



N-Channel 100-V (D-S) 175°C MOSFET

| PRODUCT SUMMARY | | |
|-------------------|---------------------------|-----------------|
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | I_D (A) |
| 100 | 0.0094 @ $V_{GS} = 10$ V | 90 ^a |

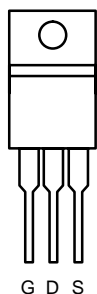
FEATURES

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

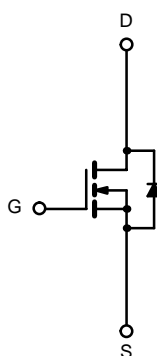
APPLICATIONS

- Automotive
 - 42-V Power Bus
 - DC/DC Conversion
 - Motor Drivers
 - Injection Systems

TO-220AB



Top View
SUP90N10-09



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) | | | | |
|---|----------------------------|----------------|------------------|------------------|
| Parameter | | Symbol | Limit | Unit |
| Drain-Source Voltage | | V_{DS} | 100 | V |
| Gate-Source Voltage | | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 175^\circ\text{C}$) | $T_C = 25^\circ\text{C}$ | I_D | 90 ^a | A |
| | $T_C = 125^\circ\text{C}$ | | 64 ^a | |
| Pulsed Drain Current | | I_{DM} | 240 | |
| Avalanche Current | | I_{AR} | 75 | |
| Repetitive Avalanche Energy ^b | $L = 0.1$ mH | E_{AR} | 280 | mJ |
| Maximum Power Dissipation ^b | $T_C = 25^\circ\text{C}$ | P_D | 300 ^c | 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 Mounted) ^d | | R_{thJA} | 40 | $^\circ\text{C/W}$ |
| Junction-to-Case (Drain) | | R_{thJC} | 0.5 | |

Notes

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

| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | |
|---|----------------------|--|-----|--------|--------|------|
| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{DS} = 0 V, I _D = 250 μA | 100 | | | V |
| Gate-Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 2 | | 4 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 80 V, V _{GS} = 0 V | | | 1 | μA |
| | | V _{DS} = 80 V, V _{GS} = 0 V, T _J = 125 °C | | | 50 | |
| | | V _{DS} = 80 V, V _{GS} = 0 V, T _J = 175 °C | | | 250 | mA |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} ≥ 5 V, V _{GS} = 10 V | 120 | | | A |
| Drain-Source On-State Resistance ^a | r _{DS(on)} | V _{GS} = 10 V, I _D = 30 A | | 0.0075 | 0.0094 | Ω |
| | | V _{GS} = 10 V, I _D = 30 A, T _J = 125 °C | | | 0.017 | |
| | | V _{GS} = 10 V, I _D = 30 A, T _J = 175 °C | | | 0.024 | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = 15 V, I _D = 30 A | 25 | | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz | | 8700 | | pF |
| Output Capacitance | C _{oss} | | | 740 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 450 | | |
| Total Gate Charge ^c | Q _g | V _{DS} = 50 V, V _{GS} = 10 V, I _D = 85 A | | 140 | 210 | nC |
| Gate-Source Charge ^c | Q _{gs} | | | 41 | | |
| Gate-Drain Charge ^c | Q _{gd} | | | 41 | | |
| Turn-On Delay Time ^c | t _{d(on)} | V _{DD} = 50 V, R _L = 0.6 Ω I _D ≅ 85 A, V _{GEN} = 10 V, R _G = 2.5 Ω | | 20 | 30 | ns |
| Rise Time ^c | t _r | | | 110 | 170 | |
| Turn-Off Delay Time ^c | t _{d(off)} | | | 65 | 100 | |
| Fall Time ^c | t _f | | | 100 | 150 | |
| Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)^b | | | | | | |
| Continuous Current | I _S | | | | 90 | A |
| Pulsed Current | I _{SM} | | | | 240 | |
| Forward Voltage ^a | V _{SD} | I _F = 50 A, V _{GS} = 0 V | | 1.0 | 1.5 | V |
| Reverse Recovery Time | t _{rr} | I _F = 50 A, di/dt = 100 A/μs | | 70 | 140 | ns |
| Peak Reverse Recovery Current | I _{RM(REC)} | | | 5.5 | 10 | A |
| Reverse Recovery Charge | Q _{rr} | | | 0.19 | 0.35 | μC |

