

## 10A, 600V N-CHANNEL MOSFET

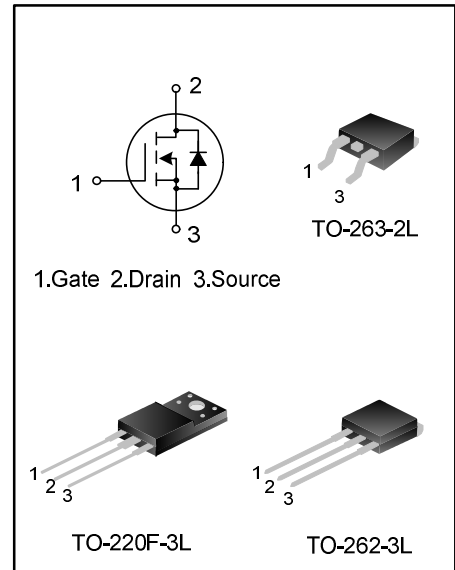
### GENERAL DESCRIPTION

SVF10N60F/S/K 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

- ◆ 10A,600V, $R_{DS(on)}(typ.)=0.75\Omega@V_{GS}=10V$
- ◆ Low gate charge
- ◆ Low  $C_{rss}$
- ◆ Fast switching
- ◆ Improved dv/dt capability



### ORDERING INFORMATION

| Part No.    | Package    | Marking   | Hazardous Substance Control | Packing   |
|-------------|------------|-----------|-----------------------------|-----------|
| SVF10N60F   | TO-220F-3L | SVF10N60F | Pb free                     | Tube      |
| SVF10N60S   | TO-263-2L  | SVF10N60S | Halogen free                | Tube      |
| SVF10N60STR | TO-263-2L  | SVF10N60S | Halogen free                | Tape&Reel |
| SVF10N60K   | TO-262-3L  | SVF10N60K | Pb free                     | Tube      |

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

| Characteristics                                               |                        | Symbol           | Ratings   |           |           | Unit |
|---------------------------------------------------------------|------------------------|------------------|-----------|-----------|-----------|------|
|                                                               |                        |                  | SVF10N60F | SVF10N60S | SVF10N60K |      |
| 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>   | 50        | 150       | 148       | W    |
|                                                               |                        |                  | 0.4       | 1.20      | 1.18      | W/°C |
| Single Pulsed Avalanche Energy (Note 1)                       |                        | E <sub>AS</sub>  | 654       |           |           | 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           | Ratings   |           |           | Unit |
|-----------------------------------------|--|------------------|-----------|-----------|-----------|------|
|                                         |  |                  | SVF10N60F | SVF10N60S | SVF10N60K |      |
| Thermal Resistance, Junction-to-Case    |  | R <sub>θJC</sub> | 2.5       | 0.83      | 0.84      | °C/W |
| Thermal Resistance, Junction-to-Ambient |  | R <sub>θJA</sub> | 62.5      | 62.5      | 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                                            | 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                             | 2.0  | --   | 4.0  | V    |
| Static Drain- Source<br>On State Resistance | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =5.0A                                            | --   | 0.75 | 0.9  | Ω    |
| Input Capacitance                           | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0MHZ                                | --   | 1086 | --   | pF   |
| Output Capacitance                          | C <sub>oss</sub>    |                                                                                       | --   | 143  | --   |      |
| Reverse Transfer Capacitance                | C <sub>rss</sub>    |                                                                                       | --   | 12.0 | --   |      |
| Turn-on Delay Time                          | t <sub>d(on)</sub>  | V <sub>DD</sub> =300V, I <sub>D</sub> =10A,<br>R <sub>G</sub> =25Ω<br><br>(Note 2,3)  | --   | 21.7 | --   | ns   |
| Turn-on Rise Time                           | t <sub>r</sub>      |                                                                                       | --   | 41.8 | --   |      |
| Turn-off Delay Time                         | t <sub>d(off)</sub> |                                                                                       | --   | 79.4 | --   |      |
| Turn-off Fall Time                          | t <sub>f</sub>      |                                                                                       | --   | 40.9 | --   |      |
| Total Gate Charge                           | Q <sub>g</sub>      | V <sub>DS</sub> =480V, I <sub>D</sub> =10A,<br>V <sub>GS</sub> =10V<br><br>(Note 2,3) | --   | 28.3 | --   | nC   |
| Gate-Source Charge                          | Q <sub>gs</sub>     |                                                                                       | --   | 6.26 | --   |      |
| Gate-Drain Charge                           | Q <sub>gd</sub>     |                                                                                       | --   | 13.2 | --   |      |

