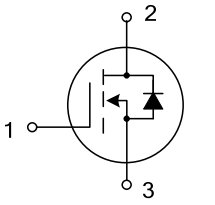
# 9A, 650V N-CHANNEL MOSFET

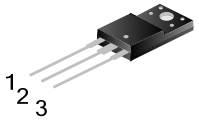
## GENERAL DESCRIPTION

SVF9N65F is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ structure VDMOS technology. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.




1.Gate 2.Drain 3.Source




TO-220F-3L

## FEATURES

- 9A, 650V, $R_{DS(on)(typ)}$=0.98Ω@$V_{GS}$=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

## NOMENCLATURE

S V F X N E X X X

Silan VDMOS Code of F-Cell process

Nominal current,using 1 or 2 digits:
Example:4 denotes 4A,
10 denotes 10A,
08 denotes 0.8A

N denotes N Channel

Special Features indication, May be omitted.
Example: E denotes embeded ESD structure

Nominal Voltage,using 2 digits
Example: 70 denotes 700V,

Package information.
Example:F:TO-220F.

## ORDERING INFORMATION

| Part No. | Package | Marking | Material | packing |
|---|---|---|---|---|
| SVF9N65F | TO-220F-3L | SVF9N65F | Pb free | Tube |

## ABSOLUTE MAXIMUM RATINGS ($T_C$=25°C unless otherwise noted)

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 650 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | V |
| Drain Current | $T_C$=25°C | $I_D$ | 9.0 | A |
| | $T_C$=100°C | | 5.69 | |
| Drain Current Pulsed | | $I_{DM}$ | 36.0 | A |
| Power Dissipation($T_C$=25°C) | | $P_D$ | 49 | W |
| -Derate above 25°C | | | 0.39 | W/°C |
| Single Pulsed Avalanche Energy (Note 1) | | $E_{AS}$ | 532 | mJ |
| Operation Junction Temperature Range | | $T_{stg}$ | -55～+150 | °C |
| Storage Temperature Range | | $I_{DM}$ | -55～+150 | °C |

## THERMAL CHARACTERISTICS

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 2.55 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 120 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_C$=25°C unless otherwise noted)

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain -Source Breakdown Voltage | $B_{VDSS}$ | $V_{GS}$=0V, $I_D$=250μA | 650 | -- | -- | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=650V, $V_{GS}$=0V | -- | -- | 1.0 | μA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V, $V_{DS}$=0V | -- | -- | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$= $V_{DS}$, $I_D$=250μA | 2.0 | -- | 4.0 | V |
| Static Drain- Source On State Resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=4.5A | -- | 0.98 | 1.2 | Ω |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=25V, $V_{GS}$=0V, f=1.0MHz | -- | 928.0 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 109.3 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 4.6 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=325V, $R_G$=10Ω, $I_D$=9.0A (Note2, 3) | -- | 12.8 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 25.7 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 31.1 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 23.9 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=520V, $I_D$=9.0A, $V_{GS}$=10V (Note2, 3) | -- | 20.71 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 5.69 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 8.47 | -- | |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current | $I_S$ | Integral Reverse P-N Junction Diode in the MOSFET | -- | -- | 9.0 | A |
| Pulsed Source Current | $I_{SM}$ | | -- | -- | 36.0 | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=9.0A,$V_{GS}$=0V | -- | -- | 1.4 | V |
| Reverse Recovery Time | $T_{rr}$ | $I_S$=9.0A,$V_{GS}$=0V, $dI_F/dt$=100A/μS | -- | 574.2 | -- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 4.36 | -- | μC |

**Notes:**

1. L=30mH, $I_{AS}$=5.78A, $V_{DD}$=50V, $R_G$=25Ω, starting $T_J$=25°C;
2. Pulse Test: Pulse width ≤300μs,Duty cycle≤2%;
3. Essentially independent of operating temperature.

## TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

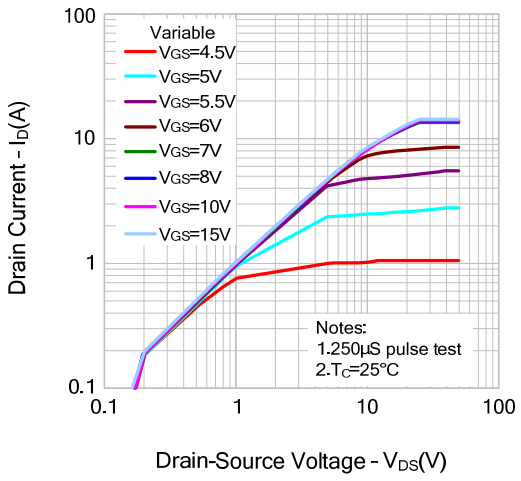



Figure 2. Transfer Characteristics

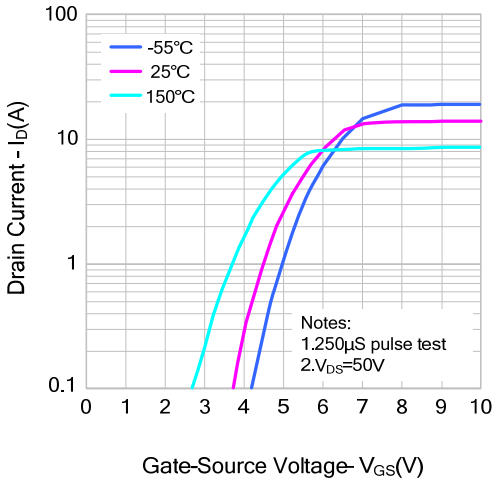



Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

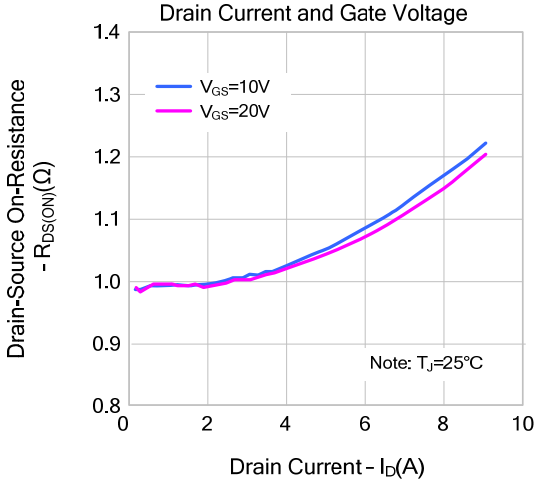
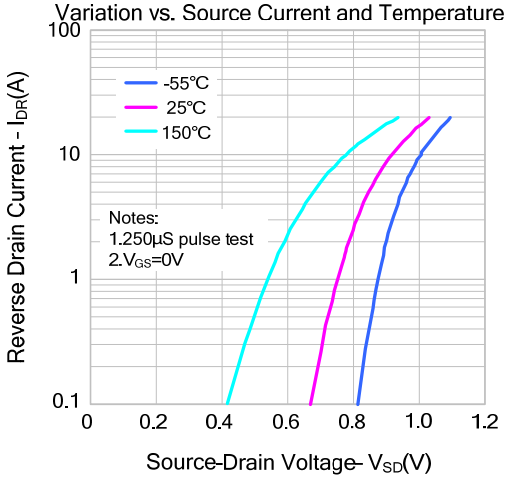



Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature



## TYPICAL CHARACTERISTICS(continued)

Figure 5. Capacitance Characteristics

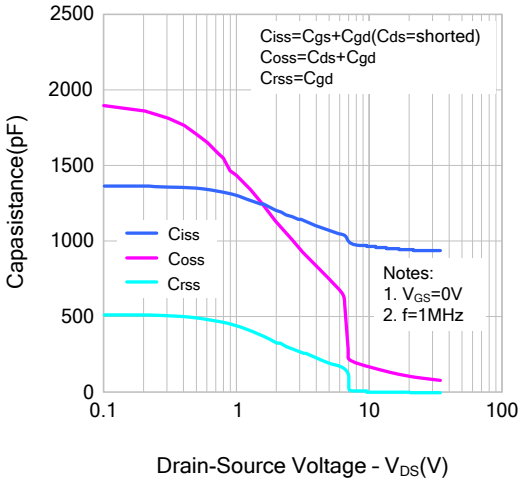



Figure 6. Gate Charge Characteristics

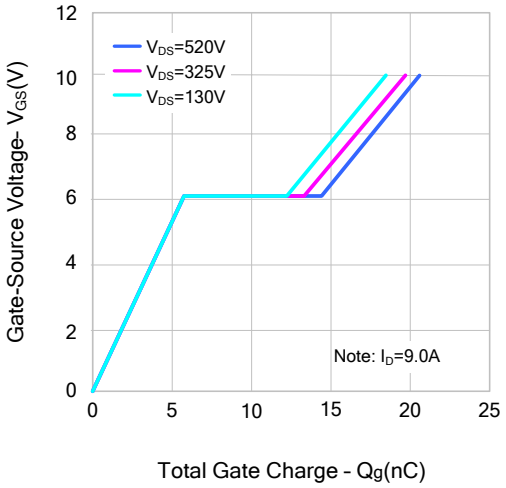



Figure 7. Breakdown Voltage Variation vs. Temperature

