

N-Channel 80 V (D-S) MOSFET



FEATURES

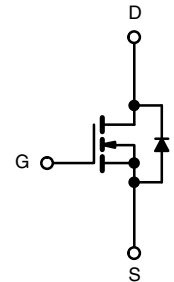
- TrenchFET® power MOSFET
- Maximum 175 °C junction temperature
- Very low Q_{gd} reduces power loss from passing through $V_{plateau}$
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Power supply
- Secondary synchronous rectification
- 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) | 80 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V | 0.00210 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = 7.5$ V | 0.00247 |
| Q_g typ. (nC) | 151.2 |
| I_D (A) | 150 ^d |
| Configuration | Single |

ORDERING INFORMATION

| | |
|---------------------------------|---------------|
| Package | TO-263 |
| Lead (Pb)-free and halogen-free | SUM60020E-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 ($T_J = 150$ °C) | I_D | $T_C = 25$ °C | 150 ^d |
| | | $T_C = 70$ °C | 150 ^d |
| Pulsed drain current ($t = 100$ μ s) | I_{DM} | 500 | A |
| Avalanche current | I_{AS} | 60 | |
| Single avalanche energy ^a | E_{AS} | 180 | mJ |
| Maximum power dissipation ^a | P_D | $T_C = 25$ °C | 375 ^b |
| | | $T_C = 125$ °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

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



| SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted) | | | | | | |
|---|---------------|--|------|---------|-----------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | |
| Drain-source breakdown voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 80 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | - | 4 | |
| Gate-body leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | - | - | ± 250 | nA |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$ | - | - | 1 | μA |
| | | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | - | - | 150 | |
| | | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | - | - | 5 | mA |
| On-state drain current ^a | $I_{D(on)}$ | $V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$ | 120 | - | - | A |
| Drain-source on-state resistance ^a | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}$ | - | 0.00175 | 0.00210 | Ω |
| | | $V_{GS} = 7.5\text{ V}, I_D = 20\text{ A}$ | - | 0.00190 | 0.00247 | |
| Forward transconductance ^a | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 30\text{ A}$ | - | 115 | - | S |
| Dynamic ^b | | | | | | |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}, f = 1\text{ MHz}$ | - | 10 680 | - | μF |
| Output capacitance | C_{oss} | | - | 1180 | - | |
| Reverse transfer capacitance | C_{rss} | | - | 50 | - | |
| Total gate charge ^c | Q_g | $V_{DS} = 40\text{ V}, V_{GS} = 10\text{ V}, I_D = 41.7\text{ A}$ | - | 151.2 | 227 | nC |
| Gate-source charge ^c | Q_{gs} | | - | 48.4 | - | |
| Gate-drain charge ^c | Q_{gd} | | - | 24 | - | |
| Output charge | Q_{oss} | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$ | - | 138 | 207 | |
| Gate resistance | R_g | $f = 1\text{ MHz}$ | 0.34 | 1.7 | 3.4 | Ω |
| Turn-on delay time ^c | $t_{d(on)}$ | $V_{DD} = 40\text{ V}, R_L = 1.2\text{ }\Omega$ $I_D \cong 33.3\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$ | - | 30 | 60 | ns |
| Rise time ^c | t_r | | - | 13 | 26 | |
| Turn-off delay time ^c | $t_{d(off)}$ | | - | 50 | 100 | |
| Fall time ^c | t_f | | - | 15 | 30 | |
| Drain-Source Body Diode Ratings and Characteristics ^b ($T_C = 25\text{ }^\circ\text{C}$) | | | | | | |
| Pulsed current ($t = 100\text{ }\mu\text{s}$) | I_{SM} | | - | - | 250 | A |
| Forward voltage ^a | V_{SD} | $I_F = 10\text{ A}, V_{GS} = 0\text{ V}$ | - | 0.75 | 1.5 | V |
| Reverse recovery time | t_{rr} | $I_F = 33.3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | - | 80 | 160 | ns |
| Peak reverse recovery charge | $I_{RM(REC)}$ | | - | 4 | 6 | A |
| Reverse recovery charge | Q_{rr} | | - | 0.182 | 0.275 | μC |
| Reverse recovery fall time | t_a | | - | 44 | - | ns |
| Reverse recovery rise time | t_b | | - | 36 | - | |

