



## N-Channel 20-V (D-S) 175°C MOSFET

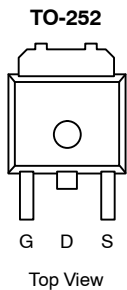
| PRODUCT SUMMARY     |                                  |                                 |
|---------------------|----------------------------------|---------------------------------|
| V <sub>DS</sub> (V) | r <sub>DS(on)</sub> (Ω)          | I <sub>D</sub> (A) <sup>a</sup> |
| 20                  | 0.0033 @ V <sub>GS</sub> = 10 V  | 39                              |
|                     | 0.0053 @ V <sub>GS</sub> = 4.5 V | 31                              |

### FEATURES

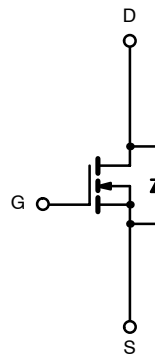
- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- PWM Optimized for High-Efficiency
- 100% R<sub>g</sub> Tested

### APPLICATIONS

- Synchronous Buck Converter
  - Low-Side
  - Secondary Synchronous Rectifier



Drain Connected to Tab



Ordering Information: SUD70N02-03P

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25°C UNLESS OTHERWISE NOTED) |                       |                                   |                  |      |
|---|-----------------------|-----------------------------------|------------------|------|
| Parameter   |                       | Symbol                            | Limit            | Unit |
| Drain-Source Voltage  |                       | V <sub>DS</sub>                   | 20               | V    |
| Gate-Source Voltage   |                       | V <sub>GS</sub>                   | ±20              |      |
| Continuous Drain Current <sup>a</sup>                                   | T <sub>A</sub> = 25°C | I <sub>D</sub>                    | 39 <sup>a</sup>  | A    |
|   | T <sub>C</sub> = 25°C |                                   | 70 <sup>b</sup>  |      |
| Pulsed Drain Current  |                       | I <sub>DM</sub>                   | 100              |      |
| Continuous Source Current (Diode Conduction) <sup>a</sup>               |                       | I <sub>S</sub>                    | 37               |      |
| Maximum Power Dissipation   | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 8.3 <sup>a</sup> | W    |
|   | T <sub>C</sub> = 25°C |                                   | 100              |      |
| Operating Junction and Storage Temperature Range                        |                       | T <sub>J</sub> , T <sub>stg</sub> | -55 to 175       | °C   |

| THERMAL RESISTANCE RATINGS               |              |                   |         |         |      |
|--|--------------|-------------------|---------|---------|------|
| Parameter                                |              | Symbol            | Typical | Maximum | Unit |
| Maximum Junction-to-Ambient <sup>a</sup> | t ≤ 10 sec   | R <sub>thJA</sub> | 15      | 18      | °C/W |
|  | Steady State |                   | 40      | 50      |      |
| Maximum Junction-to-Case                 |              | R <sub>thJC</sub> | 1.2     | 1.5     |      |

Notes

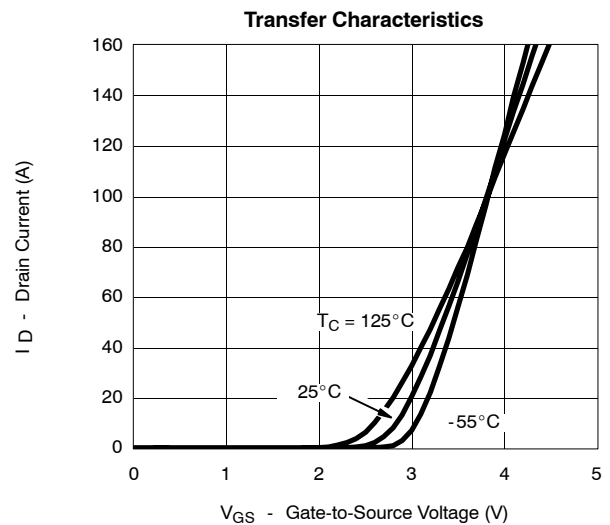
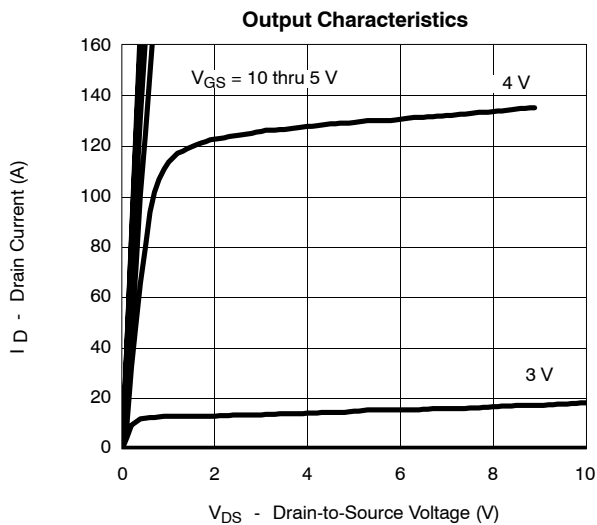
- a. Surface Mounted on FR4 Board, t ≤ 10 sec.
- b. Limited by package

