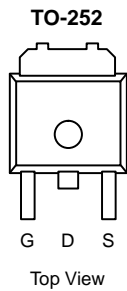




## N-Channel 40-V (D-S) 175°C MOSFET

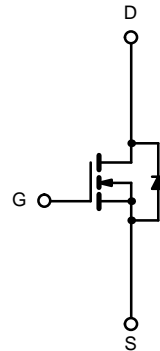
| PRODUCT SUMMARY |                           |           |
|-----------------|---------------------------|-----------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
| 40              | 0.025 @ $V_{GS} = 10$ V   | 25        |
|                 | 0.040 @ $V_{GS} = 4.5$ V  | 20        |

**175°C Rated**  
Maximum Junction Temperature  
**TrenchFET®**  
Power MOSFETs



Order Number:  
SUD25N04-25

Drain Connected to Tab



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                          |                           |                  |
|---|--------------------------|---------------------------|------------------|
| Parameter   | Symbol                   | Limit                     | Unit             |
| Drain-Source Voltage  | $V_{DS}$                 | 40                        | V                |
| Gate-Source Voltage   | $V_{GS}$                 | $\pm 20$                  |                  |
| Continuous Drain Current ( $T_J = 175^\circ\text{C}$ ) <sup>b</sup>         | $I_D$                    | $T_C = 25^\circ\text{C}$  | A                |
|   |                          | $T_C = 125^\circ\text{C}$ |                  |
| Pulsed Drain Current  | $I_{DM}$                 | 50                        |                  |
| Continuous Source Current (Diode Conduction) <sup>b</sup>                   | $I_S$                    | 50                        |                  |
| Avalanche Current   | $I_{AR}$                 | 25                        | mJ               |
| Repetitive Avalanche Energy (Duty Cycle $\leq 1\%$ )                        | $L = 0.1$ mH<br>$E_{AR}$ | 31                        |                  |
| Maximum Power Dissipation   | $P_D$                    | $T_C = 25^\circ\text{C}$  | W                |
|   |                          | $T_A = 25^\circ\text{C}$  |                  |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{stg}$           | -55 to 175                | $^\circ\text{C}$ |

| THERMAL RESISTANCE RATINGS       |            |                 |         |      |                           |
|----------------------------------|------------|-----------------|---------|------|---------------------------|
| Parameter                        | Symbol     | Typical         | Maximum | Unit |                           |
| Junction-to-Ambient <sup>b</sup> | $R_{thJA}$ | $t \leq 10$ sec | 20      | 25   | $^\circ\text{C}/\text{W}$ |
|                                  |            | Steady State    | 40      | 50   |                           |
| Junction-to-Case                 | $R_{thJC}$ | 3.7             | 4.5     |      |                           |

Notes

- a. Surface Mounted on 1" x 1" FR4 Board.
- b. See SOA curve for voltage derating.



| SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)               |                      |  |     |                  |       |      |
|--|----------------------|--|-----|------------------|-------|------|
| Parameter  | Symbol               | Test Condition   | Min | Typ <sup>a</sup> | Max   | Unit |
| <b>Static</b>  |                      |  |     |                  |       |      |
| Drain-Source Breakdown Voltage   | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA   | 40  |                  |       | V    |
| Gate Threshold Voltage   | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA  | 1.0 | 2.0              | 3.0   |      |
| Gate-Body Leakage  | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V   |     |                  | ±100  | nA   |
| Zero Gate Voltage Drain Current  | I <sub>DSS</sub>     | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V  |     |                  | 1     | μA   |
|  |                      | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C   |     |                  | 50    |      |
|  |                      | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C   |     |                  | 150   |      |
| On-State Drain Current <sup>b</sup>  | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V  | 50  |                  |       | A    |
| Drain-Source On-State Resistance <sup>b</sup>                                | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A  |     | 0.02             | 0.025 | Ω    |
|  |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A, T <sub>J</sub> = 125 °C   |     |                  | 0.040 |      |
|  |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A, T <sub>J</sub> = 175 °C   |     |                  | 0.053 |      |
|  |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A   |     | 0.031            | 0.040 |      |
| Forward Transconductance <sup>b</sup>  | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 25 A  |     | 15               |       | S    |
| <b>Dynamic<sup>a</sup></b>   |                      |  |     |                  |       |      |
| Input Capacitance  | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, F = 1 MHz   |     | 510              |       | pF   |
| Output Capacitance   | C <sub>oss</sub>     |  |     | 125              |       |      |
| Reverse Transfer Capacitance   | C <sub>rss</sub>     |  |     | 65               |       |      |
| Total Gate Charge <sup>c</sup>   | Q <sub>g</sub>       | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A  |     | 13               | 20    | nC   |
| Gate-Source Charge <sup>c</sup>  | Q <sub>gs</sub>      |  |     | 2.5              |       |      |
| Gate-Drain Charge <sup>c</sup>   | Q <sub>gd</sub>      |  |     | 3                |       |      |
| Turn-On Delay Time <sup>c</sup>  | t <sub>d(on)</sub>   | V <sub>DD</sub> = 20 V, R <sub>L</sub> = 0.8 Ω<br>I <sub>D</sub> ≅ 25 A, V <sub>GEN</sub> = 10 V, R <sub>G</sub> = 2.5 Ω |     | 5                | 10    | ns   |
| Rise Time <sup>c</sup>   | t <sub>r</sub>       |  |     | 47               | 70    |      |
| Turn-Off Delay Time <sup>c</sup>   | t <sub>d(off)</sub>  |  |     | 12               | 20    |      |
| Fall Time <sup>c</sup>   | t <sub>f</sub>       |  |     | 3                | 6     |      |
| <b>Source-Drain Diode Ratings and Characteristic (T<sub>C</sub> = 25 °C)</b> |                      |  |     |                  |       |      |
| Pulsed Current   | I <sub>SM</sub>      |  |     |                  | 50    | A    |
| Diode Forward Voltage <sup>b</sup>   | V <sub>SD</sub>      | I <sub>F</sub> = 25 A, V <sub>GS</sub> = 0 V   |     | 1.1              | 1.3   | V    |
| Source-Drain Reverse Recovery Time   | t <sub>rr</sub>      | I <sub>F</sub> = 25 A, di/dt = 100 A/μs  |     | 17               | 30    | ns   |