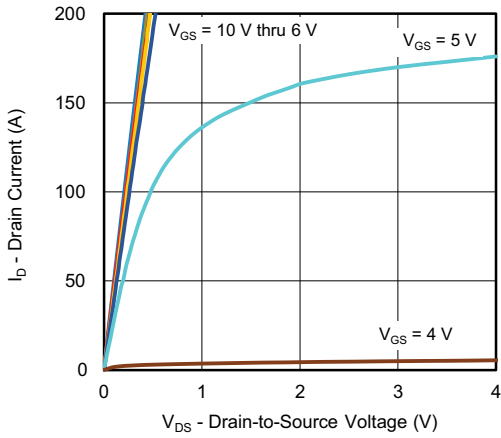
Notes

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

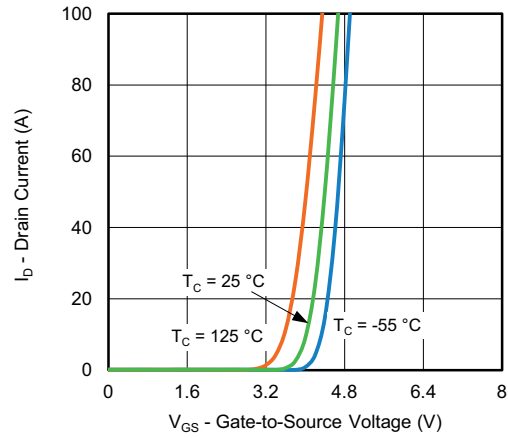
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



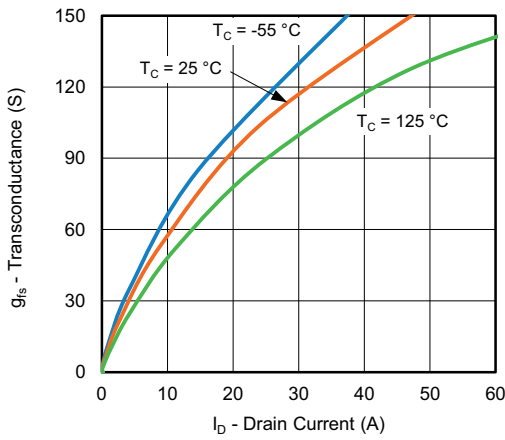
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