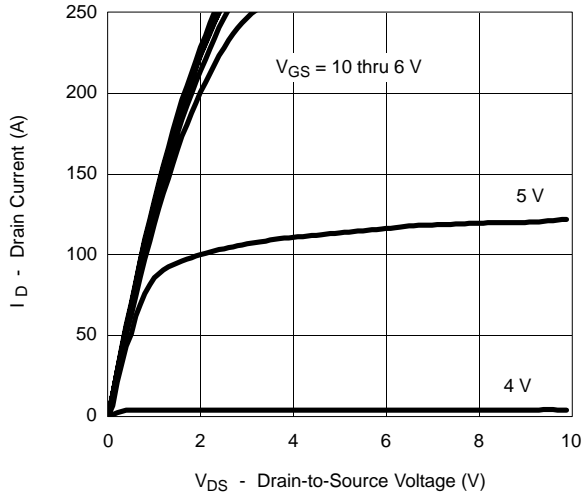
Notes

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

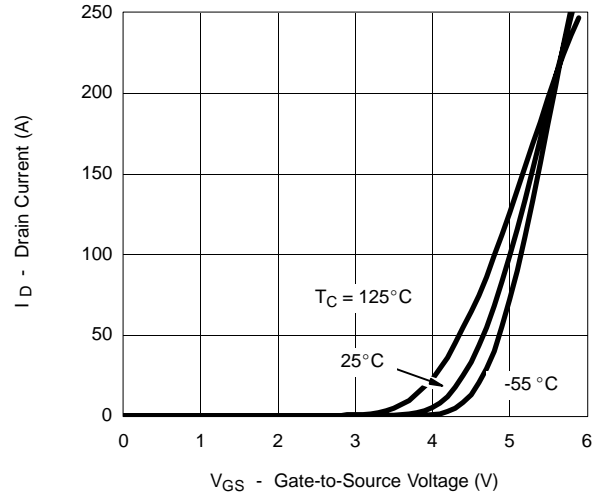


TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

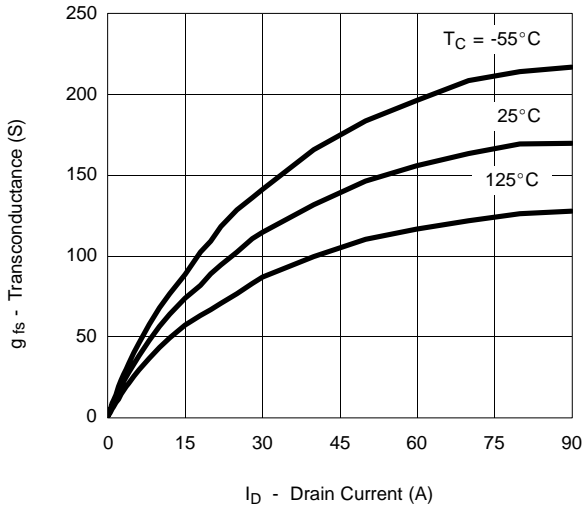
Output Characteristics



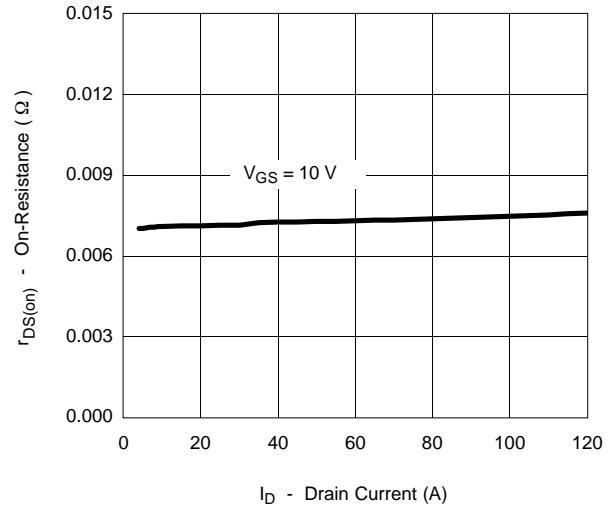
Transfer Characteristics



