

10A, 600V N-CHANNEL MOSFET

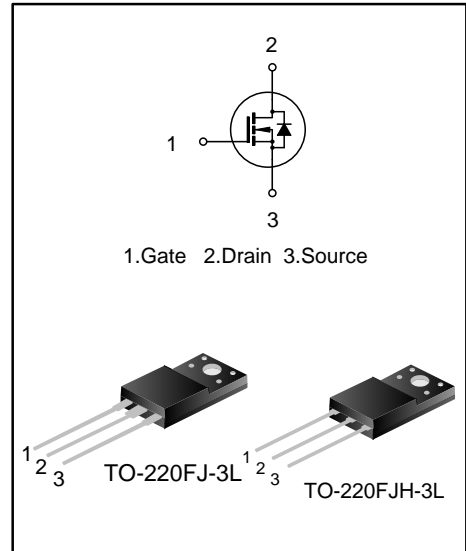
GENERAL DESCRIPTION

SVFP10N60CAFJ/FJH is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ high-voltage planar VDMOS technology. The improved process and cell structure 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 supplies, DC-DC converters and H-bridge PWM motor drivers.

FEATURES

- ◆ 10A, 600V, $R_{DS(on)(typ.)}=0.60\Omega @ V_{GS}=10V$
- ◆ Low gate charge
- ◆ Low Crss
- ◆ Fast switching
- ◆ Improved dv/dt capability



ORDERING INFORMATION

| Part No. | Package | Marking | Hazardous Substance Control | Packing Type |
|----------------|--------------|------------|-----------------------------|--------------|
| SVFP10N60CAFJ | TO-220FJ-3L | P10N60CAFJ | Halogen free | Tube |
| SVFP10N60CAFJH | TO-220FJH-3L | P10N60CA | Halogen free | Tube |

ABSOLUTE MAXIMUM RATINGS (T_A=25°C UNLESS OTHERWISE NOTED)

| Characteristics | | Symbol | Ratings | Unit |
|---|------------------------|------------------|----------|------|
| Drain-Source Voltage | | V _{DS} | 600 | V |
| Gate-Source Voltage | | V _{GS} | ±30 | V |
| Drain Current | T _C = 25°C | I _D | 10 | A |
| | T _C = 100°C | | 6.3 | |
| Drain Current Pulsed | | I _{DM} | 40 | A |
| Power Dissipation(T _C =25°C) | | P _D | 45 | W |
| -Derate above 25°C | | | 0.36 | |
| Single Pulsed Avalanche Energy (Note 1) | | E _{AS} | 750 | mJ |
| Reverse diode dv/dt (Note 2) | | dv/dt | 4.5 | V/ns |
| MOSFET dv/dt ruggedness (Note 3) | | dv/dt | 50 | V/ns |
| Operation Junction Temperature Range | | T _J | -55~+150 | °C |
| Storage Temperature Range | | T _{stg} | -55~+150 | °C |

THERMAL CHARACTERISTICS

| Characteristics | Symbol | Value | Unit |
|---|------------------|-------|------|
| Thermal Resistance, Junction-to-Case | R _{θJC} | 2.78 | °C/W |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} | 62.5 | °C/W |

ELECTRICAL CHARACTERISTICS (T_J=25°C UNLESS OTHERWISE NOTED)

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit | |
|---|---------------------|--|-----------------------|------|------|------|---|
| Drain -Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 600 | -- | -- | V | |
| Drain-Source Leakage Current | I _{DSS} | V _{DS} =600V, V _{GS} =0V | -- | -- | 1 | 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 | -- | 4 | V | |
| Static Drain-Source On State Resistance | R _{DS(on)} | V _{GS} =10V, I _D =5.0A | T _J =25°C | -- | 0.60 | 0.75 | Ω |
| | | | T _J =125°C | -- | 1.27 | -- | |
| Gate resistance | R _g | f=1.0MHz | -- | 4.5 | -- | Ω | |
| Input Capacitance | C _{iss} | V _{DS} =25V, V _{GS} =0V, f=1.0MHz | -- | 1300 | -- | pF | |
| Output Capacitance | C _{oss} | | -- | 150 | -- | | |
| Reverse Transfer Capacitance | C _{riss} | | -- | 14 | -- | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =300V, I _D =10A, R _G =25Ω (Note 4,5) | -- | 23 | -- | ns | |
| Turn-on Rise Time | t _r | | -- | 42 | -- | | |
| Turn-off Delay Time | t _{d(off)} | | -- | 67 | -- | | |
| Turn-off Fall Time | t _f | | -- | 36 | -- | | |
| Total Gate Charge | Q _g | V _{DS} =480V, I _D =10A, V _{GS} =10V (Note 4,5) | -- | 34 | -- | nC | |
| Gate-Source Charge | Q _{gs} | | -- | 7.3 | -- | | |
| Gate-Drain Charge | Q _{gd} | | -- | 15 | -- | | |

