



## 2A, 600V N-CHANNEL MOSFET

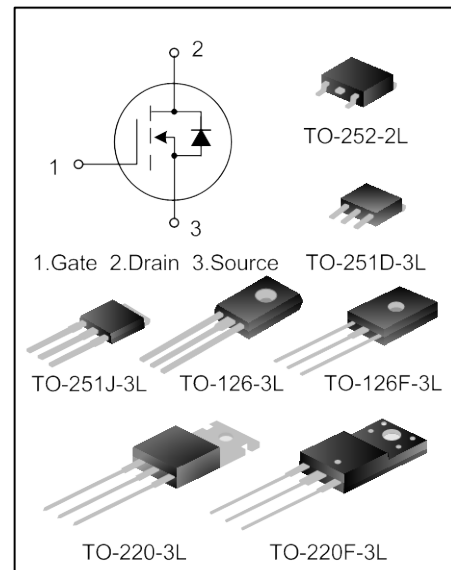
### GENERAL DESCRIPTION

SVF2N60M/MG/MJ/N/NF/F/FG/T/D 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.

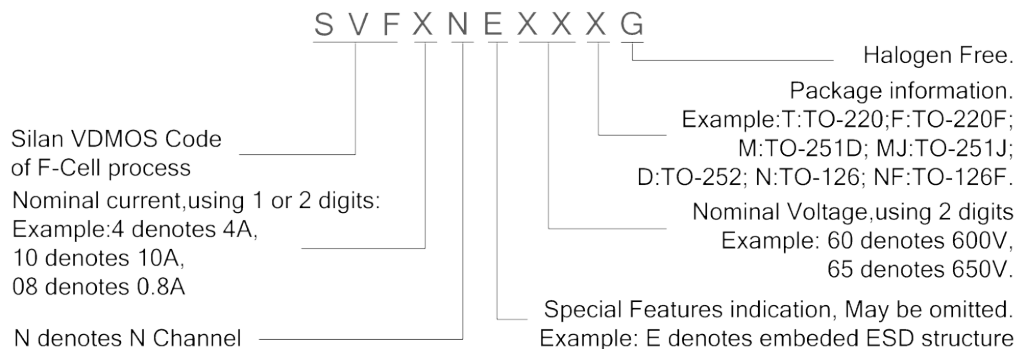
These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.

### FEATURES

- \* 2A,600V, $R_{DS(on)(typ.)}=3.7\Omega@V_{GS}=10V$
- \* Low gate charge
- \* Low  $C_{rss}$
- \* Fast switching
- \* Improved dv/dt capability



### NOMENCLATURE



### ORDERING INFORMATION

Part No.	Package Type	Marking	Material	Packing
SVF2N60M	TO-251D-3L	SVF2N60M	Pb free	Tube
SVF2N60MG	TO-251D-3L	SVF2N60MG	Halogen free	Tube
SVF2N60MJ	TO-251J-3L	SVF2N60MJ	Pb free	Tube
SVF2N60N	TO-126-3L	SVF2N60N	Pb free	Bulk
SVF2N60NF	TO-126F-3L	SVF2N60NF	Pb free	Tube
SVF2N60F	TO-220F-3L	SVF2N60F	Pb free	Tube
SVF2N60FG	TO-220F-3L	SVF2N60FG	Halogen free	Tube
SVF2N60T	TO-220-3L	SVF2N60T	Pb free	Tube



SVF2N60D	TO-252-2L	SVF2N60D	Pb free	Tube
SVF2N60DTR	TO-252-2L	SVF2N60D	Pb free	Tape & Reel



**ABSOLUTE MAXIMUM RATINGS** ( $T_C=25^\circ\text{C}$  unless otherwise noted)

Characteristics		Symbol	Ratings						Unit
			SVF2N6 0M(G)/D	SVF2N 60MJ	SVF2 N60N	SVF2N 60NF	SVF2 N60T	SVF2N 60F(G)	
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>	2.0						A
	T <sub>C</sub> =100°C		1.3						
Drain Current Pulsed		I <sub>DM</sub>	8						A
Power Dissipation(T <sub>C</sub> =25°C) -Derate above 25°C		P <sub>D</sub>	34	35	30	16	44	23	W
			0.27	0.28	0.24	0.13	0.35	0.18	W/°C
Single Pulsed Avalanche Energy(Note 1)		E <sub>AS</sub>	115						mJ
Operation Junction Temperature Range		T <sub>J</sub>	-55~+150						°C
Storage Temperature Range		T <sub>sta</sub>	-55~+150						°C

