

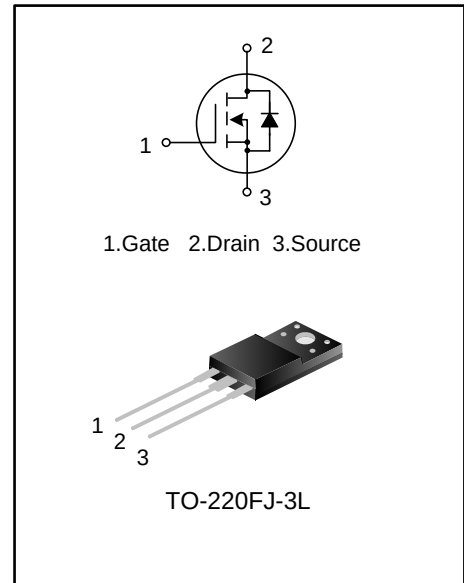
## 10A, 600V N-CHANNEL MOSFET

### GENERAL DESCRIPTION

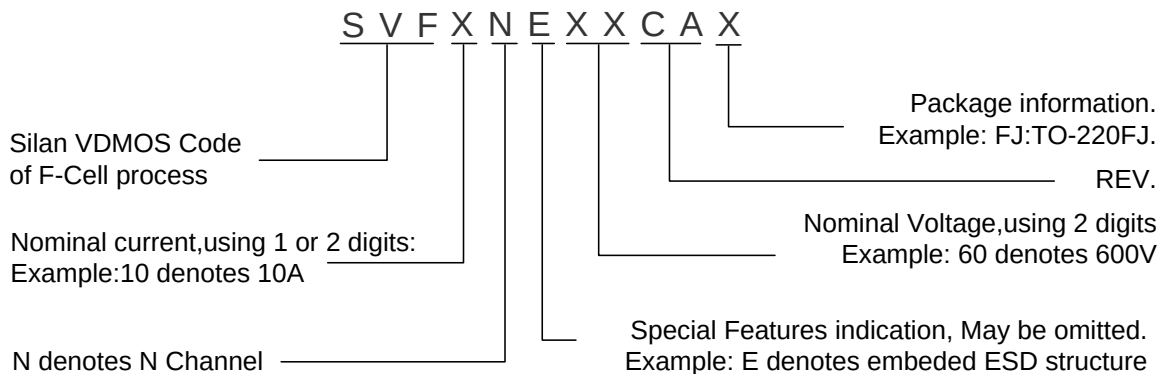
SVF10N60CAFJ is an N-channel enhancement mode power MOS field effect transistor which is produced using Silan proprietary F-Cell™ structure VDMOS technology. The improved process and cell structure have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are widely used in AC-DC power suppliers, 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  $C_{rss}$
- Fast switching
- Improved dv/dt capability



### NOMENCLATURE



### ORDERING INFORMATION

| Part No.     | Package     | Marking   | Hazardous Substance Control | Packing |
|--------------|-------------|-----------|-----------------------------|---------|
| SVF10N60CAFJ | TO-220FJ-3L | 10N60CAFJ | Halogen free                | Tube    |

**ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C unless otherwise noted)**

| Characteristics                                               |                        | Symbol           | Ratings  | Unit |
|---------------------------------------------------------------|------------------------|------------------|----------|------|
| Drain-Source Voltage                                          |                        | V <sub>DS</sub>  | 600      | V    |
| Gate-Source Voltage                                           |                        | V <sub>GS</sub>  | ±30      | V    |
| Drain Current                                                 | T <sub>C</sub> = 25°C  | I <sub>D</sub>   | 10       | A    |
|                                                               | T <sub>C</sub> = 100°C |                  | 6.3      |      |
| Drain Current Pulsed                                          |                        | I <sub>DM</sub>  | 40       | A    |
| Power Dissipation(T <sub>C</sub> =25°C)<br>-Derate above 25°C |                        | P <sub>D</sub>   | 45       | W    |
|                                                               |                        |                  | 0.36     | W/°C |
| Single Pulsed Avalanche Energy (Note 1)                       |                        | E <sub>AS</sub>  | 750      | mJ   |
| Operation Junction Temperature Range                          |                        | T <sub>J</sub>   | -55~+150 | °C   |
| Storage Temperature Range                                     |                        | T <sub>stg</sub> | -55~+150 | °C   |

