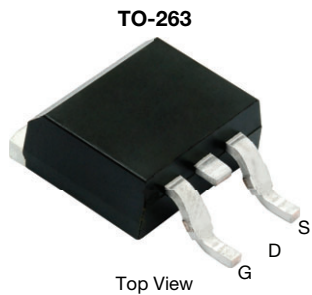




**THE DATASHEET OF
SUM60061EL-GE3**



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

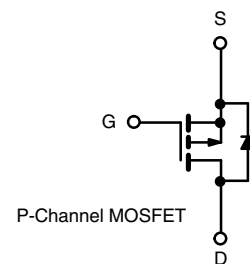


RoHS
COMPLIANT
HALOGEN
FREE

| PRODUCT SUMMARY | |
|---|--------|
| V_{DS} (V) | -80 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = -10$ V | 0.0061 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = -4.5$ V | 0.0086 |
| Q_g typ. (nC) | 145 |
| I_D (A) | -150 |
| Configuration | Single |

APPLICATIONS

- Battery protection
- Motor drive control
- Load switch



| ORDERING INFORMATION | |
|---------------------------------|----------------|
| Package | TO-263 |
| Lead (Pb)-free and halogen-free | SUM60061EL-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} | ± 20 | |
| Continuous drain current ^d ($T_J = 175$ °C) | $T_C = 25$ °C | I_D | -150 ^d | A |
| | $T_C = 70$ °C | | -150 ^d | |
| Pulsed drain current (100 μ s) | | I_{DM} | -250 | |
| Avalanche current | L = 0.1 mH | I_{AS} | -75 | |
| Single pulse avalanche energy ^a | | E_{AS} | 281 | mJ |
| Power dissipation | $T_C = 25$ °C ^c | P_D | 375 | W |
| | $T_C = 125$ °C ^b | | 125 | |
| 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 ^b | R_{thJA} | 40 | °C/W |
| Junction-to-case | | R_{thJC} | 0.4 | |

Notes

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



| 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 = -10 mA | -80 | - | - | V |
| Gate threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -250 μA | -1.5 | - | -2.5 | |
| Gate-body leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | - | - | ± 100 | nA |
| Zero gate voltage drain current | I _{DSS} | V _{DS} = -80 V, V _{GS} = 0 V | - | - | -10 | μA |
| | | V _{DS} = -64 V, V _{GS} = 0 V, T _J = 125 °C | - | - | -50 | |
| | | V _{DS} = -64 V, V _{GS} = 0 V, T _J = 175 °C | - | - | -250 | |
| On-state drain current ^a | I _{D(on)} | V _{DS} ≤ -5 V, V _{GS} = -10 V | -30 | - | - | A |
| Drain-source on-state resistance ^a | R _{DS(on)} | V _{GS} = -10 V, I _D = -20 A | - | 0.0051 | 0.0061 | Ω |
| | | V _{GS} = -4.5 V, I _D = -15 A | - | 0.0069 | 0.0086 | |
| Forward transconductance ^a | g _{fs} | V _{DS} = -15 V, I _D = -15 A | - | 80 | - | S |
| Dynamic ^b | | | | | | |
| Input capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = -40 V, f = 1 MHz | - | 9600 | - | pF |
| Output capacitance | C _{oss} | | - | 3300 | - | |
| Reverse transfer capacitance | C _{rss} | | - | 110 | - | |
| Total gate charge ^c | Q _g | V _{DS} = -40 V, V _{GS} = -10 V, I _D = -110 A | - | 145 | 218 | nC |
| Gate-source charge ^c | Q _{gs} | | - | 34 | - | |
| Gate-drain charge ^c | Q _{gd} | | - | 16 | - | |
| Gate resistance | R _g | f = 1 MHz | 0.46 | 2.3 | 4.6 | Ω |
| Turn-on delay time ^c | t _{d(on)} | V _{DD} = -40 V, R _L = 0.71 Ω I _D ≅ -20 A, V _{GEN} = -10 V, R _g = 1 Ω | - | 25 | 35 | ns |
| Rise time ^c | t _r | | - | 20 | 30 | |
| Turn-off delay time ^c | t _{d(off)} | | - | 90 | 140 | |
| Fall time ^c | t _f | | - | 20 | 30 | |
| Drain-Source Body Diode Characteristics (T_C = 25 °C ^b) | | | | | | |
| Continuous current | I _S | | - | - | -150 | A |
| Pulsed current | I _{SM} | | - | - | -250 | |
| 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 = -20 A, di/dt = 100 A/μs | - | 90 | 135 | ns |
| Peak reverse recovery charge | I _{RM(REC)} | | - | -2.8 | -4.2 | A |
| Reverse recovery charge | Q _{rr} | | - | 145 | 218 | nC |