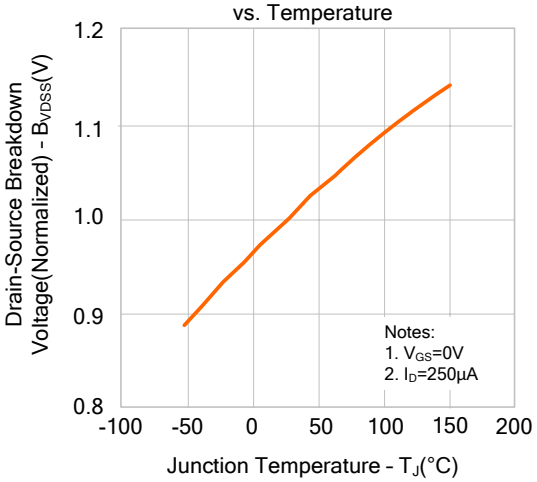



Figure 8. On-resistance Variation vs. Temperature

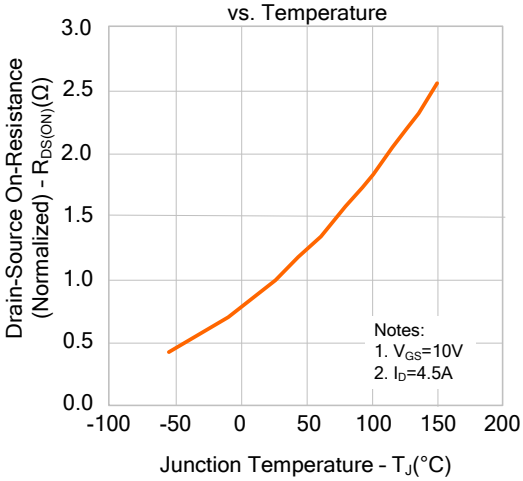



Figure 9. Max. Safe Operating Area

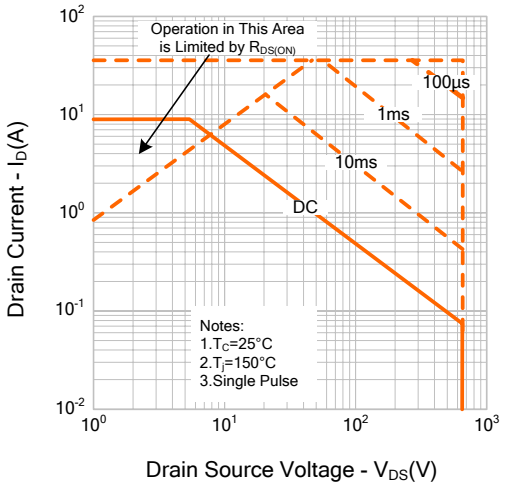
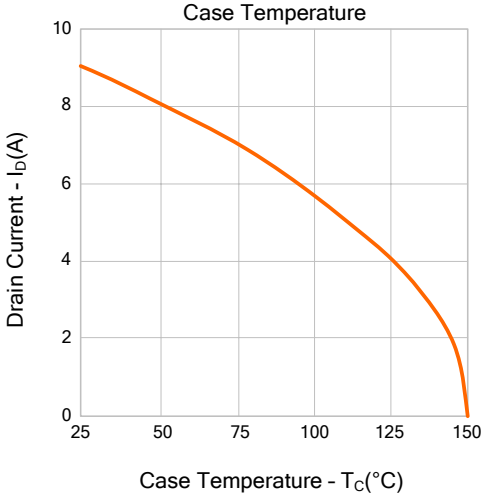
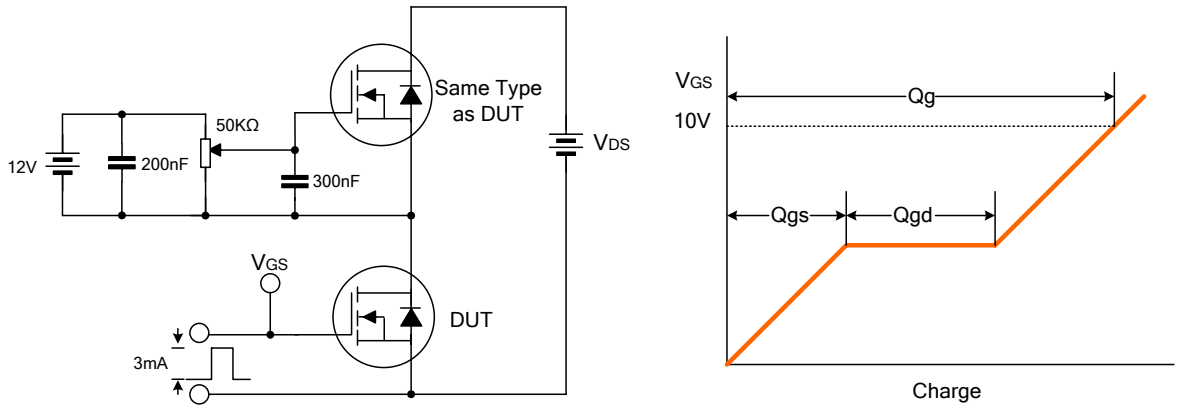



