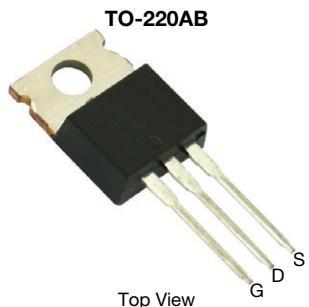


## P-Channel 80 V (D-S) MOSFET



### 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)



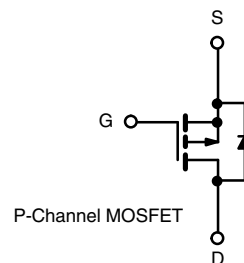
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### 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 |

### APPLICATIONS

- Battery protection
- Motor drive control
- Load switch



### 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><br>( $T_J = 175$ °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<br>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   |

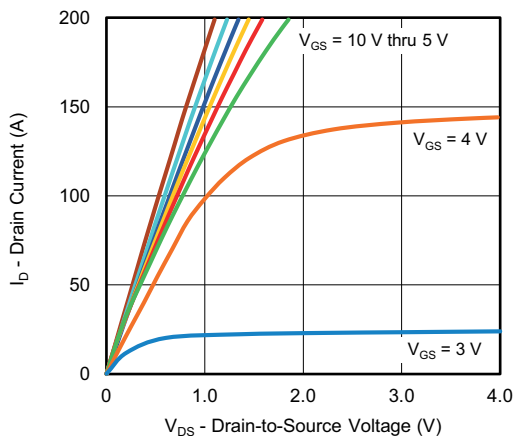
**Notes**

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

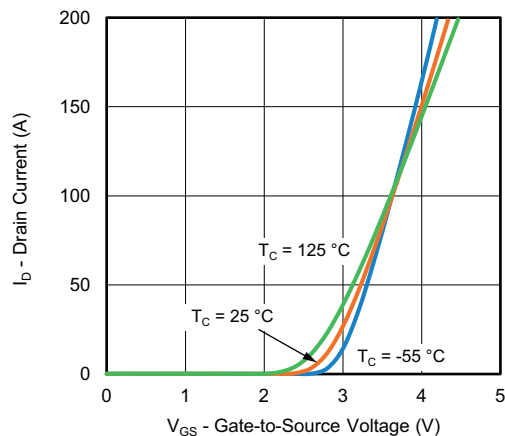
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



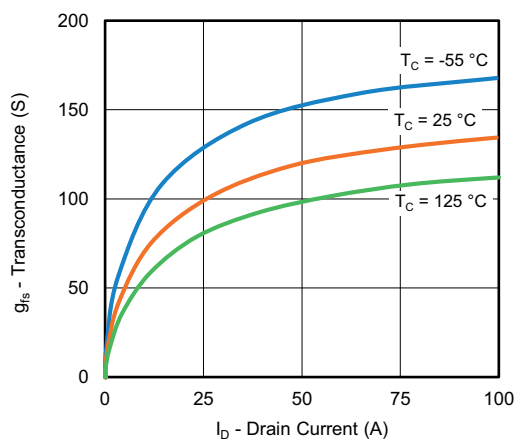
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



