

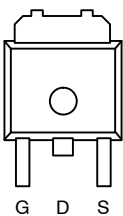


## N-Channel 30-V (D-S) MOSFET

## PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>a</sup> |
|--------------|---------------------------|------------------------|
| 30           | 0.016 @ $V_{GS} = 10$ V   | 15                     |
|              | 0.024 @ $V_{GS} = 4.5$ V  | 12                     |

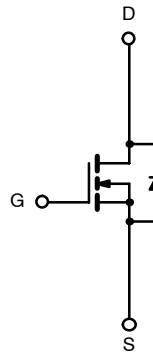
TO-252



Drain Connected to Tab

Top View

Ordering Information: SUD50N03-16P—E3 (Lead Free)



N-Channel MOSFET

## FEATURES

- TrenchFET® Power MOSFET
- PWM Optimized
- 100%  $R_g$  Tested

## APPLICATIONS

- High-Side DC/DC
  - Desktop
  - Server
- DDR DC/DC Converter

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

| Parameter                                                 |                           | Symbol         | Limit            | Unit             |
|-----------------------------------------------------------|---------------------------|----------------|------------------|------------------|
| Drain-Source Voltage                                      |                           | $V_{DS}$       | 30               | V                |
| Gate-Source Voltage                                       |                           | $V_{GS}$       | $\pm 20$         |                  |
| Continuous Drain Current <sup>a</sup>                     | $T_C = 25^\circ\text{C}$  | $I_D$          | 37               | A                |
|                                                           | $T_A = 25^\circ\text{C}$  |                | 15               |                  |
|                                                           | $T_A = 100^\circ\text{C}$ |                | 10.6             |                  |
| Pulsed Drain Current                                      |                           | $I_{DM}$       | 40               |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup> |                           | $I_S$          | 5                | mJ               |
| Avalanche Current                                         | L = 0.1 mH                | $I_{AS}$       | 25               |                  |
| Single Pulse Avalanche Energy                             |                           | $E_{AS}$       | 31.25            |                  |
| Maximum Power Dissipation                                 | $T_C = 25^\circ\text{C}$  | $P_D$          | 40.8             | W                |
|                                                           | $T_A = 25^\circ\text{C}$  |                | 6.5 <sup>a</sup> |                  |
| Operating Junction and Storage Temperature Range          |                           | $T_J, T_{stg}$ | -55 to 175       | $^\circ\text{C}$ |

## THERMAL RESISTANCE RATINGS

| Parameter                                |                 | Symbol     | Typical | Maximum | Unit               |
|------------------------------------------|-----------------|------------|---------|---------|--------------------|
| Maximum Junction-to-Ambient <sup>a</sup> | $t \leq 10$ sec | $R_{thJA}$ | 18      | 23      | $^\circ\text{C/W}$ |
|                                          | Steady State    |            | 40      | 50      |                    |
| Maximum Junction-to-Case                 |                 | $R_{thJC}$ | 3.0     | 3.7     |                    |

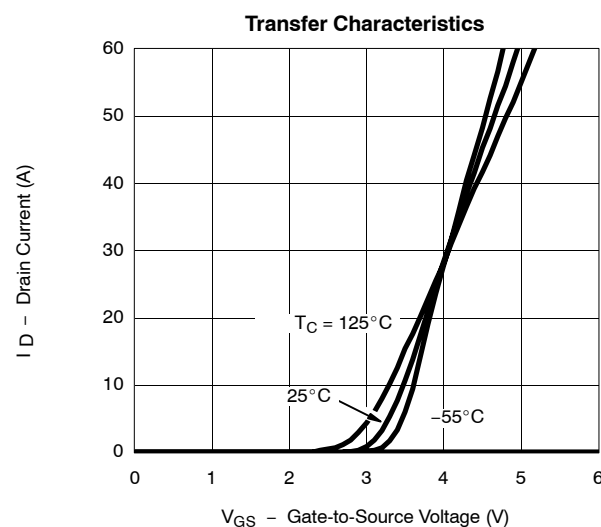
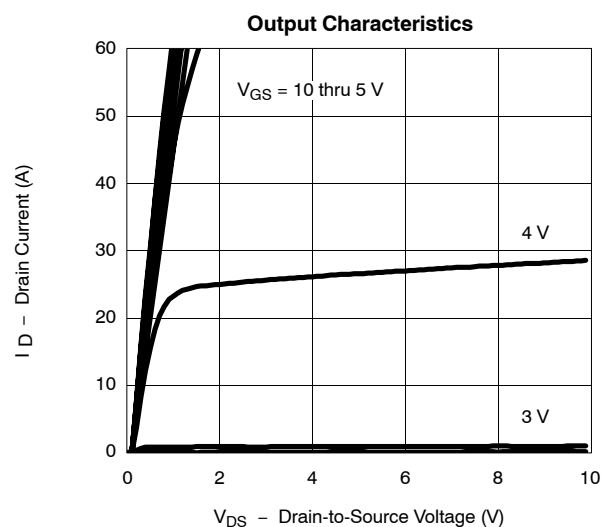
Notes

