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VISHAY

# SUD50N03-09P

**Vishay Siliconix**

# N-Channel 30-V (D-S) MOSFET

## PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ (Ω) | $I_D$ (A)[b] |
|---|---|---|
| 30 | 0.0095 @ $V_{GS}$ = 10 V | 63[b] |
| | 0.014 @ $V_{GS}$ = 4.5 V | 52[b] |

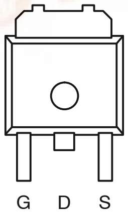
## FEATURES

- TrenchFET® Power MOSFET
- Optimized for High- or Low-Side
- 100% $R_g$ Tested

## APPLICATIONS

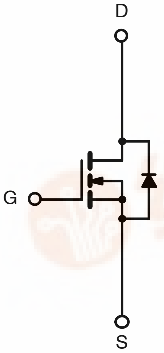
- DC/DC Converters
- Synchronous Rectifiers

TO-252



Drain Connected to Tab

Top View



N-Channel MOSFET

Ordering Information: SUD50N03-09P
SUD50N03-09P—E3 (Lead Free)

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current[a] | $T_C$ = 25°C | $I_D$ | 63[b] | A |
| | $T_C$ = 100°C | | 44.5[b] | |
| Pulsed Drain Current | | $I_{DM}$ | 50 | |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | 10 | |
| Avalanche Current | L = 0.1 mH | $I_{AS}$ | 35 | |
| Single Pulse Avalanche Energy | | $E_{AS}$ | 61 | mJ |
| Maximum Power Dissipation | $T_C$ = 25°C | $P_D$ | 65.2 | W |
| | $T_A$ = 25°C | | 7.5[a] | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | –55 to 175 | °C |

## THERMAL RESISTANCE RATINGS

| Parameter | | Symbol | Typical | Maximum | Unit |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient[a] | t ≤ 10 sec | $R_{thJA}$ | 16 | 20 | °C/W |
| | Steady State | | 40 | 50 | |
| Maximum Junction-to-Case | | $R_{thJC}$ | 1.8 | 2.3 | |

Notes
a. Surface Mounted on FR4 Board, t ≤ 10 sec.
b. Based on maximum allowable Junction Temperature, package limitation current is 50 A.

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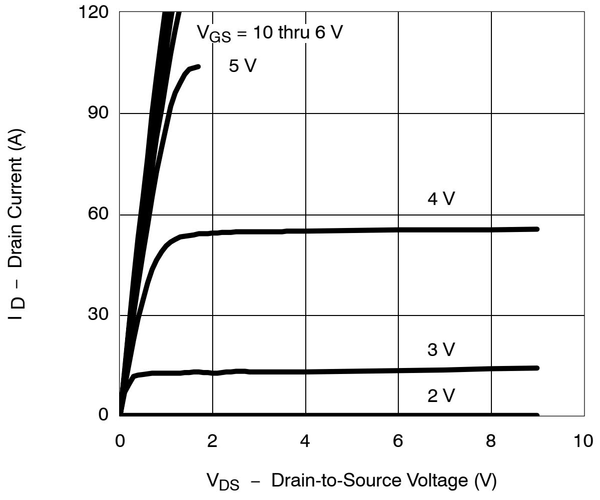
## SPECIFICATIONS ($T_J$ = 25°C UNLESS OTHERWISE NOTED)

