



# N-Channel 60-V (D-S) 175°C MOSFET

| PRODUCT SUMMARY   |                           |                  |
|-------------------|---------------------------|------------------|
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A)        |
| 60                | 0.0052 @ $V_{GS} = 10$ V  | 110 <sup>a</sup> |
|                   | 0.0072 @ $V_{GS} = 4.5$ V |                  |

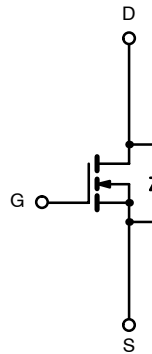
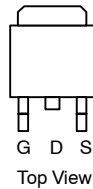
## FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- New Low Thermal Resistance Package

## APPLICATIONS

- Automotive and Industrial

TO-263



N-Channel MOSFET

Ordering Information: SUM110N06-05L  
SUM110N06-05L—E3 (Lead Free)

| ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) |                |                                       |                  |
|---|----------------|---------------------------------------|------------------|
| Parameter   | Symbol         | Limit                                 | Unit             |
| Drain-Source Voltage  | $V_{DS}$       | 60                                    | V                |
| Gate-Source Voltage   | $V_{GS}$       | $\pm 20$                              |                  |
| Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )                      | $I_D$          | $T_C = 25^\circ\text{C}$              | 110 <sup>a</sup> |
|   |                | $T_C = 125^\circ\text{C}$             | 82 <sup>a</sup>  |
| Pulsed Drain Current  | $I_{DM}$       | 300                                   | A                |
| Avalanche Current   | $I_{AR}$       | 75                                    |                  |
| Repetitive Avalanche Energy <sup>b</sup>                                    | $E_{AR}$       | L = 0.1 mH                            | 280              |
| Maximum Power Dissipation <sup>b</sup>                                      |                |                                       | $P_D$            |
| Operating Junction and Storage Temperature Range                            | $T_J, T_{stg}$ | $T_C = 25^\circ\text{C}$              | 230 <sup>c</sup> |
|   |                | $T_A = 25^\circ\text{C}$ <sup>d</sup> | 3.75             |
|   |                | -55 to 175                            | $^\circ\text{C}$ |

| THERMAL RESISTANCE RATINGS                 |            |       |                           |
|--|------------|-------|---------------------------|
| Parameter                                  | Symbol     | Limit | Unit                      |
| Junction-to-Ambient—PCB Mount <sup>d</sup> | $R_{thJA}$ | 40    | $^\circ\text{C}/\text{W}$ |
| Junction-to-Case                           | $R_{thJC}$ | 0.65  |                           |

### Notes

- Package limited.
- Duty cycle  $\leq 1\%$ .
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

| SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)                            |                      |  |     |        |        |      |
|---|----------------------|--|-----|--------|--------|------|
| Parameter   | Symbol               | Test Condition   | Min | Typ    | Max    | Unit |
| <b>Static</b>   |                      |  |     |        |        |      |
| Drain-Source Breakdown Voltage  | V <sub>(BR)DSS</sub> | V <sub>DS</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>D</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   |     |        | 250    |      |
| On-State Drain Current <sup>a</sup>   | I <sub>D(on)</sub>   | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V  | 120 |        |        | A    |
| Drain-Source On-State Resistance <sup>a</sup>   | r <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A  |     | 0.0044 | 0.0052 | Ω    |
|   |                      | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A   |     | 0.0059 | 0.0072 |      |
|   |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125 °C   |     |        | 0.0085 |      |
|   |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175 °C   |     |        | 0.011  |      |
| Forward Transconductance <sup>a</sup>   | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A  | 30  |        |        | S    |
| <b>Dynamic<sup>b</sup></b>  |                      |  |     |        |        |      |
| Input Capacitance   | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz   |     | 4300   |        | pF   |
| Output Capacitance  | C <sub>oss</sub>     |  |     | 770    |        |      |
| Reverse Transfer Capacitance  | C <sub>rss</sub>     |  |     | 365    |        |      |
| 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> = 110 A   |     | 80     | 120    | nC   |
| Gate-Source Charge <sup>c</sup>   | Q <sub>gs</sub>      |  |     | 19     |        |      |
| Gate-Drain Charge <sup>c</sup>  | Q <sub>gd</sub>      |  |     | 20     |        |      |
| Turn-On Delay Time <sup>c</sup>   | t <sub>d(on)</sub>   | V <sub>DD</sub> = 30 V, R <sub>L</sub> = 0.27 Ω<br>I <sub>D</sub> ≅ 110 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>       |  |     | 20     | 30     |      |
| 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 Characteristics (T<sub>C</sub> = 25 °C)<sup>b</sup></b> |                      |  |     |        |        |      |
| Continuous Current  | I <sub>S</sub>       |  |     |        | 110    | A    |
| Pulsed Current  | I <sub>SM</sub>      |  |     |        | 300    |      |
| Forward Voltage <sup>a</sup>  | V <sub>SD</sub>      | I <sub>F</sub> = 110 A, V <sub>GS</sub> = 0 V  |     | 1.1    | 1.5    | V    |
| Reverse Recovery Time   | t <sub>rr</sub>      | I <sub>F</sub> = 110 A, di/dt = 100 A/μs   |     | 75     | 125    | ns   |
| Peak Reverse Recovery Current   | I <sub>RM(REC)</sub> |  |     | 2.5    | 5      | A    |
| Reverse Recovery Charge   | Q <sub>rr</sub>      |  |     | 0.095  | 0.31   | μC   |

