

N-Channel 20-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | I_D (A) ^a |
|-------------------|----------------------------|------------------------|
| 20 | 0.0045 at $V_{GS} = 10$ V | 60 |
| | 0.0065 at $V_{GS} = 4.5$ V | 60 |

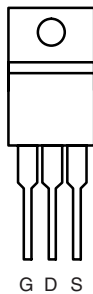
FEATURES

- TrenchFET[®] Power MOSFET
- 175 °C Junction Temperature
- 100 % R_g Tested
- 100 % UIS Tested


RoHS
COMPLIANT

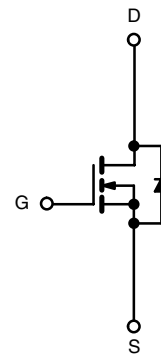
APPLICATIONS

- OR-ing

TO-220AB


Top View

DRAIN connected to TAB



N-Channel MOSFET

Ordering Information: SUP60N02-4m5P-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

| Parameter | Symbol | Limit | Unit | |
|--|----------------|----------------------------|------------------|---|
| Drain-Source Voltage | V_{DS} | 20 | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | | |
| Continuous Drain Current ($T_J = 175$ °C) | I_D | $T_C = 25$ °C | 60 ^a | A |
| | | $T_C = 100$ °C | 60 ^a | |
| Pulsed Drain Current | I_{DM} | 120 | | |
| Single Pulse Avalanche Current | I_{AS} | 50 | mJ | |
| Single Pulse Avalanche Energy | E_{AS} | 125 | | |
| Maximum Power Dissipation ^b | P_D | $T_C = 25$ °C | 120 ^c | W |
| | | $T_A = 25$ °C ^d | 3.75 | |
| 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) ^d | R_{thJA} | 40 | °C/W |
| Junction-to-Case | R_{thJC} | 1.25 | |

Notes:

