

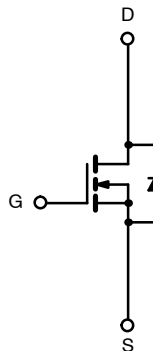
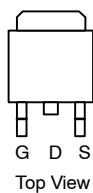


## N-Channel 200-V (D-S) 175°C MOSFET

## PRODUCT SUMMARY

| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A)       |
|-------------------|---------------------------|-----------------|
| 200               | 0.030 @ $V_{GS} = 10$ V   | 65 <sup>a</sup> |

TO-263



Ordering Information: SUM65N20-30  
SUM65N20-30-E3 (Lead Free)

N-Channel MOSFET

## FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- New Low Thermal Resistance Package
- 100%  $R_g$  Tested

## APPLICATIONS

- Automotive
  - 42-V EPS and ABS
  - DC/DC Conversion
  - Motor Drives
- Isolated DC/DC converters
  - Primary-Side Switch
  - High Voltage Synchronous Rectifier

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

| Parameter                                              |                            | Symbol         | Limit            | Unit             |
|--------------------------------------------------------|----------------------------|----------------|------------------|------------------|
| Drain-Source Voltage                                   |                            | $V_{DS}$       | 200              | V                |
| Gate-Source Voltage                                    |                            | $V_{GS}$       | $\pm 20$         |                  |
| Continuous Drain Current ( $T_J = 175^\circ\text{C}$ ) | $T_C = 25^\circ\text{C}$   | $I_D$          | 65 <sup>a</sup>  | A                |
|                                                        | $T_C = 125^\circ\text{C}$  |                | 37 <sup>a</sup>  |                  |
| Pulsed Drain Current                                   |                            | $I_{DM}$       | 140              |                  |
| Avalanche Current                                      |                            | $I_{AR}$       | 35               |                  |
| Repetitive Avalanche Energy <sup>b</sup>               | $L = 0.1$ mH               | $E_{AR}$       | 61               | mJ               |
| Maximum Power Dissipation <sup>b</sup>                 | $T_C = 25^\circ\text{C}$   | $P_D$          | 375 <sup>c</sup> | W                |
|                                                        | $T_A = 25^\circ\text{C}^d$ |                | 3.75             |                  |
| Operating Junction and Storage Temperature Range       |                            | $T_J, T_{stg}$ | -55 to 175       | $^\circ\text{C}$ |

## THERMAL RESISTANCE RATINGS

| Parameter                |                                 | Symbol     | Limit | Unit               |
|--------------------------|---------------------------------|------------|-------|--------------------|
| Junction-to-Ambient      | PCB Mount (TO-263) <sup>d</sup> | $R_{thJA}$ | 40    | $^\circ\text{C/W}$ |
| Junction-to-Case (Drain) |                                 | $R_{thJC}$ | 0.4   |                    |