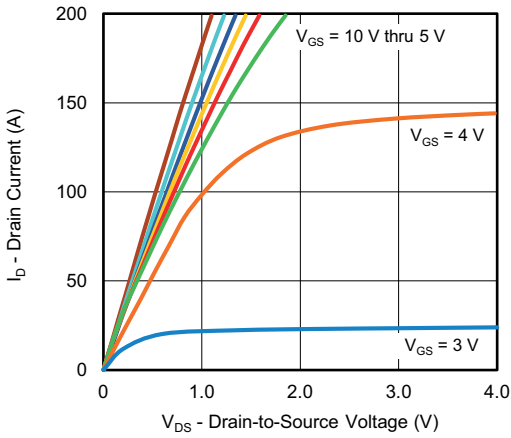
Notes

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

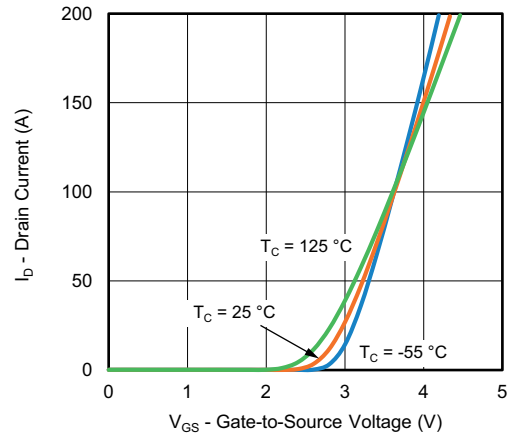
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



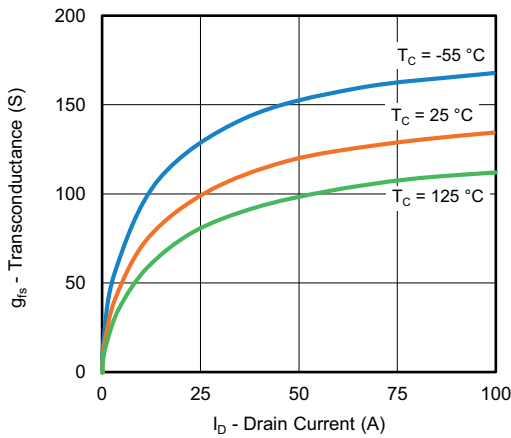
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



