# N-Channel 60-V (D-S) 175°C MOSFET

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | $r_{DS(on)}$ (Ω) | $I_D$ (A)[c] |
| 60 | 0.016 @ $V_{GS}$ = 10 V | 50 |

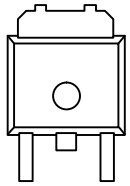
## FEATURES

- TrenchFET® Power MOSFET

## APPLICATIONS

- Automotive
  - ABS
  - EPS
  - Motor Drives
- Industrial

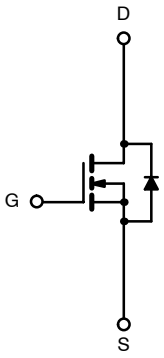
**TO-252**




Drain Connected to Tab

Top View

Ordering Information: SUD50N06-16




N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | |
|---|---|---|---|---|
| Parameter | | Symbol | Limit | Unit |
| Drain-Source Voltage | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current ($T_J$ = 175°C)[b] | $T_C$ = 25°C | $I_D$ | 50[c] | A |
| | $T_C$ = 125°C | | 28 | |
| Pulsed Drain Current | | $I_{DM}$ | 100 | |
| Continuous Source Current (Diode Conduction) | | $I_S$ | 50[c] | |
| Avalanche Current, Single Pulse | | $I_{AS}$ | 35 | |
| Avalanche Energy | L = 0.1 mH | $E_{AS}$ | 61 | mJ |
| Maximum Power Dissipation | $T_C$ = 25°C | $P_D$ | 88[b] | W |
| | $T_A$ = 25°C | | 3[a] | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55 to 175 | °C |

| THERMAL RESISTANCE RATINGS | | | | | |
|---|---|---|---|---|---|
| Parameter | | Symbol | Typical | Maximum | Unit |
| Junction-to-Ambient[a] | t ≤ 10 sec | $R_{thJA}$ | 20 | 25 | °C/W |
| | Steady State | | 40 | 50 | |
| Junction-to-Case | | $R_{thJC}$ | 1.4 | 1.7 | |

Notes
a. Surface Mounted on 1" x1" FR4 Board.
b. See SOA curve for voltage derating.
c. Calculate continuous current based on maximum allowable junction temperature when using infinite heat sink. Package limitation current is 50 A.

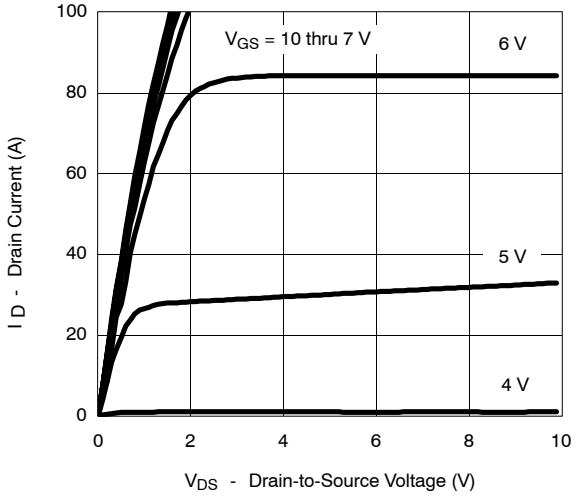
## SPECIFICATIONS ($T_J$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Condition | Min | Typ[a] | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | 2.0 | | 4.0 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 60 V, $V_{GS}$ = 0 V | | | 1 | μA |
| | | $V_{DS}$ = 60 V, $V_{GS}$ = 0 V, $T_J$ = 125°C | | | 50 | |
| | | $V_{DS}$ = 60 V, $V_{GS}$ = 0 V, $T_J$ = 175°C | | | 250 | |
| On-State Drain Current[b] | $I_{D(on)}$ | $V_{DS}$ = 5 V, $V_{GS}$ = 10 V | 50 | | | A |
| Drain-Source On-State Resistance[b] | $r_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 20 A | | 0.0128 | 0.016 | Ω |
| | | $V_{GS}$ = 10 V, $I_D$ = 20 A, $T_J$ = 125°C | | | 0.027 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 20 A, $T_J$ = 175°C | | | 0.032 | |
| Forward Transconductance[b] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 20 A | | 20 | | S |
| **Dynamic[a]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, F = 1 MHz | | 2100 | | pF |
| Output Capacitance | $C_{oss}$ | | | 300 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 125 | | |
| Gate Resistance | $R_g$ | f = 1 MHz | | 1.7 | | Ω |
| Total Gate Charge[c] | $Q_g$ | $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 50 A | | 30 | 45 | nC |
| Gate-Source Charge[c] | $Q_{gs}$ | | | 11 | | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | 8 | | |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = 30 V, $R_L$ = 0.6 Ω<br>$I_D$ ≅ 50 A, $V_{GEN}$ = 10 V, $R_G$ = 2.5 Ω | | 10 | 15 | ns |
| Rise Time[c] | $t_r$ | | | 12 | 20 | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | 20 | 30 | |
| Fall Time[c] | $t_f$ | | | 10 | 15 | |
| **Source-Drain Diode Ratings and Characteristic ($T_C$ = 25°C)** | | | | | | |
| Pulsed Current | $I_{SM}$ | | | | 100 | A |
| Diode Forward Voltage[b] | $V_{SD}$ | $I_F$ = 30 A, $V_{GS}$ = 0 V | | 1.0 | 1.5 | V |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F$ = 50 A, di/dt = 100 A/μs | | 50 | 85 | ns |