## Notes

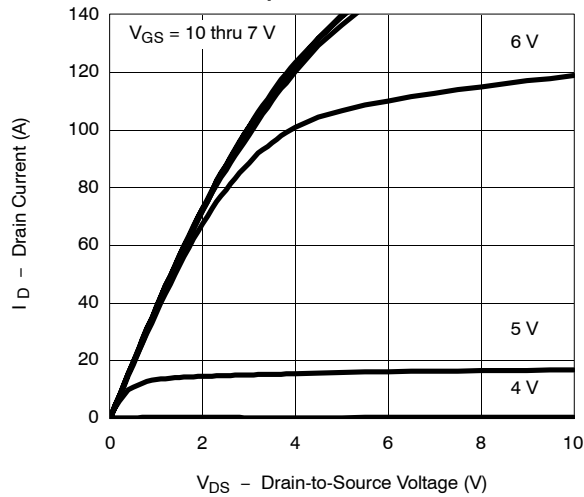
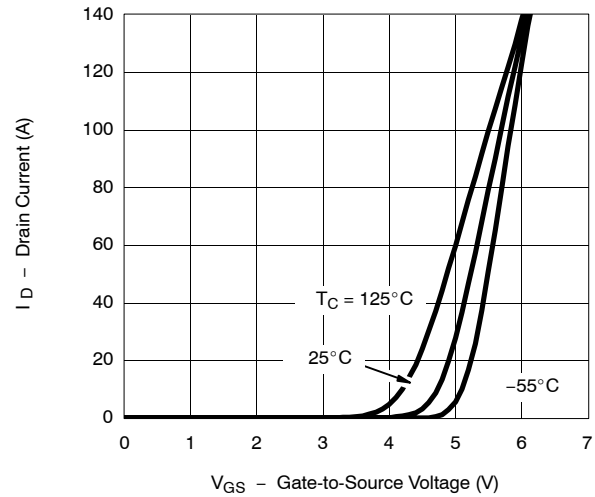
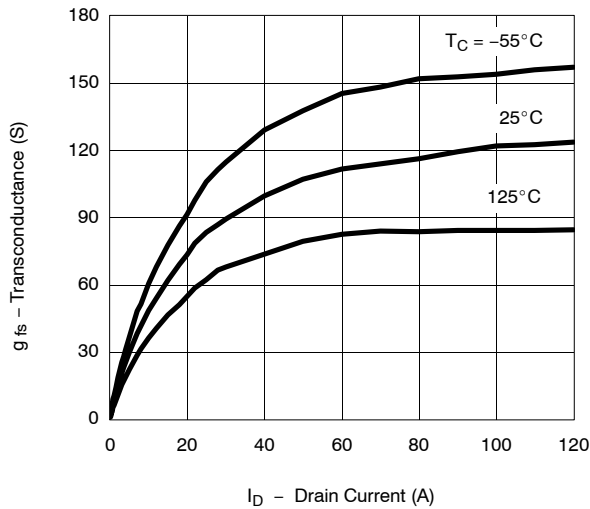
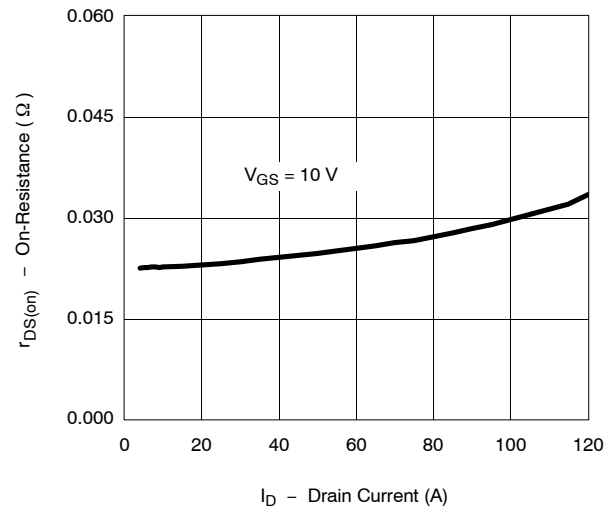
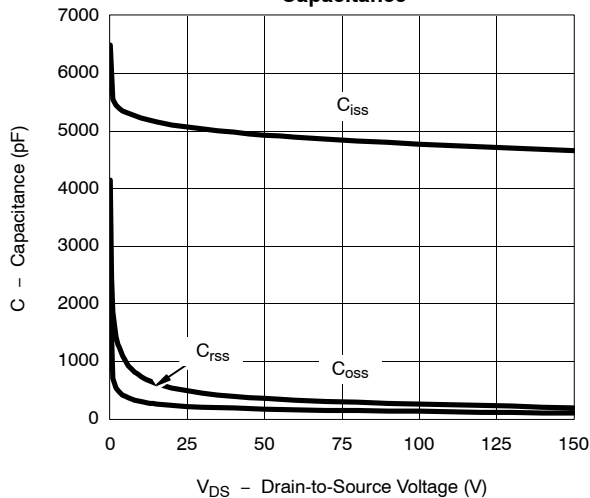
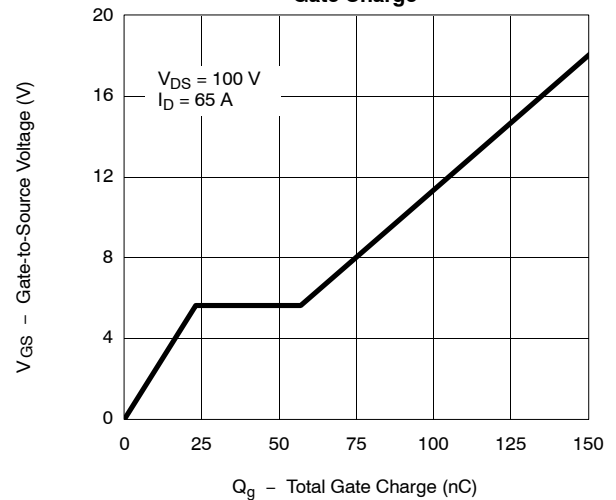
- a. Package limited.  
b. Duty cycle  $\leq 1\%$ .  
c. See SOA curve for voltage derating.  
d. When mounted on 1" square PCB (FR-4 material).