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

| Characteristics           | Symbol          | Test conditions                                                                  | Min. | Typ. | Max. | Unit |
|---------------------------|-----------------|----------------------------------------------------------------------------------|------|------|------|------|
| Continuous Source Current | I <sub>S</sub>  | Integral Reverse P-N Junction<br>Diode in the MOSFET                             | --   | --   | 10   | A    |
| Pulsed Source Current     | I <sub>SM</sub> |                                                                                  | --   | --   | 40   |      |
| Diode Forward Voltage     | V <sub>SD</sub> | I <sub>S</sub> =10A, V <sub>GS</sub> =0V                                         | --   | --   | 1.3  | V    |
| Reverse Recovery Time     | T <sub>rr</sub> | I <sub>S</sub> =10A, V <sub>GS</sub> =0V,<br>dI <sub>F</sub> /dt=100A/μS(Note 2) | --   | 542  | --   | ns   |
| Reverse Recovery Charge   | Q <sub>rr</sub> |                                                                                  | --   | 4.18 | --   | μC   |

**Notes:**

1. L=30mH, I<sub>AS</sub>=6.0A, V<sub>DD</sub>=100V, R<sub>G</sub>=25Ω, starting T<sub>J</sub>=25°C;
2. Pulse Test: Pulse width ≤300μs, Duty cycle≤2%;
3. Essentially independent of operating temperature.