Figure 10. Maximum Drain Current vs. Case Temperature

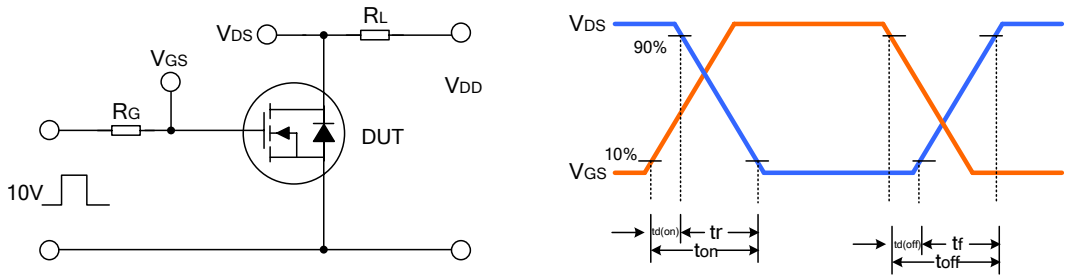


## TYPICAL TEST CIRCUIT

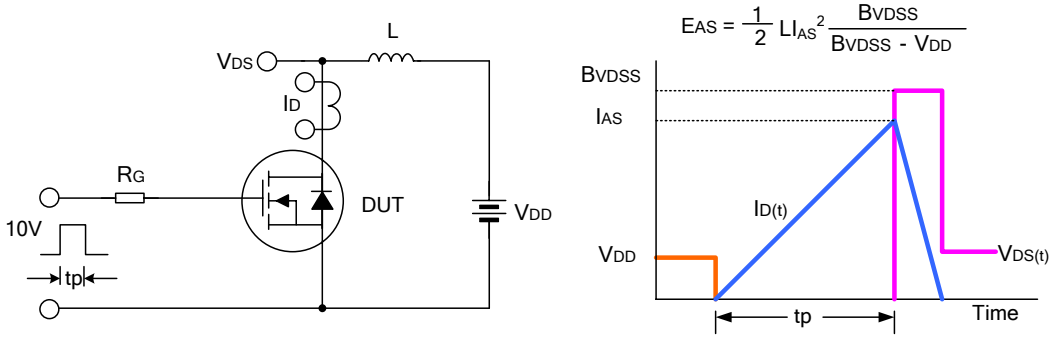
Gate Charge Test Circuit & Waveform




Resistive Switching Test Circuit & Waveform

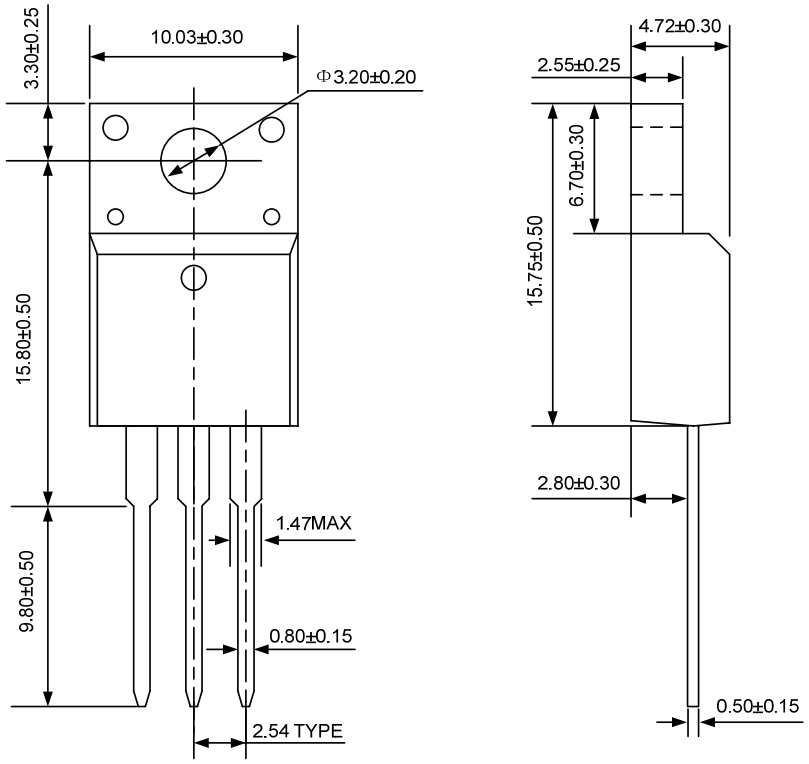



Unclamped Inductive Switching Test Circuit & Waveform



## PACKAGE OUTLINE

TO-220F-3L UNIT: mm

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## ATTACHMENT

**Revision History**

| Date | REV | Description | Page |
|---|---|---|---|
| 2012.04.13 | 1.0 | Initial release | |
| 2012.06.15 | 1.1 | Modify the typ. value of $R_{DS(on)}$ | |