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------------|----------|-------------------------------|------|------|------|---------|
| Continuous Source Current | I_S | Integral Reverse P-N Junction | -- | -- | 10 | A |
| Pulsed Source Current | I_{SM} | Diode In The MOSFET | -- | -- | 40 | |
| Diode Forward Voltage | V_{SD} | $I_S=10A, V_{GS}=0V$ | -- | -- | 1.2 | V |
| Reverse Recovery Time | T_{rr} | $I_S=10A, V_{GS}=0V,$ | -- | 530 | -- | ns |
| Reverse Recovery Charge | Q_{rr} | $dI/dt=100A/\mu s$ (Note4) | -- | 4.80 | -- | μC |

Notes:

1. $L=30mH, I_{AS}=6.0A, V_{DD}=100V, R_G=25\Omega,$ starting $T_J=25^\circ C$;
2. $V_{DS}=0\sim 400V, I_{SD}\leq 12A, T_J=25^\circ C$;
3. $V_{DS}=0\sim 480V$;
4. Pulse Test: Pulse width $\leq 300\mu s,$ Duty cycle $\leq 2\%$;
5. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

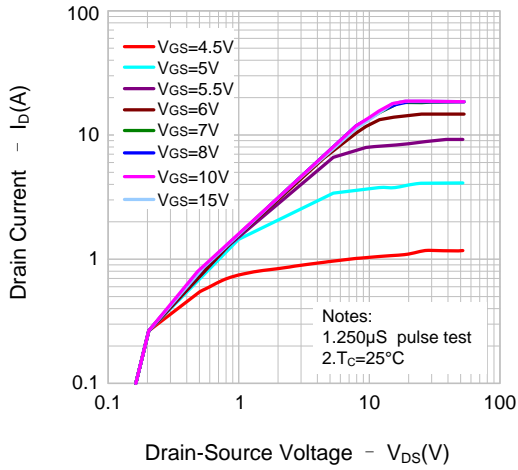


Figure 2. Transfer Characteristics

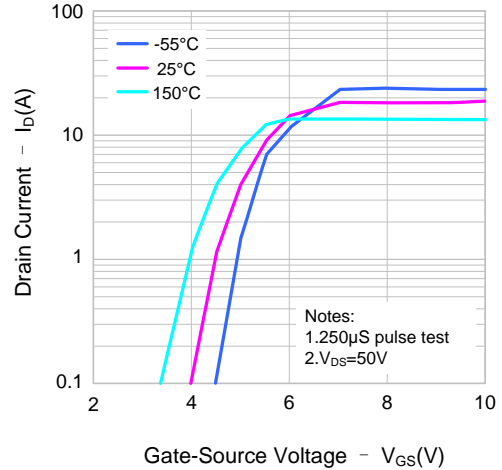


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

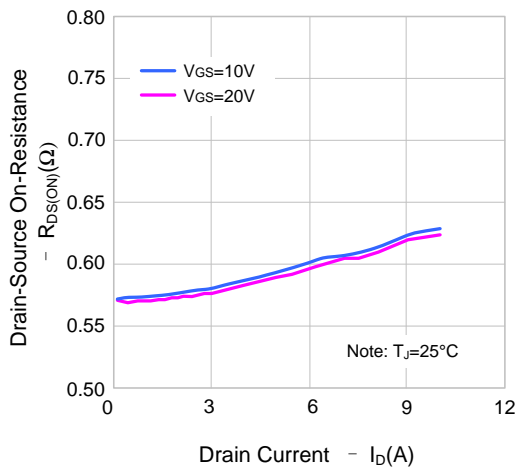


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

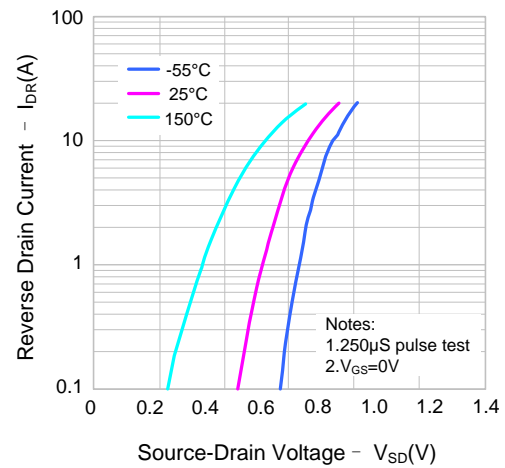


Figure 5. Capacitance Characteristics

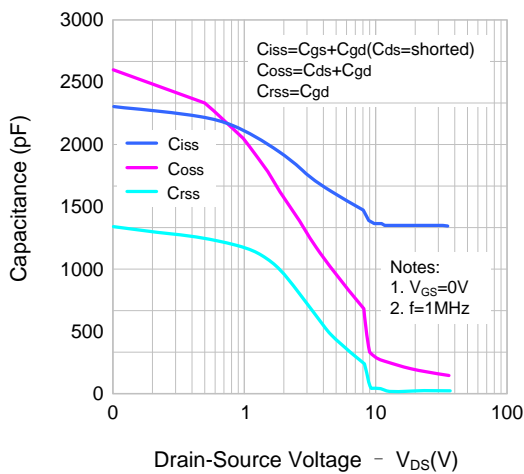
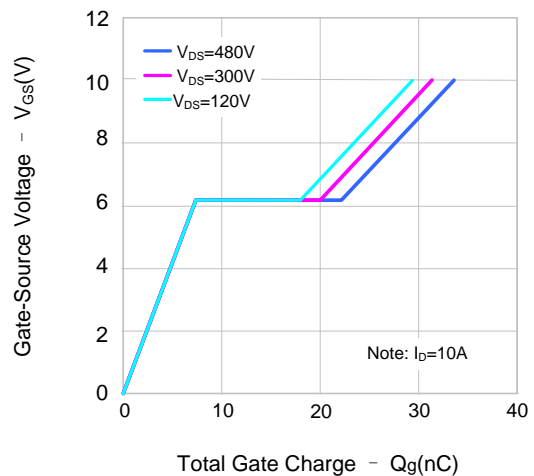


Figure 6. Gate Charge Characteristics



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Breakdown Voltage vs. Temperature

