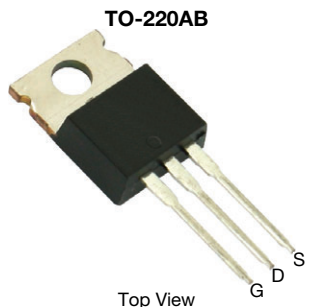


## P-Channel 80 V (D-S) MOSFET



### FEATURES

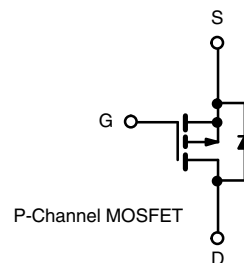
- TrenchFET® power MOSFET
- Package with low thermal resistance
- Maximum 175 °C junction temperature
- Low  $R_{DS(on)}$  minimizes power loss from conduction
- Compatible with logic-level gate driving
- 100 %  $R_g$  and UIS tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Battery protection
- Motor drive control
- Load switch



### PRODUCT SUMMARY

$V_{DS}$ (V)	-80
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -10$ V	0.0058
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0081
$Q_g$ typ. (nC)	145
$I_D$ (A)	-150
Configuration	Single

### ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free and halogen-free	SUP60061EL-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-80	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current <sup>d</sup> ( $T_J = 175$ °C)	$I_D$	-150 <sup>d</sup>	A
		-150 <sup>d</sup>	A
Pulsed drain current (100 $\mu$ s)	$I_{DM}$	-250	A
Avalanche current	$I_{AS}$	-75	A
Single pulse avalanche energy <sup>a</sup>	$E_{AS}$	281	mJ
Power dissipation	$P_D$	375	W
		125	W
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	°C

### THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-ambient	$R_{thJA}$	40	°C/W
Junction-to-case	$R_{thJC}$	0.4	°C/W

#### Notes

- Duty cycle  $\leq 1$  %
- When mounted on 1" square PCB (FR4 material)
- See SOA curve for voltage derating
- Limited by package



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -10 mA	-80	-	-	V
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1.5	-	-2.5	
Gate-body leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -80 V, V <sub>GS</sub> = 0 V	-	-	-10	μA
		V <sub>DS</sub> = -64 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	-50	
		V <sub>DS</sub> = -64 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C	-	-	-250	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≤ -5 V, V <sub>GS</sub> = -10 V	-30	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -20 A	-	0.0048	0.0058	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -15 A	-	0.0065	0.0081	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -15 A	-	80	-	S
Dynamic <sup>b</sup>						
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -40 V, f = 1 MHz	-	9600	-	pF
Output capacitance	C <sub>oss</sub>		-	3300	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	110	-	
Total gate charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = -40 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -110 A	-	145	218	nC
Gate-source charge <sup>c</sup>	Q <sub>gs</sub>		-	34	-	
Gate-drain charge <sup>c</sup>	Q <sub>gd</sub>		-	16	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	0.46	2.3	4.6	Ω
Turn-on delay time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -40 V, R <sub>L</sub> = 0.71 Ω I <sub>D</sub> ≡ -20 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	-	25	35	ns
Rise time <sup>c</sup>	t <sub>r</sub>		-	20	30	
Turn-off delay time <sup>c</sup>	t <sub>d(off)</sub>		-	90	140	
Fall time <sup>c</sup>	t <sub>f</sub>		-	20	30	
Drain-Source Body Diode Characteristics (T <sub>C</sub> = 25 °C <sup>b</sup> )						
Continuous current	I <sub>S</sub>		-	-	-150	A
Pulsed current	I <sub>SM</sub>		-	-	-250	
Forward voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = -10 A, V <sub>GS</sub> = 0 V	-	-0.8	-1.5	V
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -20 A, dI/dt = 100 A/μs	-	90	135	ns
Peak reverse recovery charge	I <sub>RM(REC)</sub>		-	-2.8	-4.2	A
Reverse recovery charge	Q <sub>rr</sub>		-	145	218	nC