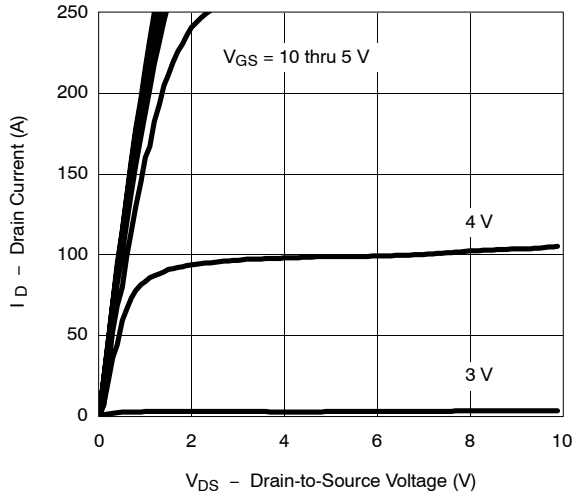
Notes

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

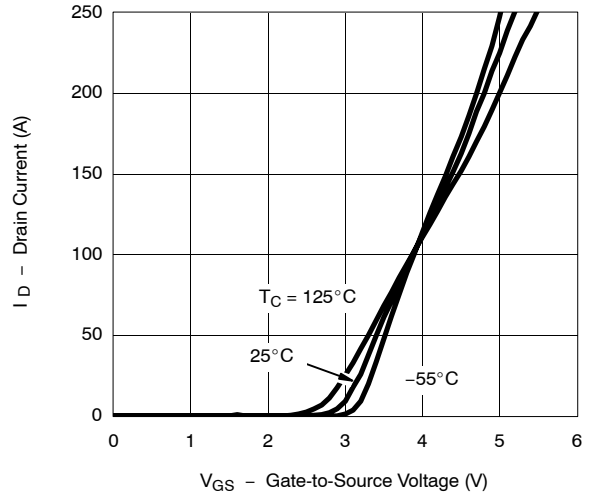


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

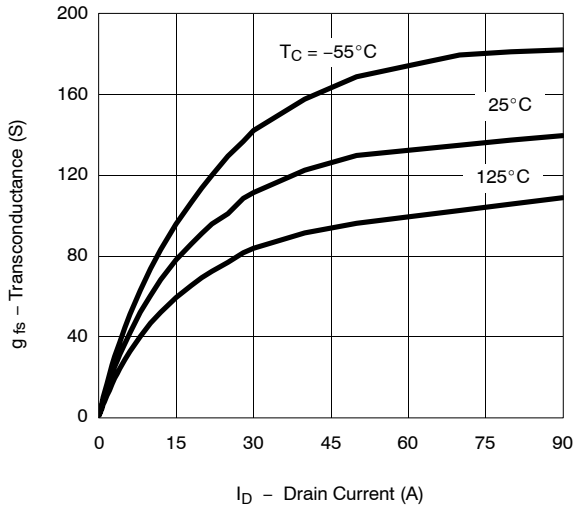
**Output Characteristics**



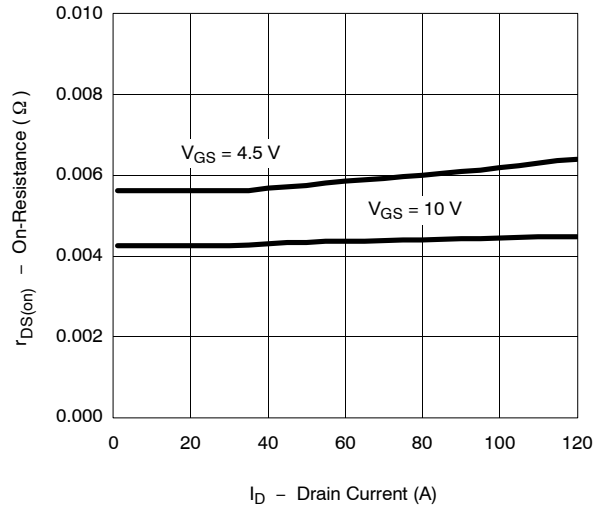