**THERMAL CHARACTERISTICS**

Characteristics	Symbol	Ratings						Unit
		SVF2N60M(G)/D	SVF2N60MJ	SVF2N60N	SVF2N60NF	SVF2N60T	SVF2N60F(G)	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.7	3.57	4.17	7.81	2.86	5.56	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	110	110	62.5	120	62.5	120	$^\circ\text{C/W}$

**ELECTRICAL CHARACTERISTICS** ( $T_C=25^\circ\text{C}$  unless otherwise noted)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	$B_{V_{DS}}$	$V_{GS}=0V, I_D=250\mu A$	600	--	--	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$	--	--	1.0	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	--	--	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	--	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=1.0A$	--	3.7	4.2	$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$	--	250.1	--	pF
Output Capacitance	$C_{oss}$		--	35.7	--	
Reverse Transfer Capacitance	$C_{rss}$		--	1.1	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=300V, I_D=2.0A, R_G=25\Omega$ (Note 2,3)	--	9.2	--	ns
Turn-on Rise Time	$t_r$		--	23.4	--	
Turn-off Delay Time	$t_{d(off)}$		--	15.3	--	
Turn-off Fall Time	$t_f$		--	20.1	--	
Total Gate Charge	$Q_g$	$V_{DS}=480V, I_D=2.0A, V_{GS}=10V$ (Note 2,3)	--	5.67	--	nC
Gate-Source Charge	$Q_{gs}$		--	1.74	--	
Gate-Drain Charge	$Q_{gd}$		--	1.99	--	



## 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	--	--	2.0	A
Pulsed Source Current	$I_{SM}$		--	--	8.0	
Diode Forward Voltage	$V_{SD}$	$I_S=2.0A, V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	$T_{rr}$	$I_S=2.0A, V_{GS}=0V,$ $dI_F/dt=100A/\mu S$	--	356.75	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	1.03	--	$\mu C$

### Notes:

1.  $L=30mH, I_{AS}=2.52, V_{DD}=145V, R_G=25\Omega$ , starting  $T_J=25^\circ C$ ;
2. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ ;
3. Essentially independent of operating temperature.

## TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

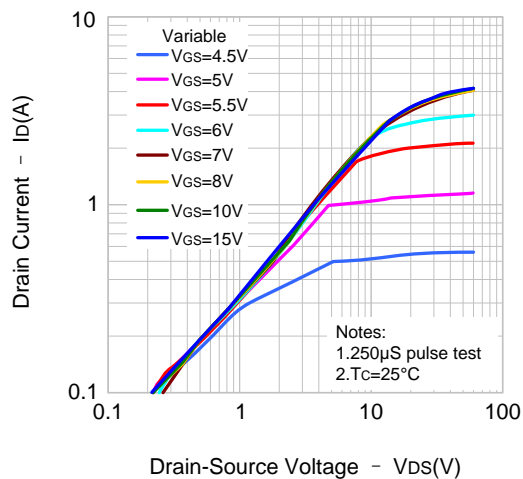


Figure 2. Transfer Characteristics

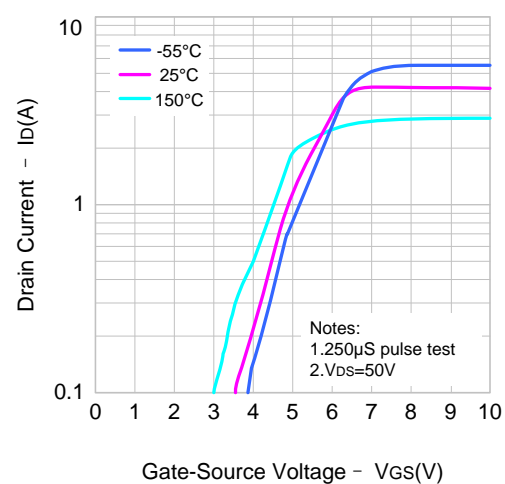


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

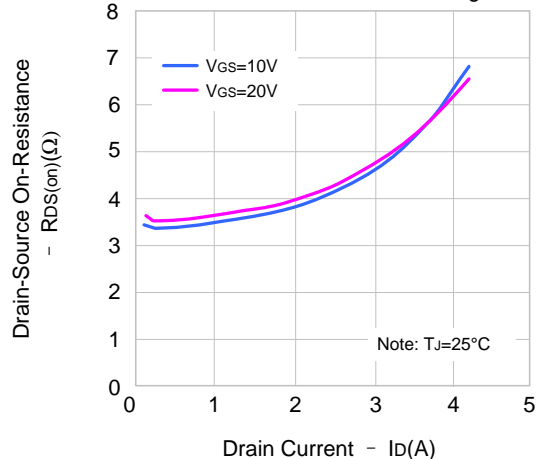
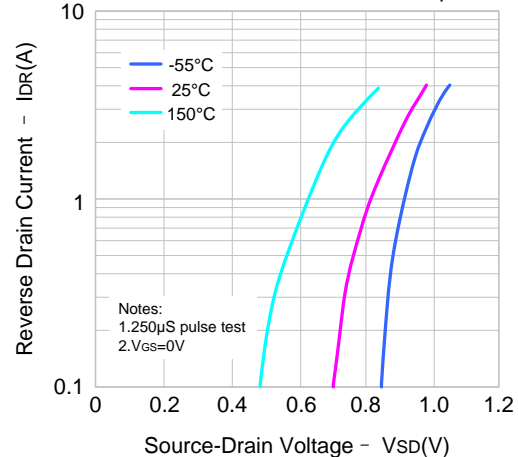


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature





## TYPICAL CHARACTERISTICS(CONTINUED)

Figure 5. Capacitance Characteristics

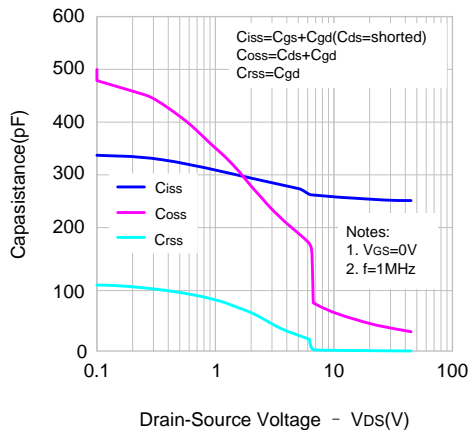


Figure 6. Gate Charge Characteristics

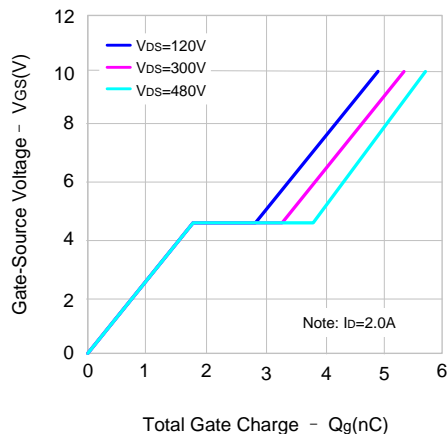


Figure 7. Breakdown Voltage Variation vs. Temperature

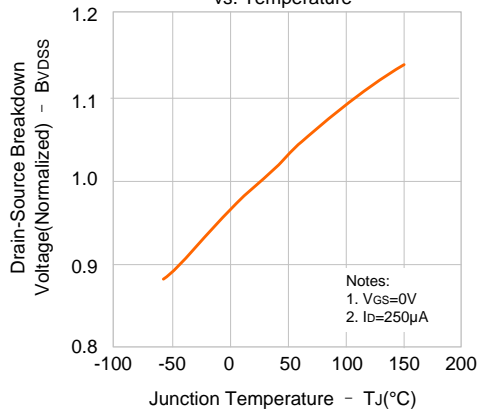


Figure 8. On-resistance Variation vs. Temperature

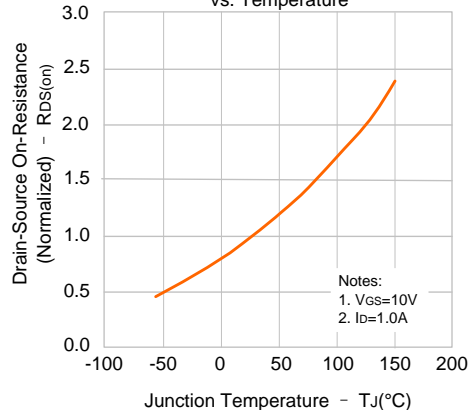


Figure 9-1. Max. Safe Operating Area(SVF2N60M(G)/D)

