

N-Channel 100-V (D-S) 175 °C MOSFET

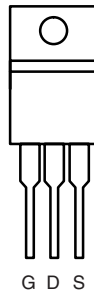
PRODUCT SUMMARY

| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | I_D (A) |
|-------------------|---------------------------|-----------|
| 100 | 0.030 at $V_{GS} = 10$ V | 40 |
| | 0.034 at $V_{GS} = 6$ V | 37.5 |

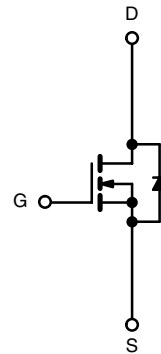
FEATURES

- TrenchFET[®] Power MOSFET
- 175 °C Junction Temperature


 Available
RoHS*
 COMPLIANT

TO-220AB


Top View



N-Channel MOSFET

Ordering Information: SUP40N10-30
 SUP40N10-30-E3 (Lead (Pb)-free)

| ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted | | | | |
|---|----------------------------|----------------|------------------|------|
| Parameter | | Symbol | Limit | Unit |
| Drain-Source Voltage | | V_{DS} | 100 | V |
| Gate-Source Voltage | | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 175$ °C) | $T_C = 25$ °C | I_D | 40 | A |
| | $T_C = 125$ °C | | 23 | |
| Pulsed Drain Current | | I_{DM} | 75 | |
| Avalanche Current | | I_{AS} | 35 | |
| Single Pulse Avalanche Energy ^a | L = 0.1 mH | E_{AS} | 61 | mJ |
| Maximum Power Dissipation ^a | $T_C = 25$ °C | P_D | 107 ^b | W |
| | $T_A = 25$ °C ^c | | 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 ^c | R_{thJA} | 40 | °C/W |
| | Free Air | | 62.5 | |
| Junction-to-Case (Drain) | | R_{thJC} | 1.4 | |

Notes:

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

* Pb containing terminations are not RoHS compliant, exemptions may apply.

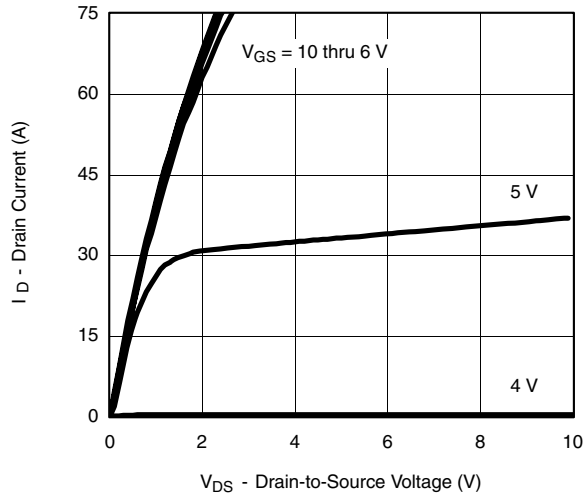
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|---|---------------|---|-----|-------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 100 | | | 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} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 50 | |
| | | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | | | 250 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | 75 | | | A |
| Drain-Source On-State Resistance ^a | $r_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$ | | 0.024 | 0.030 | Ω |
| | | $V_{GS} = 6\text{ V}, I_D = 10\text{ A}$ | | 0.026 | 0.034 | |
| | | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | | 0.054 | |
| | | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | | | 0.067 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 15\text{ A}$ | 10 | | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | | 2400 | | pF |
| Output Capacitance | C_{oss} | | | 270 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 90 | | |
| Total Gate Charge ^c | Q_g | $V_{DS} = 50\text{ V}, V_{GS} = 10\text{ V}, I_D = 40\text{ A}$ | | 35 | 60 | nC |
| Gate-Source Charge ^c | Q_{gs} | | | 11 | | |
| Gate-Drain Charge ^c | Q_{gd} | | | 9 | | |
| Gate Resistance | R_g | | | 1.7 | | Ω |
| Turn-On Delay Time ^c | $t_{d(on)}$ | $V_{DD} = 50\text{ V}, R_L = 1.25\text{ }\Omega$ $I_D \cong 40\text{ A}, V_{GEN} = 10\text{ V}, R_G = 2.5\text{ }\Omega$ | | 11 | 20 | ns |
| Rise Time ^c | t_r | | | 12 | 20 | |
| Turn-Off Delay Time ^c | $t_{d(off)}$ | | | 30 | 45 | |
| Fall Time ^c | t_f | | | 12 | 20 | |
| Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^\circ\text{C}$) ^b | | | | | | |
| Continuous Current | I_S | | | | 40 | A |
| Pulsed Current | I_{SM} | | | | 75 | |
| Forward Voltage ^a | V_{SD} | $I_F = 30\text{ A}, V_{GS} = 0\text{ V}$ | | 1.0 | 1.5 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 30\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 60 | 100 | ns |
| Peak Reverse Recovery Current | $I_{RM(REC)}$ | | | 5 | 8 | A |
| Reverse Recovery Charge | Q_{rr} | | | 0.15 | 0.4 | μC |