**SPECIFICATIONS (T<sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)**

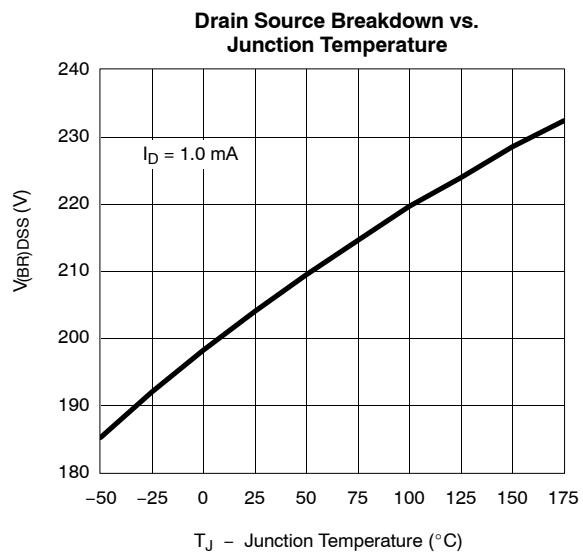
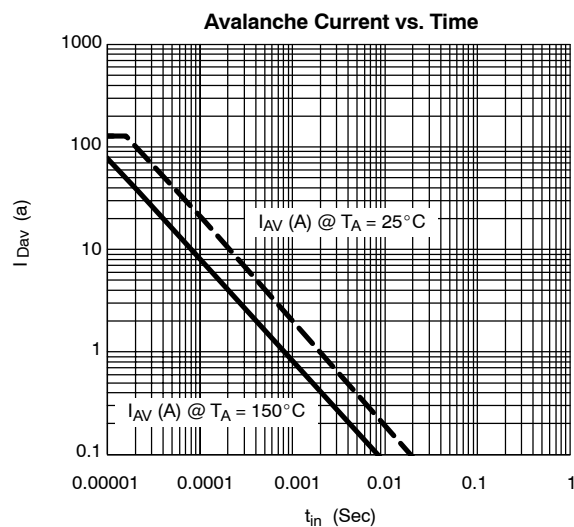
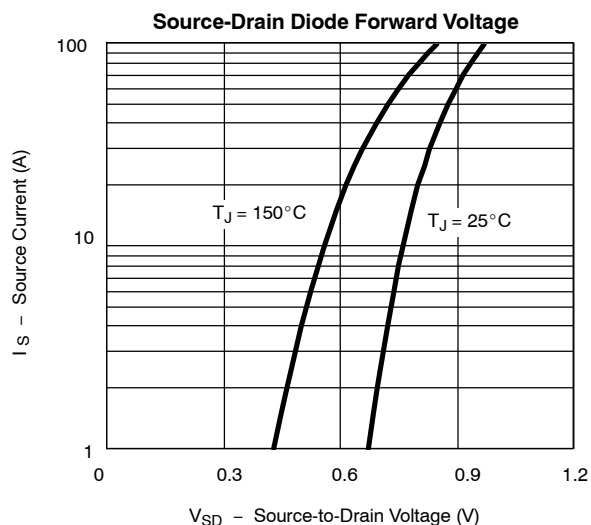
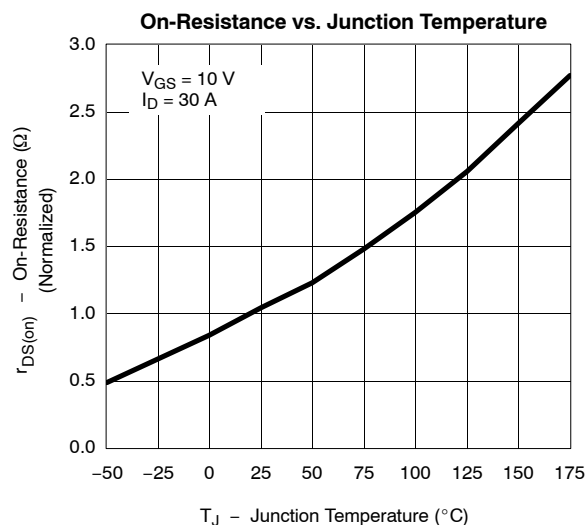
| Parameter                                                                           | Symbol               | Test Condition                                                                                                            | Min | Typ   | Max   | Unit |
|-------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------|-----|-------|-------|------|
| Static                                                                              |                      |                                                                                                                           |     |       |       |      |
| Drain-Source Breakdown Voltage                                                      | V <sub>(BR)DSS</sub> | V <sub>DS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                                            | 200 |       |       | V    |
| Gate-Threshold Voltage                                                              | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                                               | 2   |       | 4     |      |
| 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> = 200 V, V <sub>GS</sub> = 0 V                                                                            |     |       | 1     | μA   |
|                                                                                     |                      | V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C                                                    |     |       | 50    |      |
|                                                                                     |                      | V <sub>DS</sub> = 200 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                                                                             |     | 0.023 | 0.030 | Ω    |
|                                                                                     |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 125°C                                                     |     |       | 0.063 |      |
|                                                                                     |                      | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A, T <sub>J</sub> = 175°C                                                     |     |       | 0.084 |      |
| Forward Transconductance <sup>a</sup>                                               | g <sub>fs</sub>      | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 30 A                                                                             | 25  |       |       | 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                                                                  |     | 5100  |       | pF   |
| Output Capacitance                                                                  | C <sub>oss</sub>     |                                                                                                                           |     | 480   |       |      |
| Reverse Transfer Capacitance                                                        | C <sub>rss</sub>     |                                                                                                                           |     | 210   |       |      |
| Total Gate Charge <sup>c</sup>                                                      | Q <sub>g</sub>       | V <sub>DS</sub> = 100 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 85 A                                                    |     | 90    | 130   | nC   |
| Gate-Source Charge <sup>c</sup>                                                     | Q <sub>gs</sub>      |                                                                                                                           |     | 23    |       |      |
| Gate-Drain Charge <sup>c</sup>                                                      | Q <sub>gd</sub>      |                                                                                                                           |     | 34    |       |      |
| Gate Resistance                                                                     | R <sub>g</sub>       |                                                                                                                           | 0.5 | 1.7   | 3.3   | Ω    |
| Turn-On Delay Time <sup>c</sup>                                                     | t <sub>d(on)</sub>   | V <sub>DD</sub> = 100 V, R <sub>L</sub> = 1.5 Ω<br>I <sub>D</sub> ≅ 65 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω |     | 24    | 35    | ns   |
| Rise Time <sup>c</sup>                                                              | t <sub>r</sub>       |                                                                                                                           |     | 220   | 330   |      |
| Turn-Off Delay Time <sup>c</sup>                                                    | t <sub>d(off)</sub>  |                                                                                                                           |     | 45    | 70    |      |
| Fall Time <sup>c</sup>                                                              | t <sub>f</sub>       |                                                                                                                           |     | 200   | 300   |      |
| Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25°C) <sup>b</sup> |                      |                                                                                                                           |     |       |       |      |
| Continuous Current                                                                  | I <sub>S</sub>       |                                                                                                                           |     |       | 65    | A    |
| Pulsed Current                                                                      | I <sub>SM</sub>      |                                                                                                                           |     |       | 140   |      |
| Forward Voltage <sup>a</sup>                                                        | V <sub>SD</sub>      | I <sub>F</sub> = 65 A, V <sub>GS</sub> = 0 V                                                                              |     | 1.0   | 1.5   | V    |
| Reverse Recovery Time                                                               | t <sub>rr</sub>      | I <sub>F</sub> = 50 A, di/dt = 100 A/μs                                                                                   |     | 130   | 200   | ns   |
| Peak Reverse Recovery Current                                                       | I <sub>RM(REC)</sub> |                                                                                                                           |     | 8     | 12    | A    |
| Reverse Recovery Charge                                                             | Q <sub>rr</sub>      |                                                                                                                           |     | 0.52  | 1.2   | μC   |