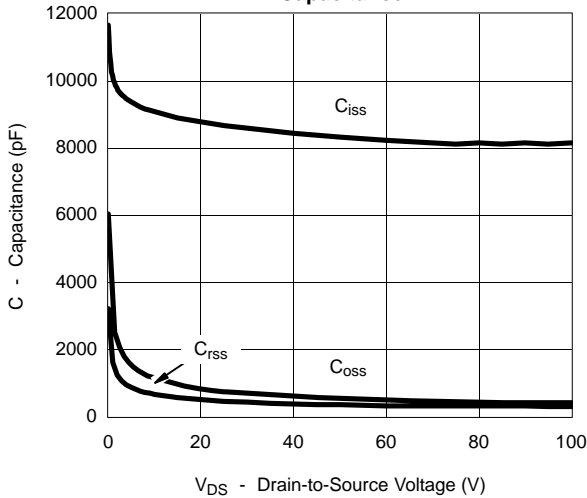
Transconductance



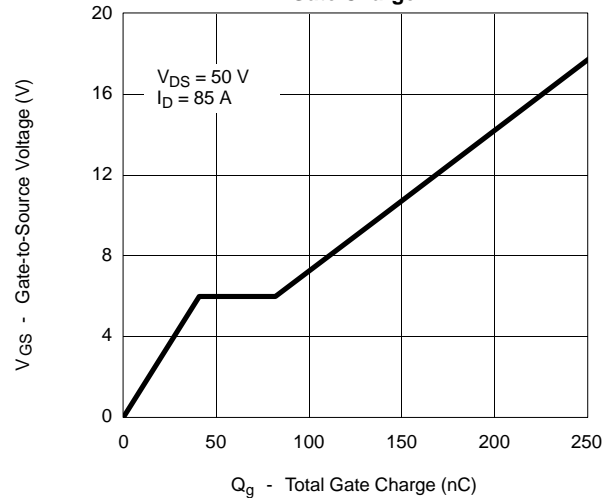
On-Resistance vs. Drain Current



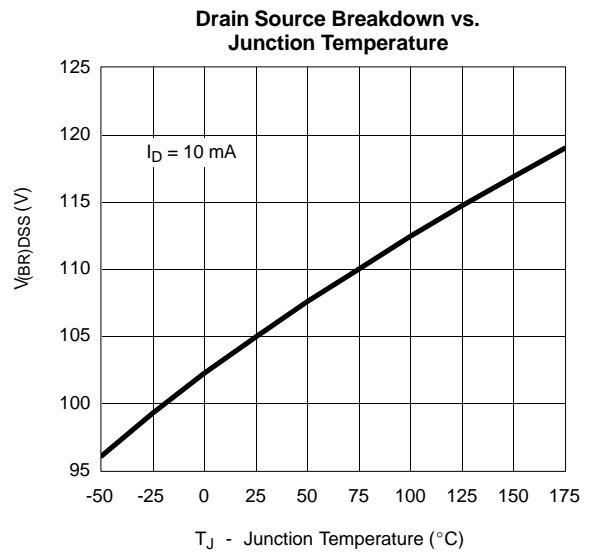
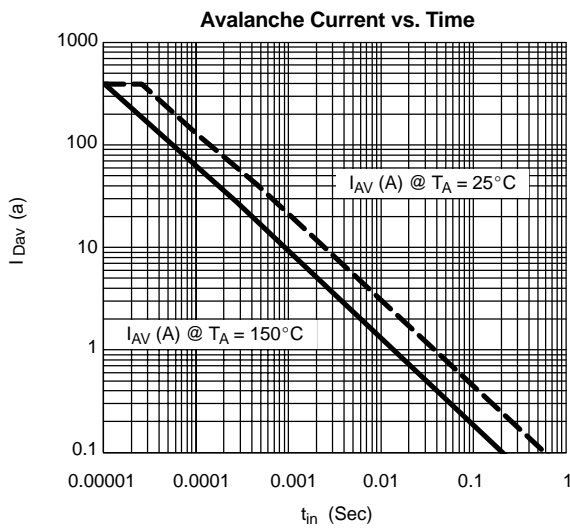
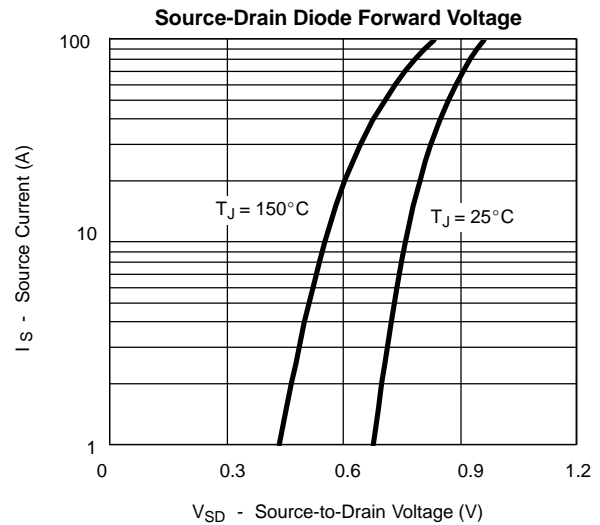
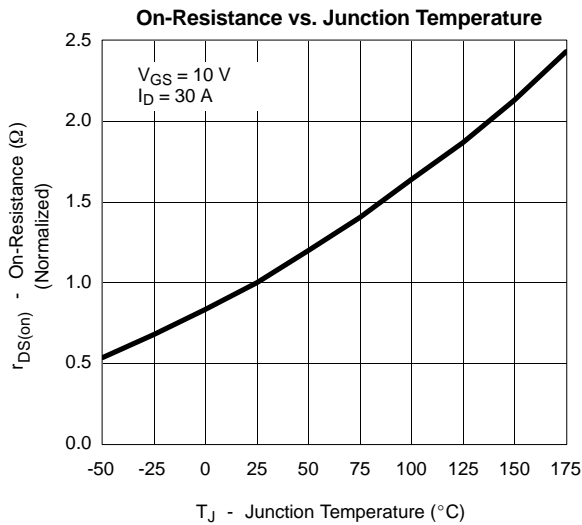
Capacitance