Notes:

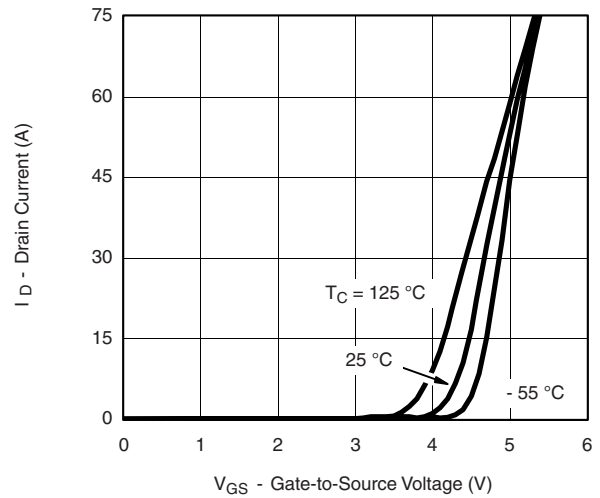
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

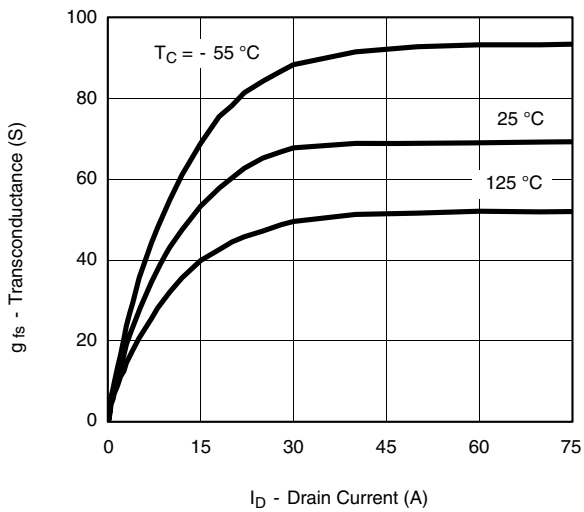
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