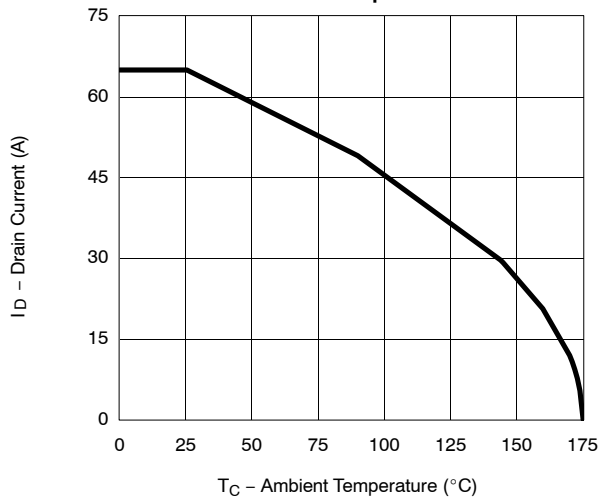
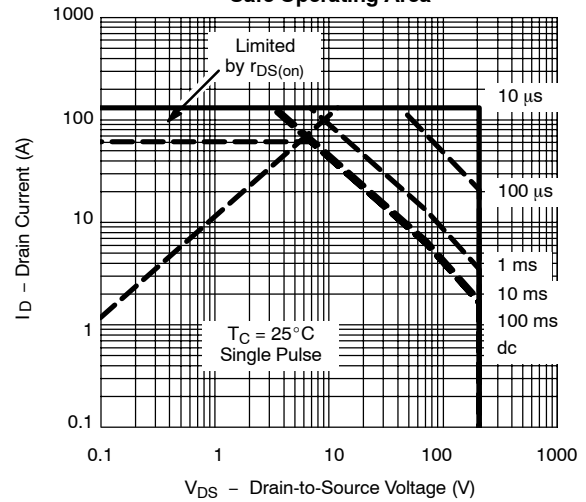
**Notes**

- 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 Avalanche and Drain Current  
vs. Case Temperature****Safe Operating Area****Normalized Thermal Transient Impedance, Junction-to-Case**