



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

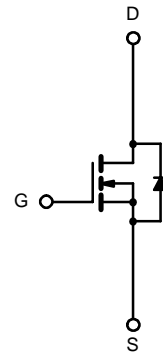
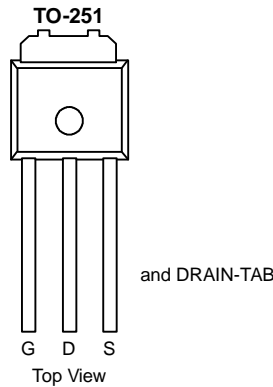
| PRODUCT SUMMARY |                           |                        |
|-----------------|---------------------------|------------------------|
| $V_{DS}$ (V)    | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) <sup>b</sup> |
| 30              | 0.0095 @ $V_{GS} = 10$ V  | 63 <sup>b</sup>        |
|                 | 0.014 @ $V_{GS} = 4.5$ V  | 52 <sup>b</sup>        |

### FEATURES

- TrenchFET® Power MOSFET
- Optimized for High- or Low-Side

### APPLICATIONS

- DC/DC Converters
- Synchronous Rectifiers



Order Number: SUU50N03-09P  
SUU50N03-09P—E3 (Lead (Pb)-Free)

N-Channel MOSFET

| 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>                                       | $T_C = 25^\circ\text{C}$  | $I_D$          | 63 <sup>b</sup>   | A                |
|   | $T_C = 100^\circ\text{C}$ |                | 44.5 <sup>b</sup> |                  |
| Pulsed Drain Current  |                           | $I_{DM}$       | 50                |                  |
| Continuous Source Current (Diode Conduction) <sup>a</sup>                   |                           | $I_S$          | 10                |                  |
| Avalanche Current   | L = 0.1 mH                | $I_{AS}$       | 35                |                  |
| Single Pulse Avalanche Energy   |                           | $E_{AS}$       | 61                | mJ               |
| Maximum Power Dissipation   | $T_C = 25^\circ\text{C}$  | $P_D$          | 65.2              | W                |
|   | $T_A = 25^\circ\text{C}$  |                | 7.5 <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 | $R_{thJA}$ | 16      | 20      | $^\circ\text{C/W}$ |
|  | Steady State    |            | 40      | 50      |                    |
| Maximum Junction-to-Case                 |                 | $R_{thJC}$ | 1.8     | 2.3     |                    |

Notes

- a. Surface Mounted on FR4 Board,  $t \leq 10$  sec.  
b. Based on maximum allowable Junction Temperature, package limitation current is 50 A.

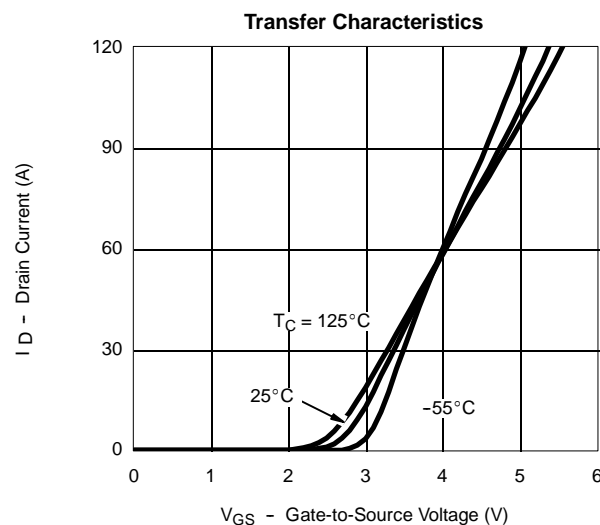
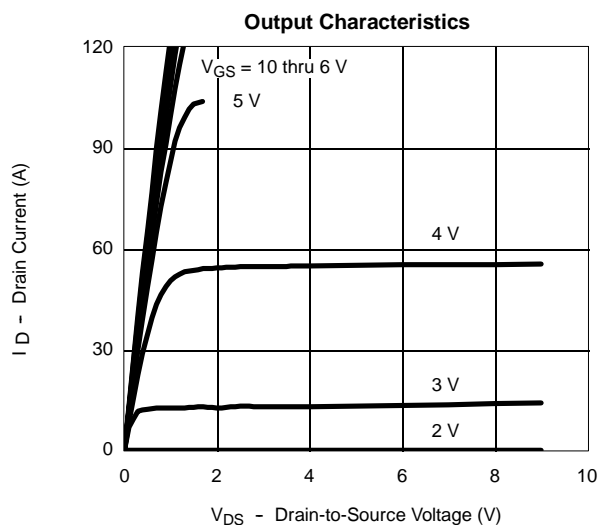


