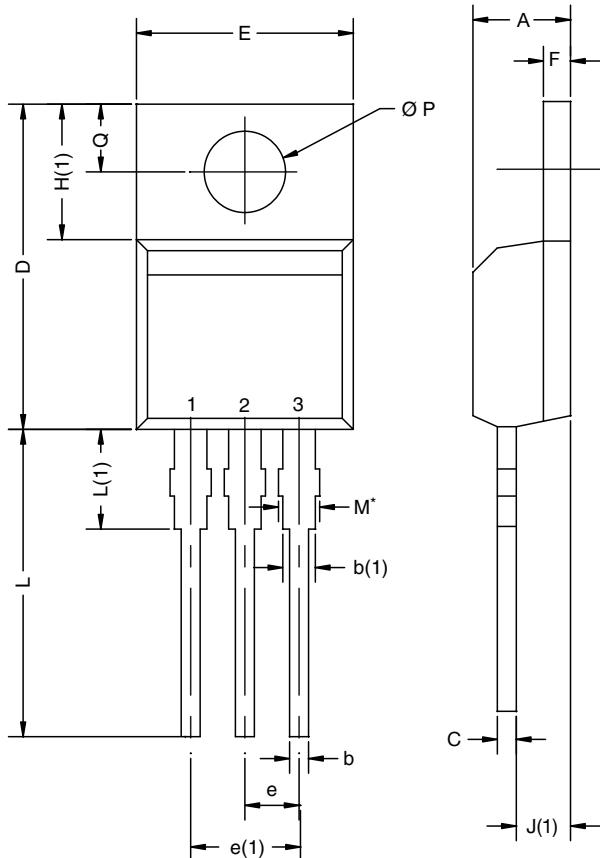


### Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction to Case (25 °C)

Normalized transient thermal impedance curtailed to Case 25 °C are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

### TO-220AB

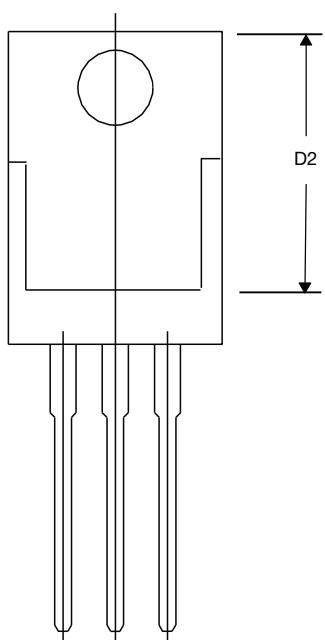


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)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