



## N-Channel 60-V (D-S), 175°C MOSFET

## PRODUCT SUMMARY

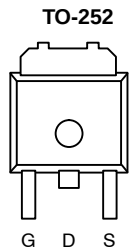
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>c</sup> |
|-------------------|---------------------------|------------------------|
| 60                | 0.0074 @ $V_{GS} = 10$ V  | 96                     |
|                   | 0.0088 @ $V_{GS} = 4.5$ V | 88                     |

## FEATURES

- TrenchFET® Power MOSFETS
- 175°C Junction Temperature

## APPLICATIONS

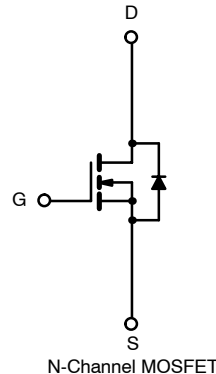
- Automotive Such As:
  - High-Side Switch
  - Motor Drives
  - 12-V Battery
- Secondary Synchronous Rectification



Top View

Drain Connected to Tab

Ordering Information: SUD50N06-07L—E3



N-Channel MOSFET

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

| Parameter                                              |                           | Symbol         | Limit           | Unit             |
|--------------------------------------------------------|---------------------------|----------------|-----------------|------------------|
| Drain-Source Voltage                                   |                           | $V_{DS}$       | 60              | V                |
| Gate-Source Voltage                                    |                           | $V_{GS}$       | $\pm 20$        |                  |
| Continuous Drain Current ( $T_J = 175^\circ\text{C}$ ) | $T_C = 25^\circ\text{C}$  | $I_D$          | 96 <sup>c</sup> | A                |
|                                                        | $T_C = 100^\circ\text{C}$ |                | 67 <sup>c</sup> |                  |
| Pulsed Drain Current                                   |                           | $I_{DM}$       | 100             |                  |
| Single Pulse Avalanche Current                         | L = 0.1 mH                | $I_{AS}$       | 45              |                  |
| Single Pulse Repetitive Avalanche Energy <sup>a</sup>  |                           | $E_{AS}$       | 101             | mJ               |
| Power Dissipation                                      | $T_C = 25^\circ\text{C}$  | $P_D$          | 136             | W                |
| 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> | $t \leq 10$ sec | $R_{thJA}$ | 15      | 18      | $^\circ\text{C/W}$ |
|                                  | Steady State    |            | 40      | 50      |                    |
| Junction-to-Case                 |                 | $R_{thJC}$ | 0.85    | 1.1     |                    |