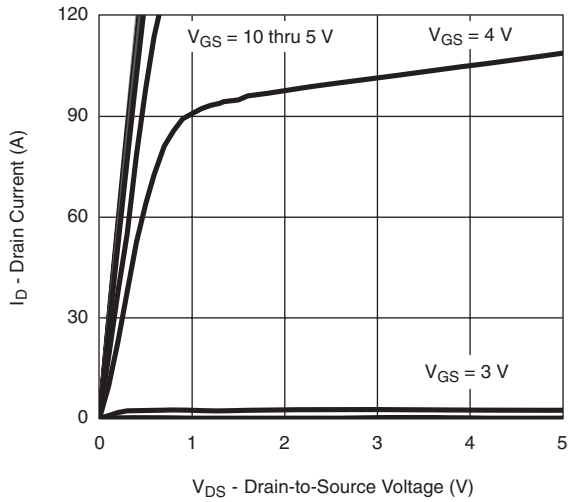
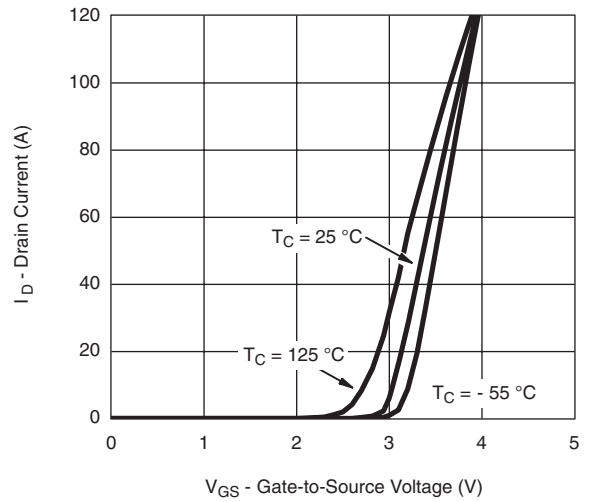
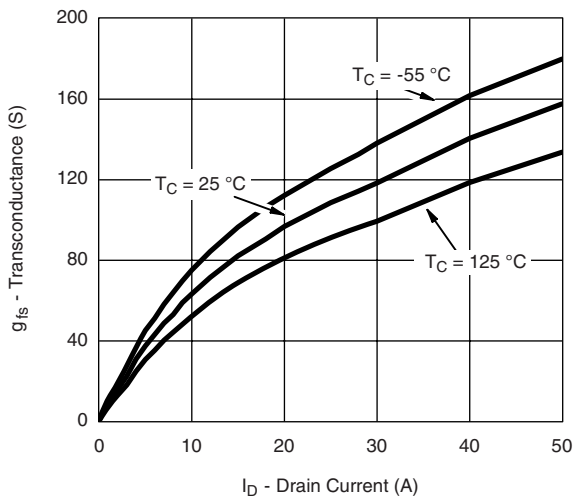
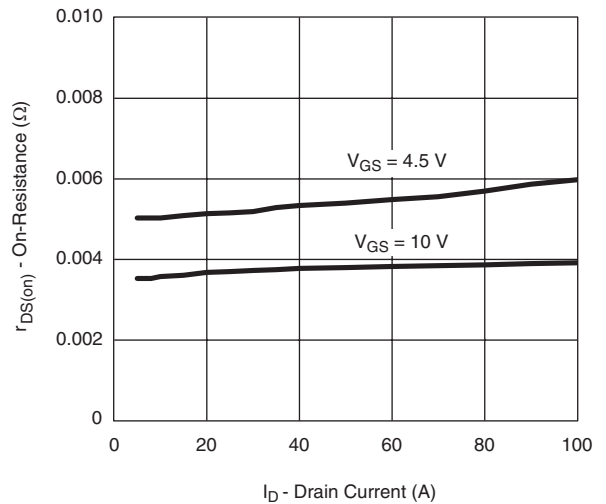
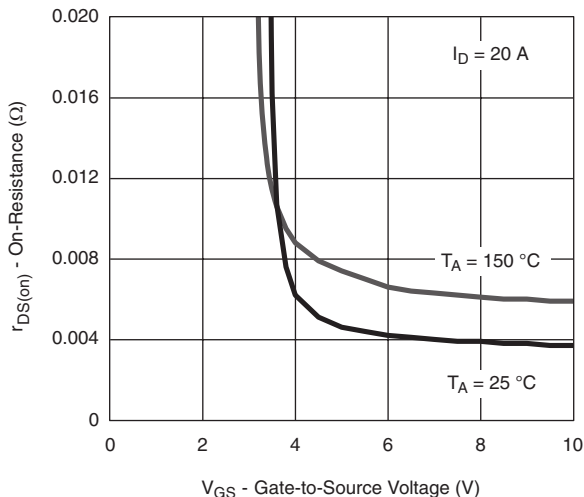
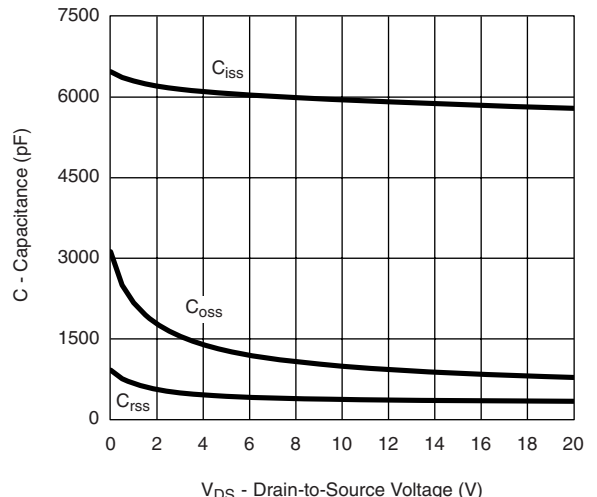
- Package limited.
- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|---|---------------|--|------|--------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 20 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 1.0 | | 3 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 50 | |
| | | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | | | 250 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | 100 | | | A |
| Drain-Source On-State Resistance ^a | $r_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 20\text{ A}$ | | 0.0036 | 0.0045 | Ω |
| | | $V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | | 0.0068 | |
| | | $V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | | | 0.008 | |
| | | $V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$ | | 0.0052 | 0.0065 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 10\text{ V}, I_D = 20\text{ A}$ | | 95 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 10\text{ V}, f = 1\text{ MHz}$ | | 5950 | | pF |
