

# N-Channel 100-V (D-S) 175 °C MOSFET

## PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| 100          | 0.024 at $V_{GS} = 10$ V  | 47        |
|              | 0.027 at $V_{GS} = 4.5$ V | 44        |

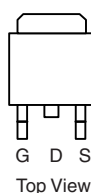
## FEATURES

- TrenchFET® Power MOSFET
- 175 °C Maximum Junction Temperature
- 100 %  $R_g$  Tested

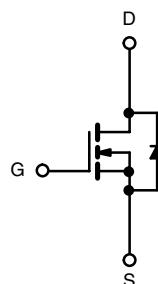


**RoHS**  
COMPLIANT

TO-263



Ordering Information: SUM47N10-24L-E3 (Lead (Pb)-free)



N-Channel MOSFET

## ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

| Parameter                                               | Symbol         | Limit             | Unit |
|---------------------------------------------------------|----------------|-------------------|------|
| Drain-Source Voltage                                    | $V_{DS}$       | 100               | V    |
| Gate-Source Voltage                                     | $V_{GS}$       | $\pm 20$          |      |
| Continuous Drain Current ( $T_J = 175$ °C) <sup>b</sup> | $I_D$          | 47                | A    |
|                                                         |                | 27                |      |
| Pulsed Drain Current                                    | $I_{DM}$       | 70                |      |
| Continuous Source Current (Diode Conduction)            | $I_S$          | 47                |      |
| Single Pulse Avalanche Current                          | $I_{AS}$       | 40                | mJ   |
| Single Pulse Avalanche Energy (Duty Cycle $\leq 1$ %)   | $E_{AS}$       | 80                |      |
| Maximum Power Dissipation                               | $P_D$          | 136 <sup>b</sup>  | W    |
|                                                         |                | 3.75 <sup>a</sup> |      |
| Operating Junction and Storage Temperature Range        | $T_J, T_{stg}$ | - 55 to 175       | °C   |

## THERMAL RESISTANCE RATINGS

| Parameter           | Symbol     | Maximum | Unit |
|---------------------|------------|---------|------|
| Junction-to-Ambient | $R_{thJA}$ | 40      | °C/W |
|                     |            | 62.5    |      |
| Junction-to-Case    | $R_{thJC}$ | 1.1     |      |

Notes:

a. Surface Mounted on 1" x 1" FR4 Board.

b. See SOA curve for voltage derating.