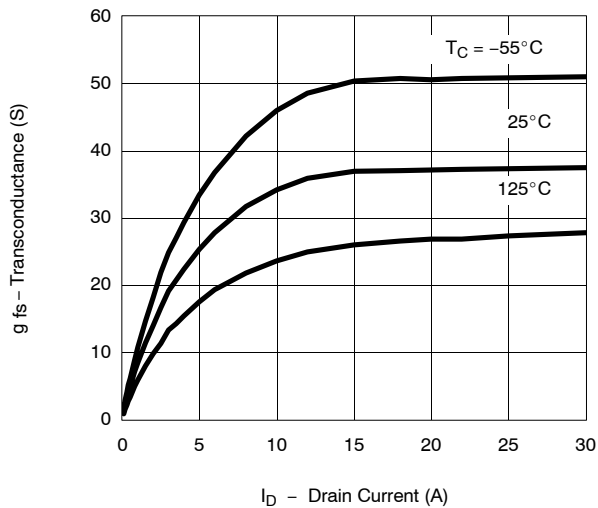
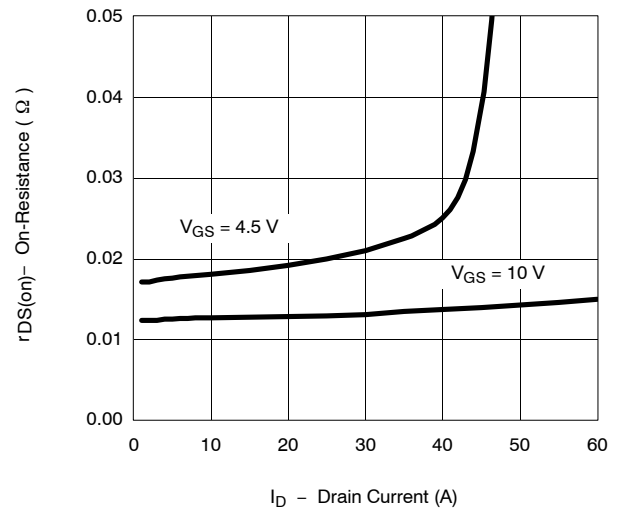
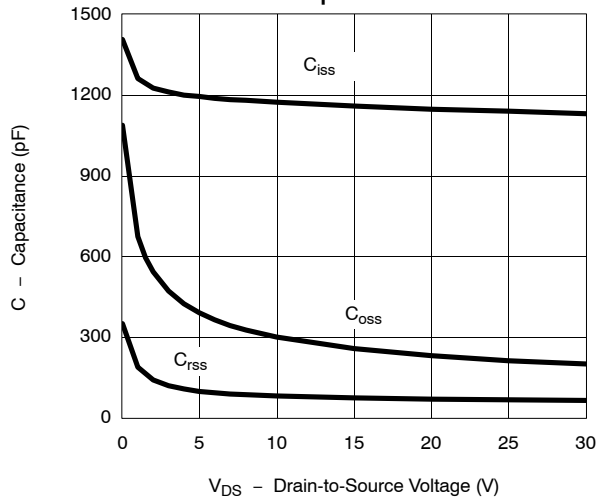
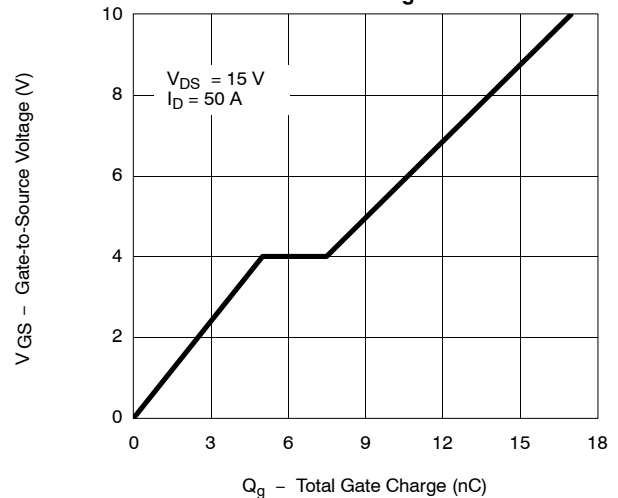