| SPECIFICATIONS (T <sub>J</sub> = 25°C UNLESS OTHERWISE NOTED)               |                      |  |     |                  |        |      |
|---|----------------------|--|-----|------------------|--------|------|
| Parameter   | Symbol               | Test Condition   | Min | Typ <sup>a</sup> | 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   | 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  | 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  |     | 0.0076           | 0.0095 | Ω    |
|   |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125°C  |     |                  | 0.015  |      |
|   |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A   |     | 0.0115           | 0.014  |      |
| Forward Transconductance <sup>b</sup>                                       | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A  | 20  |                  |        | 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   |     | 2200             |        | pF   |
| Output Capacitance  | C <sub>oss</sub>     |  |     | 410              |        |      |
| Reverse Transfer Capacitance  | C <sub>rss</sub>     |  |     | 180              |        |      |
| Gate Resistance   | R <sub>g</sub>       |  |     | 1.5              |        | Ω    |
| 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   |     | 15               | 23     | nC   |
| Gate-Source Charge <sup>c</sup>   | Q <sub>gs</sub>      |  |     | 7.5              |        |      |
| Gate-Drain Charge <sup>c</sup>  | Q <sub>gd</sub>      |  |     | 5.0              |        |      |
| 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 |     | 9                | 15     | ns   |
| Rise Time <sup>c</sup>  | t <sub>r</sub>       |  |     | 80               | 120    |      |
| Turn-Off Delay Time <sup>c</sup>  | t <sub>d(off)</sub>  |  |     | 22               | 35     |      |
| Fall Time <sup>c</sup>  | t <sub>f</sub>       |  |     | 8                | 12     |      |
|   |                      |  |     |                  |        |      |
| <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  |     | 35               | 70     | ns   |

### Notes

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

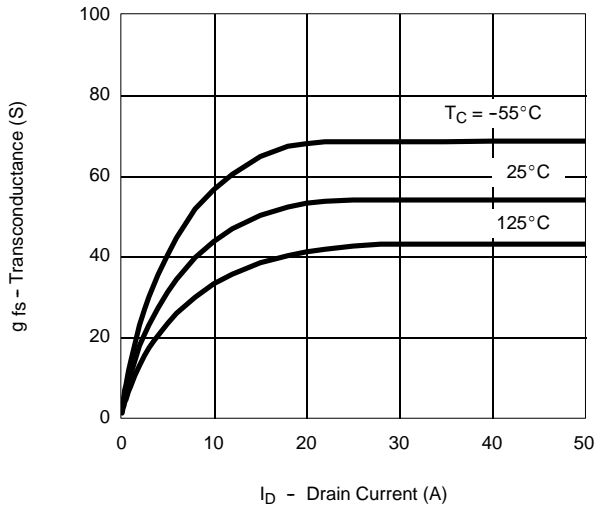
## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