**TYPICAL CHARACTERISTICS**

Figure 1. On-Region Characteristics

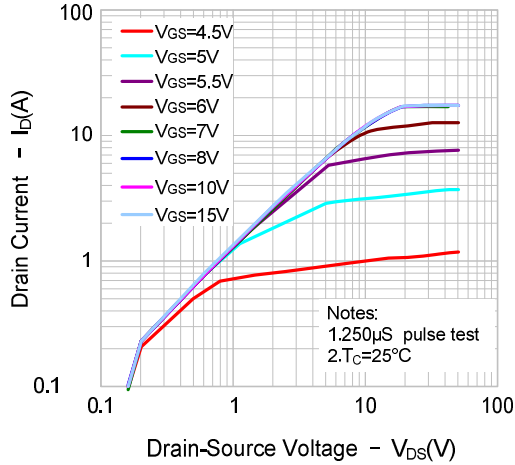


Figure 2. Transfer Characteristics

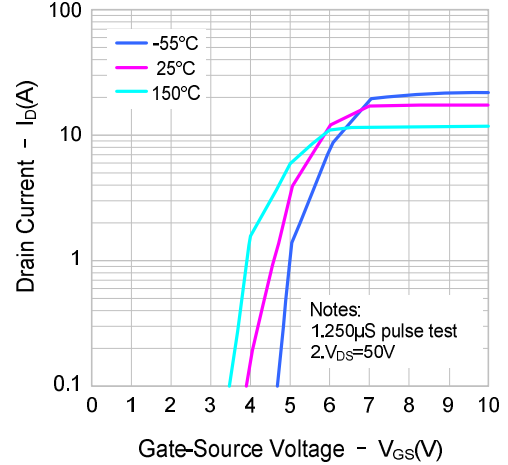


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

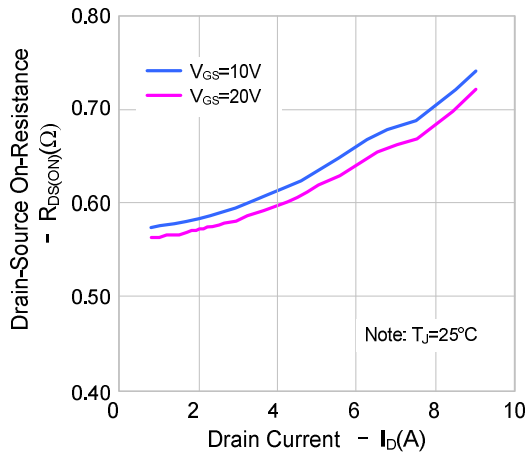


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

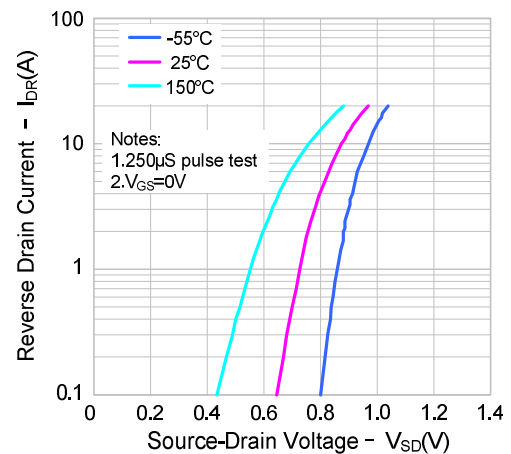


Figure 5. Capacitance Characteristics

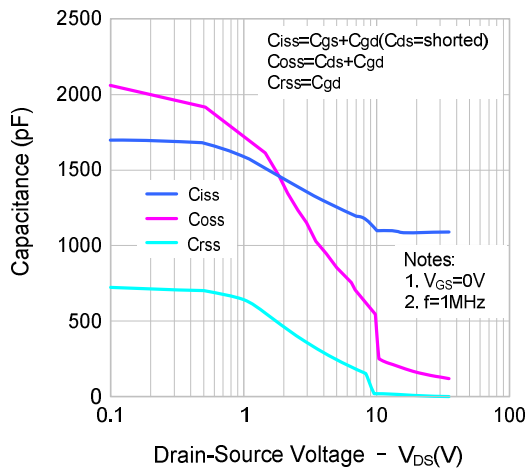
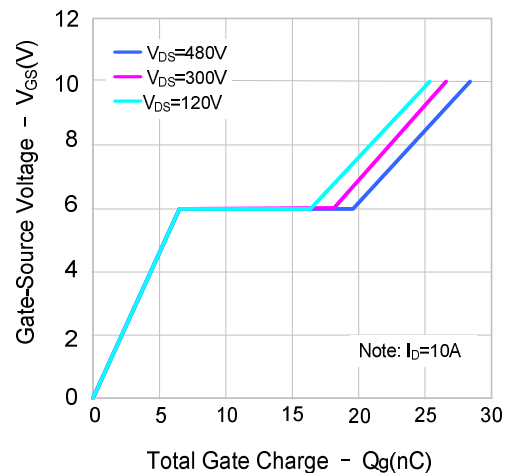