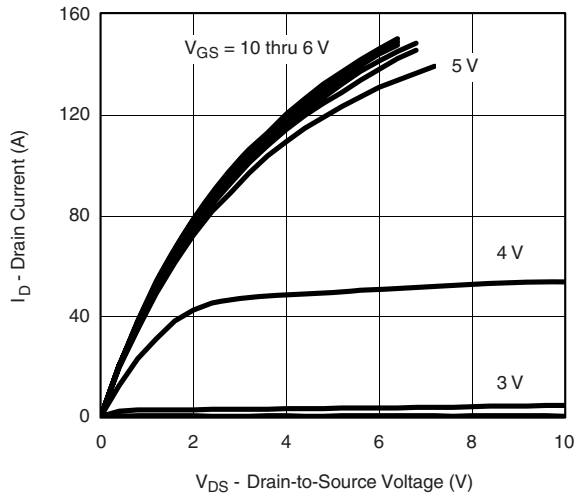
| SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted         |                      |                                                                                                                           |      |                   |       |      |
|-----------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------|------|-------------------|-------|------|
| Parameter                                                             | Symbol               | Test Conditions                                                                                                           | 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                                                                            | 100  |                   |       | 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> = 100 V, V <sub>GS</sub> = 0 V                                                                            |      |                   | 1     | μA   |
|                                                                       |                      | V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C                                                   |      |                   | 50    |      |
|                                                                       |                      | V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C                                                   |      |                   | 250   |      |
| On-State Drain Current <sup>b</sup>                                   | I <sub>D(on)</sub>   | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V                                                                             | 70   |                   |       | A    |
| Drain-Source On-State Resistance <sup>b</sup>                         | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 40 A                                                                             |      | 0.019             | 0.024 | Ω    |
|                                                                       |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 40 A, T <sub>J</sub> = 125 °C                                                    |      |                   | 0.048 |      |
|                                                                       |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 40 A, T <sub>J</sub> = 175 °C                                                    |      |                   | 0.060 |      |
|                                                                       |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A                                                                            |      | 0.021             | 0.027 |      |
| Forward Transconductance <sup>b</sup>                                 | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 40 A                                                                             |      | 70                |       | 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                                                                  |      | 2400              |       | pF   |
| Output Capacitance                                                    | C <sub>oss</sub>     |                                                                                                                           |      | 290               |       |      |
| Reverse Transfer Capacitance                                          | C <sub>rss</sub>     |                                                                                                                           |      | 120               |       |      |
| Total Gate Charge <sup>c</sup>                                        | Q <sub>g</sub>       | V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 40 A                                                     |      | 40                | 60    | nC   |
| Gate-Source Charge <sup>c</sup>                                       | Q <sub>gs</sub>      |                                                                                                                           |      | 11                |       |      |
| Gate-Drain Charge <sup>c</sup>                                        | Q <sub>gd</sub>      |                                                                                                                           |      | 9                 |       |      |
| Gate Resistance                                                       | R <sub>g</sub>       | f = 1 MHz                                                                                                                 | 1    | 2.2               | 3.5   | Ω    |
| Turn-On Delay Time <sup>c</sup>                                       | t <sub>d(on)</sub>   | V <sub>DD</sub> = 50 V, R <sub>L</sub> = 1.25 Ω<br>I <sub>D</sub> ≅ 47 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω |      | 8                 | 13    | ns   |
| Rise Time <sup>c</sup>                                                | t <sub>r</sub>       |                                                                                                                           |      | 40                | 60    |      |
| Turn-Off Delay Time <sup>c</sup>                                      | t <sub>d(off)</sub>  |                                                                                                                           |      | 15                | 25    |      |
| Fall Time <sup>c</sup>                                                | t <sub>f</sub>       |                                                                                                                           |      | 80                | 120   |      |
| Source-Drain Diode Ratings and Characteristics T <sub>C</sub> = 25 °C |                      |                                                                                                                           |      |                   |       |      |
| Pulsed Current                                                        | I <sub>SM</sub>      |                                                                                                                           |      |                   | 70    | A    |
| Diode Forward Voltage <sup>b</sup>                                    | V <sub>SD</sub>      | I <sub>F</sub> = 40 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> = 47 A, di/dt = 100 A/μs                                                                                   |      | 75                | 120   | ns   |

## Notes:

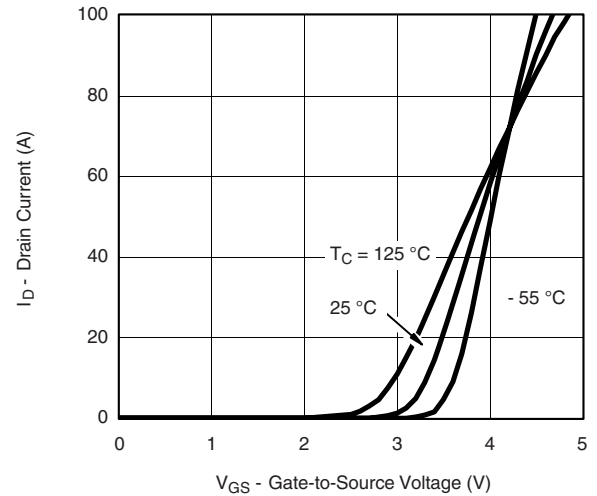
- a. Guaranteed by design, not subject to production testing.  
b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

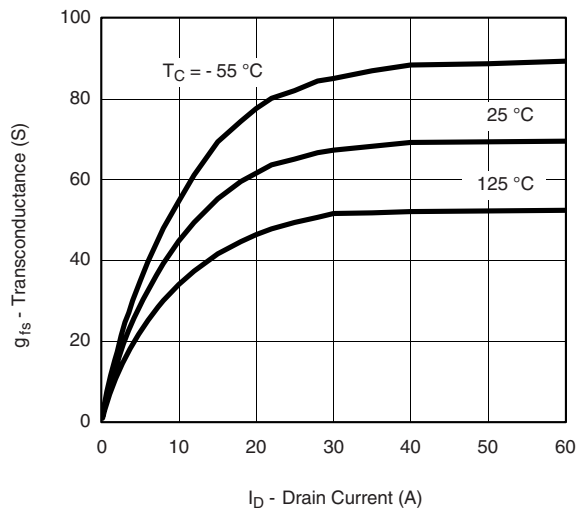
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