Gate Charge



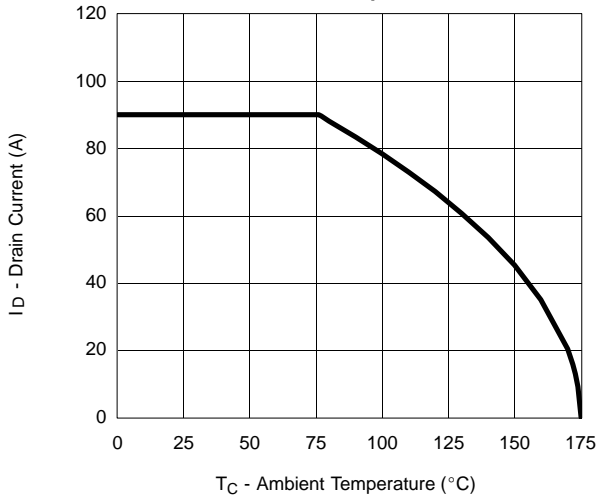
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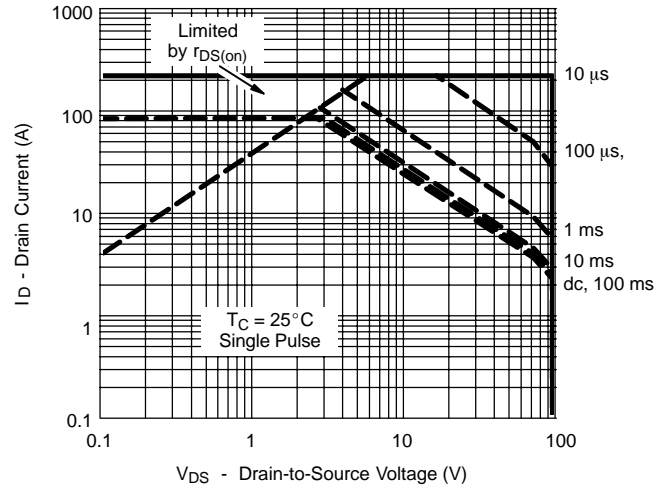


THERMAL RATINGS

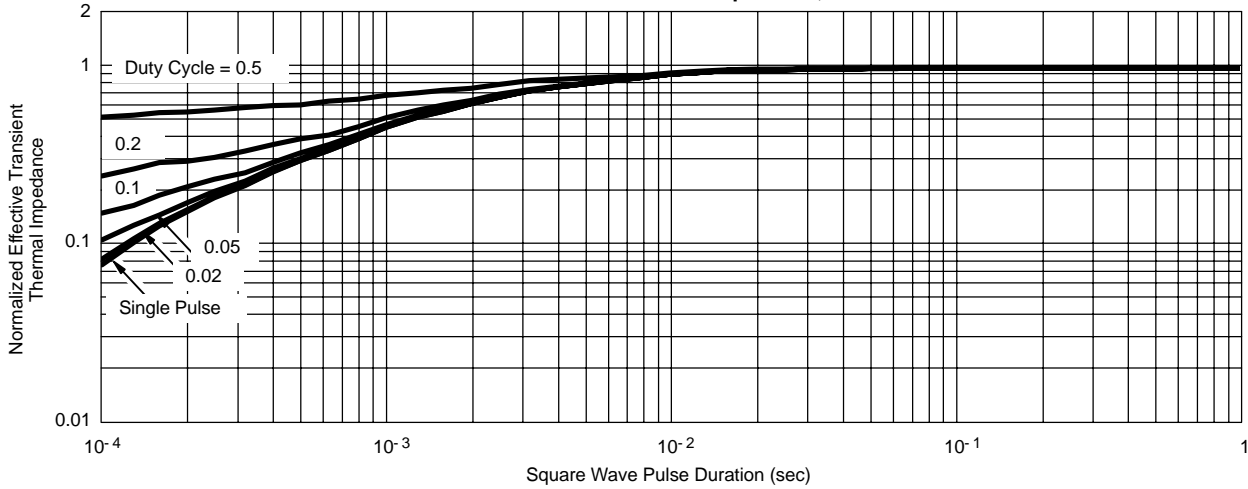
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case



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