



P-Channel 60-V (D-S) 175°C MOSFET

| PRODUCT SUMMARY | | |
|-----------------|----------------------------|------------------------|
| V_{DS} (V) | $r_{DS(on)}$ (Ω) | I_D (A) ^c |
| -60 | 0.0093 @ $V_{GS} = -10$ V | -90 |
| | 0.0118 @ $V_{GS} = -4.5$ V | -90 |

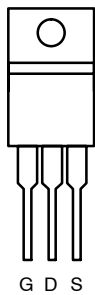
FEATURES

- TrenchFET® Power MOSFET

APPLICATIONS

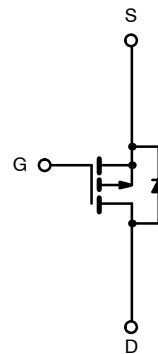
- DC/DC Primary Switch
- Automotive
 - 12-V Boardnet
 - High-Side Switches
 - Motor Drives

TO-220AB



Top View

DRAIN connected to TAB



P-Channel MOSFET

Ordering Information: SUP90P06-09L—E3

| 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} | ± 20 | |
| Continuous Drain Current ^c ($T_J = 175^\circ\text{C}$) | I_D | $T_C = 25^\circ\text{C}$ | -90 |
| | | $T_C = 125^\circ\text{C}$ | -67 |
| Pulsed Drain Current | I_{DM} | -200 | A |
| Avalanche Current | I_{AS} | -65 | mJ |
| Single Pulse Avalanche Energy ^a | E_{AS} | 211 | |
| Power Dissipation | P_D | $T_C = 25^\circ\text{C}$ | 250 ^b |
| | | $T_A = 25^\circ\text{C}$ | 2.4 |
| 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 Free Air | R_{thJA} | 62 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Case | R_{thJC} | 0.6 | |

Notes:

- Duty cycle $\leq 1\%$.
- See SOA curve for voltage derating.
- Limited by package.