## Notes:

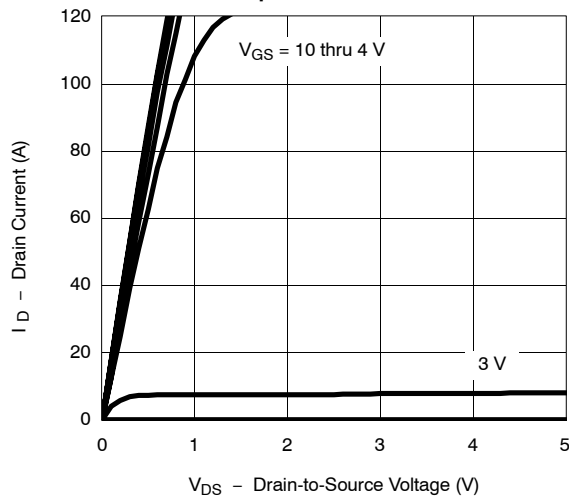
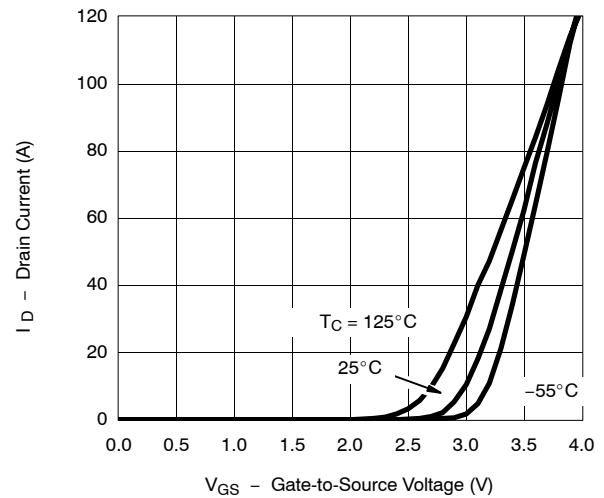
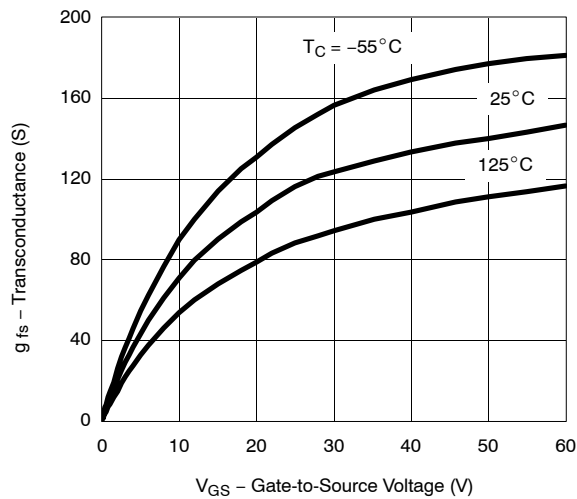
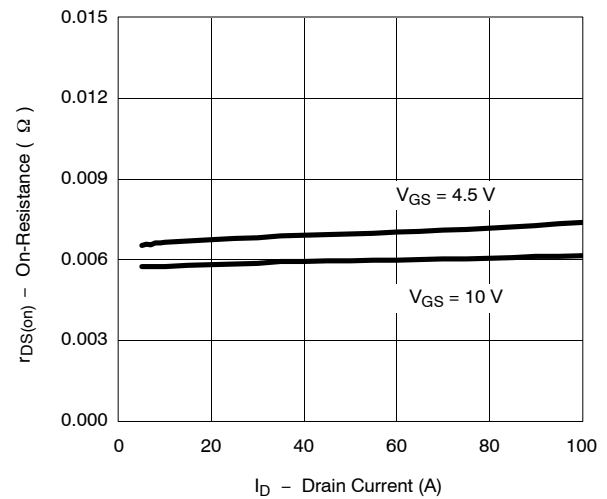
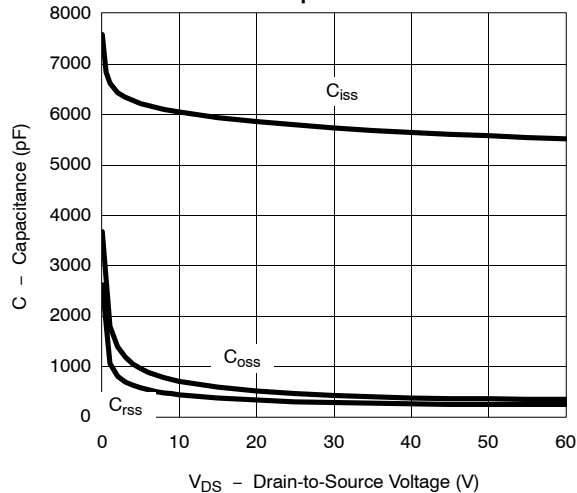
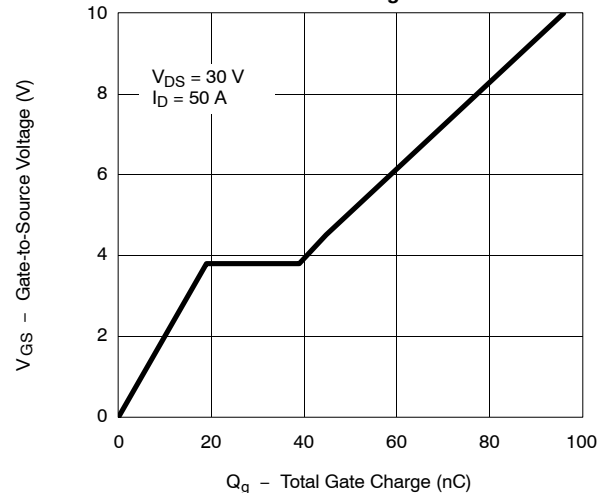
- Duty cycle  $\leq 1\%$ .
- Surface mounted on 1" FR4 board.
- Based on maximum allowable Junction Temperature. Package limitation current is 50 A.