Figure 6. Gate Charge Characteristics



**TYPICAL CHARACTERISTICS (continued)**

Figure 7. Breakdown Voltage vs. Temperature

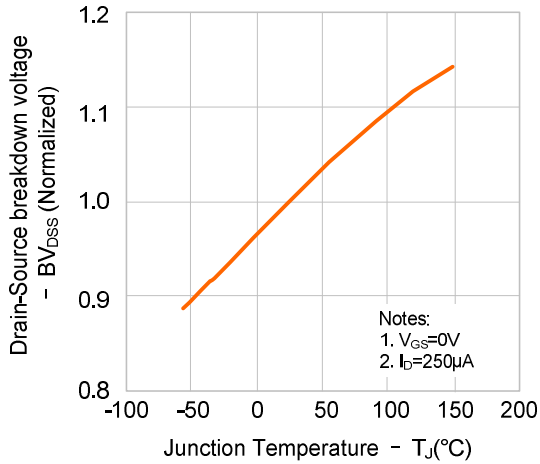


Figure 8. On-resistance Variation vs. Temperature

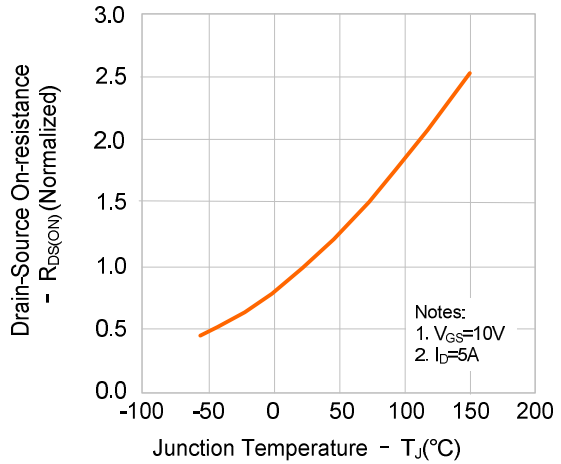


Figure 9-1. Max. Safe Operating Area(SVF10N60F)

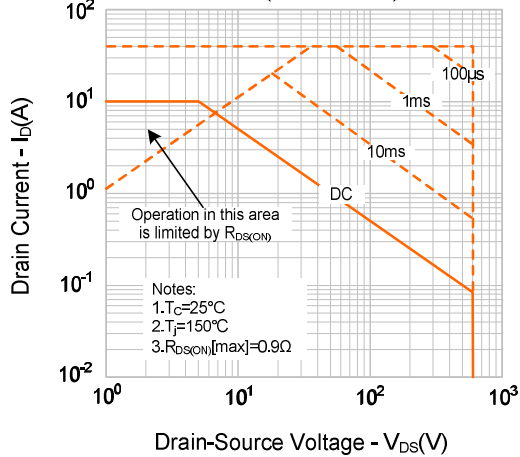


Figure 9-2. Max. Safe Operating Area(SVF10N60K)

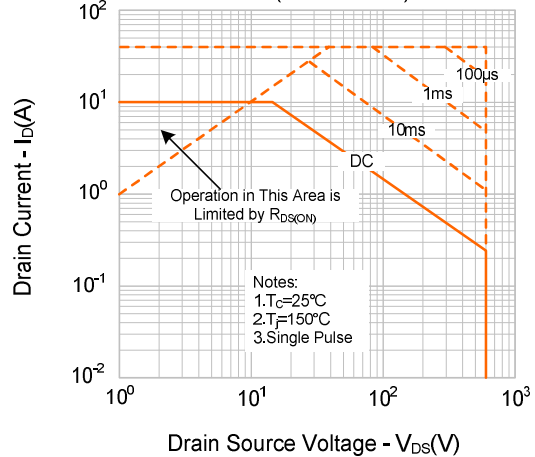


Figure 9-3. Max. Safe Operating Area(SVF10N60S)