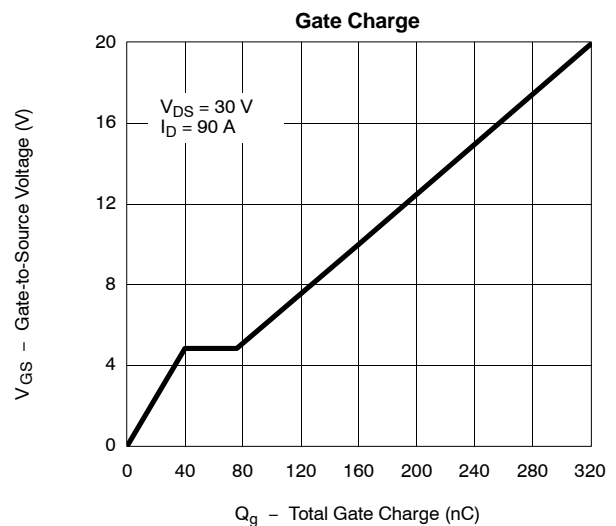
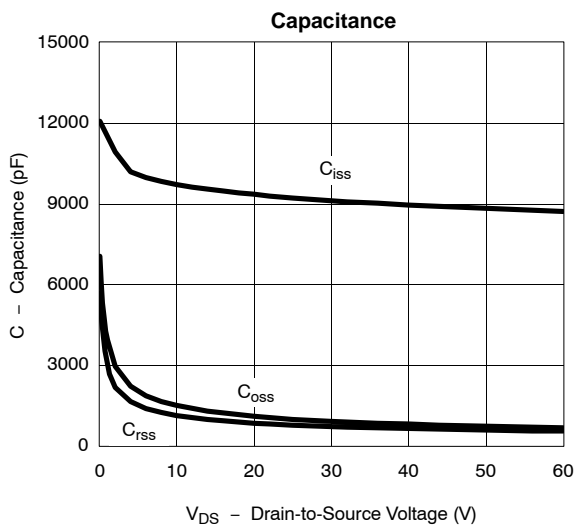
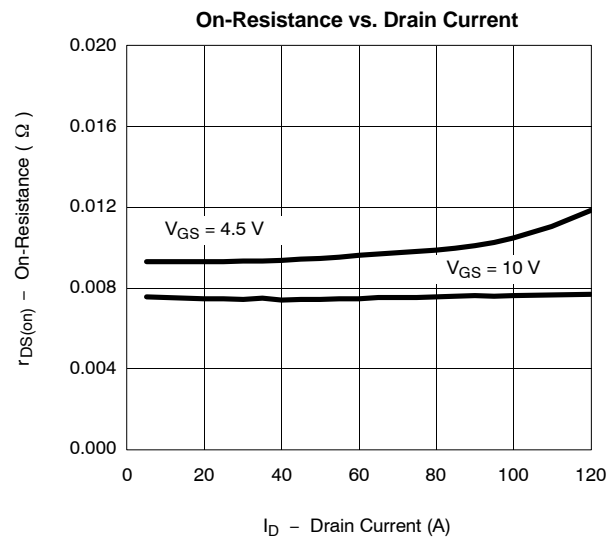
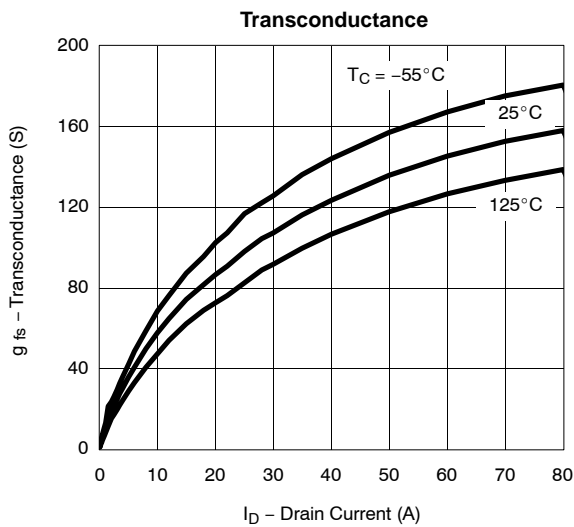
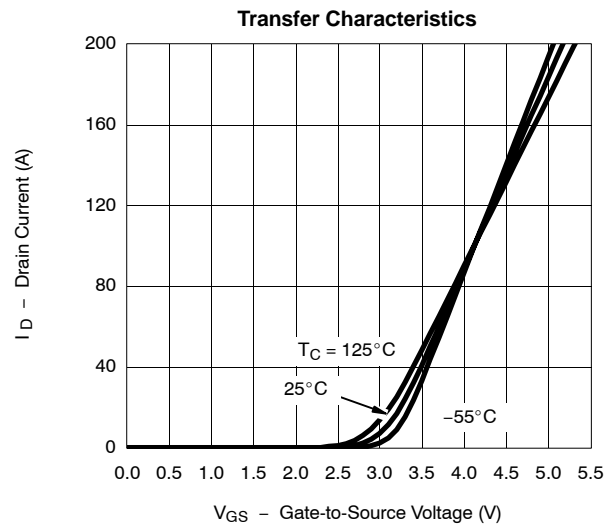
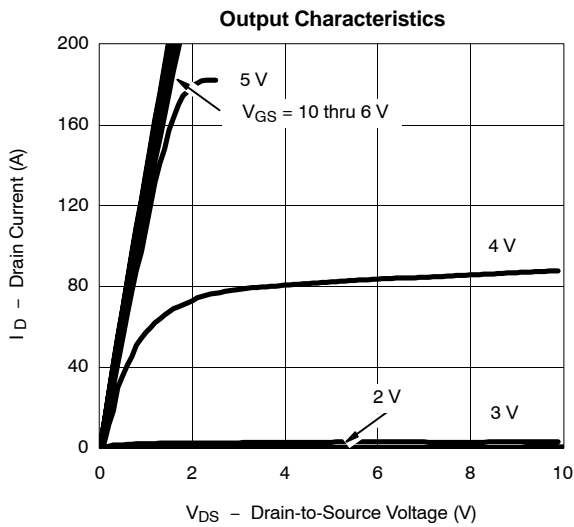
| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | |
|---|----------------------|--|------|--------|--------|------|
| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = -250 μA | -60 | | | V |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -250 μA | -1 | | -3 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = -60 V, V _{GS} = 0 V | | | -1 | μA |
| | | V _{DS} = -60 V, V _{GS} = 0 V, T _J = 125 °C | | | -50 | |
| | | V _{DS} = -60 V, V _{GS} = 0 V, T _J = 175 °C | | | -250 | |
| 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 | | 0.0074 | 0.0093 | Ω |
| | | V _{GS} = -10 V, I _D = -30 A, T _J = 125 °C | | | 0.0150 | |
| | | V _{GS} = -10 V, I _D = -30 A, T _J = 175 °C | | | 0.0190 | |
| | | V _{GS} = -4.5 V, I _D = -20 A | | 0.0094 | 0.0118 | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = -15 V, I _D = -30 A | 20 | | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = -25 V, f = 1 MHz | | 9200 | | pF |
| Output Capacitance | C _{oss} | | | 975 | | |
| Reversen Transfer Capacitance | C _{rss} | | | 760 | | |
| Total Gate Charge ^c | Q _g | V _{DS} = -30 V, V _{GS} = -10 V, I _D = -90 A | | 160 | 240 | nC |
| Gate-Source Charge ^c | Q _{gs} | | | 40 | | |
| Gate-Drain Charge ^c | Q _{gd} | | | 36 | | |
| Gate Resistance | R _g | f = 1.0 MHz | | 3 | | Ω |
| Turn-On Delay Time ^c | t _{d(on)} | V _{DD} = -30 V, R _L = 0.33 Ω I _D ≈ -90 A, V _{GEN} = -10 V, R _g = 2.5 Ω | | 20 | 30 | ns |
| Rise Time ^c | t _r | | | 190 | 285 | |
| Turn-Off Delay Time ^c | t _{d(off)} | | | 140 | 210 | |
| Fall Time ^c | t _f | | | 300 | 450 | |
| Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)^b | | | | | | |
| Continuous Current | I _s | | | | -90 | A |
| Pulsed Current | I _{SM} | | | | -200 | |
| 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 | | 60 | 90 | ns |
| Peak Reverse Recovery Current | I _{RM(REC)} | | | -3 | -4.5 | A |
| Reverse Recovery Charge | Q _{rr} | | | 0.09 | 0.2 | 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.

