

## 14A, 650V N-CHANNEL MOSFET

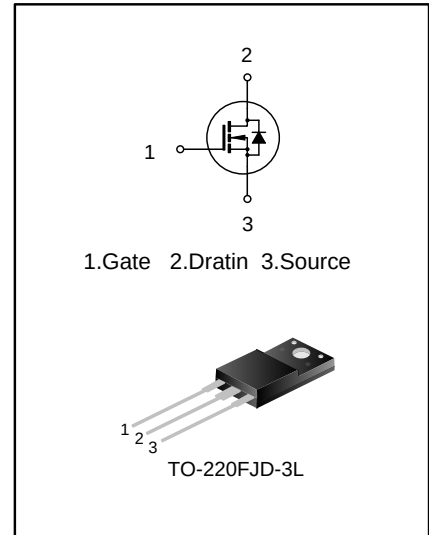
### GENERAL DESCRIPTION

The SVFP14N65CFJD 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 supplies, DC-DC converters and H-bridge PWM motor drivers.

### FEATURES

- 14A, 650V,  $R_{DS(on)}(typ.) = 0.6\Omega @ V_{GS}=10V$
- Low gate charge
- Low  $C_{rss}$
- Fast switching
- Improved  $dv/dt$  capability



### ORDERING INFORMATION

| Part No.      | Package      | Marking    | Hazardous Substance Control | Packing Type |
|---------------|--------------|------------|-----------------------------|--------------|
| SVFP14N65CFJD | TO-220FJD-3L | P14N65CFJD | 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>  | 650      | V    |
| Gate-Source Voltage                                            |                       | V <sub>GS</sub>  | ±30      | V    |
| Drain Current                                                  | T <sub>C</sub> =25°C  | I <sub>D</sub>   | 14       | A    |
|                                                                | T <sub>C</sub> =100°C |                  | 8.9      |      |
| Drain Current Pulsed                                           |                       | I <sub>DM</sub>  | 56       | A    |
| Power Dissipation(T <sub>C</sub> =25°C)<br>- Derate above 25°C |                       | P <sub>D</sub>   | 45       | W    |
|                                                                |                       |                  | 0.4      | W/°C |
| Single Pulsed Avalanche Energy (Note 1)                        |                       | E <sub>AS</sub>  | 820      | 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 Rating                          |                       | T <sub>J</sub>   | -55~+150 | °C   |
| Storage Temperature Rating                                     |                       | T <sub>stg</sub> | -55~+150 | °C   |

## THERMAL CHARACTERISTICS

| Characteristics                         | Symbol           | Ratings | 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 | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                            | 650  | --   | --   | V    |
| Drain-Source Leakage Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =650V, 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                             | 2.0  | --   | 4.0  | V    |
| On State Resistance             | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =7.0A                                            | --   | 0.6  | 0.70 | Ω    |
| Input Capacitance               | 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,<br>f=1.0MHz                                | --   | 1670 | --   | pF   |
| Output Capacitance              | C <sub>oss</sub>    |                                                                                       | --   | 169  | --   |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>    |                                                                                       | --   | 6.2  | --   |      |
| Turn-on Delay Time              | t <sub>d(on)</sub>  | V <sub>DD</sub> =325V, I <sub>D</sub> =14A,<br>R <sub>G</sub> =24Ω<br><br>(Note4,5)   | --   | 26   | --   | ns   |
| Turn-on Rise Time               | t <sub>r</sub>      |                                                                                       | --   | 45   | --   |      |
| Turn-off Delay Time             | t <sub>d(off)</sub> |                                                                                       | --   | 89   | --   |      |
| Turn-off Fall Time              | t <sub>f</sub>      |                                                                                       | --   | 44   | --   |      |
| Total Gate Charge               | Q <sub>g</sub>      | V <sub>DS</sub> =520V, I <sub>D</sub> =14A,<br>V <sub>GS</sub> =10V<br><br>(Note 4,5) | --   | 33   | --   | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>     |                                                                                       | --   | 12   | --   |      |
| Gate-Drain Charge               | Q <sub>gd</sub>     |                                                                                       | --   | 12   | --   |      |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Characteristics           | Symbol   | Test conditions                                        | Min. | Typ. | Max. | Unit    |
|---------------------------|----------|--------------------------------------------------------|------|------|------|---------|
| Continuous Source Current | $I_S$    | Integral Reverse P-N Junction<br>Diode in the MOSFET   | --   | --   | 14   | A       |
| Pulsed Source Current     | $I_{SM}$ |                                                        | --   | --   | 56   |         |
| Diode Forward Voltage     | $V_{SD}$ | $I_S=14A, V_{GS}=0V$                                   | --   | --   | 1.3  | V       |
| Reverse Recovery Time     | $T_{rr}$ | $I_S=14A, V_{GS}=0V,$<br>$di_F/dt=100A/\mu s$ (Note 4) | --   | 570  | --   | ns      |
| Reverse Recovery Charge   | $Q_{rr}$ |                                                        | --   | 6.0  | --   | $\mu C$ |