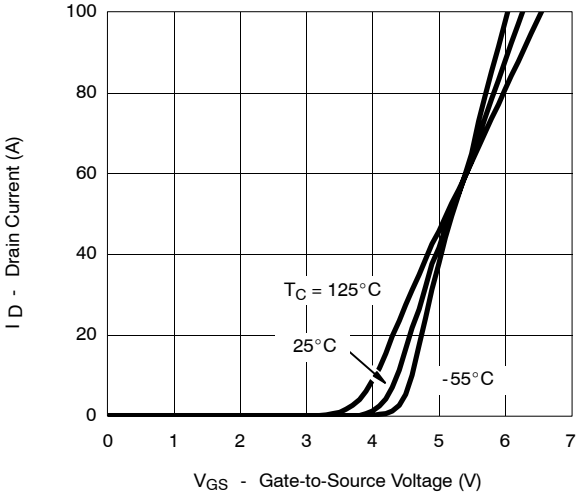
Notes
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
c. Independent of operating temperature.

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

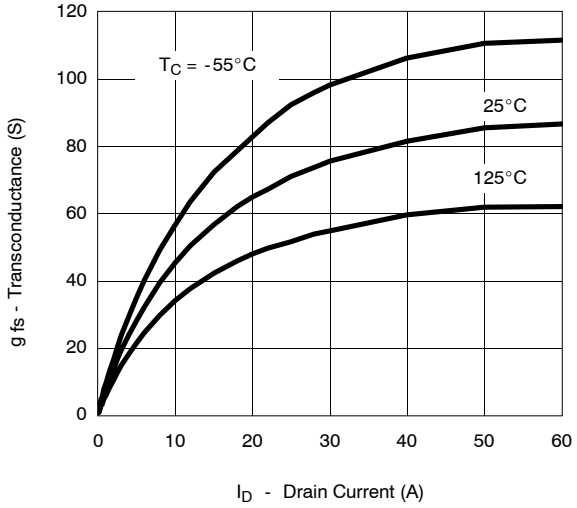
**Output Characteristics**



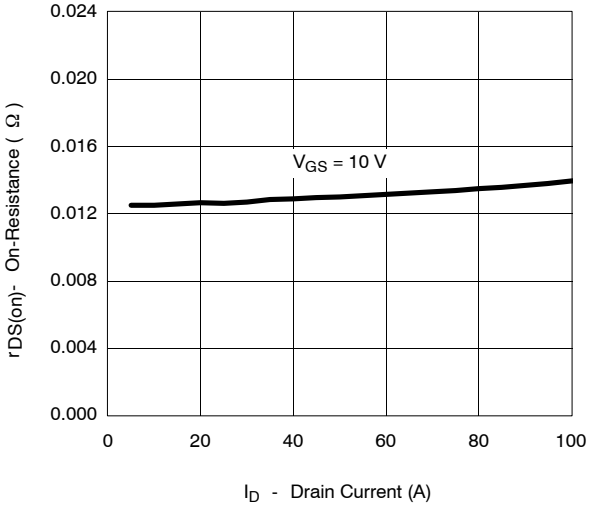

**Transfer Characteristics**



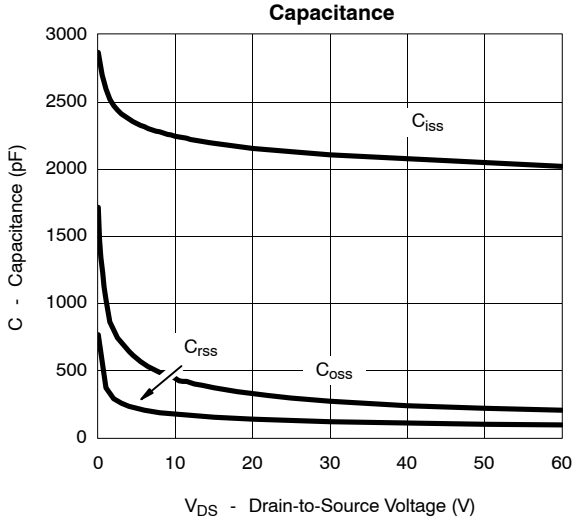