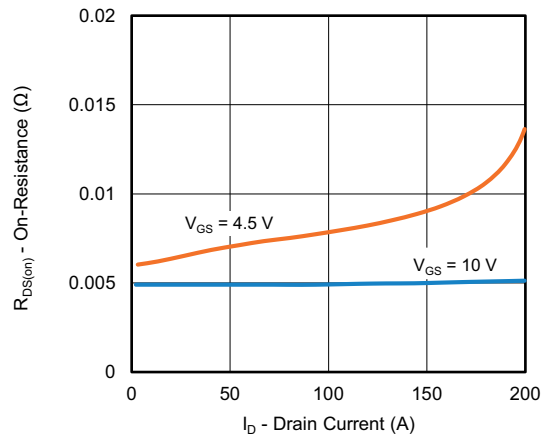
Output Characteristics



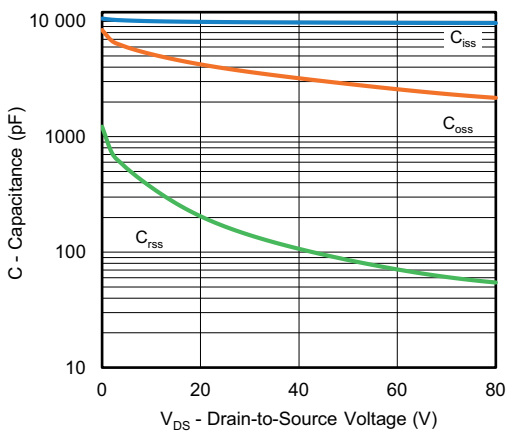
Transfer Characteristics



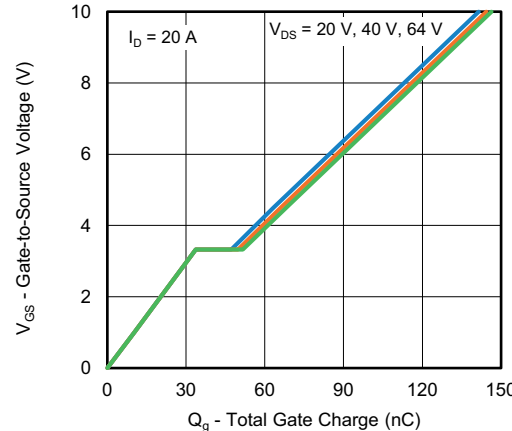
Transconductance



On-Resistance vs. Drain Current



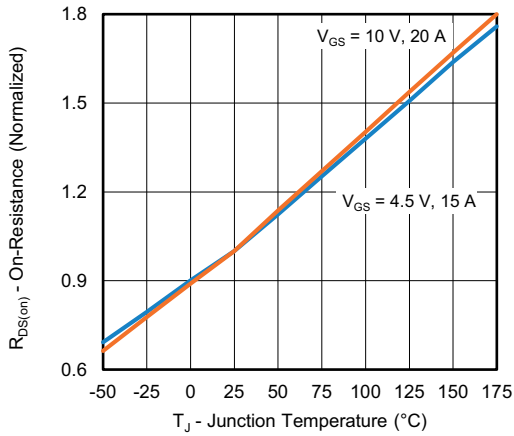
Capacitance



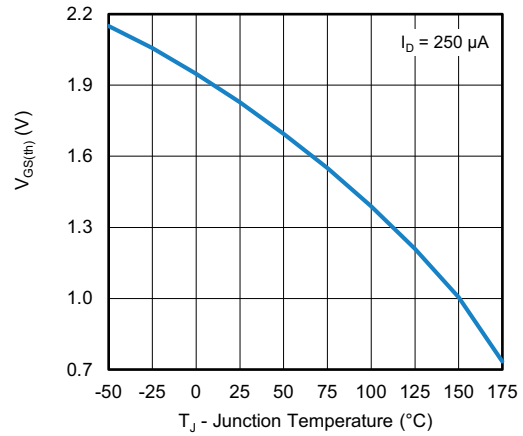
Gate Charge



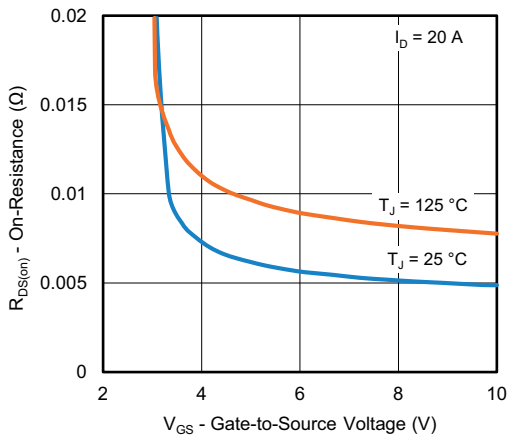
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



