

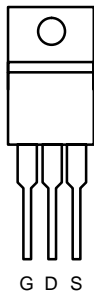


## N-Channel 60-V (D-S) 175°C MOSFET

| PRODUCT SUMMARY   |                           |            |
|-------------------|---------------------------|------------|
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A)  |
| 60                | 0.0052 @ $V_{GS} = 10$ V  | $\pm 85^a$ |
|                   | 0.0072 @ $V_{GS} = 4.5$ V |            |

**175°C Rated**  
Maximum Junction Temperature  
**TrenchFET®**  
Power MOSFETs

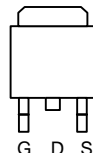
TO-220AB



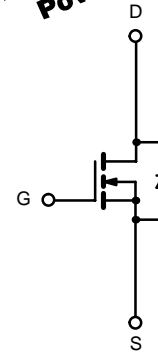
Top View  
SUP85N06-05

DRAIN connected to TAB

TO-263



Top View  
SUB85N06-05



N-Channel MOSFET

| 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 ( $T_J = 175^\circ\text{C}$ )                      | $I_D$          | $T_C = 25^\circ\text{C}$                       | $\pm 85^a$                                     |
|   |                | $T_C = 125^\circ\text{C}$                      | $\pm 85^a$                                     |
| Pulsed Drain Current  | $I_{DM}$       | $\pm 240$                                      | A  |
| Avalanche Current   | $I_{AR}$       | $\pm 75$                                       |  |
| Repetitive Avalanche Energy <sup>b</sup>                                    | $E_{AR}$       | L = 0.1 mH                                     | 280  |
| Maximum Power Dissipation <sup>b</sup>                                      |                |  | $T_C = 25^\circ\text{C}$ (TO-220AB and TO-263) |
|   |                | $T_A = 25^\circ\text{C}$ (TO-263) <sup>d</sup> | 3.7  |
| 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        | $R_{thJA}$ | PCB Mount (TO-263) <sup>d</sup> | 40                 |
|                            |            | Free Air (TO-220AB)             | 62.5               |
| Junction-to-Case           | $R_{thJC}$ | 0.6                             | $^\circ\text{C/W}$ |

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 |
| <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> = 48 V, V <sub>GS</sub> = 0 V  |     |        | 1      | μA   |
|   |                      | V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C   |     |        | 50     |      |
|   |                      | V <sub>DS</sub> = 48 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   |     |        | 0.010  |      |
| 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   |     | 7560   |        | pF   |
| Output Capacitance  | C <sub>oss</sub>     |  |     | 1050   |        |      |
| Reverse Transfer Capacitance  | C <sub>rss</sub>     |  |     | 570    |        |      |
| 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> = 85 A  |     | 155    | 220    | nC   |
| Gate-Source Charge <sup>c</sup>   | Q <sub>gs</sub>      |  |     | 28     |        |      |
| Gate-Drain Charge <sup>c</sup>  | Q <sub>gd</sub>      |  |     | 44     |        |      |
| Turn-On Delay Time <sup>c</sup>   | t <sub>d(on)</sub>   | V <sub>DD</sub> = 30 V, R <sub>L</sub> = 0.4 Ω<br>I <sub>D</sub> ≅ 85 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>       |  |     | 90     | 130    |      |
| Turn-Off Delay Time <sup>c</sup>  | t <sub>d(off)</sub>  |  |     | 95     | 140    |      |
| Fall Time <sup>c</sup>  | t <sub>f</sub>       |  |     | 105    | 150    |      |
| <b>Source-Drain Diode Ratings and Characteristics (T<sub>C</sub> = 25 °C)<sup>b</sup></b> |                      |  |     |        |        |      |
| Continuous Current  | I <sub>S</sub>       |  |     |        | 75     | A    |
| Pulsed Current  | I <sub>SM</sub>      |  |     |        | 240    |      |
| Forward Voltage <sup>a</sup>  | V <sub>SD</sub>      | I <sub>F</sub> = 85 A, V <sub>GS</sub> = 0 V   |     | 1.1    | 1.4    | V    |
| Reverse Recovery Time   | t <sub>rr</sub>      | I <sub>F</sub> = 85 A, di/dt = 100 A/μs  |     | 50     | 85     | ns   |
| Peak Reverse Recovery Current   | I <sub>RM(REC)</sub> |  |     | 2.7    | 5      | A    |
| Reverse Recovery Charge   | Q <sub>rr</sub>      |  |     | 0.067  | 0.21   | μC   |