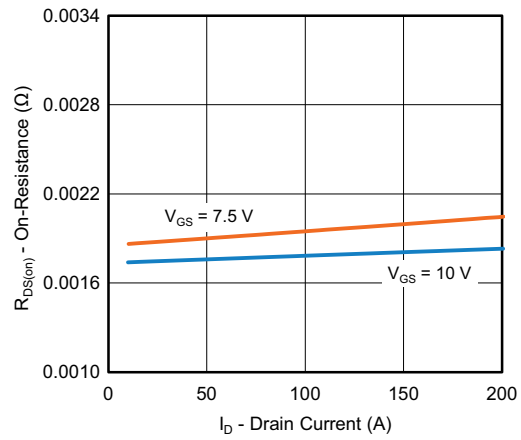
Output Characteristics



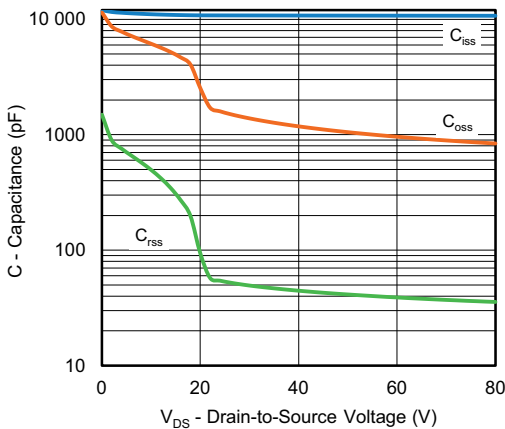
Transfer Characteristics



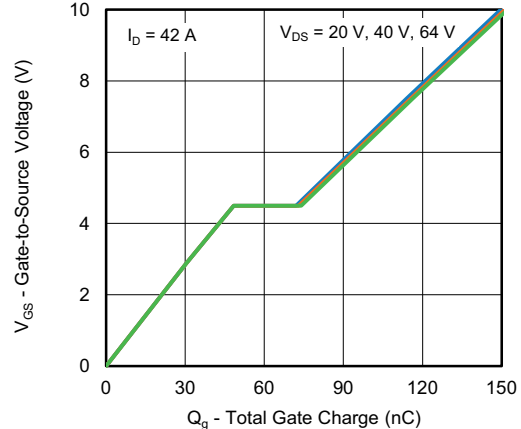
Transconductance



On-Resistance vs. Drain Current



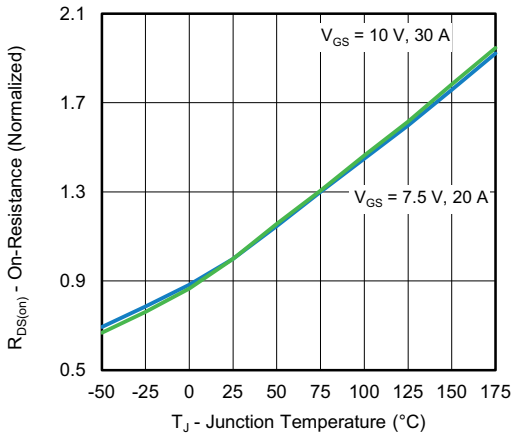
Capacitance



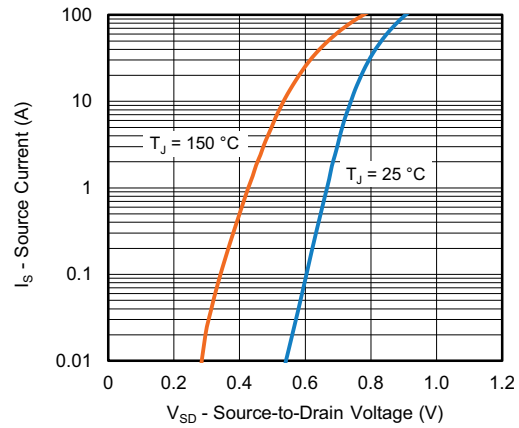
Gate Charge



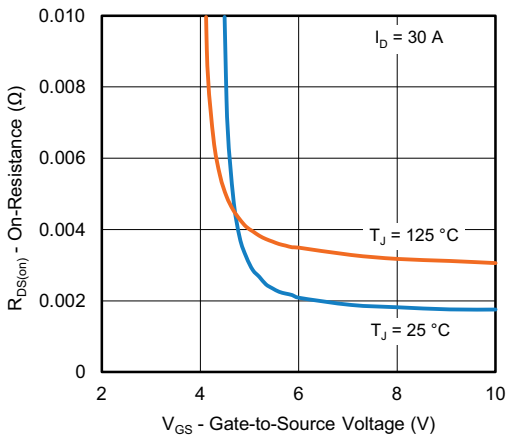
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