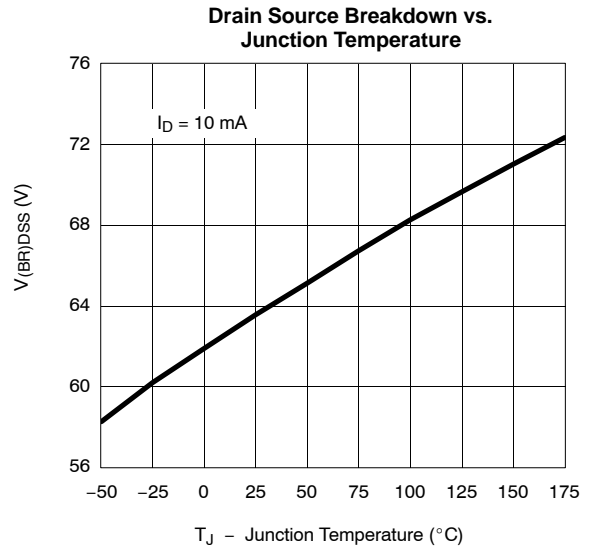
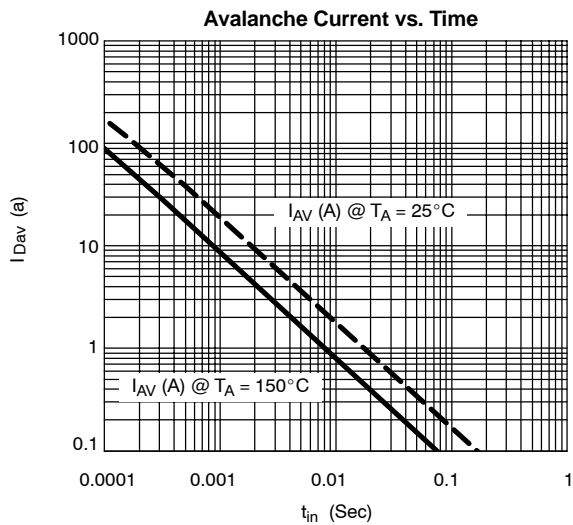
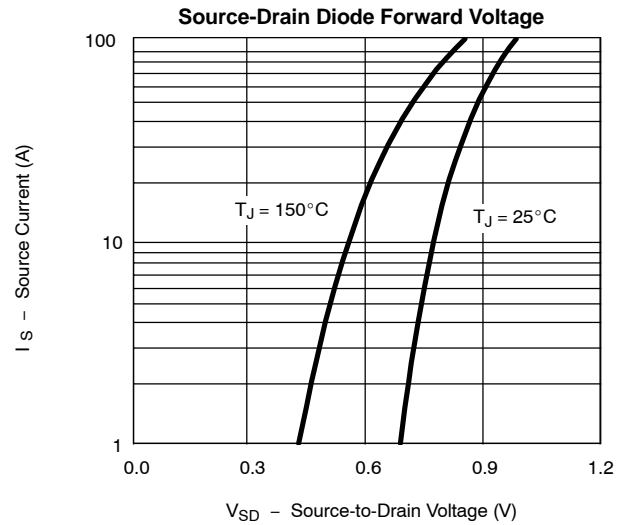
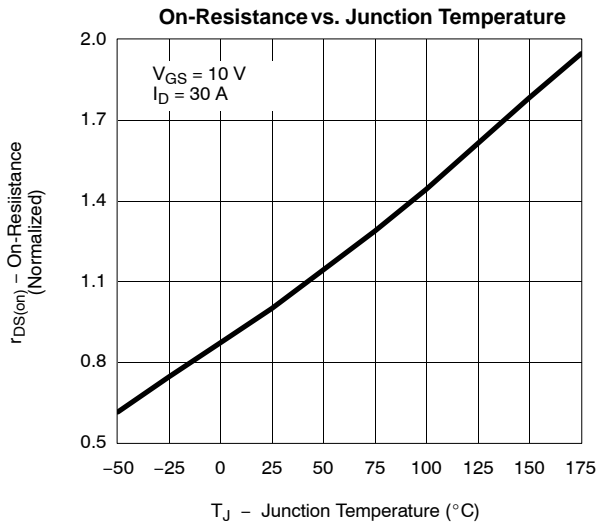