| 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 | 30 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 1.0 | | 3.0 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V | | | 1 | µA |
| | | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V, $T_J$ = 125°C | | | 50 | |
| 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 | | 0.0076 | 0.0095 | Ω |
| | | $V_{GS}$ = 10 V, $I_D$ = 20 A, $T_J$ = 125°C | | | 0.015 | |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 20 A | | 0.0115 | 0.014 | |
| 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 | | 2200 | | pF |
| Output Capacitance | $C_{oss}$ | | | 410 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 180 | | |
| Total Gate Charge[c] | $Q_g$ | $V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_D$ = 50 A | | 11 | 16 | nC |
| Gate-Source Charge[c] | $Q_{gs}$ | | | 7.5 | | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | 5.0 | | |
| Gate Resistance | $R_g$ | | 0.5 | 1.5 | 2.1 | Ω |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = 15 V, $R_L$ = 0.3 Ω<br>$I_D$ ≅ 50 A, $V_{GEN}$ = 10 V, $R_g$ = 2.5 Ω | | 9 | 15 | ns |
| Rise Time[c] | $t_r$ | | | 80 | 120 | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | 22 | 35 | |
| Fall Time[c] | $t_f$ | | | 8 | 12 | |
| **Source-Drain Diode Ratings and Characteristic ($T_C$ = 25°C)** | | | | | | |
| Pulsed Current | $I_{SM}$ | | | | 100 | A |
| Diode Forward Voltage[b] | $V_{SD}$ | $I_F$ = 50 A, $V_{GS}$ = 0 V | | 1.2 | 1.5 | V |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F$ = 50 A, di/dt = 100 A/µs | | 35 | 70 | ns |

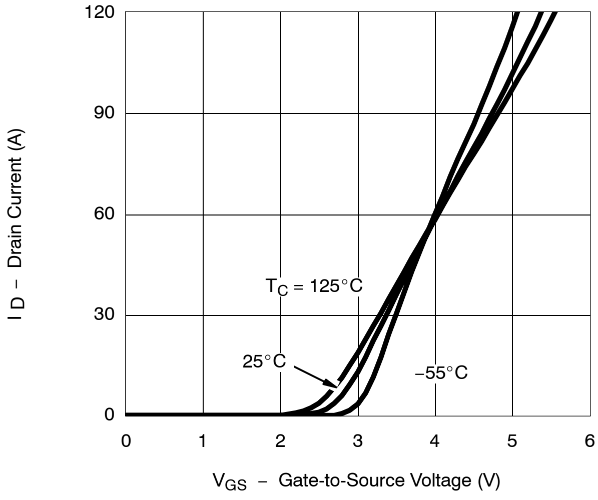
Notes
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
c. Independent of operating temperature.