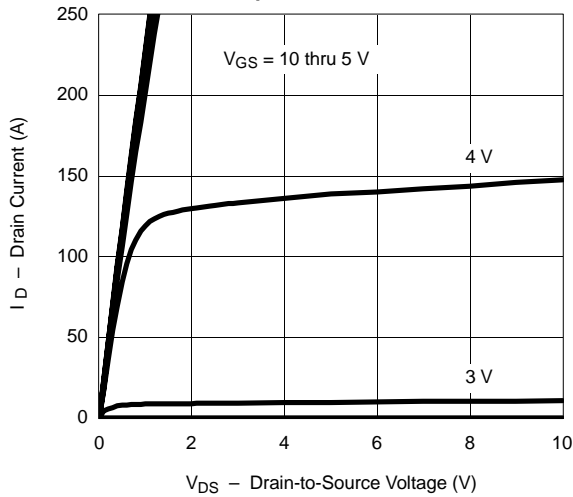
Notes

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

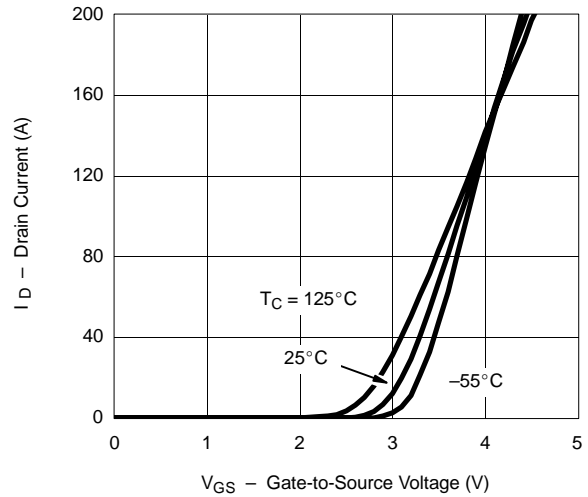


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

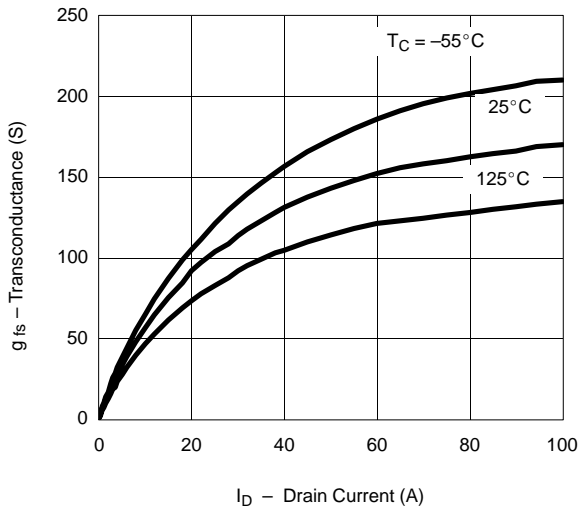
**Output Characteristics**



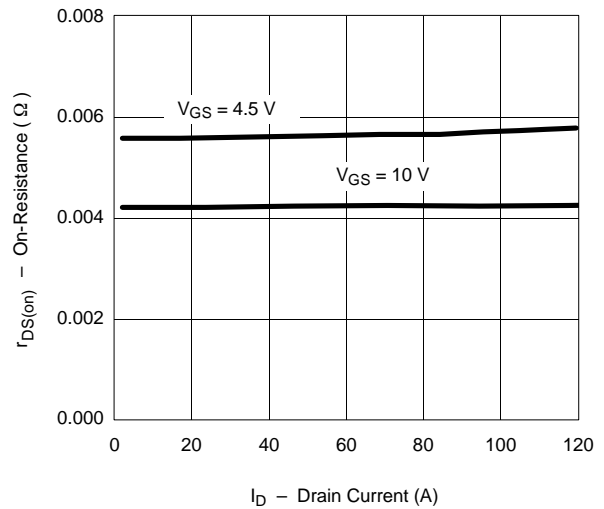