**THERMAL CHARACTERISTICS**

| Characteristics                         | Symbol           | Value | Unit |
|-----------------------------------------|------------------|-------|------|
| Thermal Resistance, Junction-to-Case    | R <sub>θJC</sub> | 2.78  | °C/W |
| Thermal Resistance, Junction-to-Ambient | R <sub>θJA</sub> | 62.5  | °C/W |

**ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise noted)**

| Characteristics                            | Symbol              | Test conditions                                                                | Min.                  | Typ.  | Max. | Unit |
|--------------------------------------------|---------------------|--------------------------------------------------------------------------------|-----------------------|-------|------|------|
| Drain -Source Breakdown Voltage            | B <sub>VDS</sub>    | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                     | 600                   | --    | --   | V    |
| Drain-Source Leakage Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =600V, V <sub>GS</sub> =0V                                     | --                    | --    | 1.0  | μA   |
| Gate-Source Leakage Current                | I <sub>GSS</sub>    | V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V                                     | --                    | --    | ±100 | nA   |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> =250μA                      | 2                     | --    | 4    | V    |
| Static Drain-Source<br>On State Resistance | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V,<br>I <sub>D</sub> =5.0A                                  | T <sub>J</sub> =25°C  | --    | 0.60 | Ω    |
|                                            |                     |                                                                                | T <sub>J</sub> =125°C | --    | 1.27 |      |
| Gate resistance                            | R <sub>g</sub>      | f=1.0MHZ                                                                       | --                    | 4.5   | --   | Ω    |
| Input Capacitance                          | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHZ                            | --                    | 1300  | --   | pF   |
| Output Capacitance                         | C <sub>oss</sub>    |                                                                                | --                    | 150   | --   |      |
| Reverse Transfer Capacitance               | C <sub>rss</sub>    |                                                                                | --                    | 13.5  | --   |      |
| Turn-on Delay Time                         | t <sub>d(on)</sub>  | V <sub>DD</sub> =300V, I <sub>D</sub> =10A, R <sub>G</sub> =25Ω<br>(Note 2,3)  | --                    | 22.87 | --   | ns   |
| Turn-on Rise Time                          | t <sub>r</sub>      |                                                                                | --                    | 42.47 | --   |      |
| Turn-off Delay Time                        | t <sub>d(off)</sub> |                                                                                | --                    | 67.40 | --   |      |
| Turn-off Fall Time                         | t <sub>f</sub>      |                                                                                | --                    | 36.27 | --   |      |
| Total Gate Charge                          | Q <sub>g</sub>      | V <sub>DS</sub> =480V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V<br>(Note 2,3) | --                    | 33.5  | --   | nC   |
| Gate-Source Charge                         | Q <sub>gs</sub>     |                                                                                | --                    | 7.3   | --   |      |
| Gate-Drain Charge                          | Q <sub>gd</sub>     |                                                                                | --                    | 14.8  | --   |      |

## 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     | $V_{SD}$ | $I_S=10A, V_{GS}=0V$          | --   | --   | 1.4  | V       |
| Reverse Recovery Time     | $T_{rr}$ | $I_S=10A, V_{GS}=0V,$         | --   | 530  | --   | ns      |
| Reverse Recovery Charge   | $Q_{rr}$ | $dI/dt=100A/\mu S$ (Note 2)   | --   | 4.80 | --   | $\mu C$ |