**Transconductance**



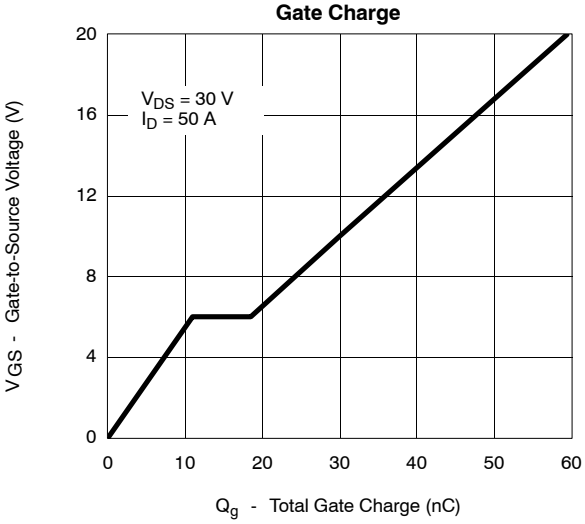

**On-Resistance vs. Drain Current**




**Capacitance**

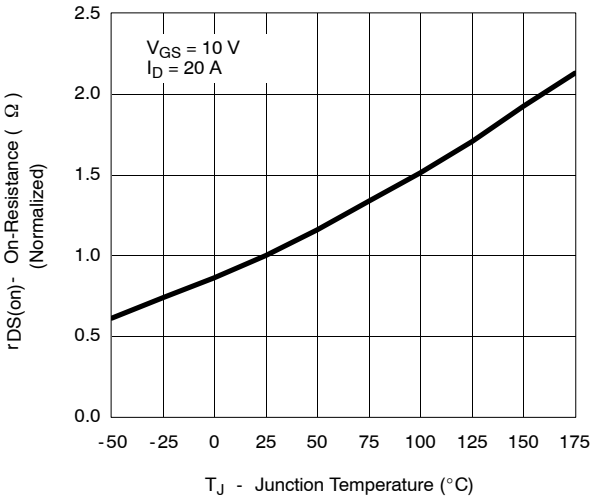



**Gate Charge**

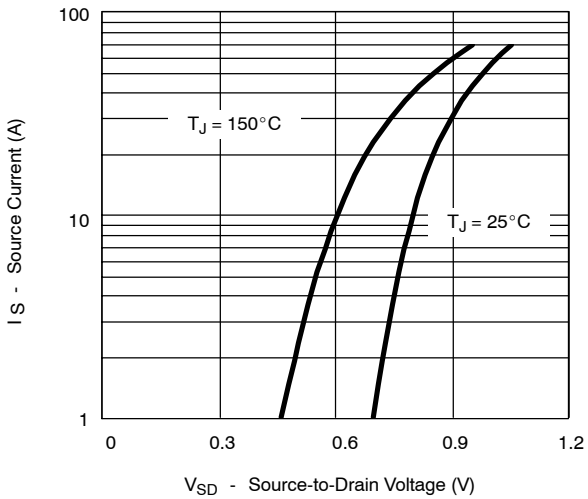


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**On-Resistance vs. Junction Temperature**