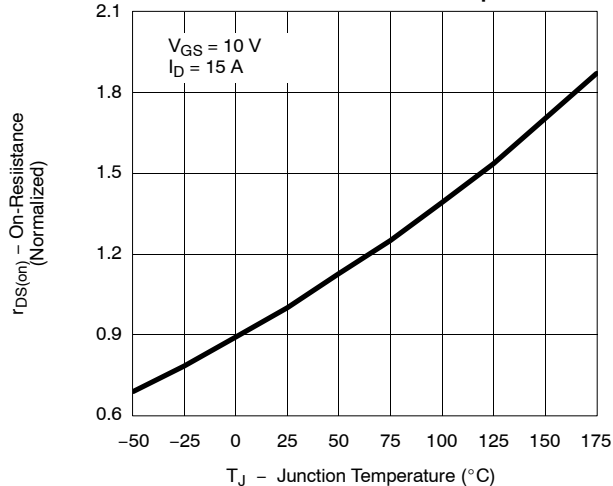
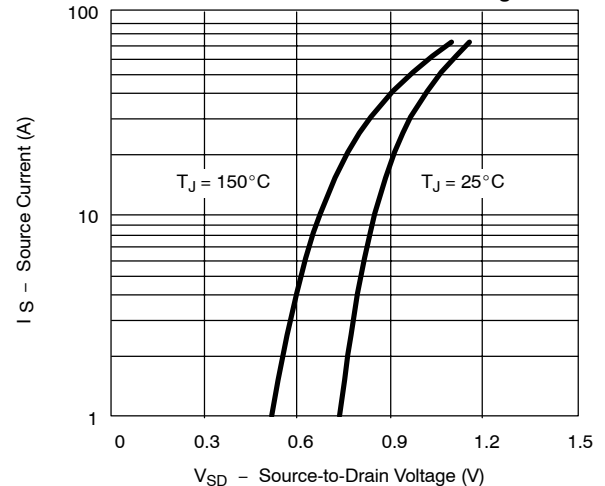
a. Surface Mounted on FR4 Board,  $t \leq 10$  sec.