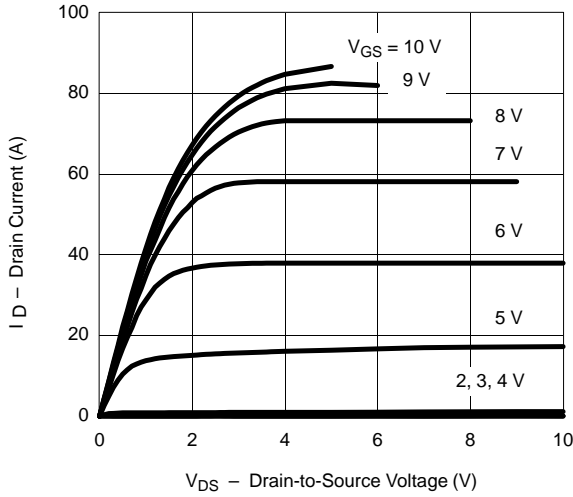
## Notes

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

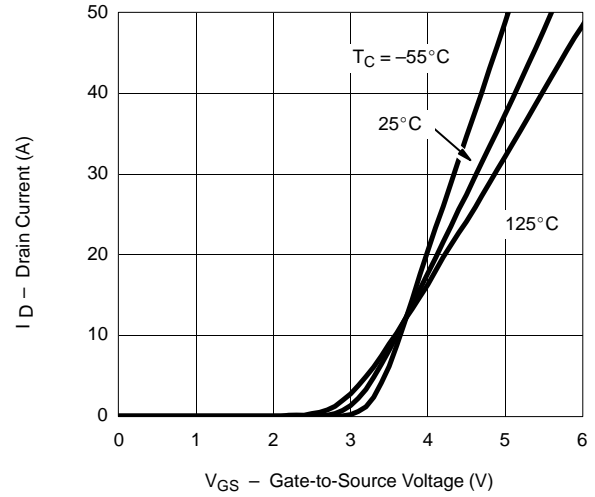


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

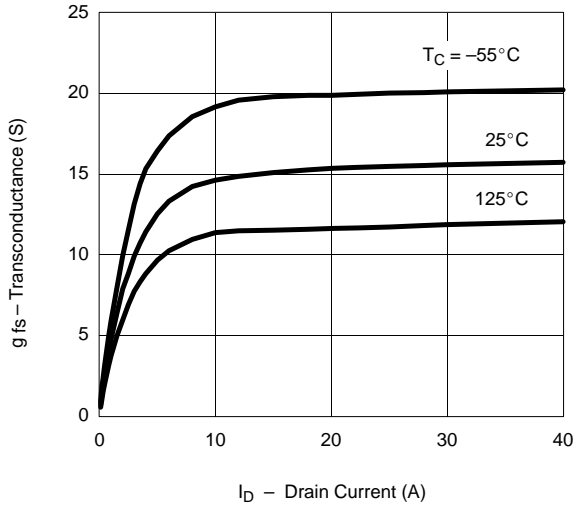
**Output Characteristics**



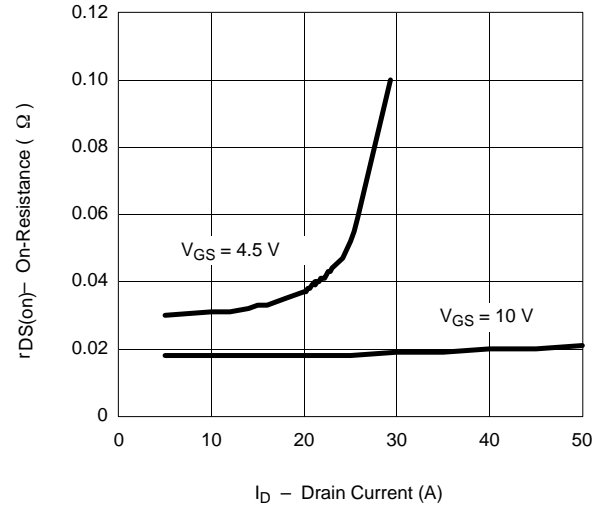
**Transfer Characteristics**



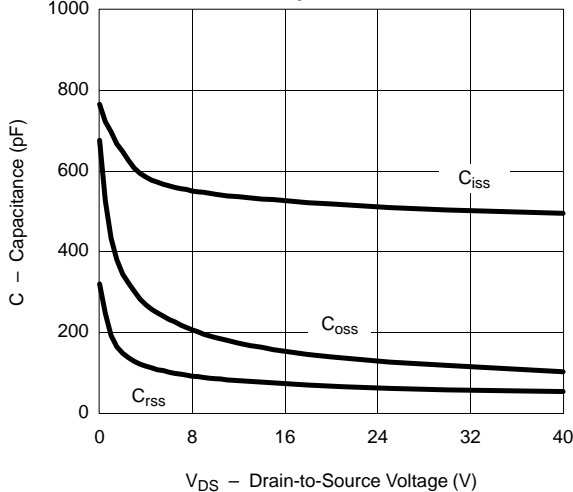
**Transconductance**



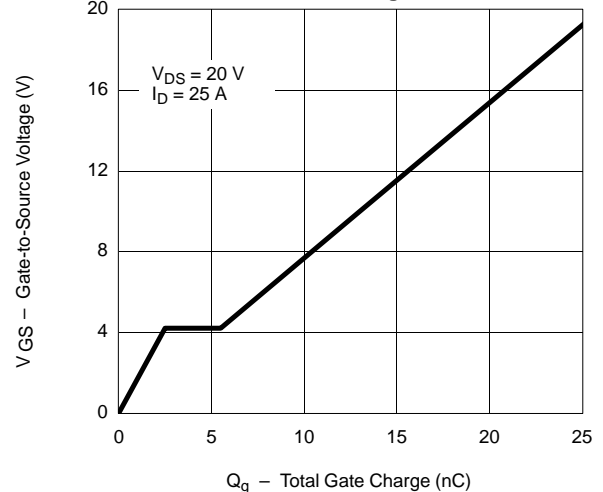