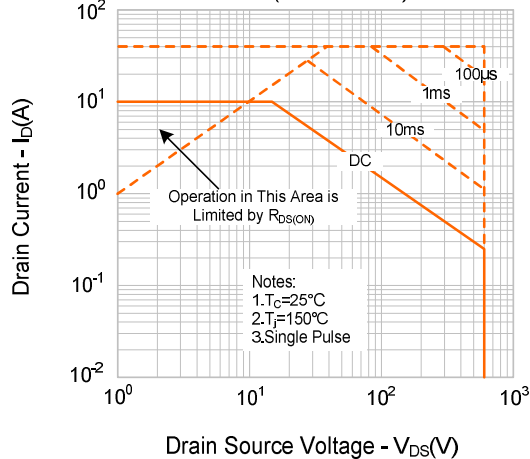
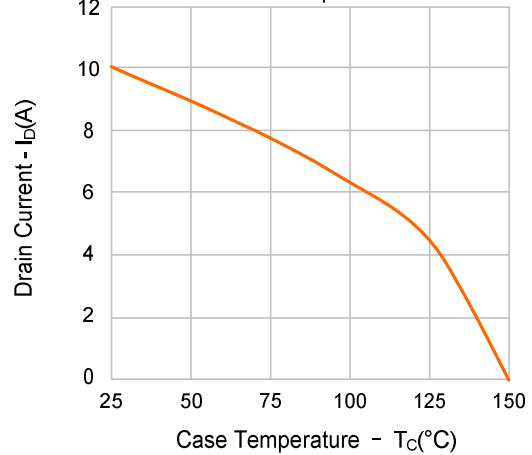
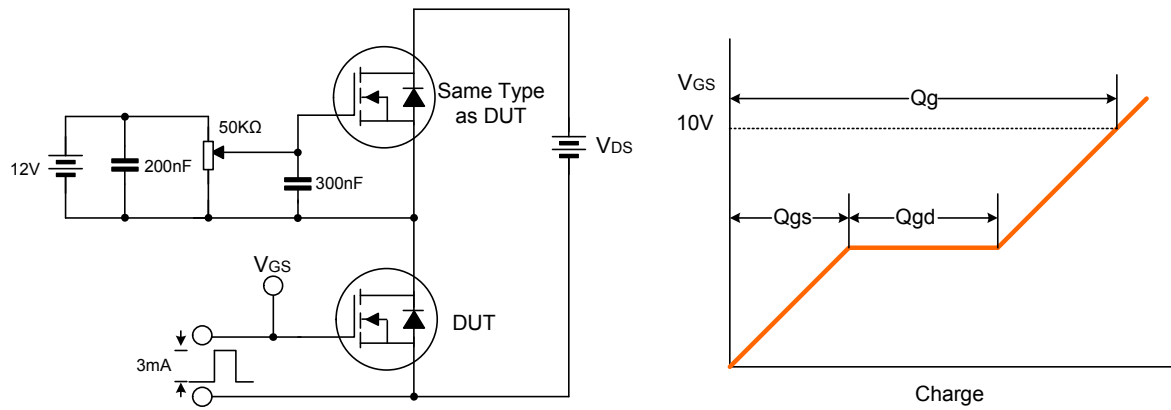


Figure 10. Maximum Drain Current vs. Case Temperature

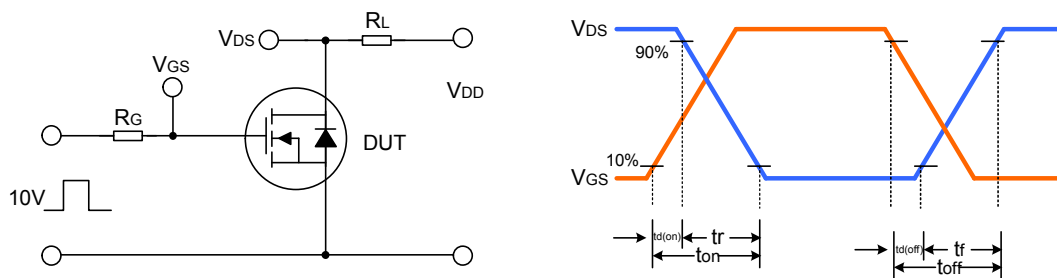


**TYPICAL TEST CIRCUIT**

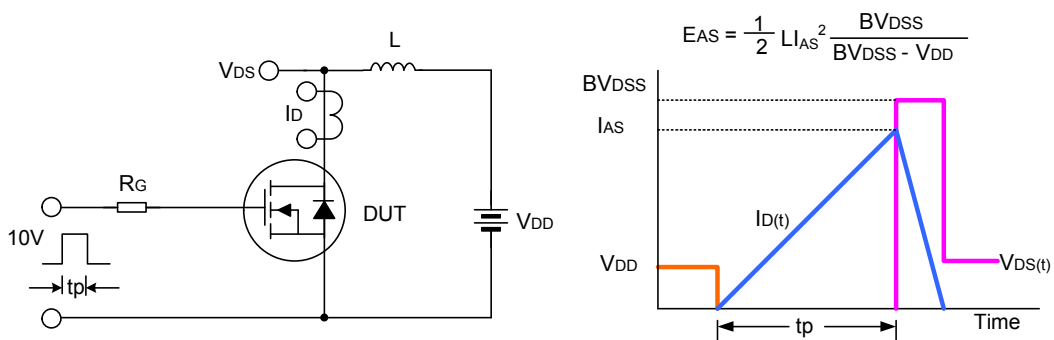
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