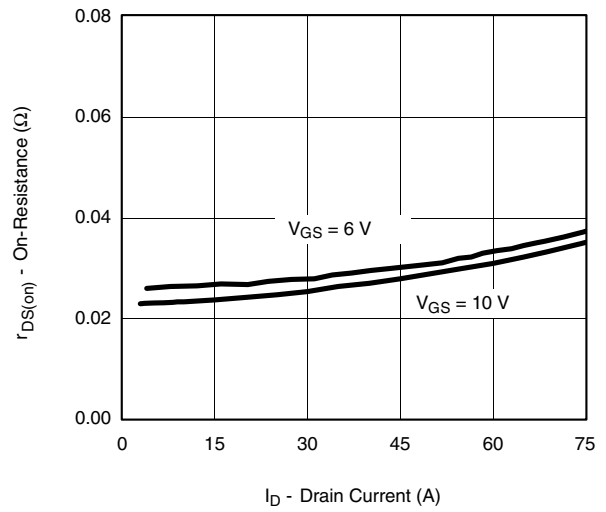
Output Characteristics



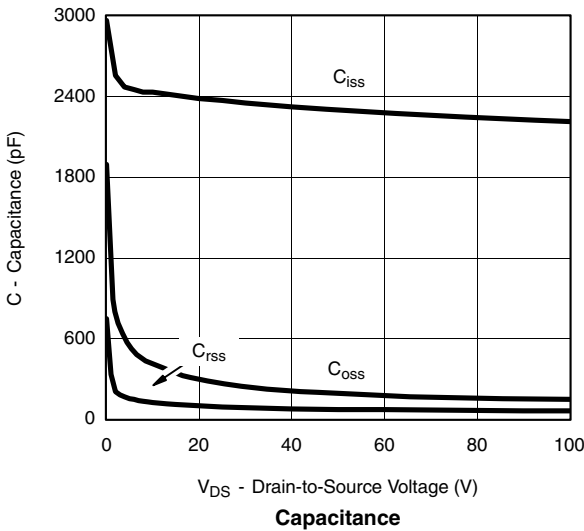
Transfer Characteristics



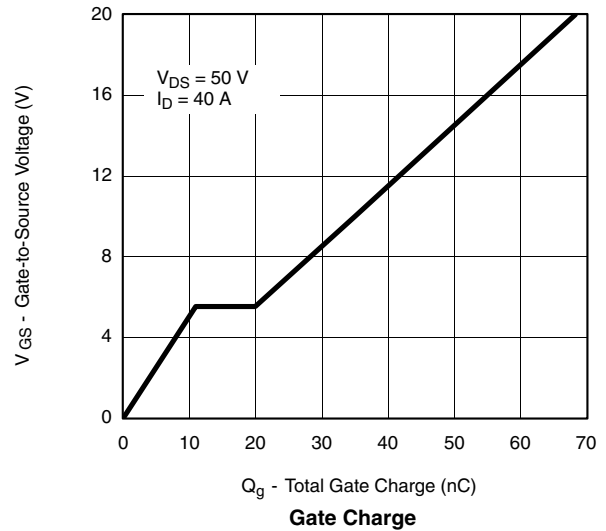
Transconductance



On-Resistance vs. Drain Current

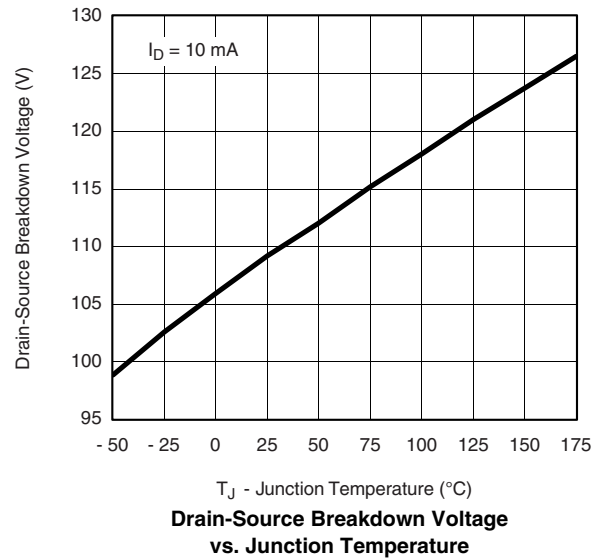
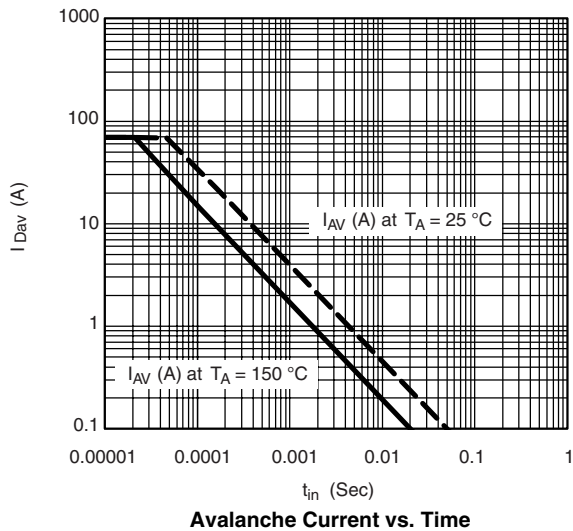
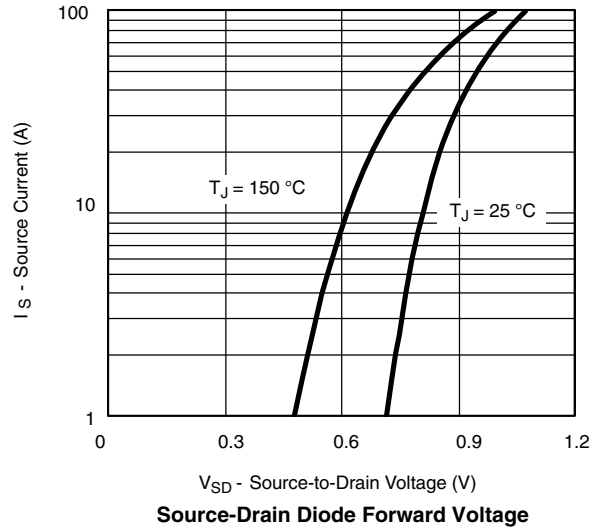
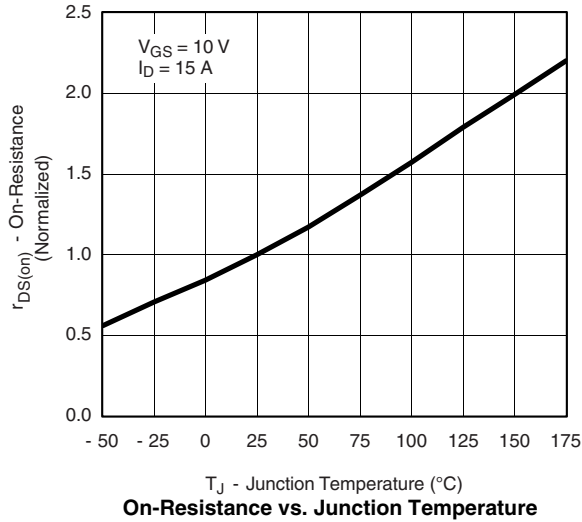