### Notes:

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

## TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

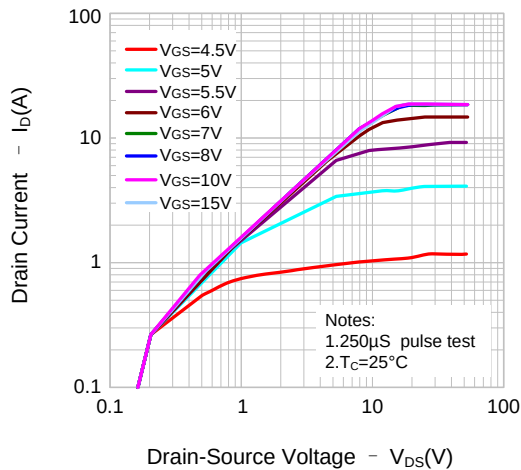


Figure 2. Transfer Characteristics

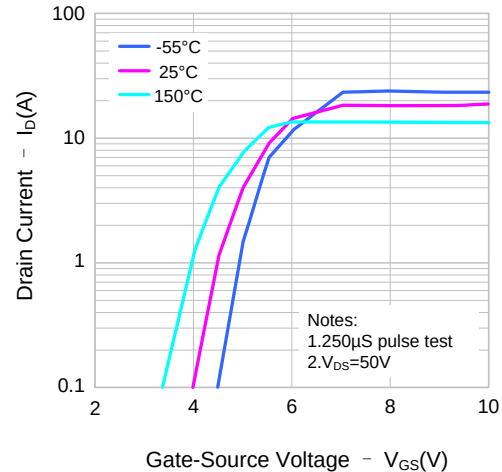


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

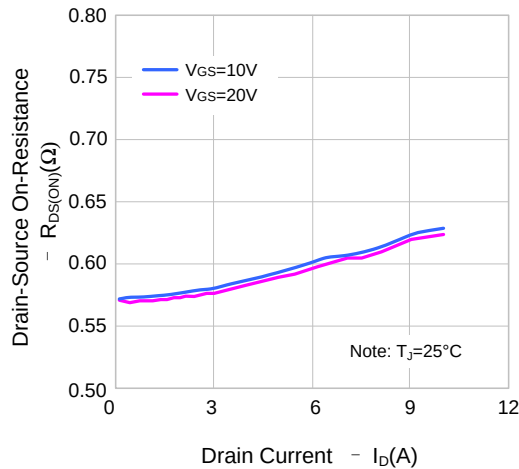
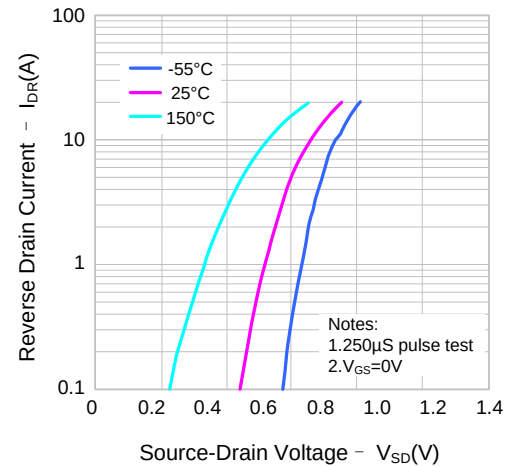