| 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   | 20  |                  |        | V    |
| Gate Threshold Voltage  | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA  | 0.8 |                  | 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> = 16 V, V <sub>GS</sub> = 0 V  |     |                  | 1      | μA   |
|   |                      | V <sub>DS</sub> = 16 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  | 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> = 20 A  |     | 0.0026           | 0.0033 | Ω    |
|   |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125°C  |     |                  | 0.0047 |      |
|   |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A   |     | 0.0042           | 0.0053 |      |
| Forward Transconductance <sup>b</sup>                                       | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 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> = 10 V, f = 1 MHz   |     | 5100             |        | pF   |
| Output Capacitance  | C <sub>oss</sub>     |  |     | 1650             |        |      |
| Reverse Transfer Capacitance  | C <sub>rss</sub>     |  |     | 800              |        |      |
| Gate Resistance   | R <sub>g</sub>       | f = 1.0 MHz  | 0.5 | 1.1              | 1.8    | Ω    |
| Total Gate Charge <sup>c</sup>  | Q <sub>g</sub>       | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 50 A   |     | 40               | 60     | nC   |
| Gate-Source Charge <sup>c</sup>   | Q <sub>gs</sub>      |  |     | 14               |        |      |
| Gate-Drain Charge <sup>c</sup>  | Q <sub>gd</sub>      |  |     | 13               |        |      |
| Turn-On Delay Time <sup>c</sup>   | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10 V, R <sub>L</sub> = 0.2 Ω<br>I <sub>D</sub> ≅ 50 A, V <sub>GEN</sub> = 10 V, R <sub>G</sub> = 2.5 Ω |     | 15               | 25     | ns   |
| Rise Time <sup>c</sup>  | t <sub>r</sub>       |  |     | 11               | 20     |      |
| Turn-Off Delay Time <sup>c</sup>  | t <sub>d(off)</sub>  |  |     | 45               | 70     |      |
| Fall Time <sup>c</sup>  | t <sub>f</sub>       |  |     | 15               | 25     |      |
|   |                      |  |     |                  |        |      |
| <b>Source-Drain Diode Ratings and Characteristic (T<sub>C</sub> = 25°C)</b> |                      |  |     |                  |        |      |
| Pulsed Current  | I <sub>SM</sub>      |  |     |                  | 100    | A    |
| Diode Forward Voltage <sup>b</sup>  | V <sub>SD</sub>      | I <sub>F</sub> = 50 A, V <sub>GS</sub> = 0 V   |     | 1.2              | 1.5    | V    |
| Source-Drain Reverse Recovery Time  | t <sub>rr</sub>      | I <sub>F</sub> = 50 A, di/dt = 100 A/μs  |     | 45               | 90     | ns   |