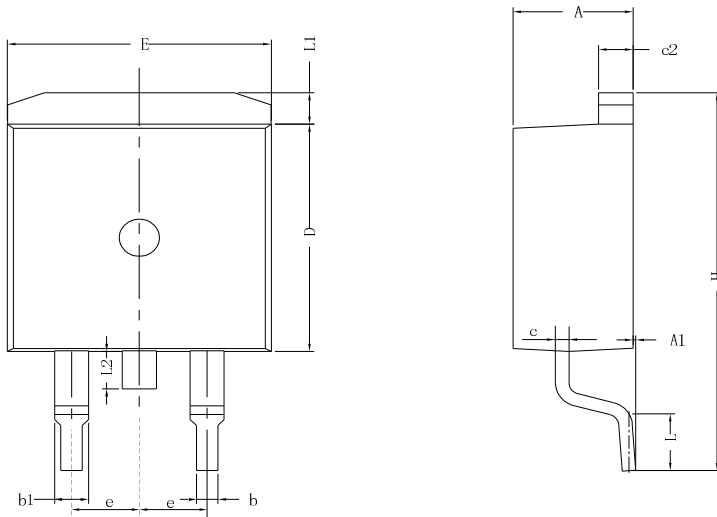
Unclamped Inductive Switching Test Circuit & Waveform



## PACKAGE OUTLINE

### TO-263-2L

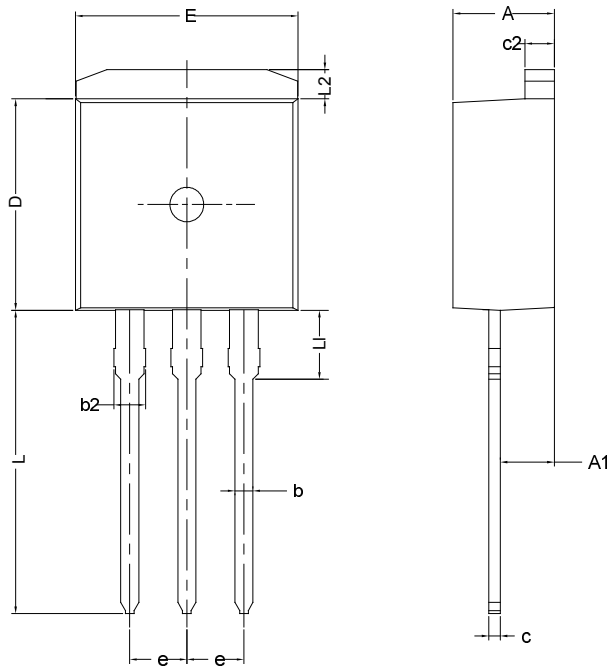
单位: 毫米



| SYMBOL | MIN     | NOM  | MAX   |
|--------|---------|------|-------|
| A      | 4.30    | 4.57 | 4.72  |
| A1     | 0       | 0.10 | 0.25  |
| b      | 0.71    | 0.81 | 0.91  |
| c      | 0.30    | ---  | 0.60  |
| c2     | 1.17    | 1.27 | 1.37  |
| D      | 8.50    | ---  | 9.35  |
| E      | 9.80    | ---  | 10.45 |
| e      | 2.54BSC |      |       |
| H      | 14.70   | ---  | 15.75 |
| L      | 2.00    | 2.30 | 2.74  |
| L1     | 1.12    | 1.27 | 1.42  |
| L2     | ---     | ---  | 1.75  |