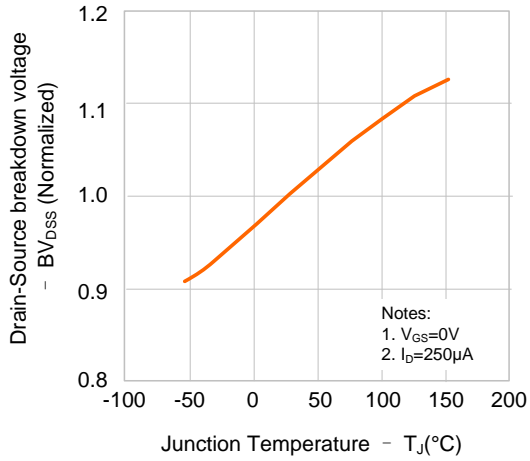


Figure 8. On-resistance Variation vs. Temperature

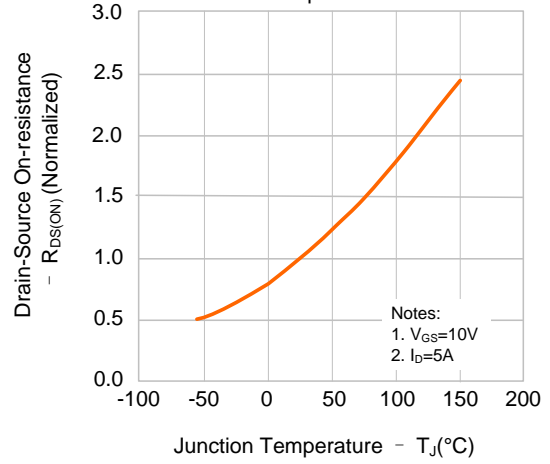


Figure 9. Max. Safe Operating Area

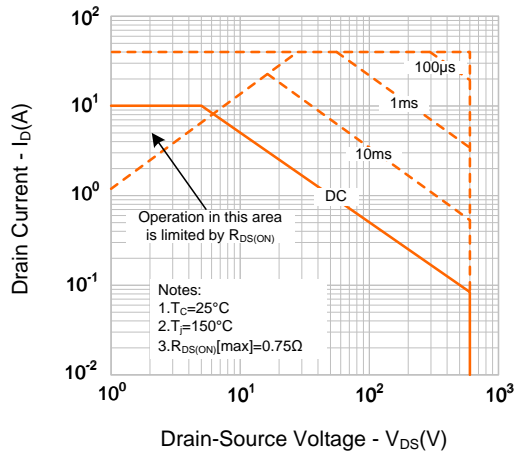
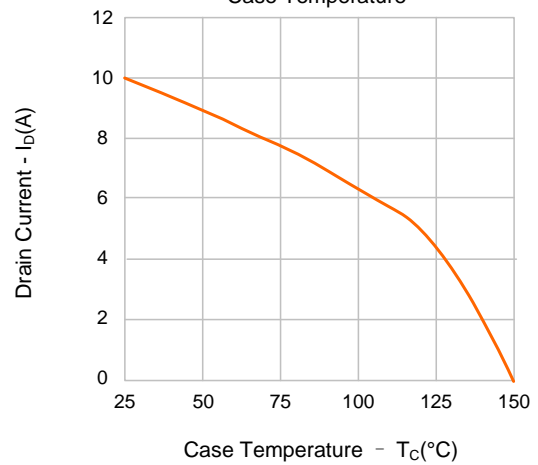
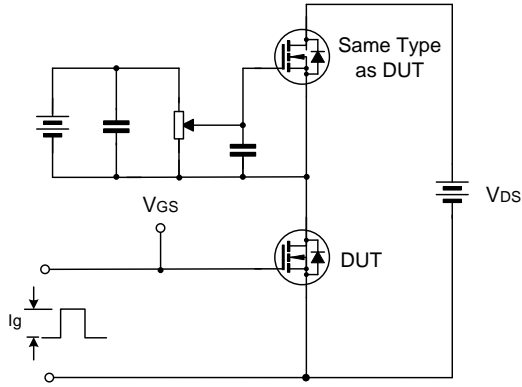


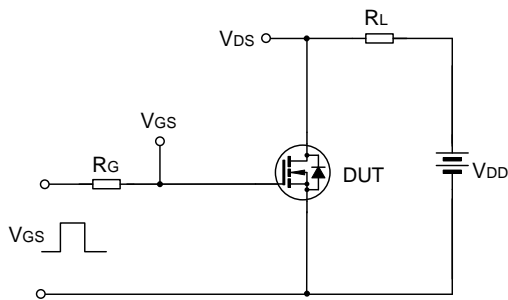
Figure 10. Max. Drain Current vs. Case Temperature



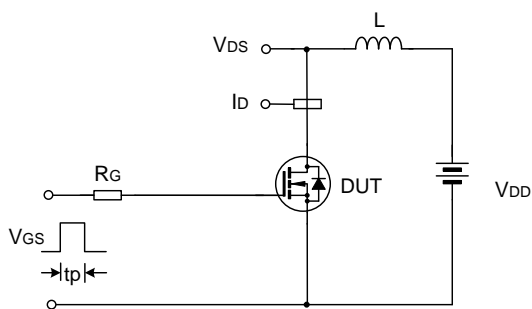
TYPICAL TEST CIRCUIT



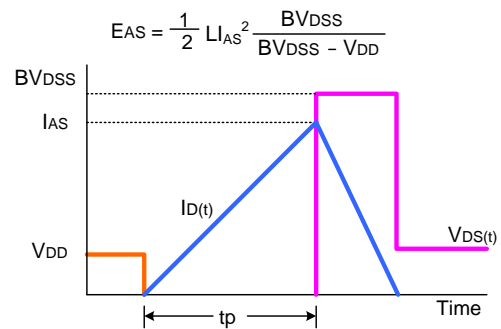
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