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature



**TYPICAL CHARACTERISTICS (continued)**

Figure 5. Capacitance Characteristics

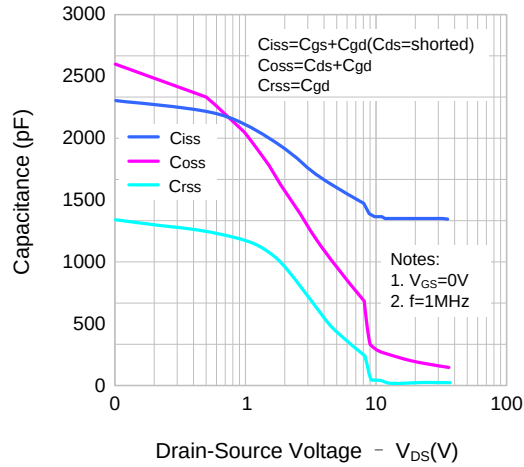


Figure 6. Gate Charge Characteristics

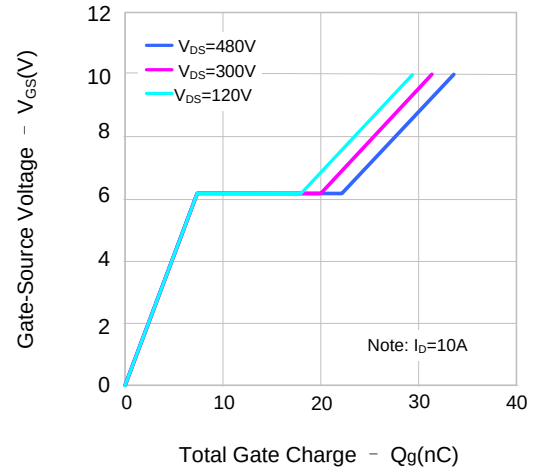


Figure 7. Breakdown Voltage vs. Temperature

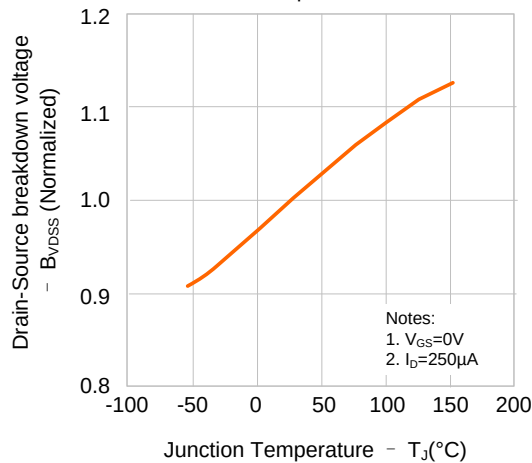


Figure 8. On-resistance Variation vs. Temperature

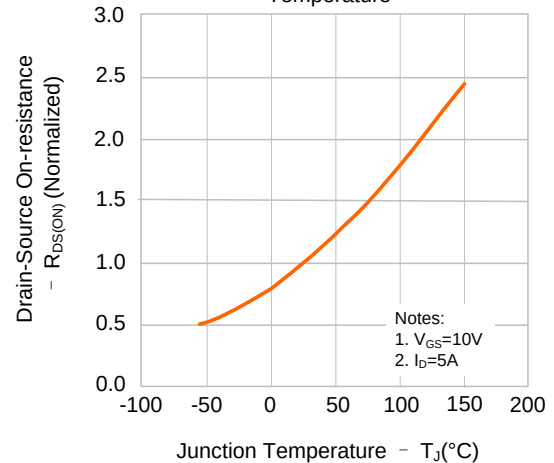


Figure 9. Max. Safe Operating Area

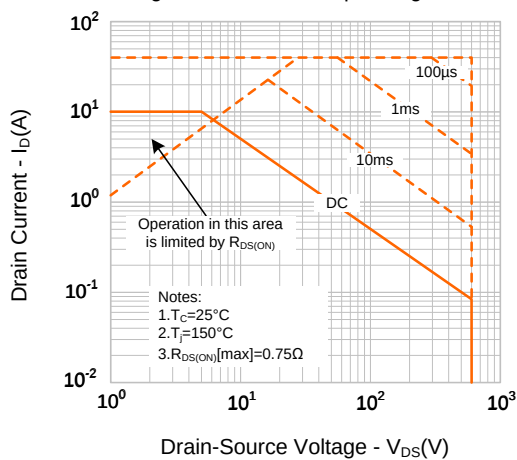
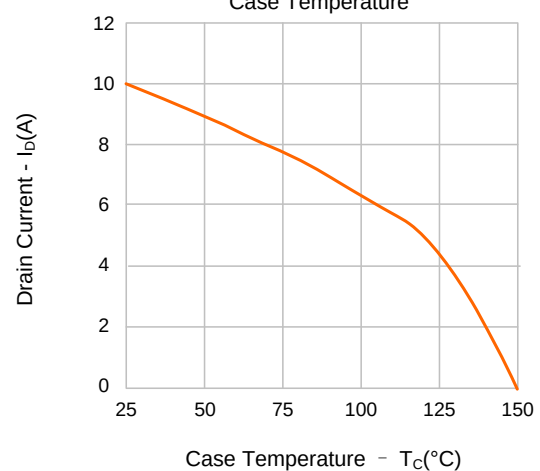
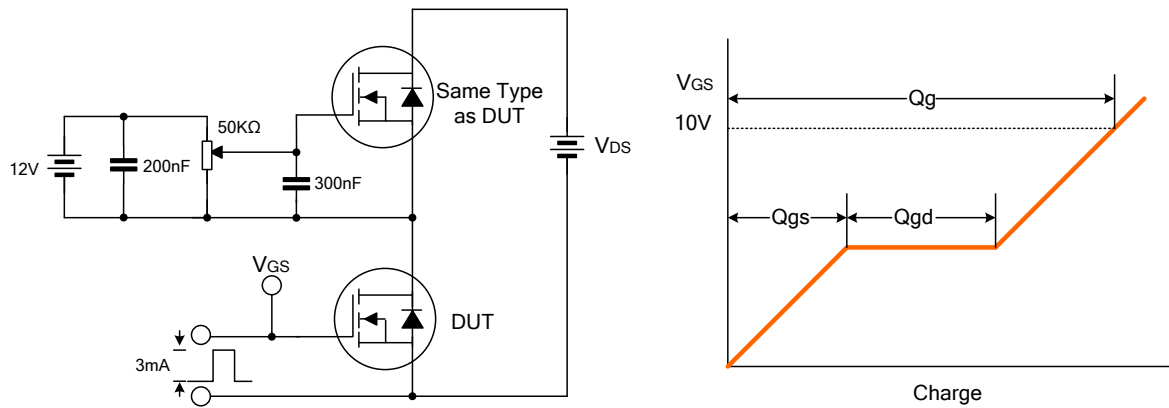