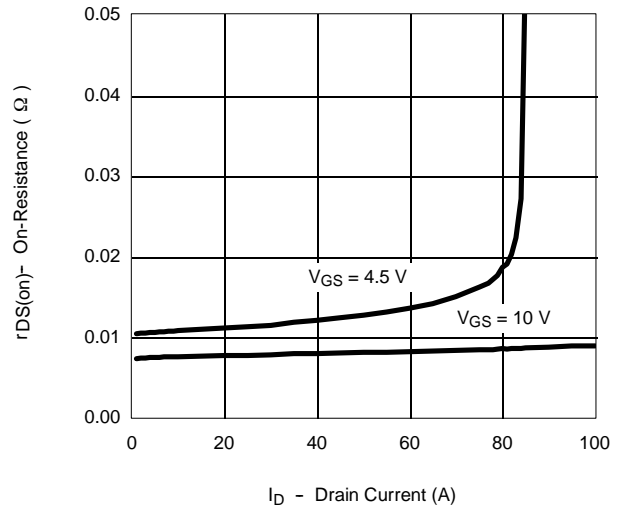


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

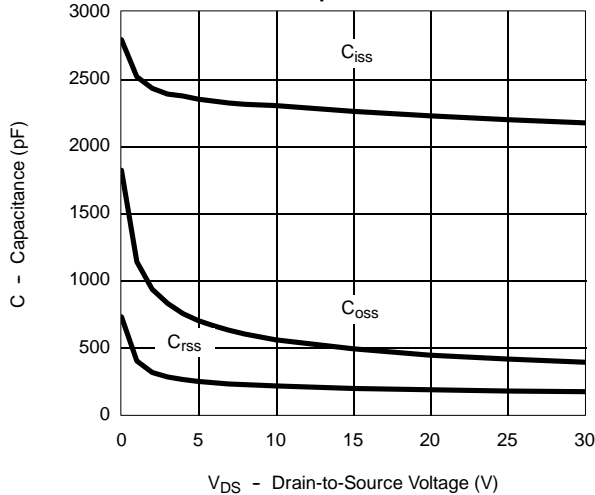
**Transconductance**



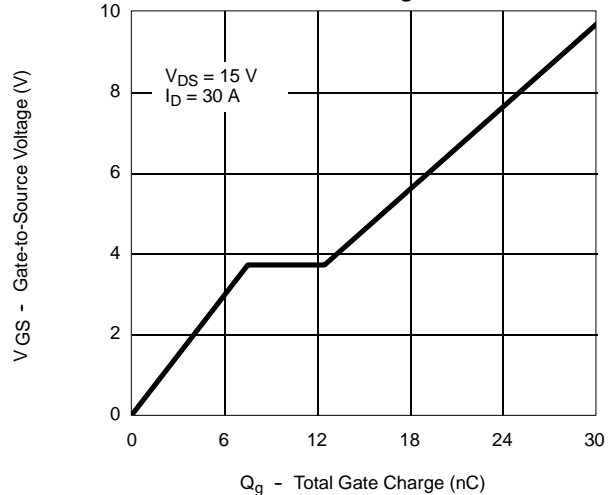
**On-Resistance vs. Drain Current**



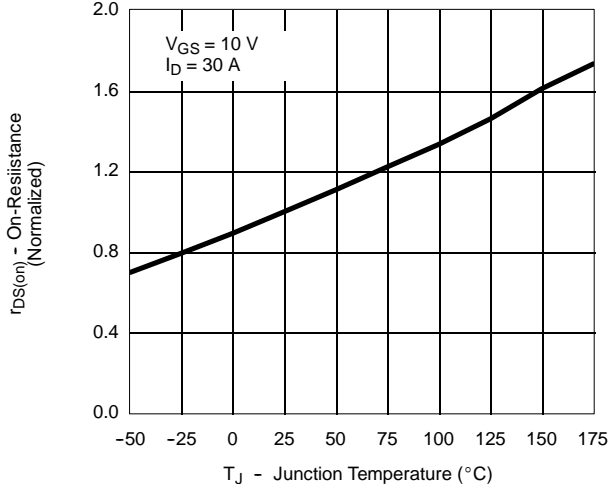
**Capacitance**



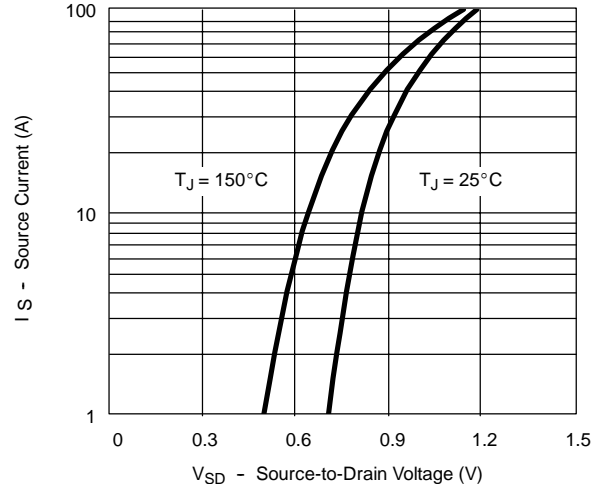
**Gate Charge**



**On-Resistance vs. Junction Temperature**

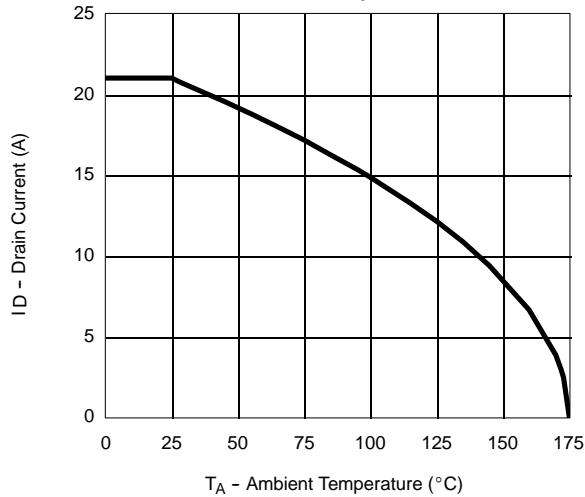