### Notes:

1.  $L=30mH, I_{AS}=6.66A, V_{DD}=100V, R_G=25\Omega$ , starting temperature  $T_J=25^\circ C$ ;
2.  $V_{DS}=0\sim 400V, I_{SD}\leq 14A, T_J=25^\circ C$ ;
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

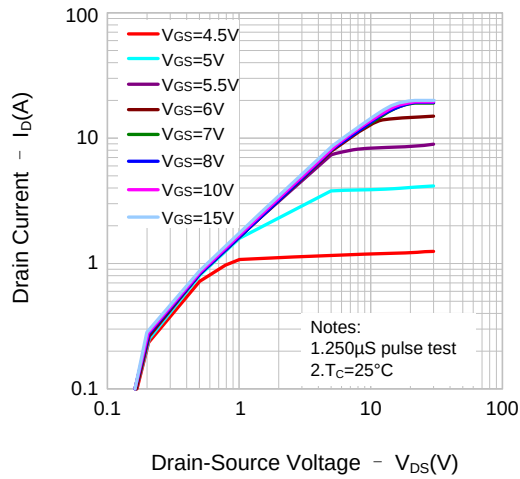


Figure 2. Transfer Characteristics

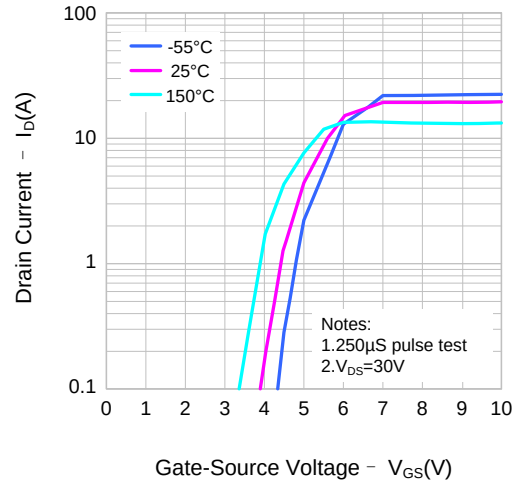


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

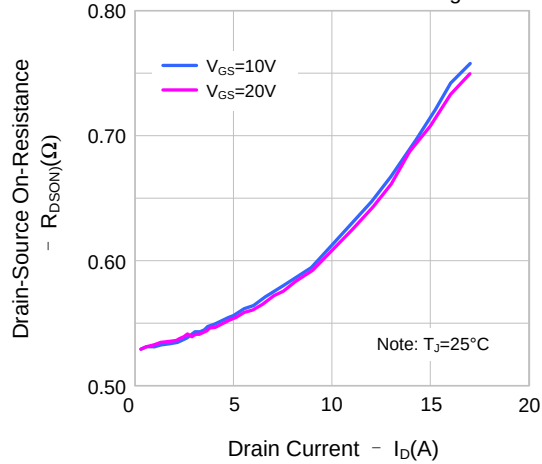


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

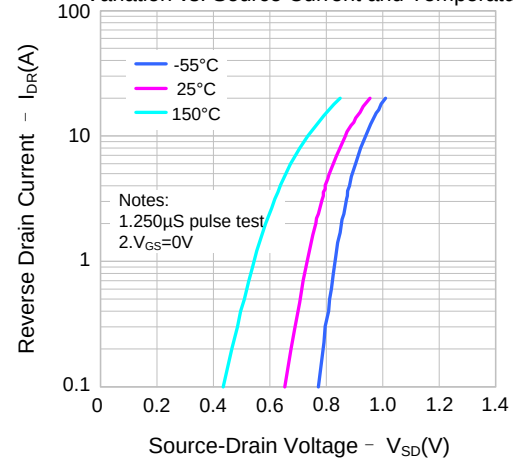