Figure 10. Max. Drain Current vs. Case Temperature

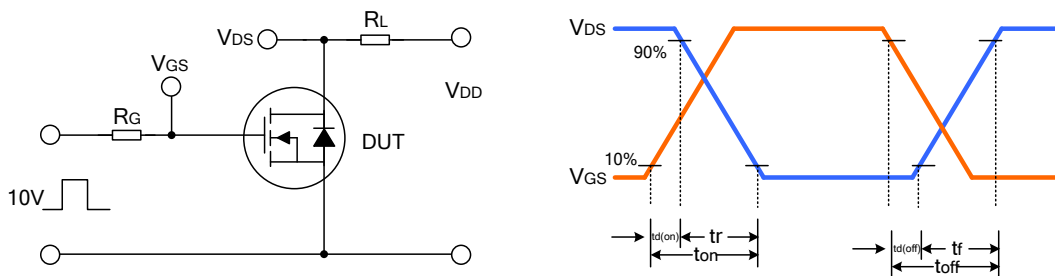


## TYPICAL TEST CIRCUIT

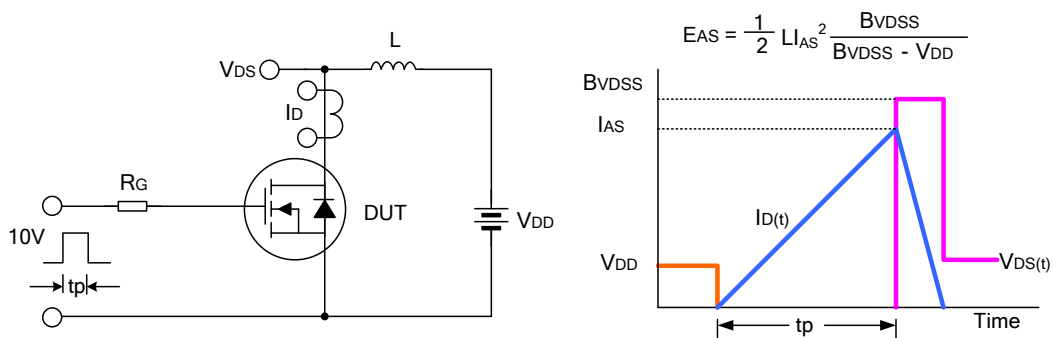
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



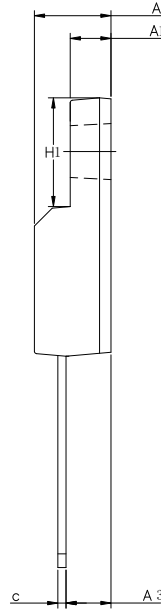
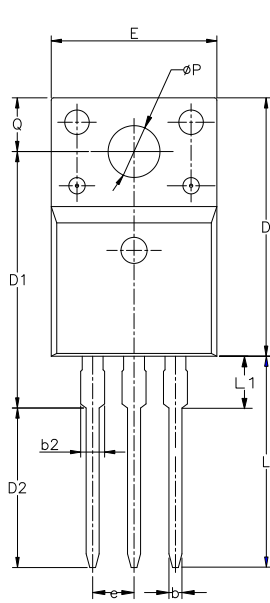
Unclamped Inductive Switching Test Circuit & Waveform



## 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        | 2.54BCS |       |       |
| H1       | 6.40    | 6.68  | 7.00  |
| L        | 12.48   | 12.98 | 13.48 |
| L1       | —       | —     | 2.00  |
| $\phi P$ | 3.00    | 3.18  | 3.40  |
| Q        | 3.05    | 3.30  | 3.55  |

### Disclaimer :

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|            |                                         |                |                                                               |
|------------|-----------------------------------------|----------------|---------------------------------------------------------------|
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Rev.: 1.4

Revision History:

1. Add  $R_{DS(ON)}$  @  $T_J=125^{\circ}\text{C}$
- 

Rev.: 1.3

Revision History:

1. Add  $R_g$
  2. Modify  $P_D$
- 

Rev.: 1.2

Revision History:

1. Modify the Typical Characteristics
  2. Modify the Absolute Maximum Ratings
  3. Modify the Electrical Characteristics
  4. Modify the Source-Drain Diode Ratings And Characteristics
- 

Rev.: 1.1

Revision History:

1. Modify the package information of TO-220FJ-3L
- 

Rev.: 1.0

Revision History:

1. First release
-