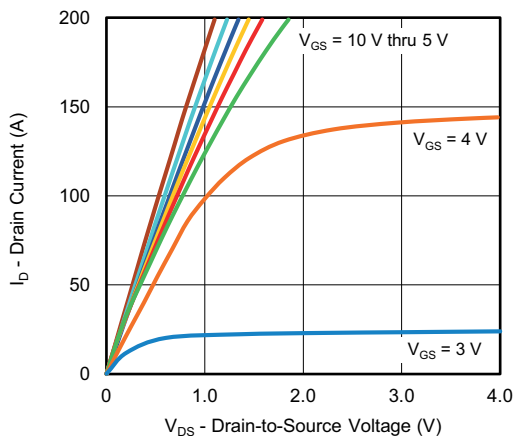
**Notes**

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %  
b. Guaranteed by design, not subject to production testing  
c. Independent of operating temperature

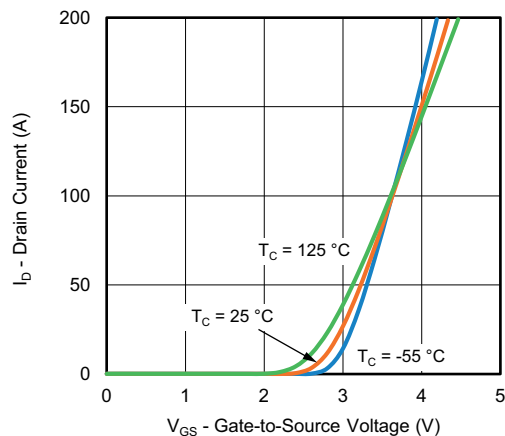
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



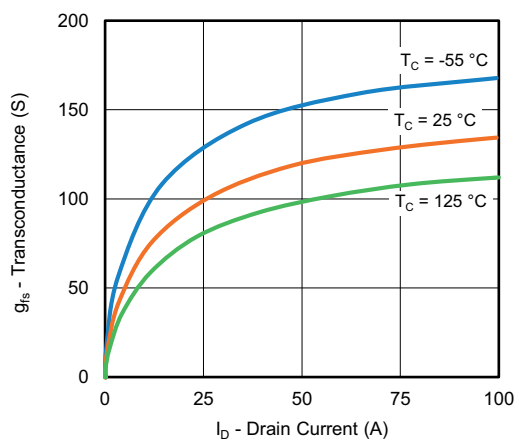
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