Figure 5. Capacitance Characteristics

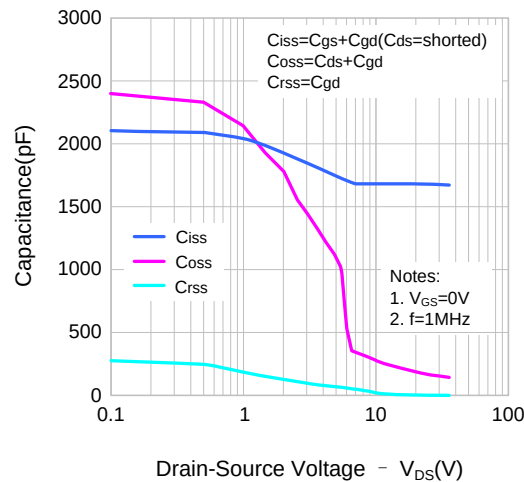
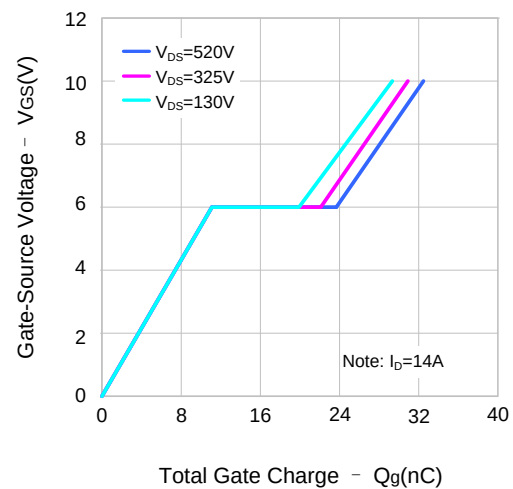


Figure 6. Gate Charge Characteristics



**TYPICAL CHARACTERISTICS(CONTINUED)**

Figure 7. Breakdown Voltage Variation vs. Temperature

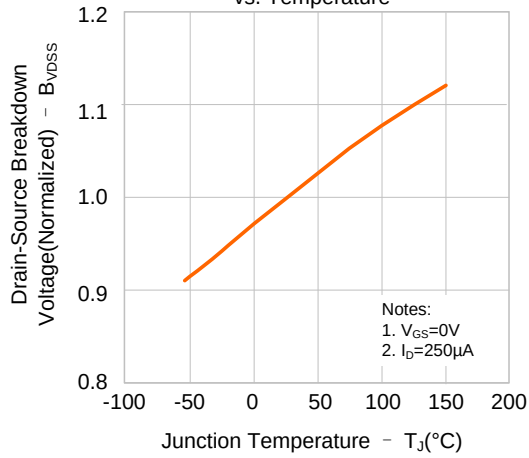


Figure 8. On-resistance Variation vs. Temperature

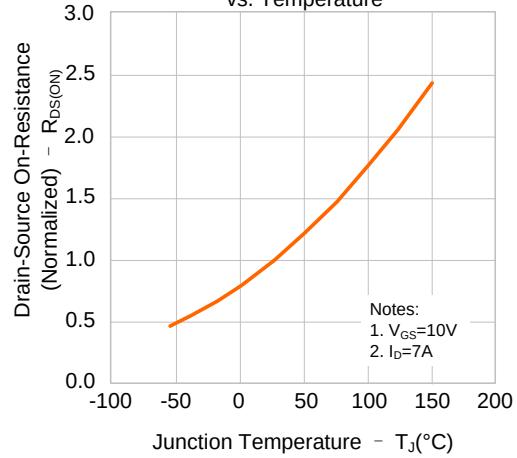


Figure 9. Max. Safe Operating Area

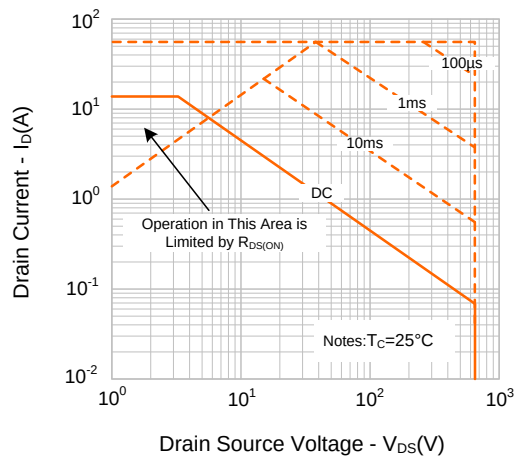
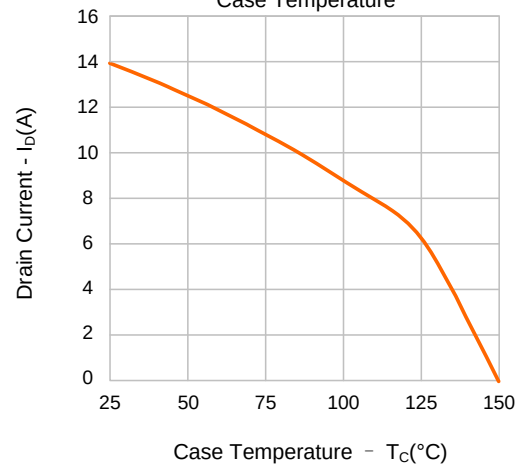
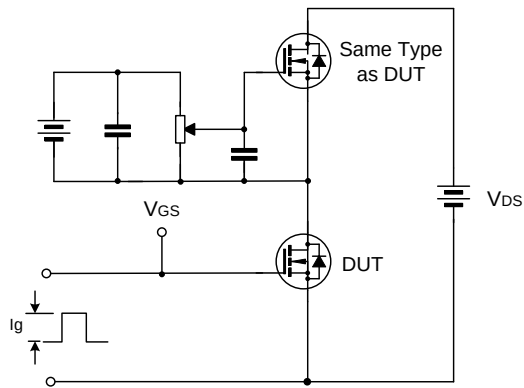