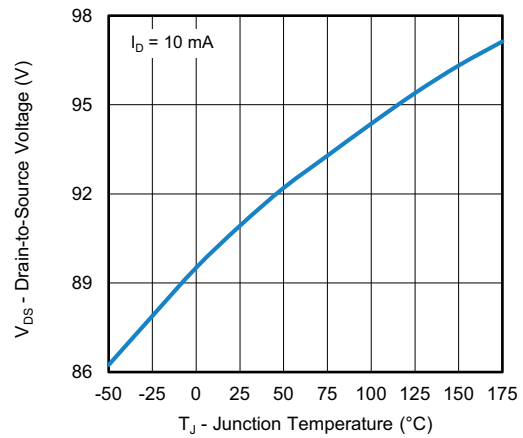
On-Resistance vs. Junction Temperature



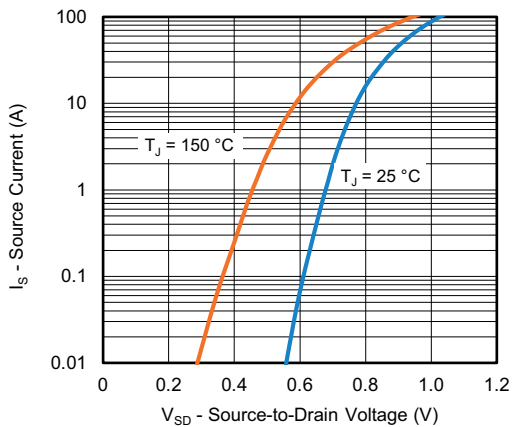
Threshold Voltage



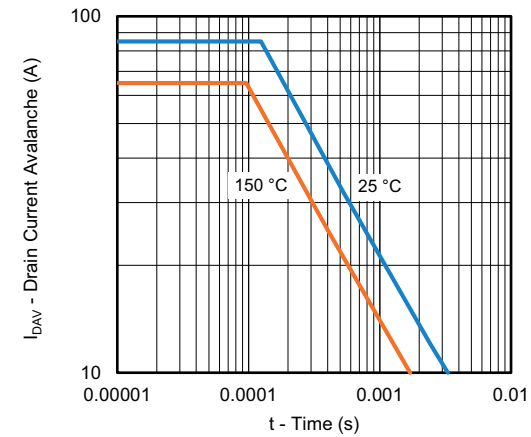
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