**Source-Drain Diode Forward Voltage**

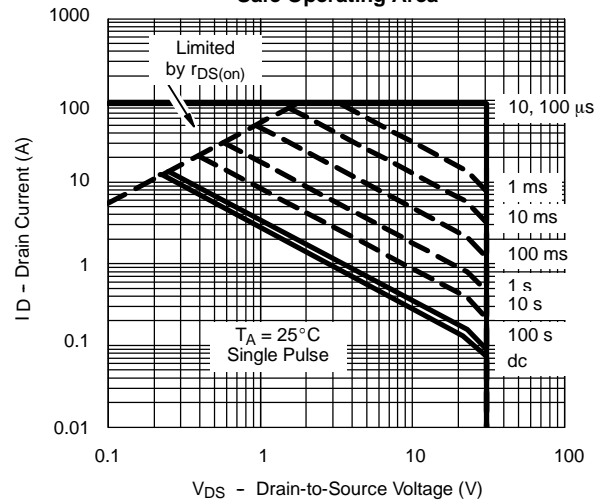


**THERMAL RATINGS**

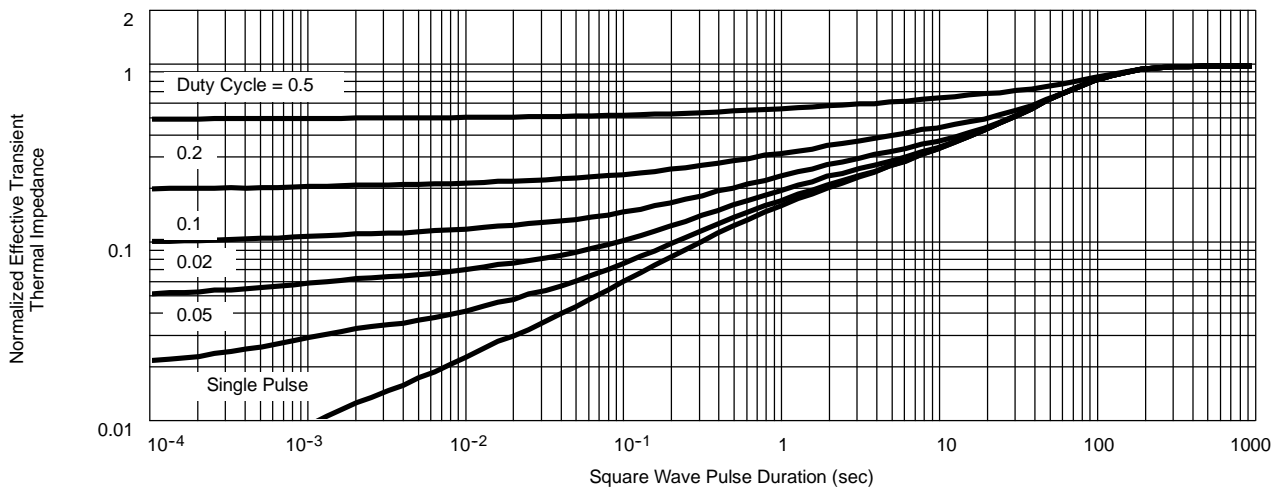
Maximum Drain Current vs. Ambient Temperature



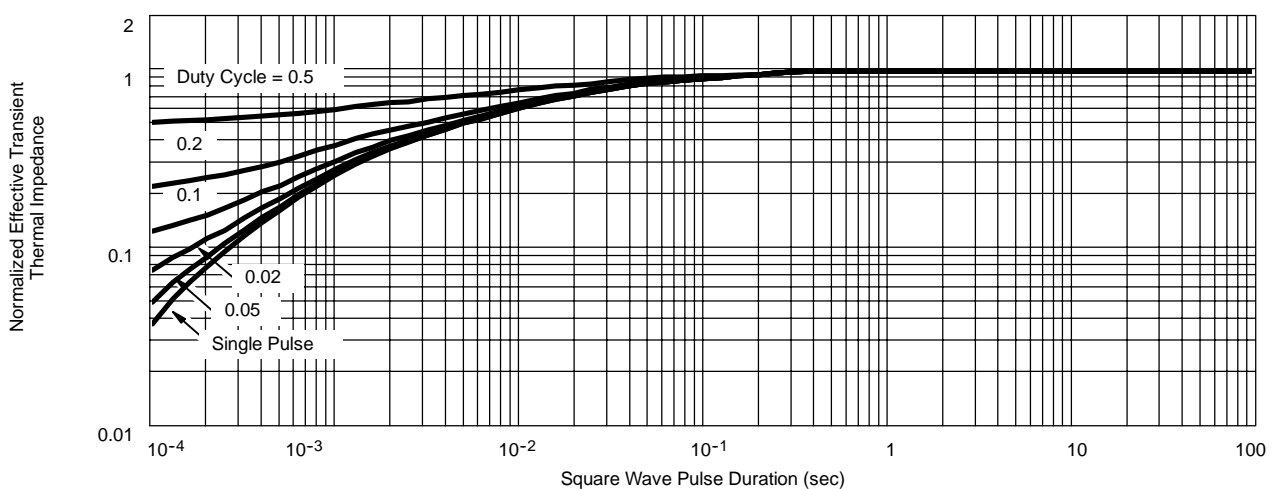
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case





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