### TO-262-3L

单位: 毫米

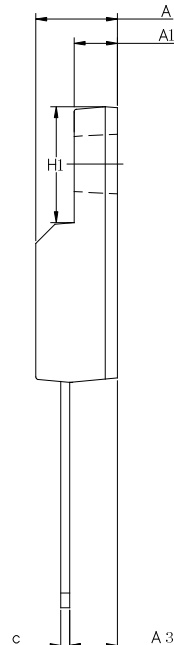
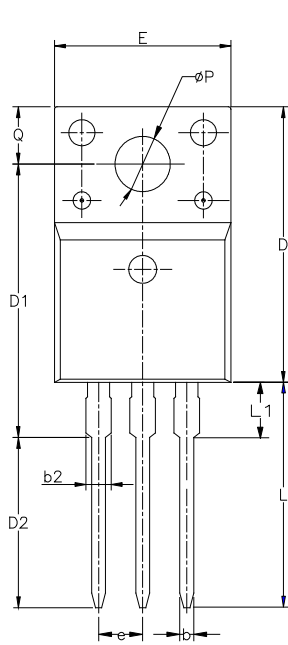


| SYMBOL | MIN      | NOM   | MAX   |
|--------|----------|-------|-------|
| A      | 4.30     | 4.50  | 4.70  |
| A1     | 2.20     | ---   | 2.92  |
| b      | 0.71     | 0.80  | 0.97  |
| b2     | 1.20     | ---   | 1.50  |
| c      | 0.34     | ---   | 0.76  |
| c2     | 1.22     | 1.30  | 1.35  |
| D      | 8.38     | ---   | 9.30  |
| E      | 9.80     | 10.16 | 10.54 |
| e      | 2.54 BSC |       |       |
| L      | 12.80    | ---   | 14.10 |
| L1     | 2.80     | 3.30  | 4.06  |
| L2     | 1.12     | ---   | 1.42  |

## PACKAGE OUTLINE

TO-220F-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      | 0.70    | 0.80  | 0.90  |
| b2     | —       | —     | 1.47  |
| c      | 0.35    | 0.50  | 0.65  |
| D      | 15.25   | 15.87 | 16.25 |
| D1     | 15.30   | 15.75 | 16.30 |
| D2     | 9.30    | 9.80  | 10.30 |
| 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     | /       | /     | 3.50  |
| ØP     | 3.00    | 3.18  | 3.40  |
| Q      | 3.05    | 3.30  | 3.55  |

### Disclaimer :

- Silan reserves the right to make changes to the information herein for the improvement of the design and performance without prior notice! Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.
- All semiconductor products malfunction or fail with some probability under special conditions. When using Silan products in system design or complete machine manufacturing, it is the responsibility of the buyer to comply with the safety standards strictly and take essential measures to avoid situations in which a malfunction or failure of such Silan products could cause loss of body injury or damage to property.
- Silan will supply the best possible product for customers!

---

|            |                                         |                |                                                               |
|------------|-----------------------------------------|----------------|---------------------------------------------------------------|
| Part No.:  | SVF10N60F/S/K                           | Document Type: | Datasheet                                                     |
| Copyright: | HANGZHOU SILAN MICROELECTRONICS CO.,LTD | Website:       | <a href="http://www.silan.com.cn">http://www.silan.com.cn</a> |

---

Rev.: 2.4

Revision History:

1. Delete the package outline of TO-220-3L
- 

Rev.: 2.3

Revision History:

1. Modify the Electrical characteristics
- 

Rev.: 2.2

Revision History:

1. Modify the general description
  2. Modify the ordering information
  3. Modify the package outline of TO-263-2L and TO-262-3L
- 

Rev.: 2.1

Revision History:

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

Rev.: 2.0

Revision History:

1. Modify the package information
- 

Rev.: 1.9

Revision History:

1. Modify the thermal characteristics
- 

Rev.: 1.8

Revision History:

1. Modify the ordering information
- 

Rev.: 1.7

Revision History:

1. Change the schematic diagram of MOS
- 

Rev.: 1.6

Revision History:

1. Modify "PACKAGE OUTLINE"
- 

Rev.: 1.5

Revision History:

1. Modify the values of  $T_{rr}$  and  $Q_{rr}$
- 

Rev.: 1.4

Revision History:

1. Add the halogen free information of SVF10N60F
- 

Rev.: 1.3

Revision History:

---

1. Add the package of TO-262-3L
- 

Rev.: 1.2

Revision History:

1. Modify "PACKAGE OUTLINE"
- 

Rev.: 1.1

Revision History:

1. Add the package of TO-263-2L
- 

Rev.: 1.0

Revision History:

1. Original
- 
-