Notes

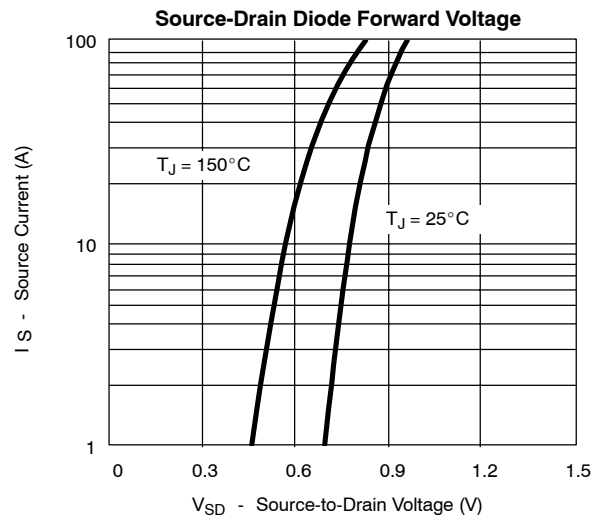
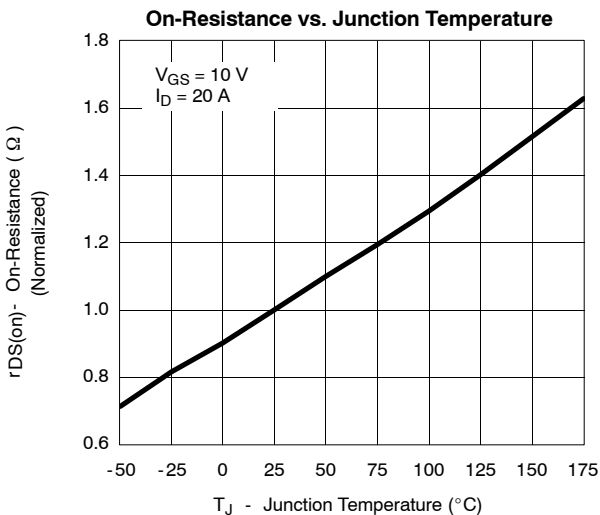
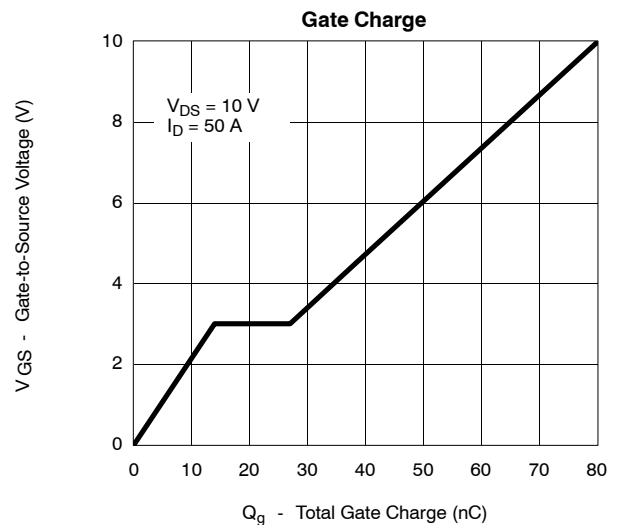
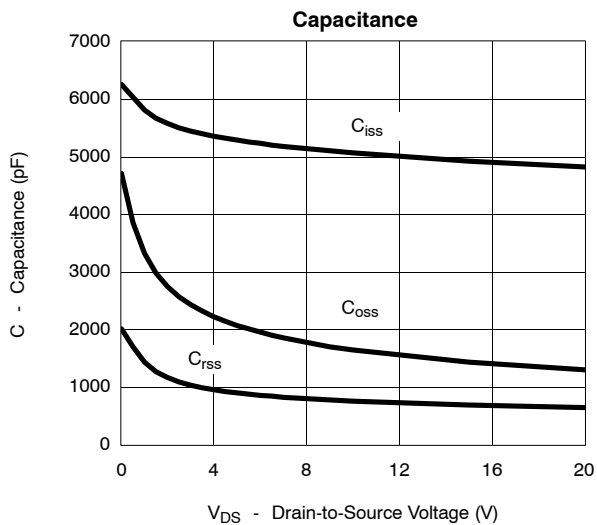
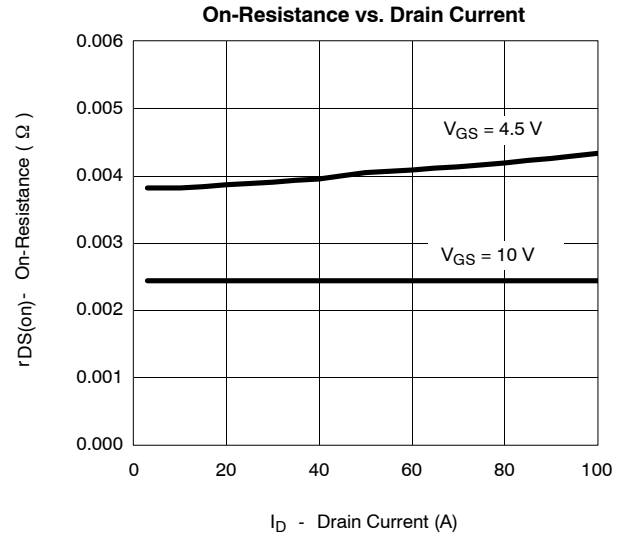
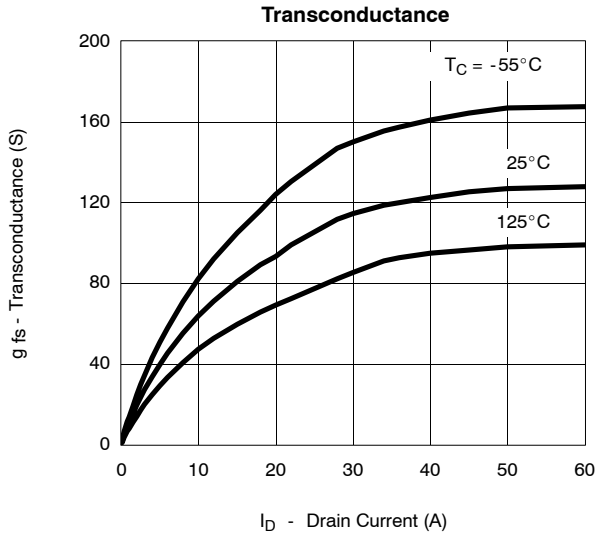
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- c. Independent of operating temperature.