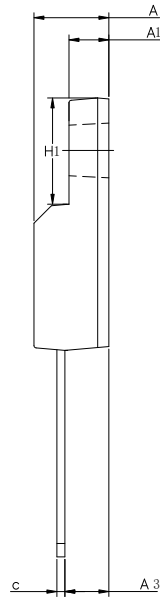
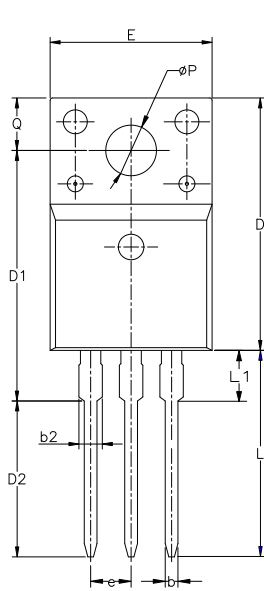
Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

TO-220FJ-3L

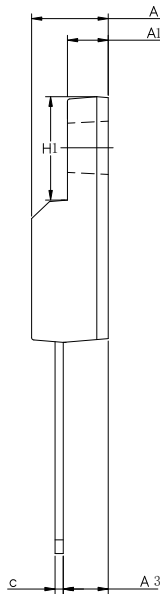
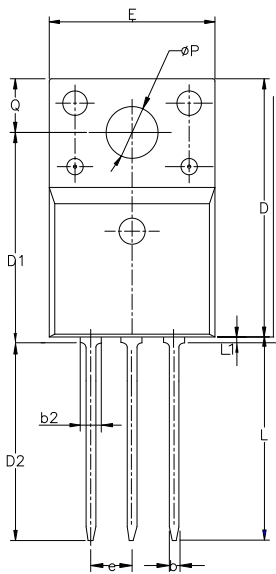
UNIT: mm



| SYMBOL | MIN | NOM | MAX |
|----------|---------|-------|-------|
| A | 4.42 | 4.70 | 5.02 |
| A1 | 2.30 | 2.54 | 2.80 |
| A3 | 2.50 | 2.76 | 3.10 |
| b | 0.55 | 0.70 | 0.85 |
| b2 | — | — | 1.29 |
| c | 0.35 | 0.50 | 0.65 |
| D | 15.25 | 15.87 | 16.25 |
| D1 | 13.97 | 14.47 | 14.97 |
| D2 | 10.58 | 11.08 | 11.58 |
| E | 9.73 | 10.16 | 10.36 |
| e | 2.54BSC | | |
| H1 | 6.40 | 6.68 | 7.00 |
| L | 12.48 | 12.98 | 13.48 |
| L1 | — | — | 2.00 |
| ϕP | 3.00 | 3.18 | 3.40 |
| Q | 3.05 | 3.30 | 3.55 |

TO-220FJH-3L

UNIT: mm



| SYMBOL | MIN | NOM | MAX |
|----------|---------|-------|-------------|
| A | 4.42 | 4.70 | 5.02 |
| A1 | 2.30 | 2.54 | 2.80 |
| A3 | 2.50 | 2.76 | 3.10 |
| b | 0.55 | 0.70 | 0.80 |
| b2 | — | — | 1.29 |
| c | 0.35 | 0.50 | 0.65 |
| D | 15.25 | 15.87 | 16.25 |
| D1 | 12.87 | 13.07 | 13.27 |
| D2 | 12.28 | 12.48 | 12.68 |
| E | 9.73 | 10.16 | 10.36 |
| e | 2.54BSC | | |
| H1 | 6.40 | 6.68 | 7.00 |
| L | 12.48 | 12.98 | 13.48 |
| L1 | — | — | 0.85 |
| ϕP | 3.00 | 3.18 | 3.40 |
| Q | 3.05 | 3.30 | 3.55 |

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|------------|---|----------------|---|
| Part No.: | SVFP10N60CAFJ/FJH | Document Type: | Datasheet |
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Rev.: 1.3

Revision History:

1. Motify Electrical schematic and TYPICAL TEST CIRCUIT
-

Rev.: 1.2

Revision History:

1. Add TO-220FJH-3L
-

Rev.: 1.1

Revision History:

1. Modify I_{DSS} and V_{SD}
-

Rev.: 1.0

Revision History:

1. First Release
-
-