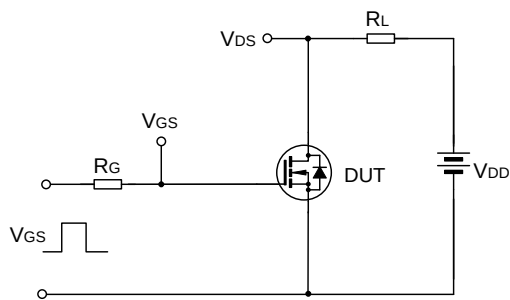
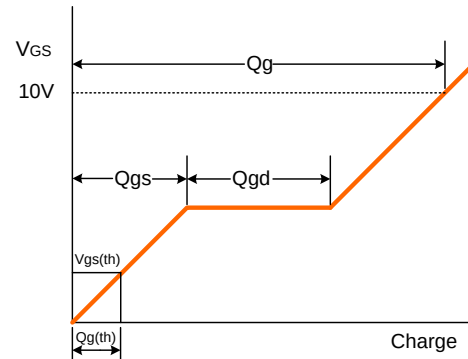
Figure 10. Maximum Drain Current vs. Case Temperature



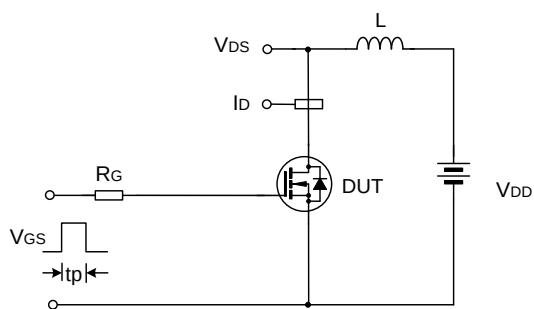
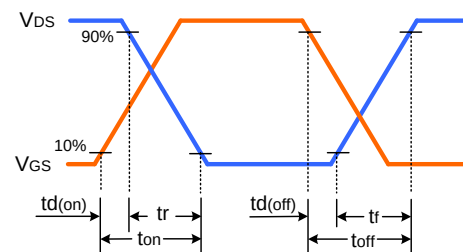
## TYPICAL TEST CIRCUIT



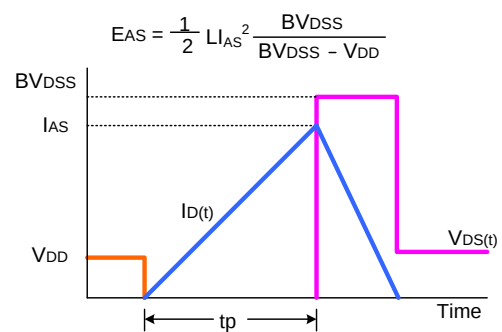
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



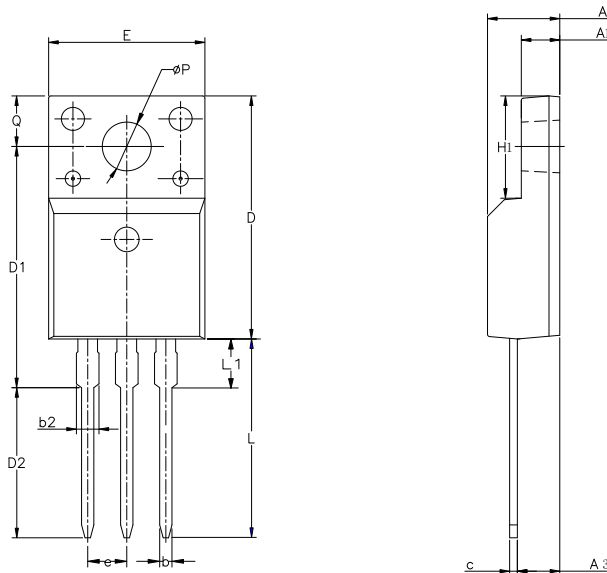
Unclamped Inductive Switching Test Circuit & Waveform



## PACKAGE OUTLINE

TO-220FJD-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  |
| øP     | 3.00    | 3.18  | 3.40  |
| Q      | 3.05    | 3.30  | 3.55  |

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|            |                                         |                |                                                               |
|------------|-----------------------------------------|----------------|---------------------------------------------------------------|
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Rev.: 1.1

Revision History:

1. Modify Electrical schematic and TYPICAL TEST CIRCUIT
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Rev.: 1.0

Revision History:

1. First release
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