**Transfer Characteristics**



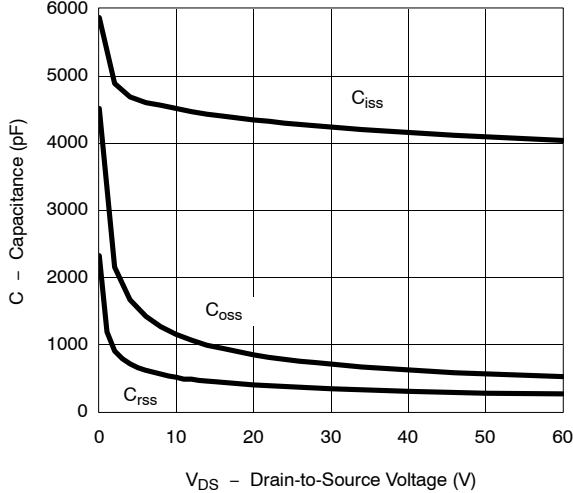
**Transconductance**



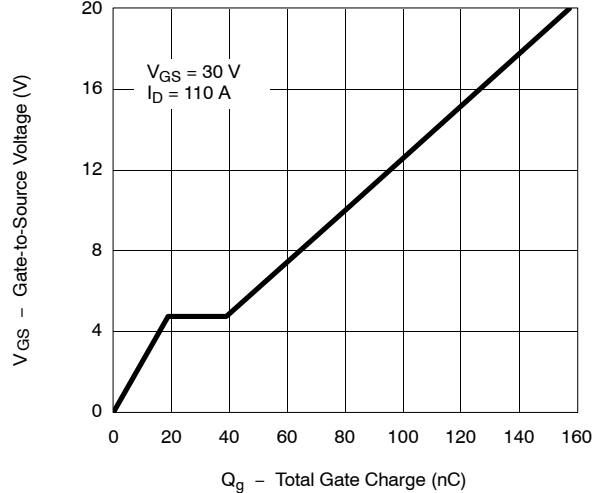
**On-Resistance vs. Drain Current**



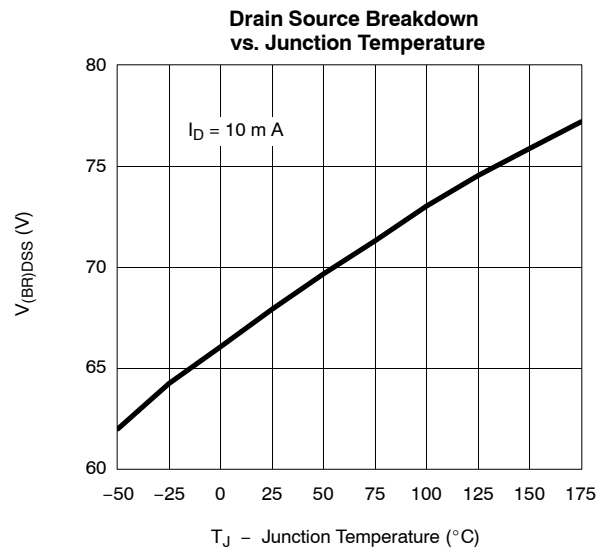
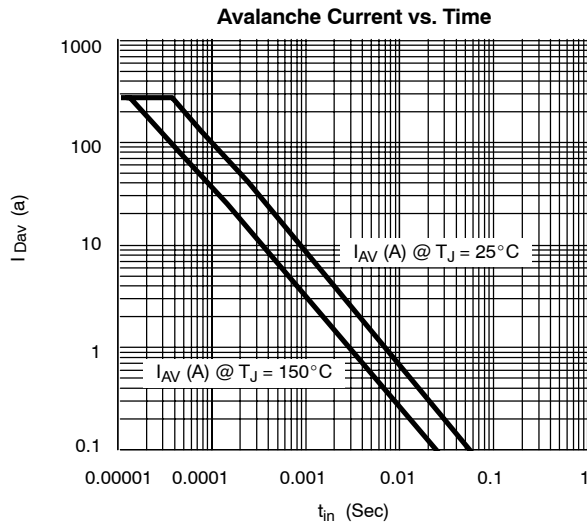
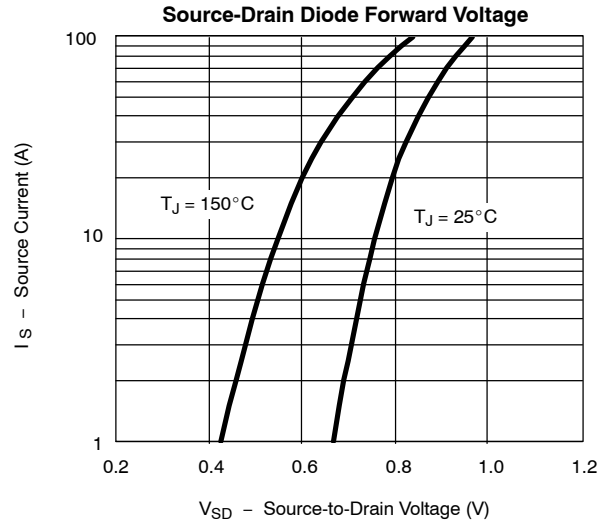