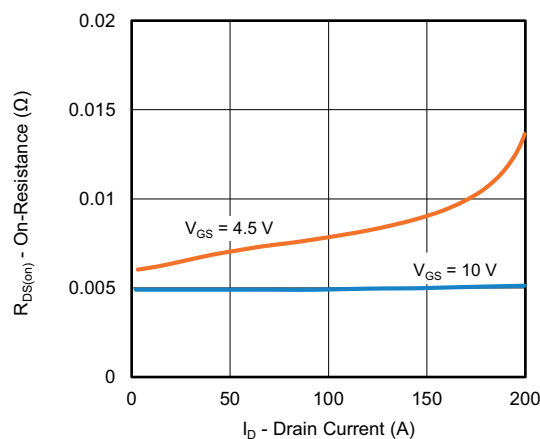
**Output Characteristics**



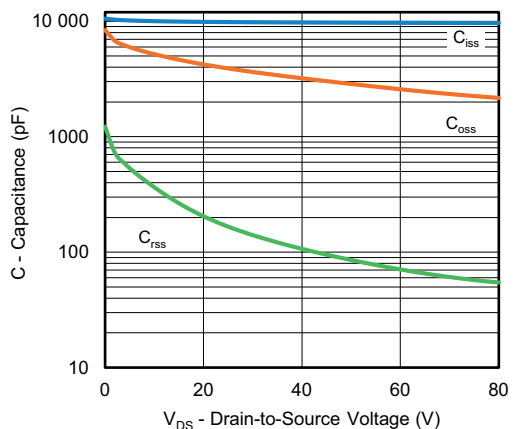
**Transfer Characteristics**



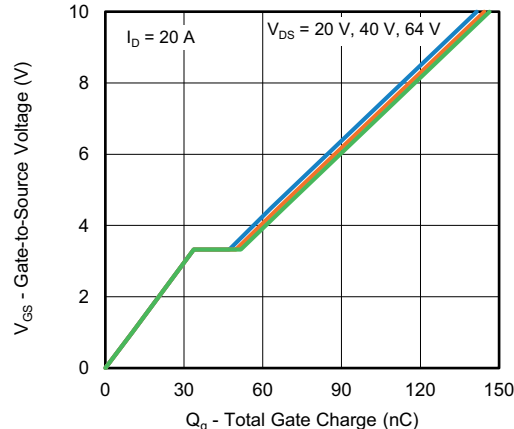
**Transconductance**



**On-Resistance vs. Drain Current**



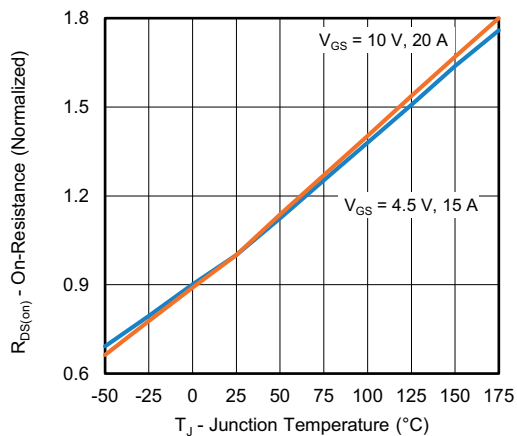
**Capacitance**



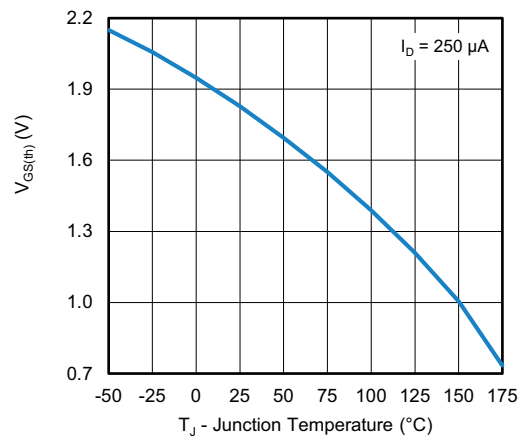
**Gate Charge**



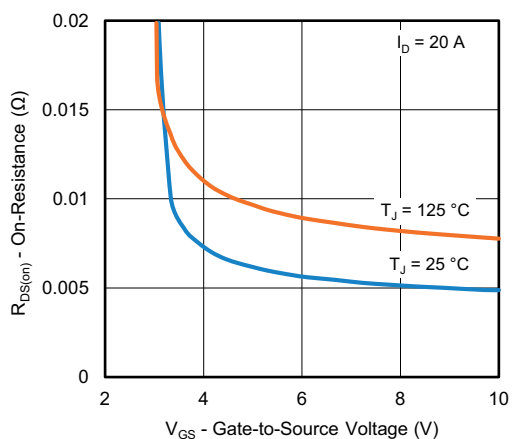
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



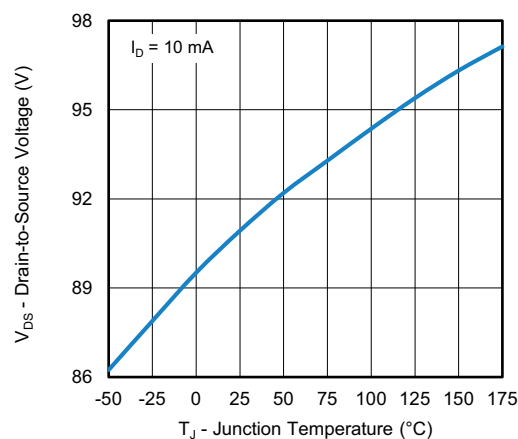
**On-Resistance vs. Junction Temperature**