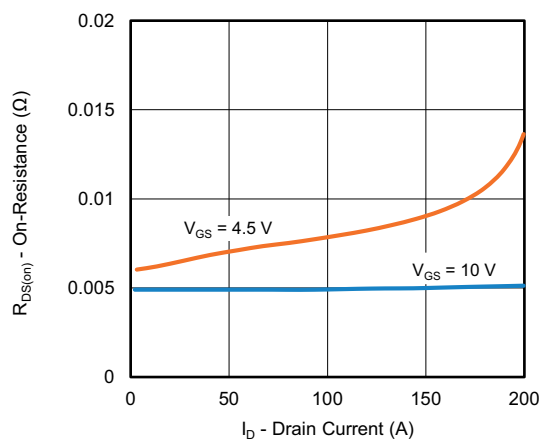
**Output Characteristics**



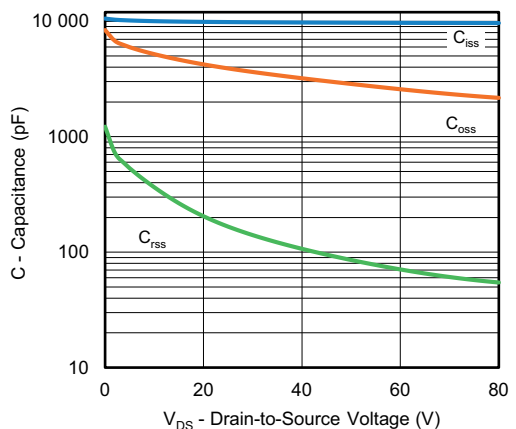
**Transfer Characteristics**



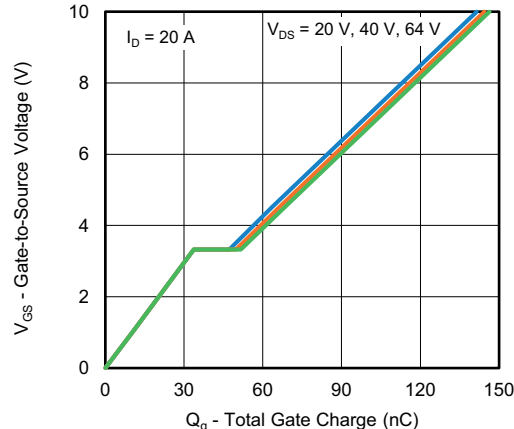
**Transconductance**



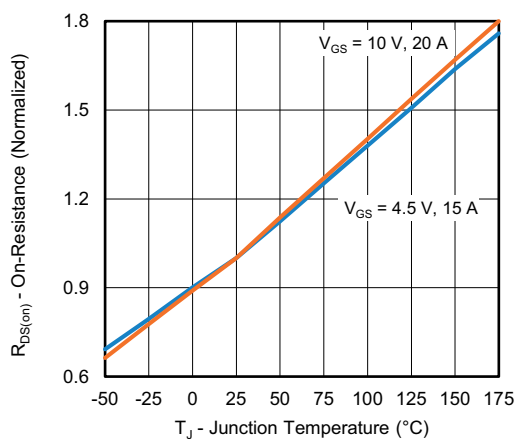
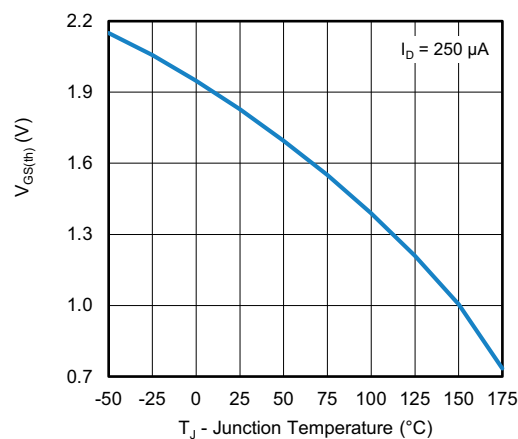
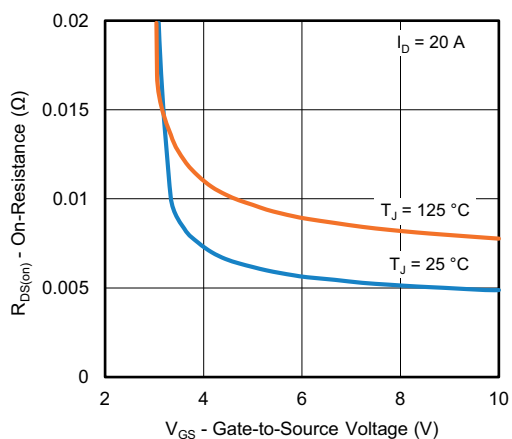
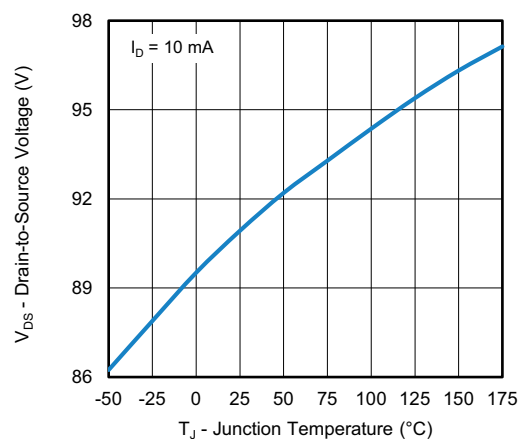
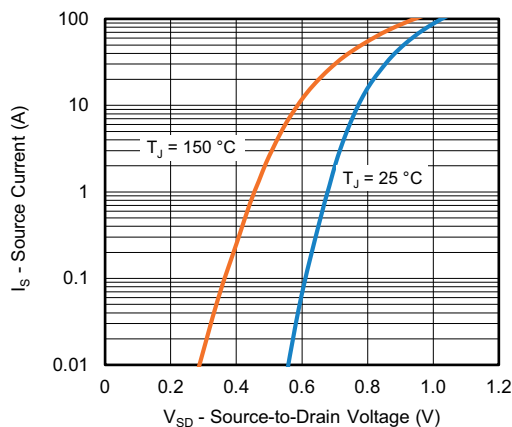
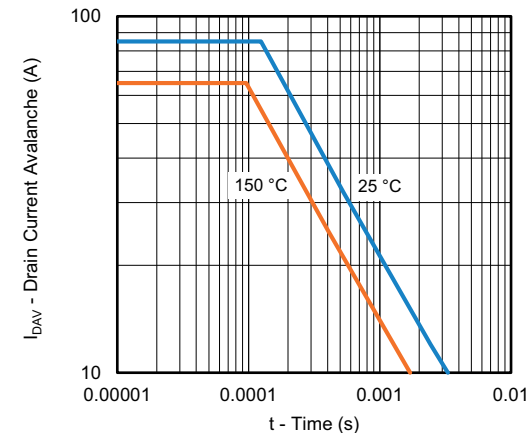
**On-Resistance vs. Drain Current**