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**Output Characteristics**

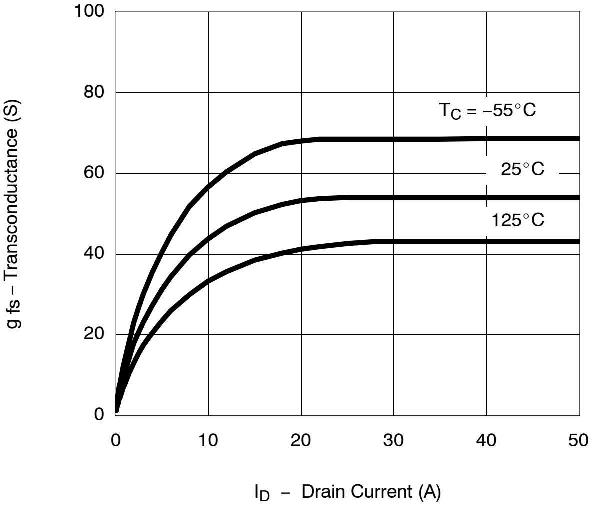


**Transfer Characteristics**

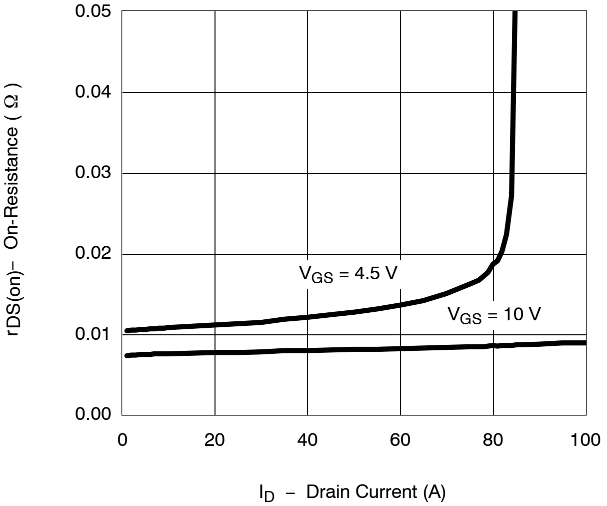


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

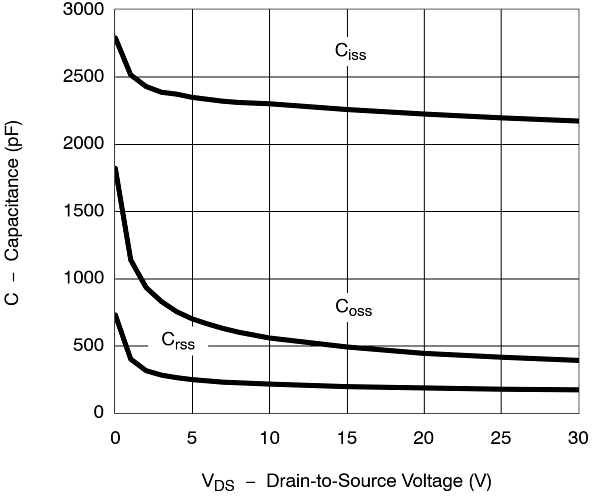
**Transconductance**



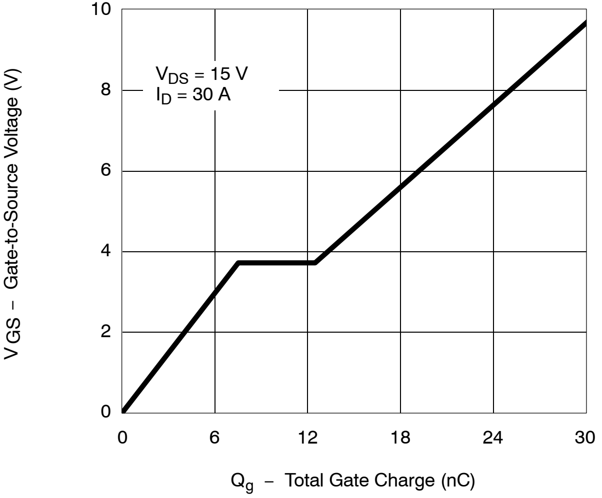
**On-Resistance vs. Drain Current**



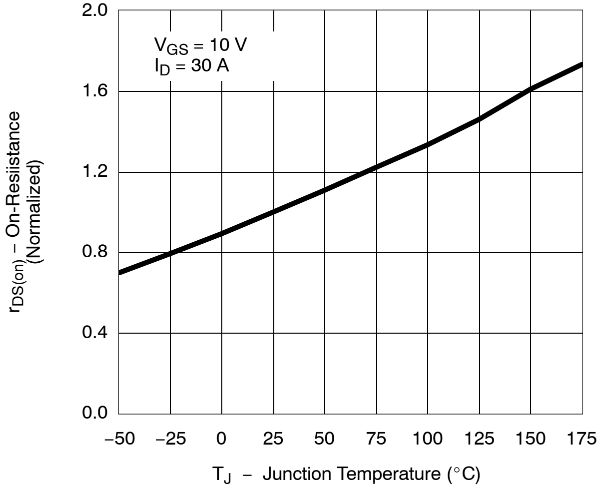
**Capacitance**



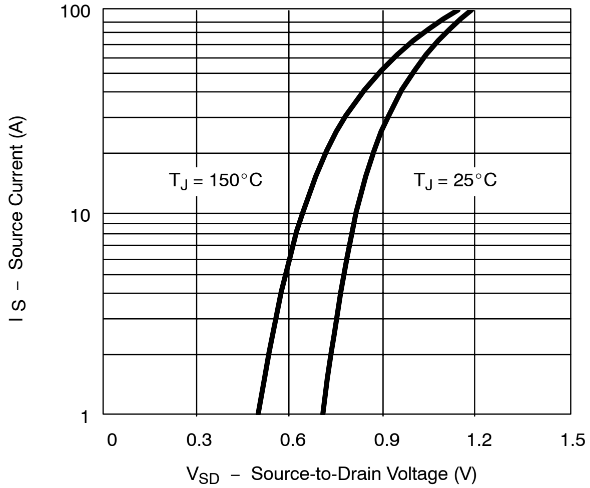