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)





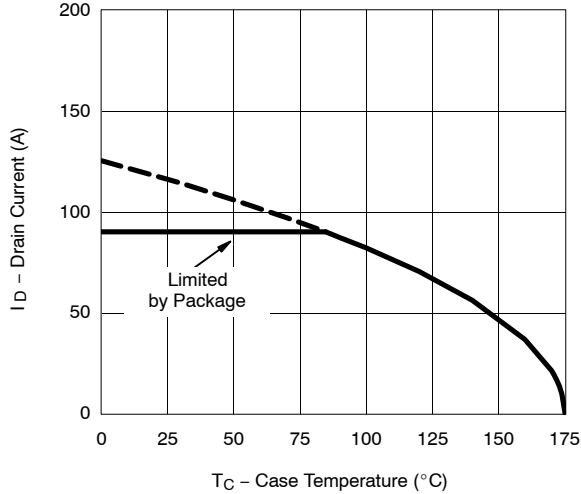
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



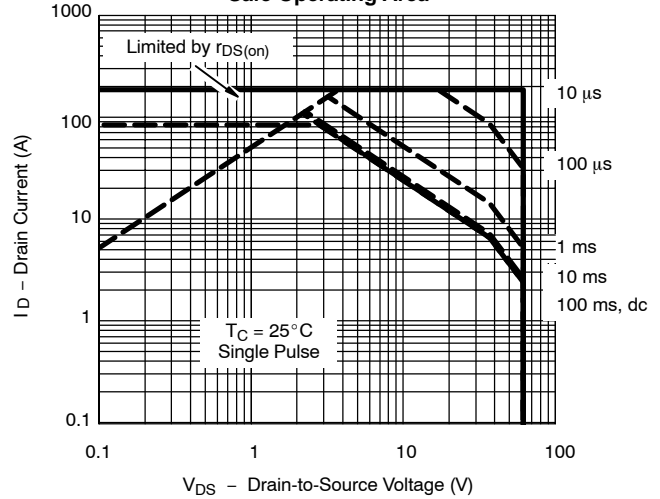


THERMAL RATINGS

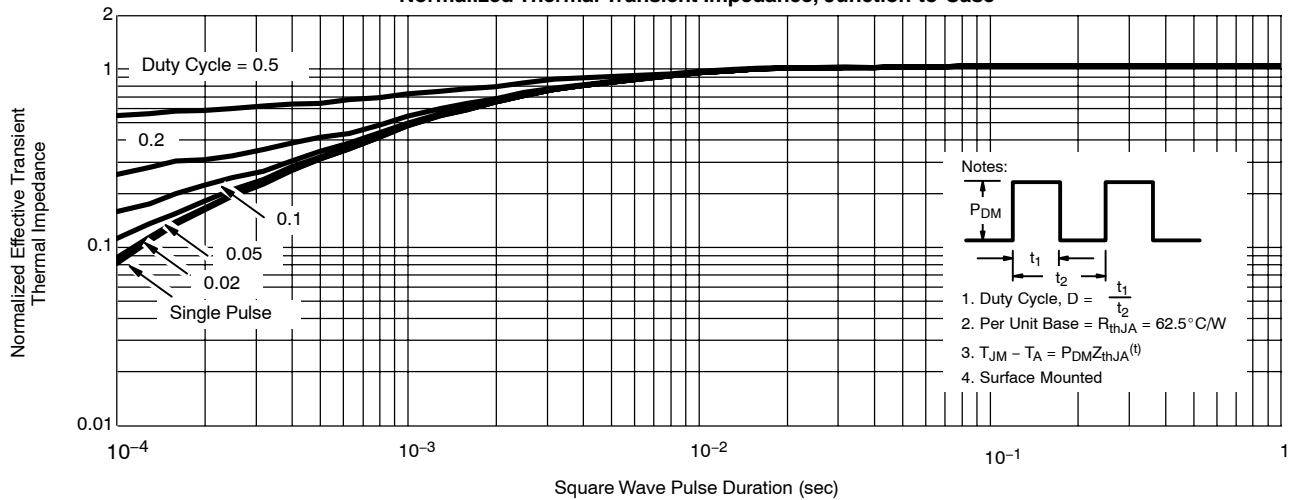
Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case





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