**Capacitance**

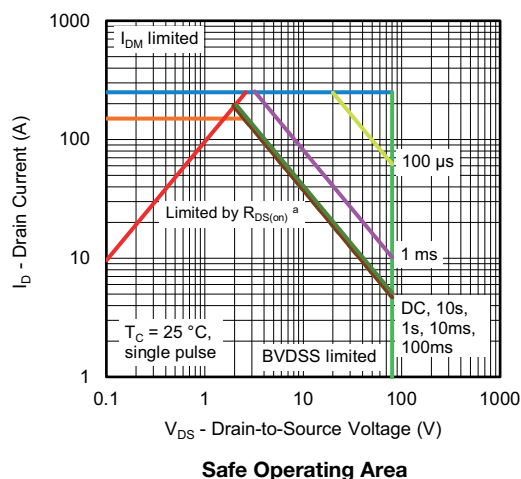


**Gate Charge**

**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**

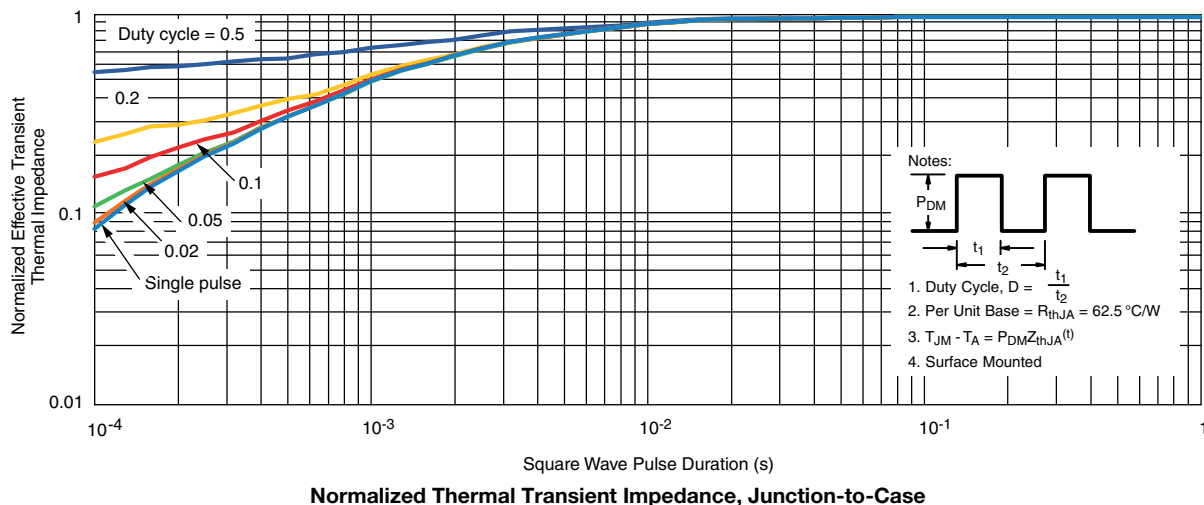


**THERMAL RATINGS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



**Note**

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



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## TO-220AB

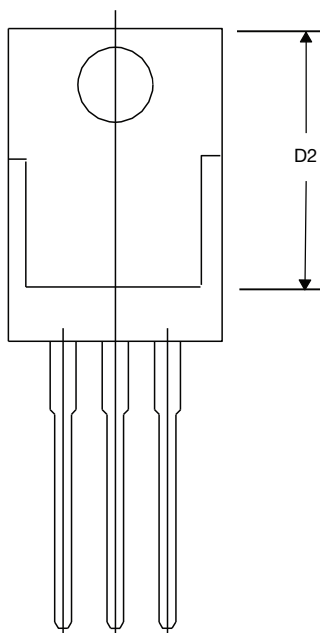


| DIM. | MILLIMETERS |       | INCHES |       |
|------|-------------|-------|--------|-------|
|      | MIN.        | MAX.  | MIN.   | MAX.  |
| A    | 4.25        | 4.65  | 0.167  | 0.183 |
| b    | 0.69        | 1.01  | 0.027  | 0.040 |
| b(1) | 1.20        | 1.73  | 0.047  | 0.068 |
| c    | 0.36        | 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 |
| 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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