**Transfer Characteristics**



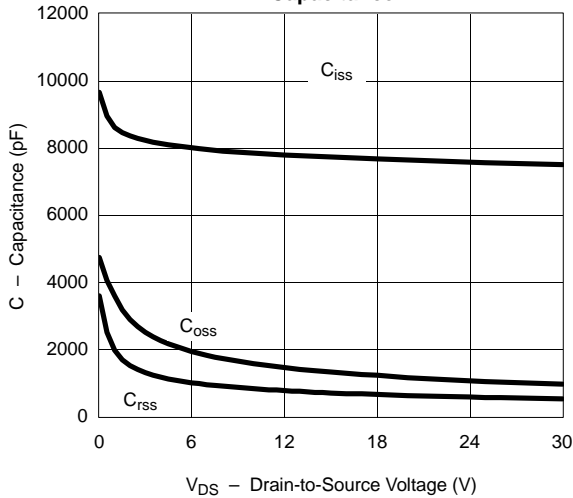
**Transconductance**



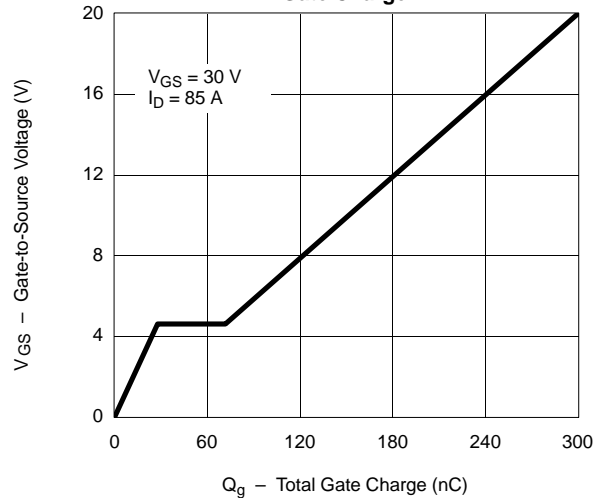
**On-Resistance vs. Drain Current**



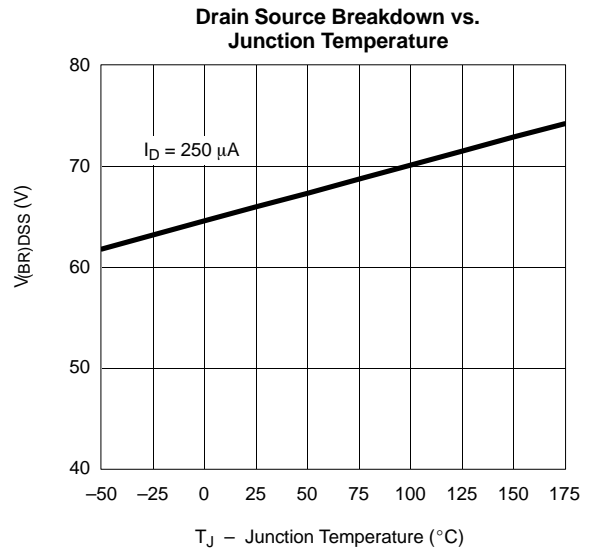
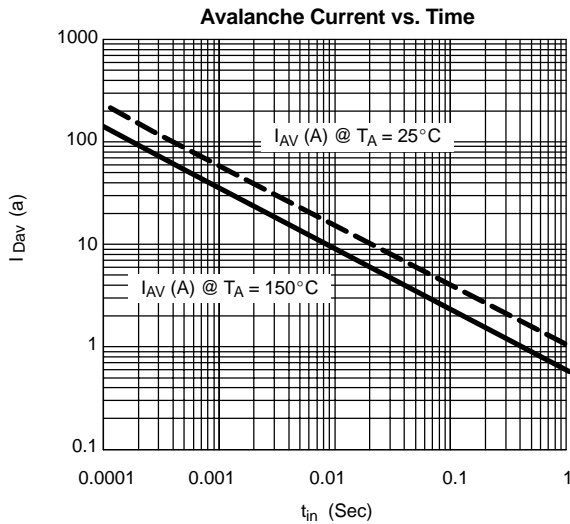
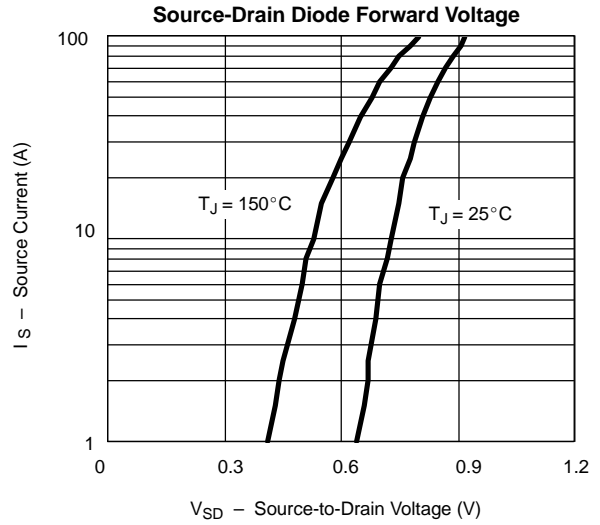
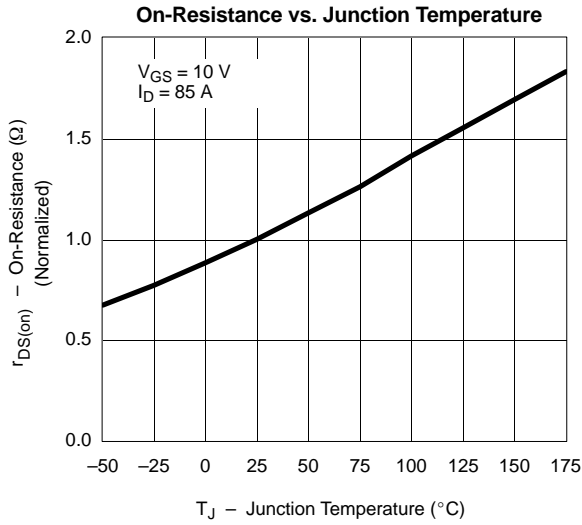
**Capacitance**