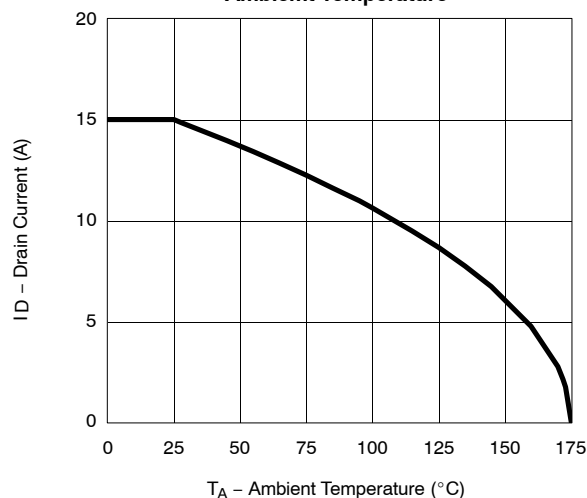
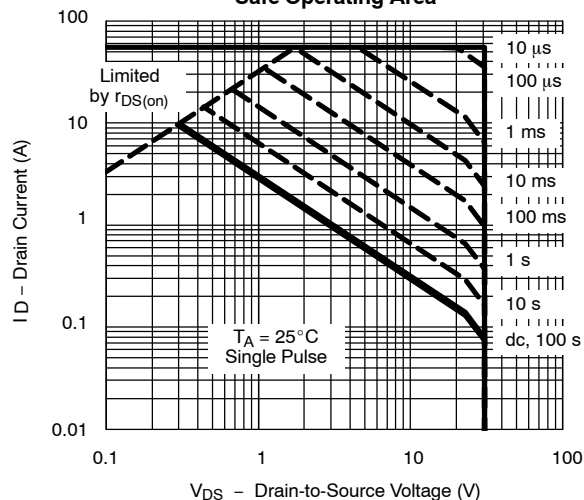
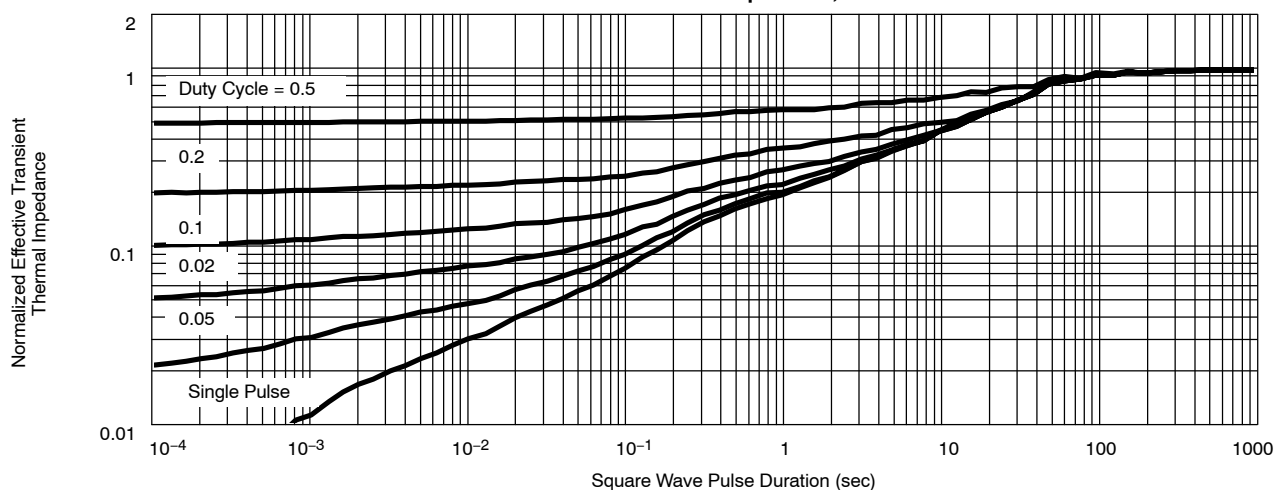
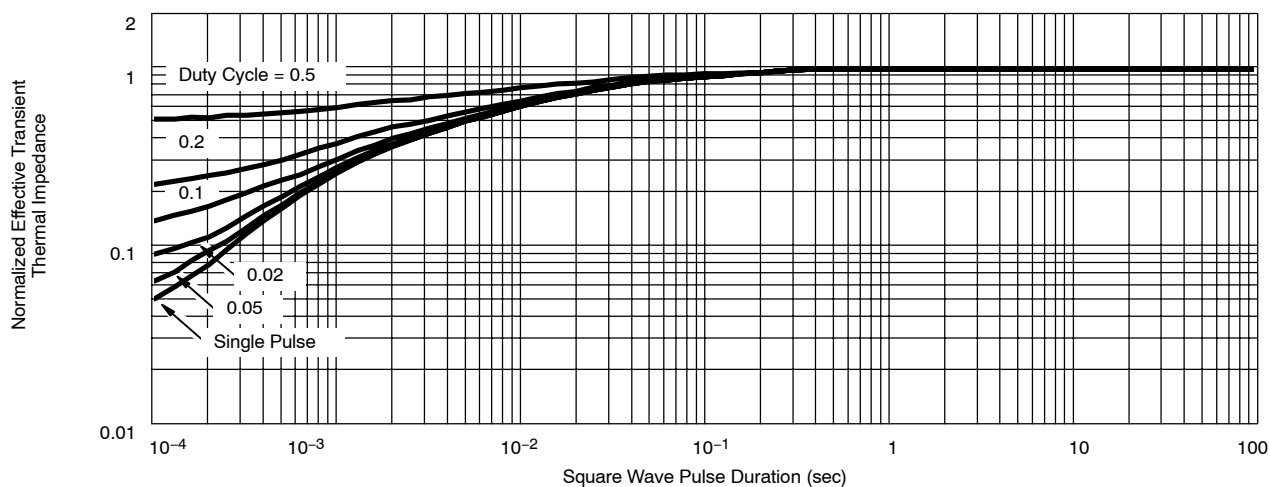
| SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)         |                      |                                                                                                                          |     |                  |       |      |
|------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------|-----|------------------|-------|------|
| Parameter                                                              | Symbol               | Test Condition                                                                                                           | Min | Typ <sup>a</sup> | Max   | Unit |
| Static                                                                 |                      |                                                                                                                          |     |                  |       |      |
| Drain-Source Breakdown Voltage                                         | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                                           | 30  |                  |       | 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 |                  | 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> = 30 V, V <sub>GS</sub> = 0 V                                                                            |     |                  | 1     | μA   |
|                                                                        |                      | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C                                                   |     |                  | 50    |      |
| On-State Drain Current <sup>b</sup>                                    | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V                                                                            | 40  |                  |       | A    |
| Drain-Source On-State Resistance <sup>b</sup>                          | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A                                                                            |     | 0.0128           | 0.016 | Ω    |
|                                                                        |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C                                                   |     |                  | 0.025 |      |
|                                                                        |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A                                                                           |     | 0.019            | 0.024 |      |
| Forward Transconductance <sup>b</sup>                                  | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A                                                                            | 10  |                  |       | S    |
| Dynamic <sup>a</sup>                                                   |                      |                                                                                                                          |     |                  |       |      |
| Input Capacitance                                                      | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz                                                                 |     | 1150             |       | pF   |
| Output Capacitance                                                     | C <sub>oss</sub>     |                                                                                                                          |     | 215              |       |      |