**On-Resistance vs. Drain Current**



**Capacitance**



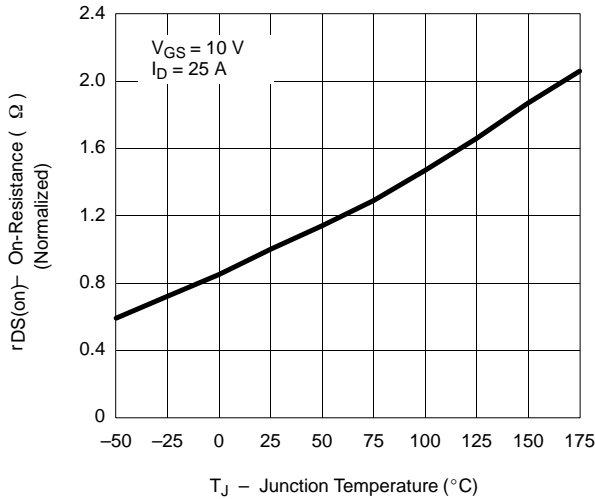
**Gate Charge**



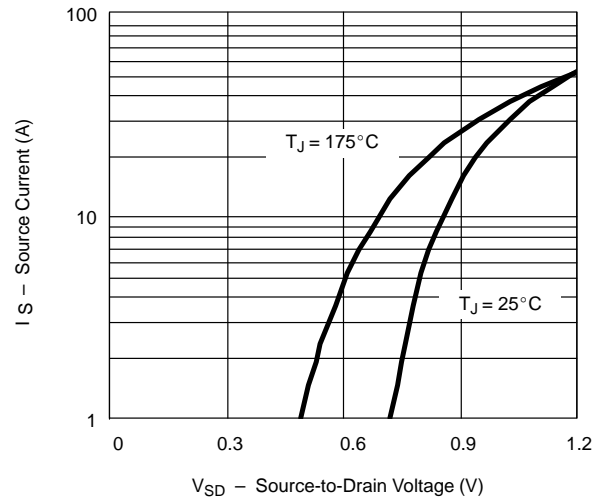


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

On-Resistance vs. Junction Temperature

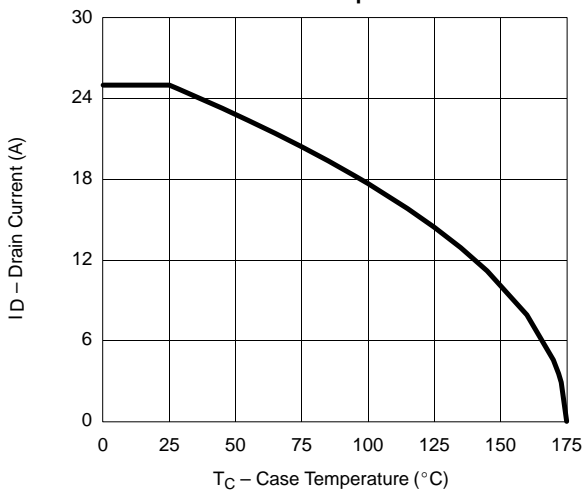


Source-Drain Diode Forward Voltage

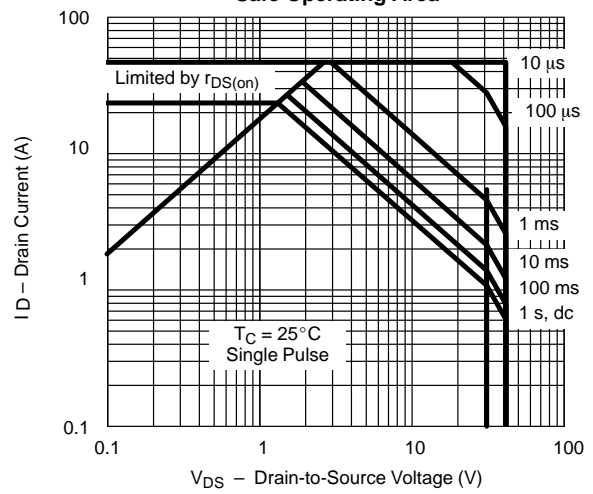


**THERMAL RATINGS**

Maximum Avalanche Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