**SPECIFICATIONS ( $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

| Parameter                                                                           | Symbol               | Test Condition                                                                                                           | Min | Typ    | Max    | Unit |
|-------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------|-----|--------|--------|------|
| Static                                                                              |                      |                                                                                                                          |     |        |        |      |
| Drain-Source Breakdown Voltage                                                      | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                                           | 60  |        |        | V    |
| Gate Threshold Voltage                                                              | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA                                                             | 1   |        | 3      |      |
| 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> = 60 V, V <sub>GS</sub> = 0 V                                                                            |     |        | 1      | μA   |
|                                                                                     |                      | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C                                                    |     |        | 50     |      |
|                                                                                     |                      | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175°C                                                    |     |        | 150    |      |
| On-State Drain Current <sup>a</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>a</sup>                                       | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A                                                                            |     | 0.0061 | 0.0074 | Ω    |
|                                                                                     |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125°C                                                    |     |        | 0.0122 |      |
|                                                                                     |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 175°C                                                    |     |        | 0.0148 |      |
|                                                                                     |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A                                                                           |     | 0.0071 | 0.0088 |      |
| Forward Transconductance <sup>a</sup>                                               | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 15 A                                                                            | 20  | 80     |        | S    |
| Dynamic <sup>b</sup>                                                                |                      |                                                                                                                          |     |        |        |      |
| Input Capacitance                                                                   | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz                                                                 |     | 5800   |        | pF   |
| Output Capacitance                                                                  | C <sub>oss</sub>     |                                                                                                                          |     | 450    |        |      |
| Reverse Transfer Capacitance                                                        | C <sub>rss</sub>     |                                                                                                                          |     | 300    |        |      |
| Total Gate Charge <sup>c</sup>                                                      | Q <sub>g</sub>       | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A                                                    |     | 96     | 144    | nC   |
| Gate-Source Charge <sup>c</sup>                                                     | Q <sub>gs</sub>      |                                                                                                                          |     | 19     |        |      |
| Gate-Drain Charge <sup>c</sup>                                                      | Q <sub>gd</sub>      |                                                                                                                          |     | 20     |        |      |
| Gate Resistance                                                                     | R <sub>g</sub>       |                                                                                                                          |     | 1.5    |        | Ω    |
| Turn-On Delay Time <sup>c</sup>                                                     | t <sub>d(on)</sub>   | V <sub>DD</sub> = 30 V, R <sub>L</sub> = 0.6 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>       |                                                                                                                          |     | 13     | 20     |      |
| Turn-Off Delay Time <sup>c</sup>                                                    | t <sub>d(off)</sub>  |                                                                                                                          |     | 62     | 95     |      |
| Fall Time <sup>c</sup>                                                              | t <sub>f</sub>       |                                                                                                                          |     | 14     | 25     |      |
| Source-Drain Ciode Ratings and Characteristics (T <sub>C</sub> = 25°C) <sup>b</sup> |                      |                                                                                                                          |     |        |        |      |
| Continuous Current                                                                  | I <sub>s</sub>       |                                                                                                                          |     |        | 50     | A    |
| Pulsed Current                                                                      | I <sub>SM</sub>      |                                                                                                                          |     |        | 100    |      |
| Forward Voltage <sup>a</sup>                                                        | V <sub>SD</sub>      | I <sub>F</sub> = 30 A, V <sub>GS</sub> = 0 V                                                                             |     | 0.90   | 1.50   | V    |
| Reverse Recovery Time                                                               | t <sub>rr</sub>      | I <sub>F</sub> = 30 A, di/dt = 100 A/μs                                                                                  |     | 37     | 55     | ns   |

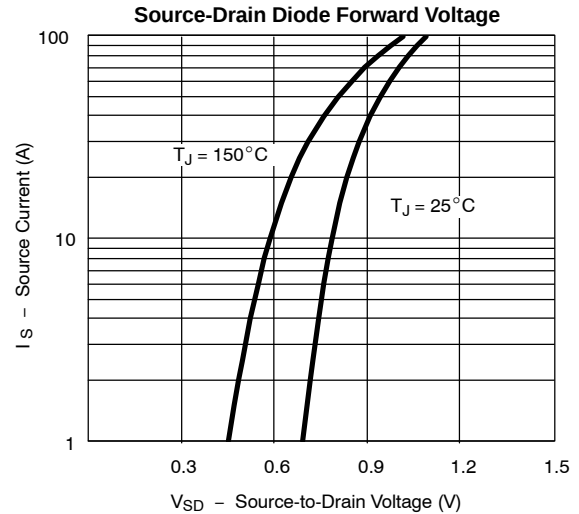
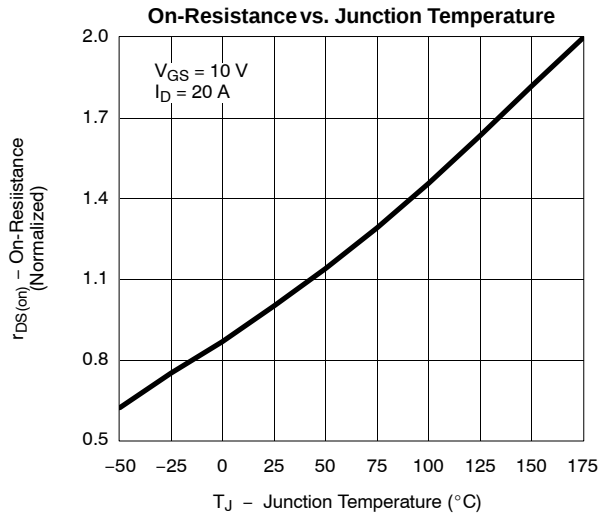
## Notes:

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



### THERMAL RATINGS