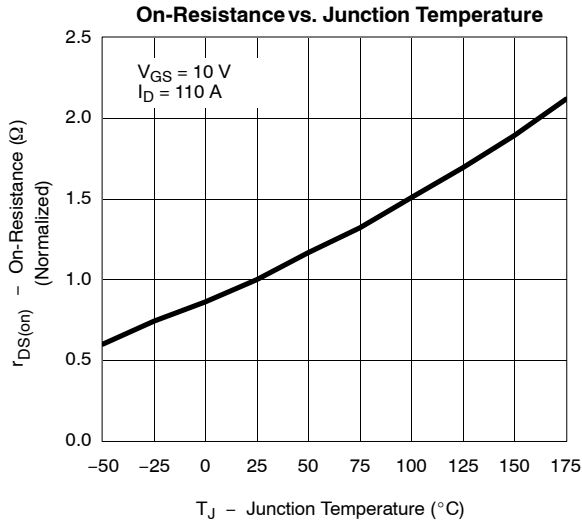
**Capacitance**



**Gate Charge**



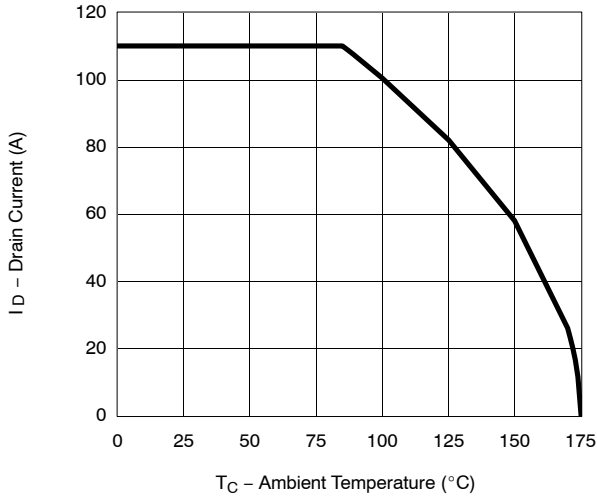
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



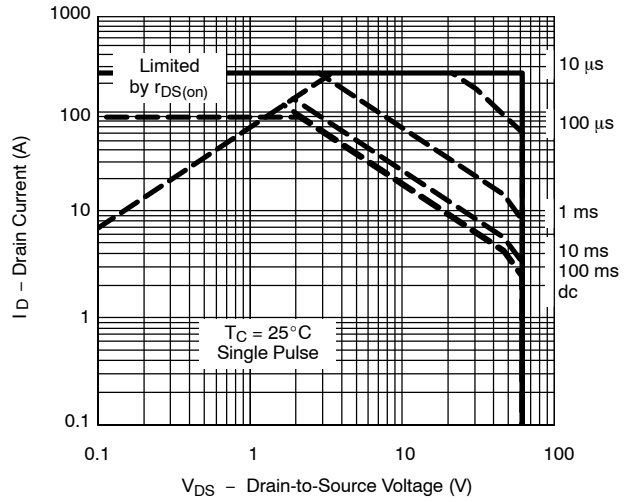


**THERMAL RATINGS**

Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