| Output Capacitance | C_{oss} | | | 985 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 365 | | |
| Total Gate Charge ^b | Q_g | $V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$ | | 33 | 50 | nC |
| Gate-Source Charge ^b | Q_{gs} | | | 18 | | |
| Gate-Drain Charge ^b | Q_{gd} | | | 7 | | |
| Gate Resistance | R_g | | 0.75 | 1.5 | 2.3 | Ω |
| Turn-On Delay Time ^b | $t_{d(on)}$ | $V_{DD} = 10\text{ V}, R_L = 0.2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1.0\text{ }\Omega$ | | 15 | 25 | ns |
| Rise Time ^b | t_r | | | 7 | 11 | |
| Turn-Off Delay Time ^b | $t_{d(off)}$ | | | 35 | 55 | |
| Fall Time ^b | t_f | | | 8 | 12 | |
| Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^\circ\text{C}$ ^c | | | | | | |
| Continuous Current | I_S | | | | 60 | A |
| Pulsed Current | I_{SM} | | | | 100 | |
| Forward Voltage ^a | V_{SD} | $I_F = 20\text{ A}, V_{GS} = 0\text{ V}$ | | 0.85 | 1.5 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 45 | 90 | ns |
| Peak Reverse Recovery Current | I_{RM} | | | 1.7 | 3.4 | A |
| Reverse Recovery Charge | Q_{rr} | | | 0.039 | 0.155 | μC |