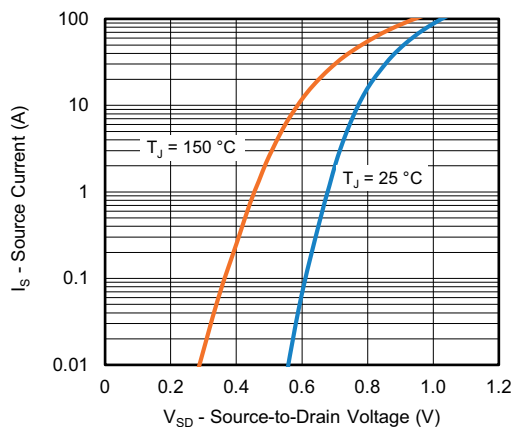
**Threshold Voltage**



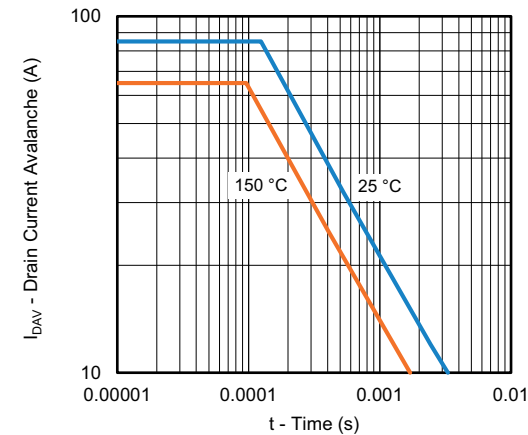
**On-Resistance vs. Gate-to-Source Voltage**



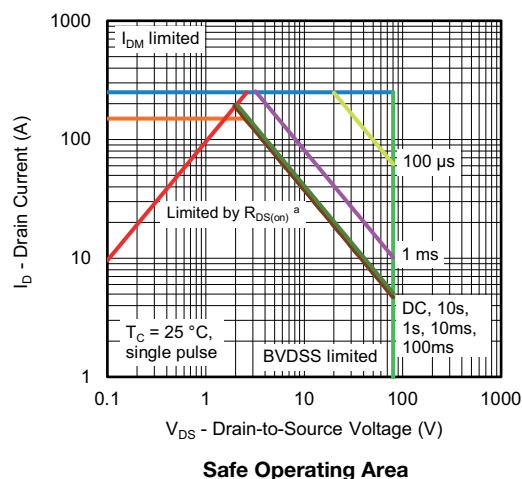
**Drain Source Breakdown vs. Junction Temperature**



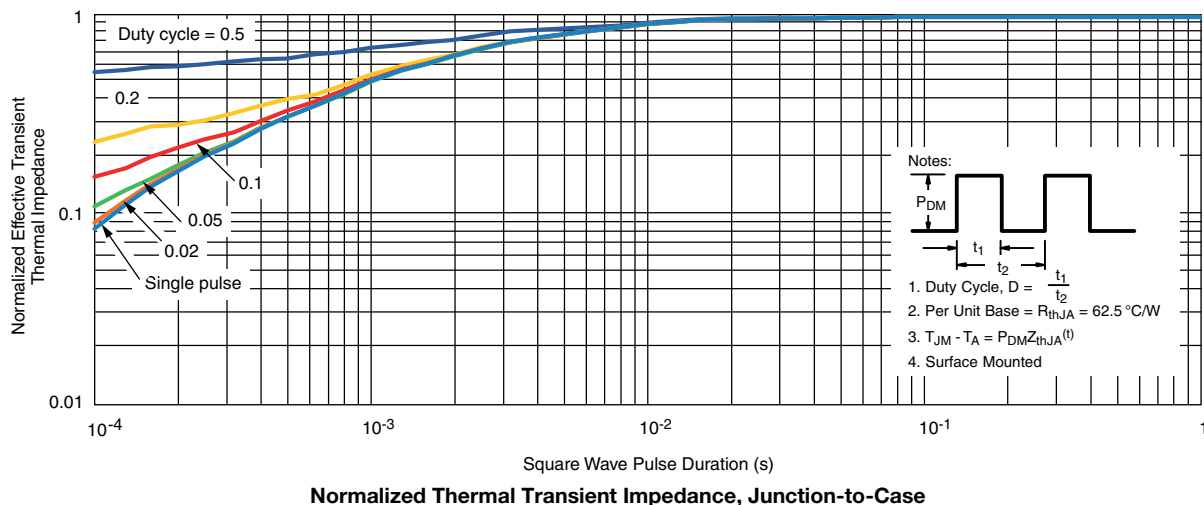
**Source Drain Diode Forward Voltage**



**Avalanche Current vs. Time**

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

**Note**

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



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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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