Capacitance

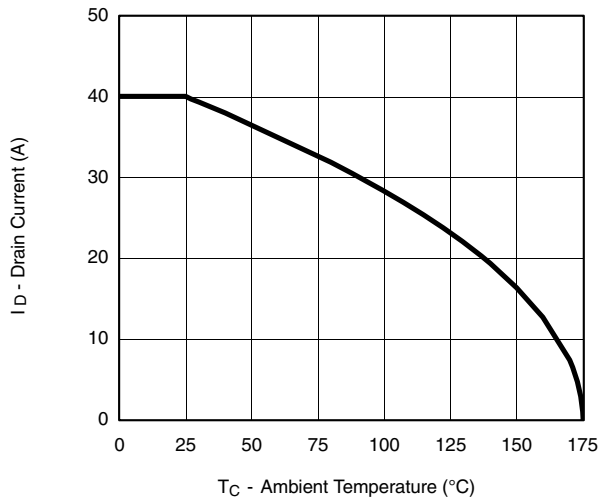


Gate Charge

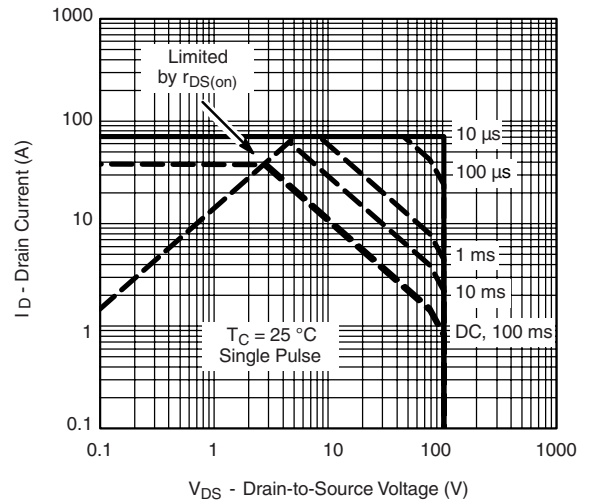
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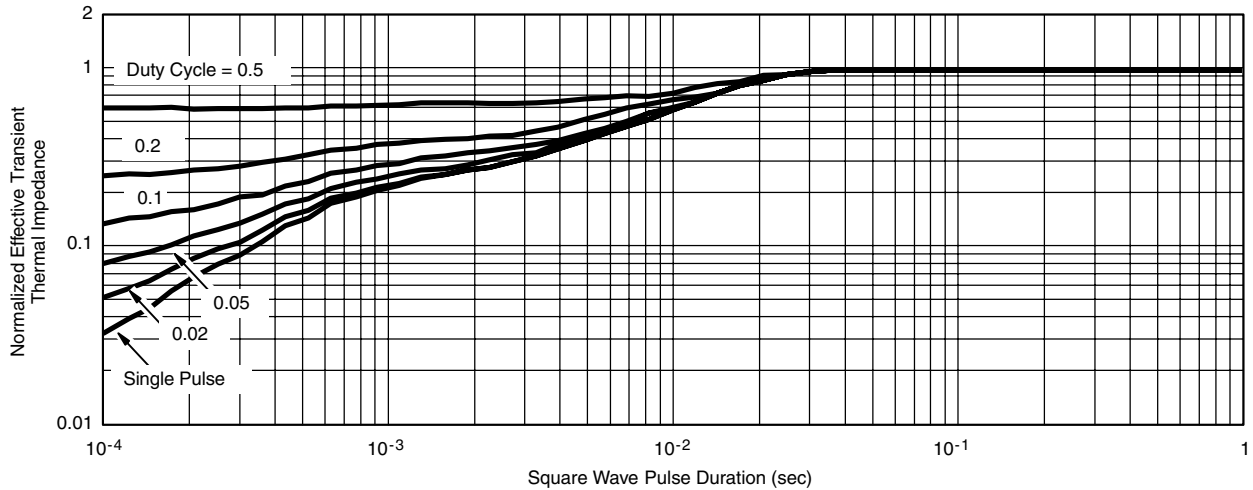
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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