**Gate Charge**



**On-Resistance vs. Junction Temperature**

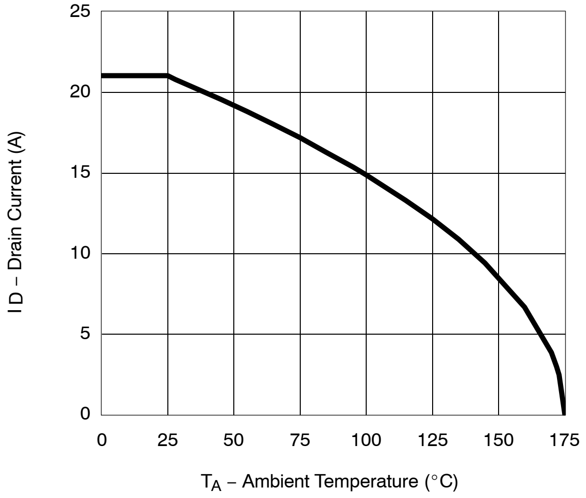


**Source-Drain Diode Forward Voltage**

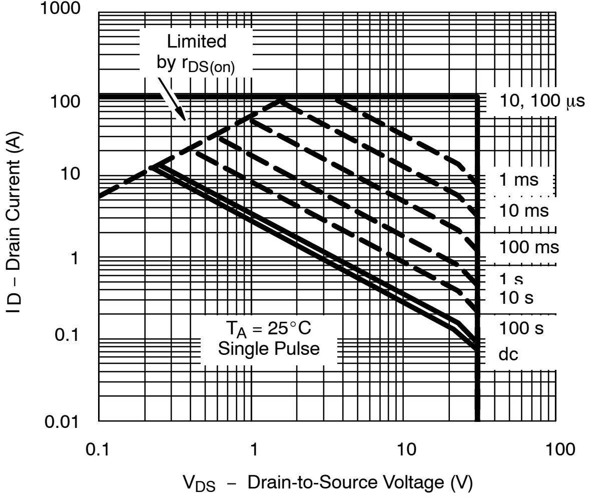


## THERMAL RATINGS

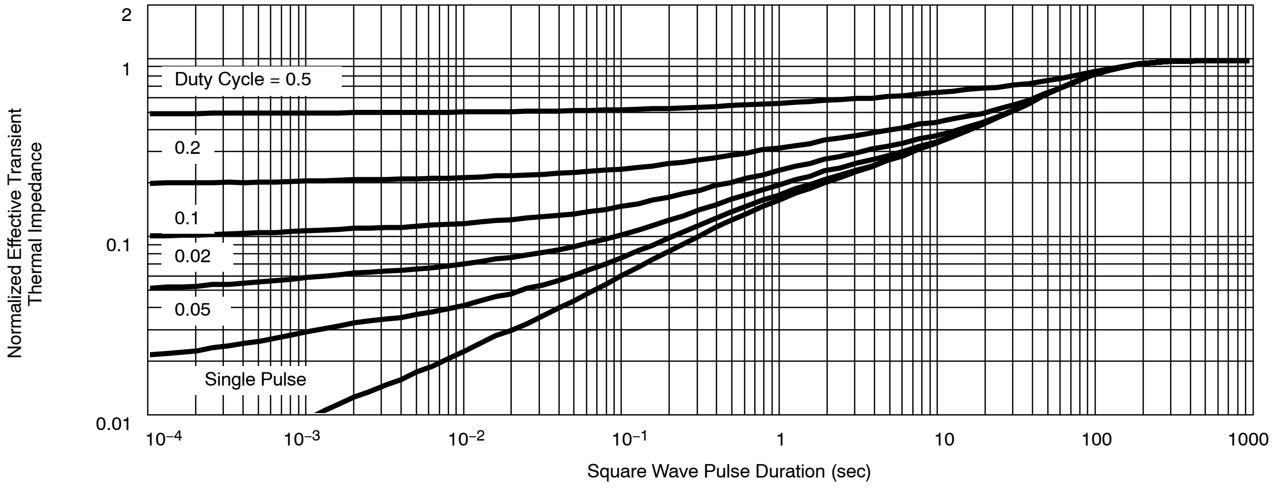
**Maximum Drain Current vs. Ambiemt Temperature**



**Safe Operating Area**



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



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