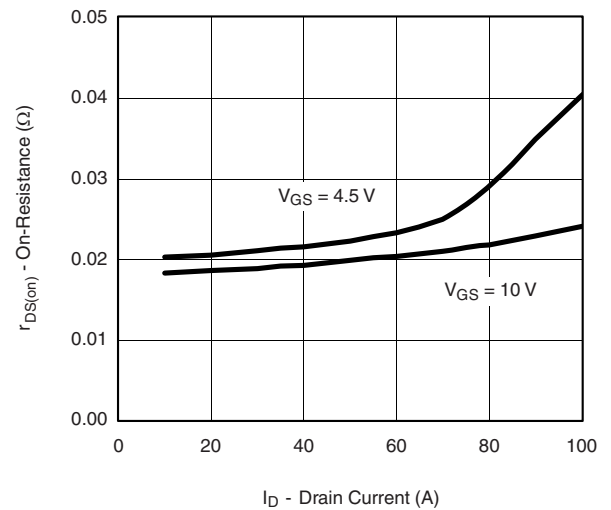
Output Characteristics



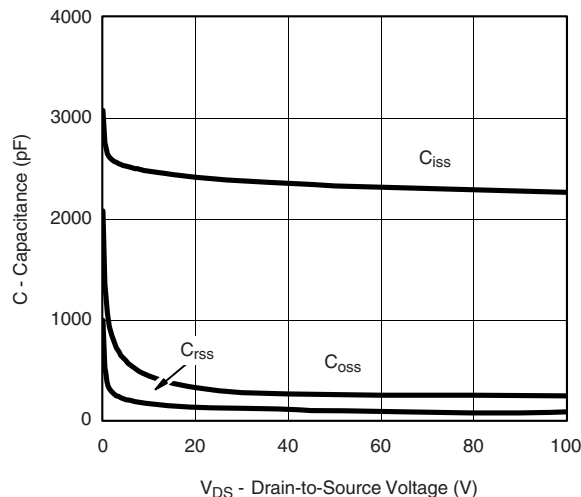
Transfer Characteristics



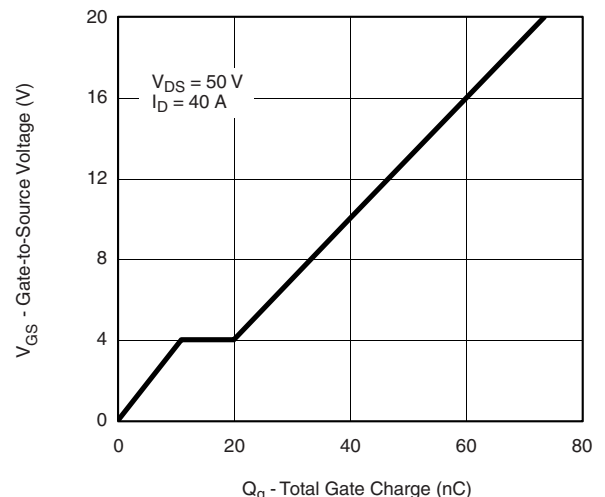
Transconductance



On-Resistance vs. Drain Current

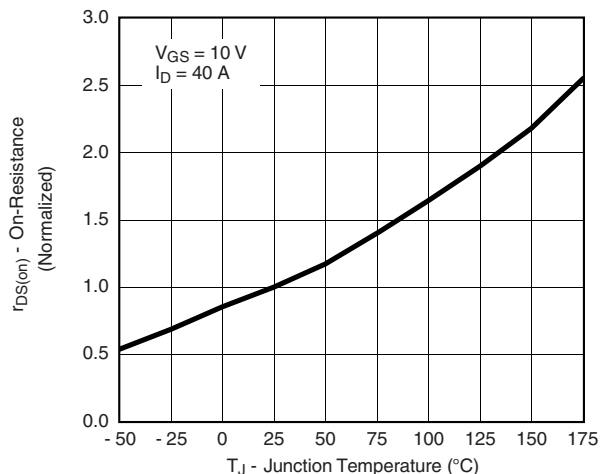


Capacitance

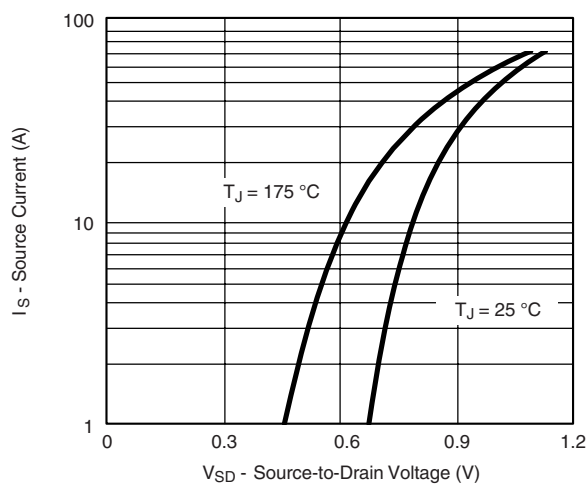


Gate Charge

## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