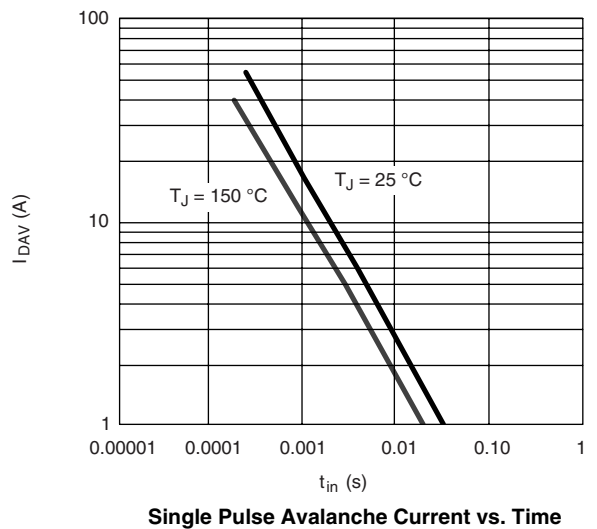
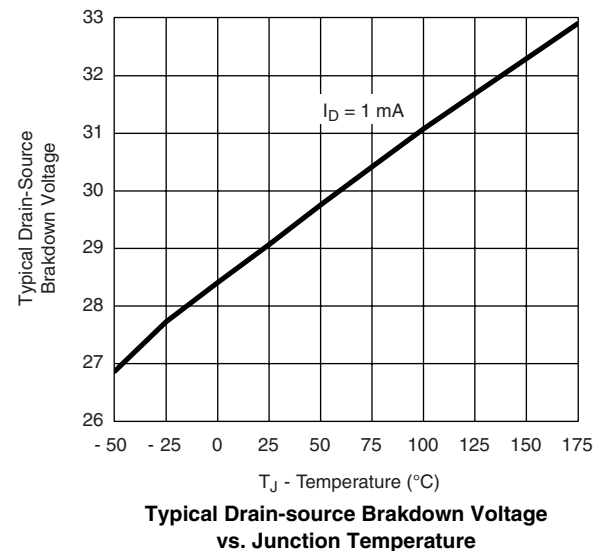
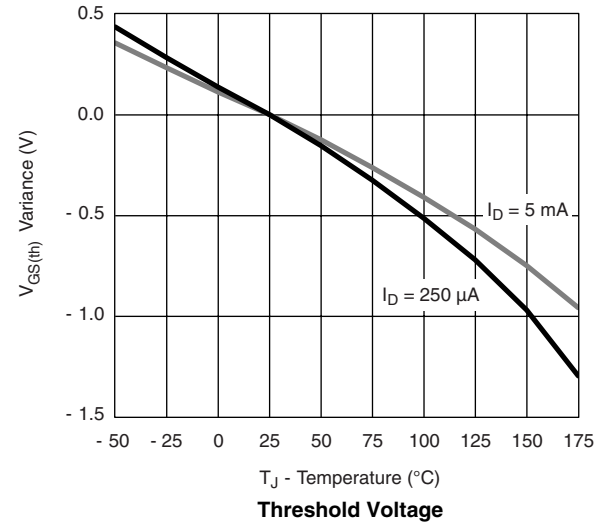
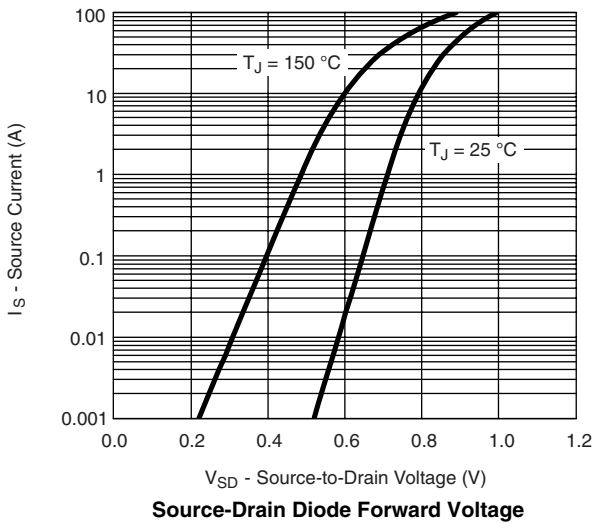
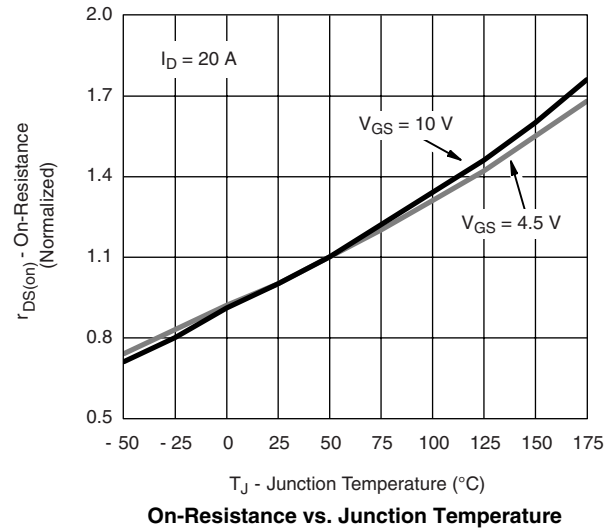
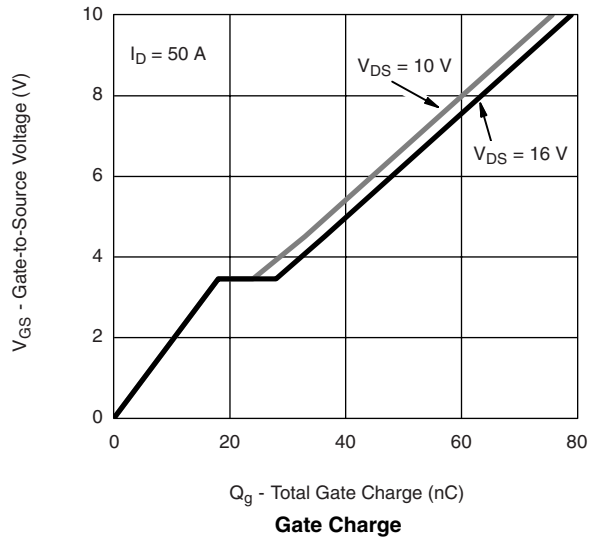
Notes:

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

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.

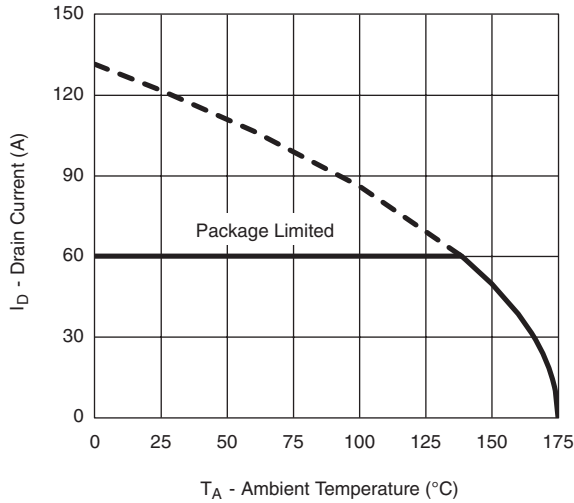
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

On-Resistance vs. Gate-to-Source Voltage

Capacitance

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

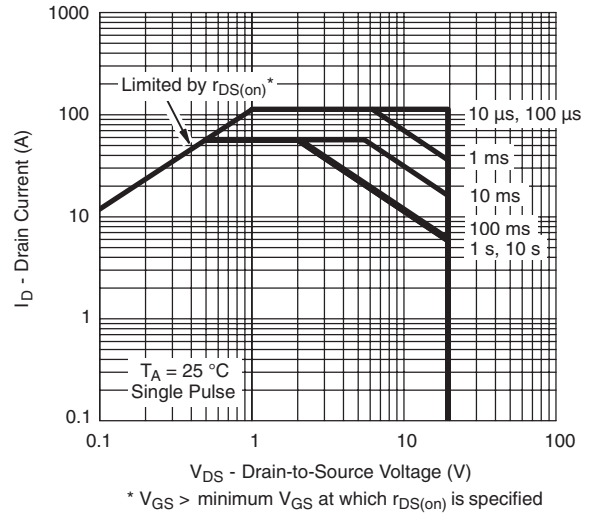




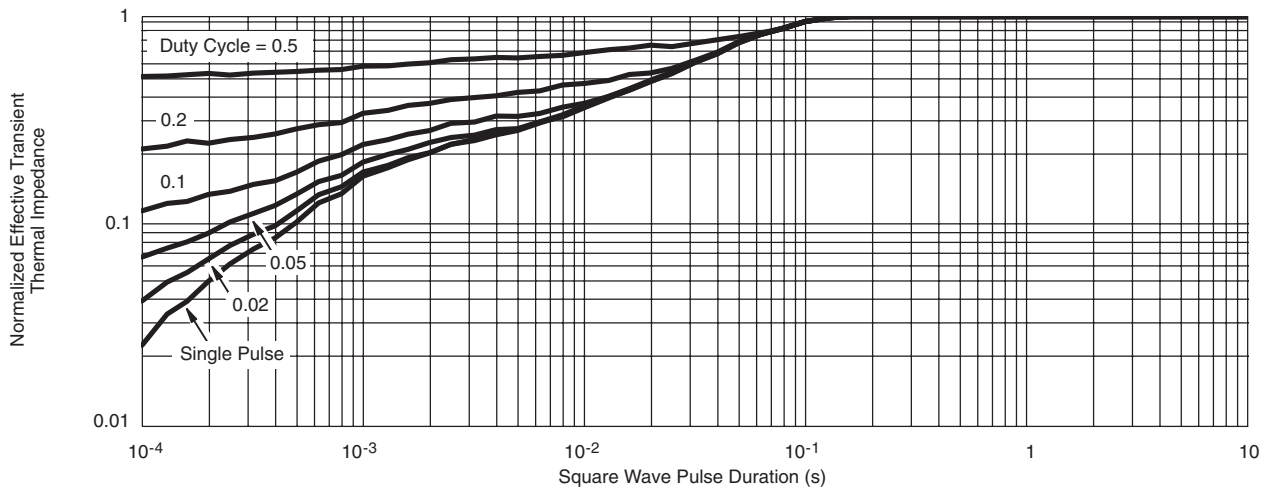
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Drain Current vs. Ambient Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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