**Gate Charge**



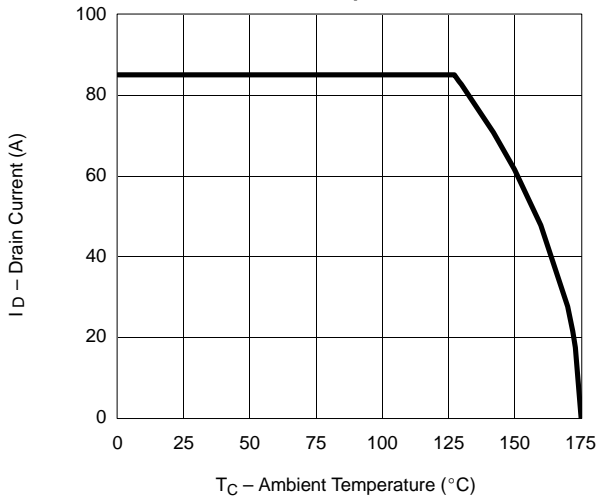
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**



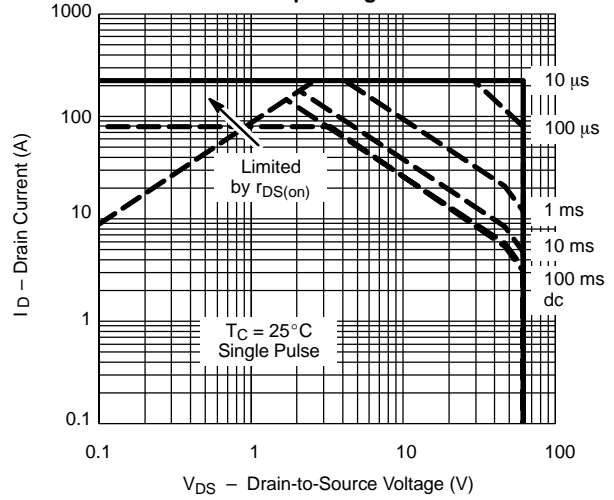


**THERMAL RATINGS**

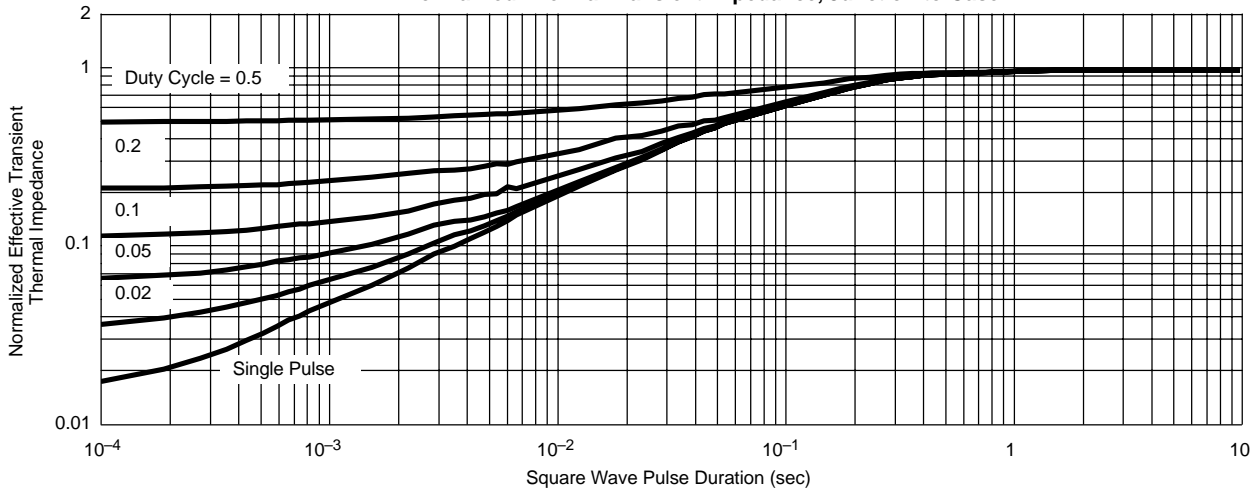
Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case



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