| Reverse Transfer Capacitance                                           | C <sub>rss</sub>     |                                                                                                                          |     | 70               |       |      |
| Total Gate Charge <sup>c</sup>                                         | Q <sub>g</sub>       | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 50 A                                                   |     | 8.5              | 13    | nC   |
| Gate-Source Charge <sup>c</sup>                                        | Q <sub>gs</sub>      |                                                                                                                          |     | 5                |       |      |
| Gate-Drain Charge <sup>c</sup>                                         | Q <sub>gd</sub>      |                                                                                                                          |     | 2.5              |       |      |
| Gate Resistance                                                        | R <sub>g</sub>       |                                                                                                                          | 2.7 | 5.5              | 8.25  | Ω    |
| Turn-On Delay Time <sup>c</sup>                                        | t <sub>d(on)</sub>   | V <sub>DD</sub> = 15 V, R <sub>L</sub> = 0.3 Ω<br>I <sub>D</sub> ≅ 50 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω |     | 7                | 15    | ns   |
| Rise Time <sup>c</sup>                                                 | t <sub>r</sub>       |                                                                                                                          |     | 20               | 30    |      |
| Turn-Off Delay Time <sup>c</sup>                                       | t <sub>d(off)</sub>  |                                                                                                                          |     | 25               | 40    |      |
| Fall Time <sup>c</sup>                                                 | t <sub>f</sub>       |                                                                                                                          |     | 12               | 20    |      |
| Source-Drain Diode Ratings and Characteristic (T <sub>C</sub> = 25 °C) |                      |                                                                                                                          |     |                  |       |      |
| Pulsed Current                                                         | I <sub>SM</sub>      |                                                                                                                          |     |                  | 40    | A    |
| Diode Forward Voltage <sup>b</sup>                                     | V <sub>SD</sub>      | I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V                                                                             |     | 1.0              | 1.5   | V    |
| Source-Drain Reverse Recovery Time                                     | t <sub>rr</sub>      | I <sub>F</sub> = 40 A, di/dt = 100 A/μs                                                                                  |     | 25               | 70    | ns   |

## Notes

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

TYPICAL CHARACTERISTICS ( $25^\circ\text{C}$  UNLESS NOTED)

**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.  
Ambient Temperature****Safe Operating Area****Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Case**



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