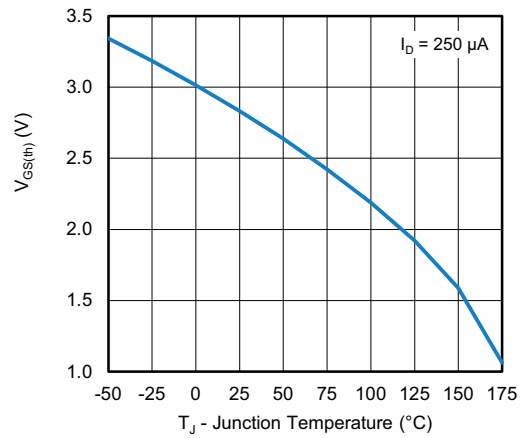
On-Resistance vs. Junction Temperature



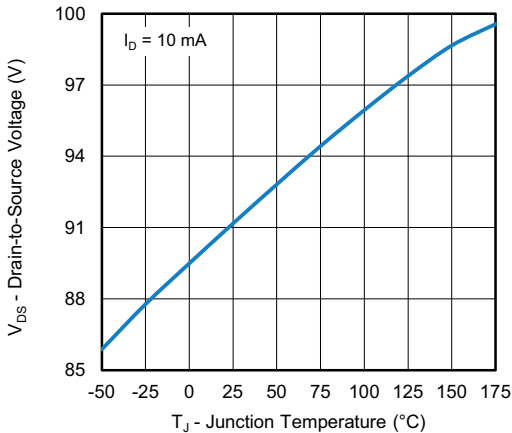
Source Drain Diode Forward Voltage



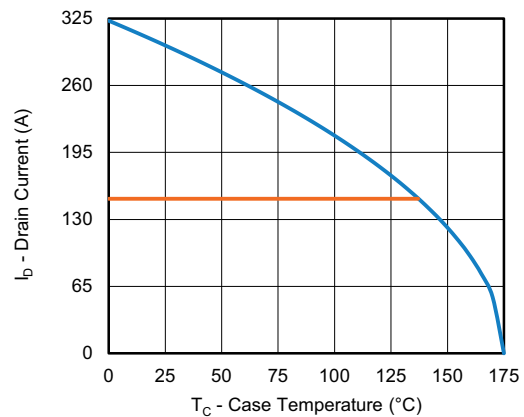
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



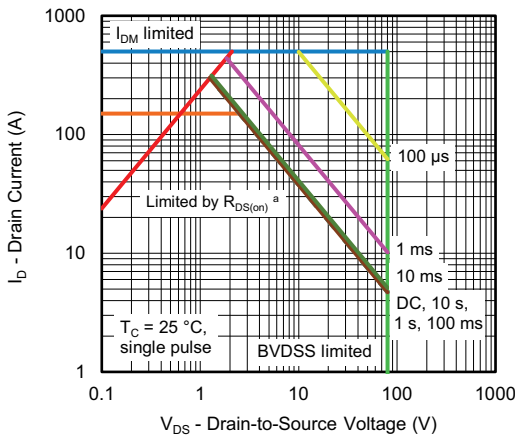
Drain Source Breakdown vs. Junction Temperature



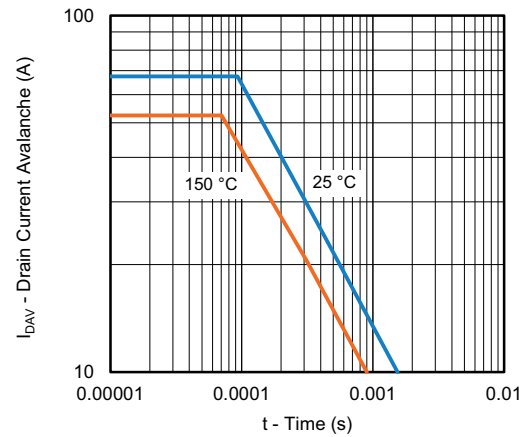
Current De-rating



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



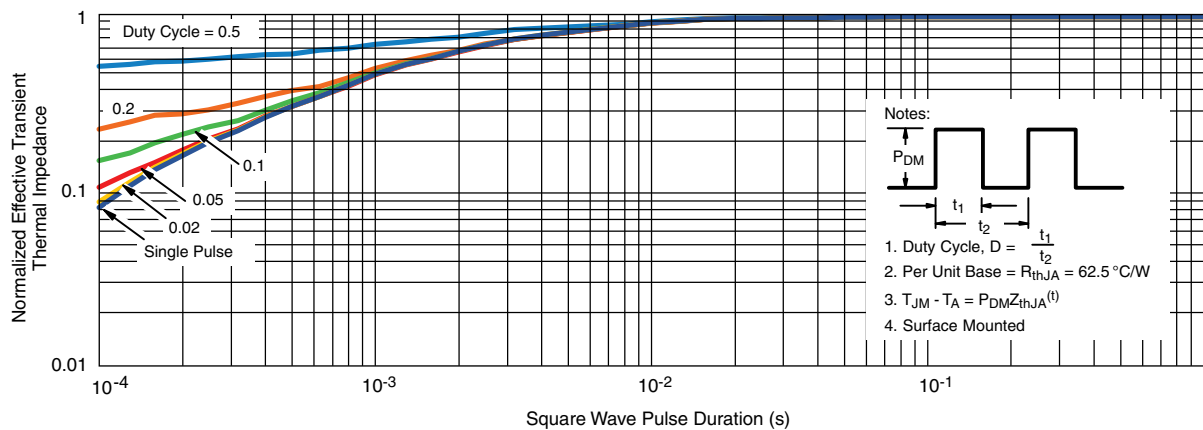
Safe Operating Area



Single Pulse Avalanche Current Capability vs. Time

Note

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



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction to Ambient ($25\text{ }^\circ\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Case ($25\text{ }^\circ\text{C}$)
- 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

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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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