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



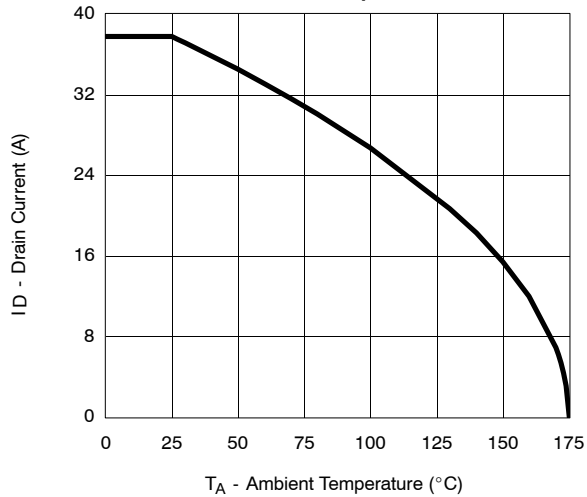


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

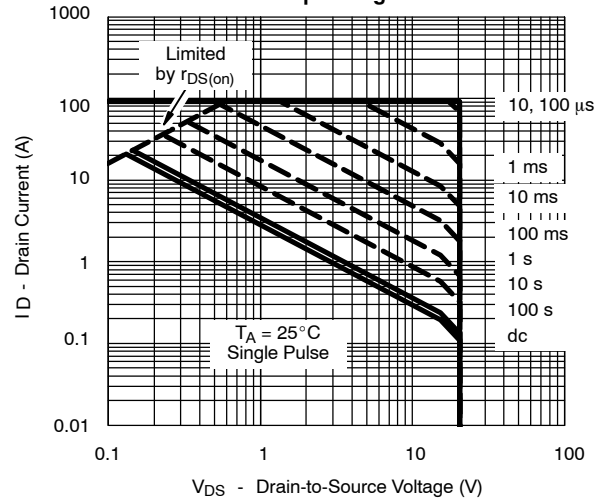


**THERMAL RATINGS**

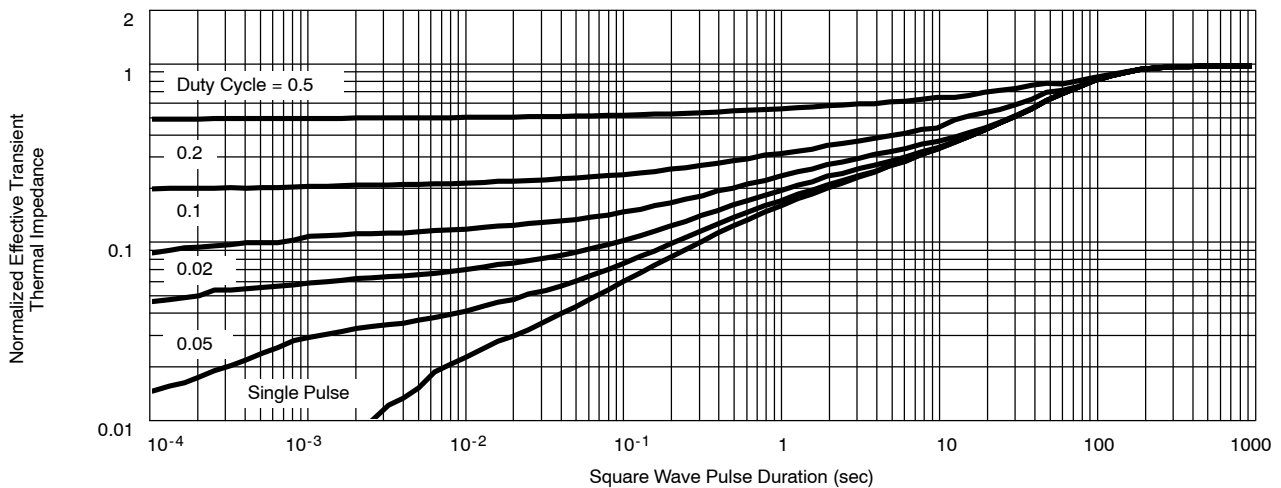
Maximum Drain Current vs. Ambient Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