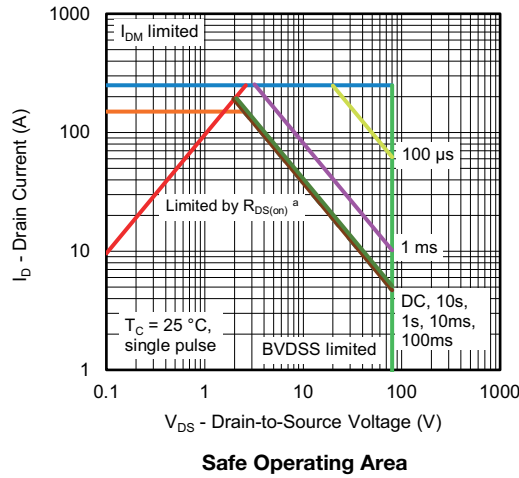
Source Drain Diode Forward Voltage



Avalanche Current vs. Time

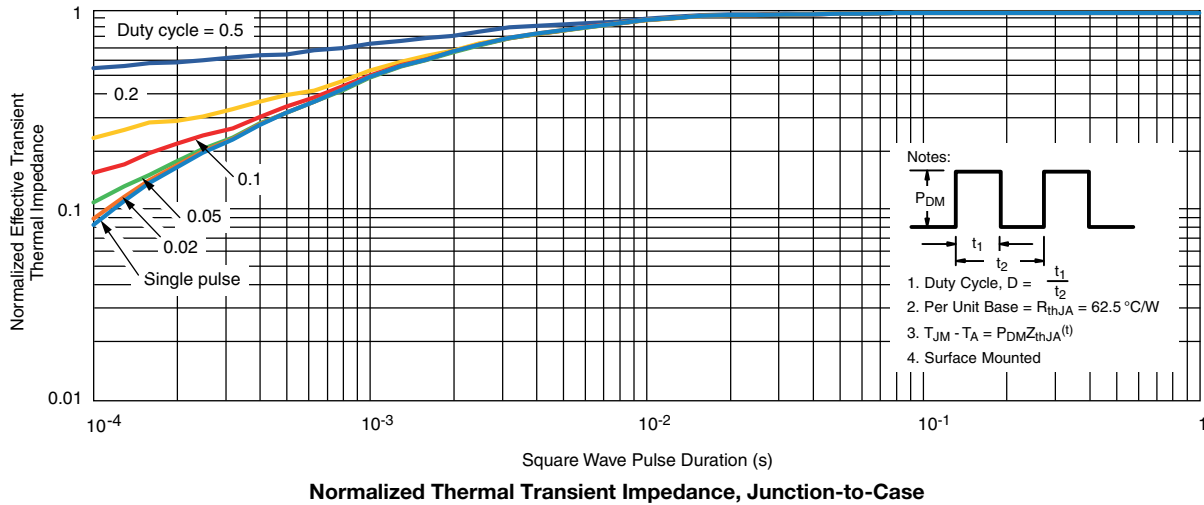


THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



Note

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



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TO-263 (D²PAK): 3-LEAD



| DIM. | INCHES | | MILLIMETERS | | |
|---------------------------------|------------|-------|-------------|--------|-------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 0.160 | 0.190 | 4.064 | 4.826 | |
| b | 0.020 | 0.039 | 0.508 | 0.990 | |
| b1 | 0.020 | 0.035 | 0.508 | 0.889 | |
| b2 | 0.045 | 0.055 | 1.143 | 1.397 | |
| c* | Thin lead | 0.013 | 0.018 | 0.330 | 0.457 |
| | Thick lead | 0.023 | 0.028 | 0.584 | 0.711 |
| c1 | Thin lead | 0.013 | 0.017 | 0.330 | 0.431 |
| | Thick lead | 0.023 | 0.027 | 0.584 | 0.685 |
| c2 | 0.045 | 0.055 | 1.143 | 1.397 | |
| D | 0.340 | 0.380 | 8.636 | 9.652 | |
| D1 | 0.220 | 0.240 | 5.588 | 6.096 | |
| D2 | 0.038 | 0.042 | 0.965 | 1.067 | |
| D3 | 0.045 | 0.055 | 1.143 | 1.397 | |
| D4 | 0.044 | 0.052 | 1.118 | 1.321 | |
| E | 0.380 | 0.410 | 9.652 | 10.414 | |
| E1 | 0.245 | - | 6.223 | - | |
| E2 | 0.355 | 0.375 | 9.017 | 9.525 | |
| E3 | 0.072 | 0.078 | 1.829 | 1.981 | |
| e | 0.100 BSC | | 2.54 BSC | | |
| K | 0.045 | 0.055 | 1.143 | 1.397 | |
| L | 0.575 | 0.625 | 14.605 | 15.875 | |
| L1 | 0.090 | 0.110 | 2.286 | 2.794 | |
| L2 | 0.040 | 0.055 | 1.016 | 1.397 | |
| L3 | 0.050 | 0.070 | 1.270 | 1.778 | |
| L4 | 0.010 BSC | | 0.254 BSC | | |
| M | - | 0.002 | - | 0.050 | |
| ECN: T13-0707-Rev. K, 30-Sep-13 | | | | | |
| DWG: 5843 | | | | | |

Notes

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- *: Thin lead is for SUB, SYB.
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
- This feature is for thick lead.

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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