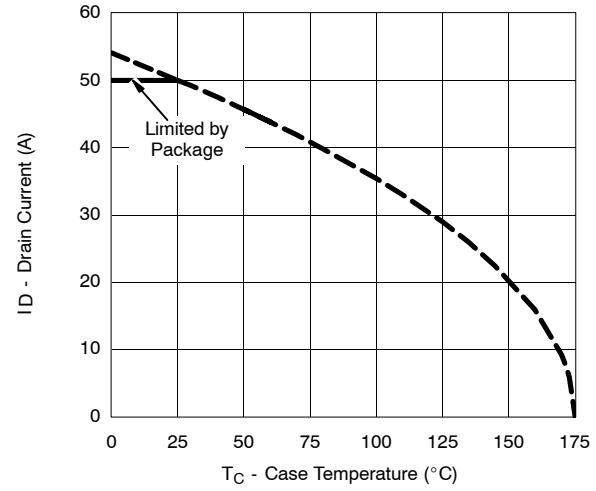



**Source-Drain Diode Forward Voltage**

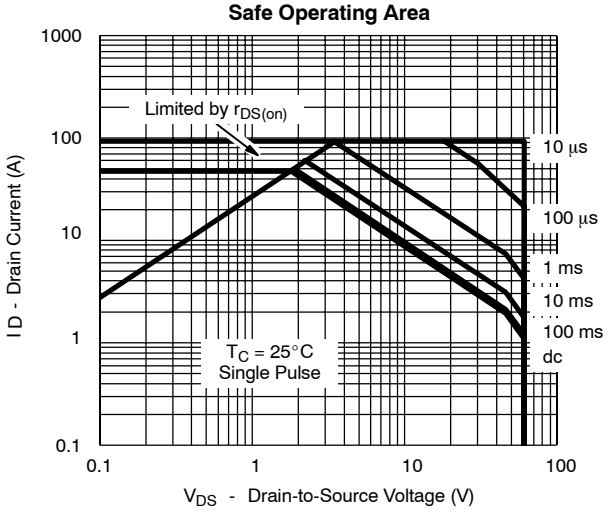



## THERMAL RATINGS

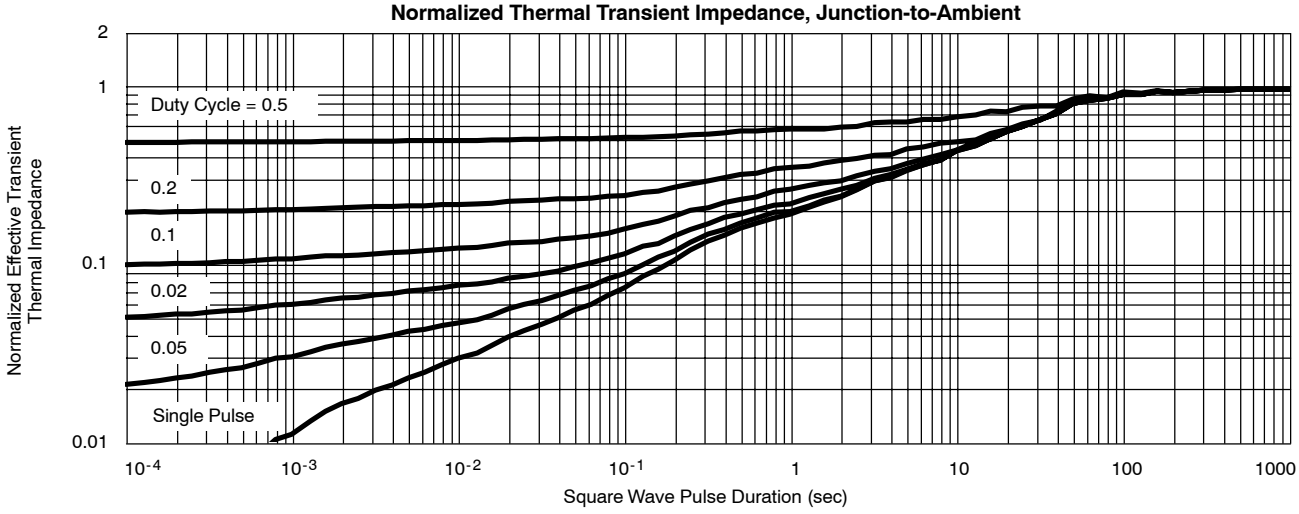
**Maximum Avalanche Drain Current vs. Case Temperature**




**Safe Operating Area**




**Normalized Thermal Transient Impedance, Junction-to-Ambient**



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