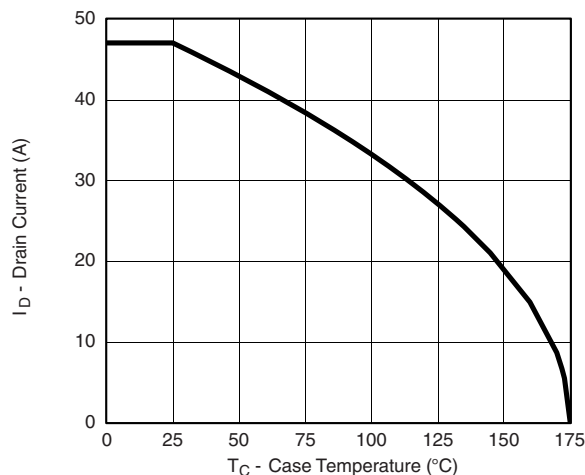


On-Resistance vs. Junction Temperature

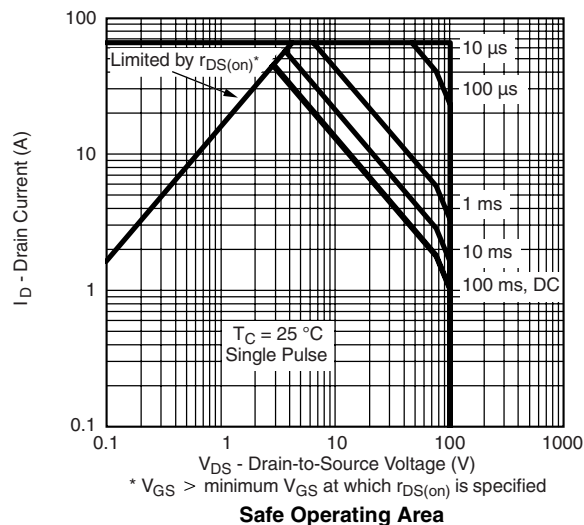


Source-Drain Diode Forward Voltage

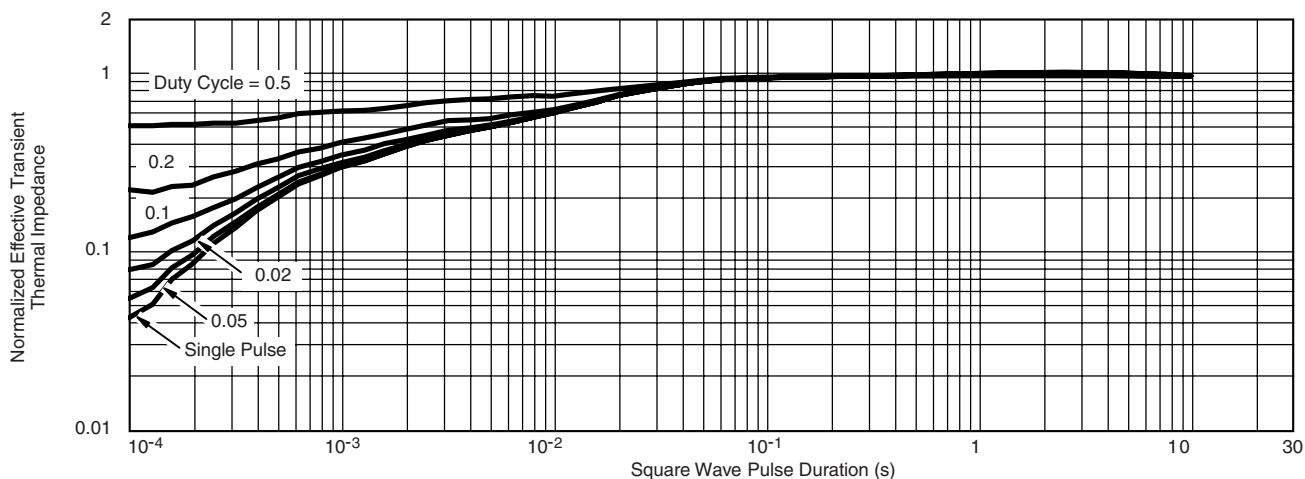
## THERMAL RATINGS



Maximum Avalanche Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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