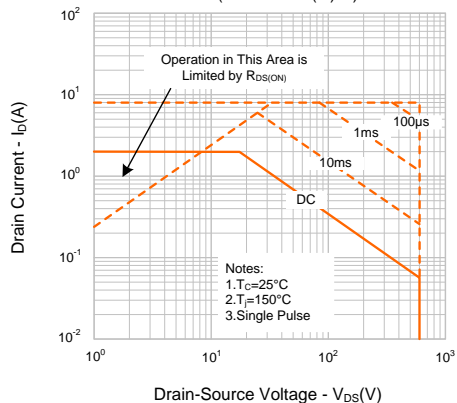
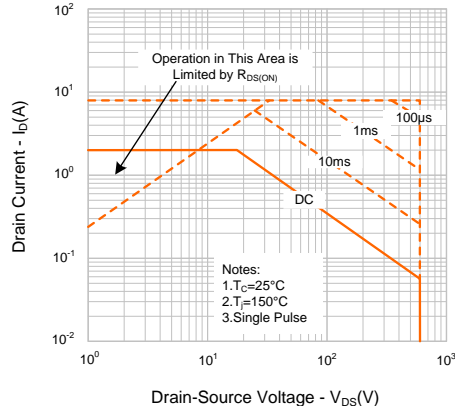


Figure 9-2. Max. Safe Operating Area(SVF2N60MJ)





## TYPICAL CHARACTERISTICS (CONTINUED)

Figure 9-3. Max. Safe Operating Area(SVF2N60T)

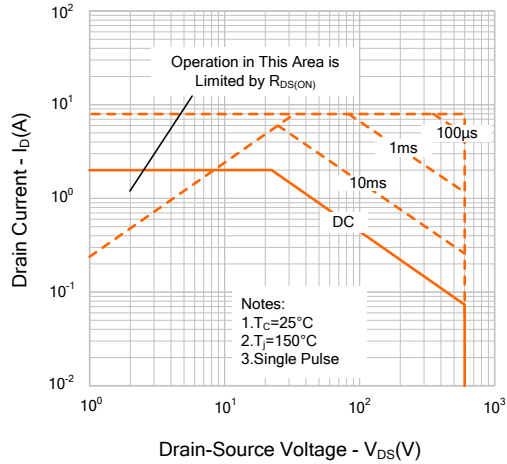


Figure 9-4. Max. Safe Operating Area(SVF2N60F(FG))

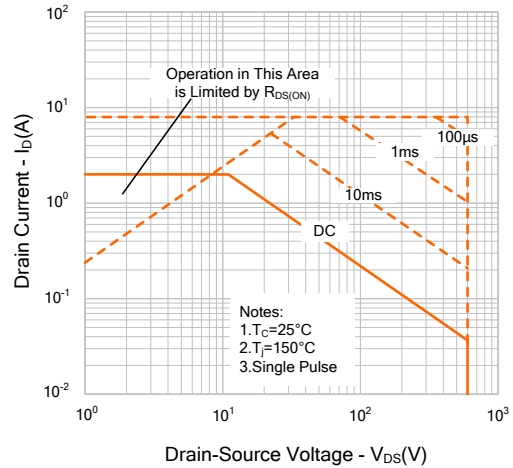


Figure 9-5. Max. Safe Operating Area(SVF2N60N)

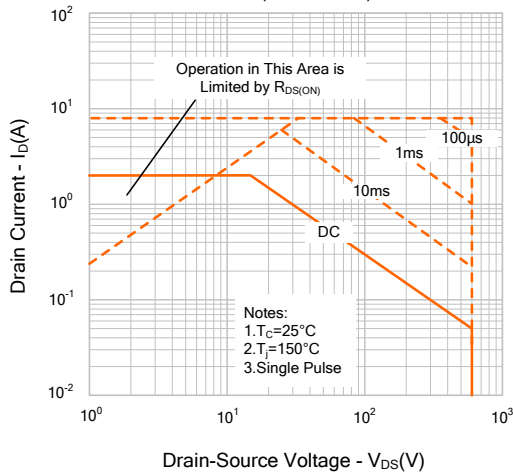


Figure 9-6. Max. Safe Operating Area(SVF2N60NF)

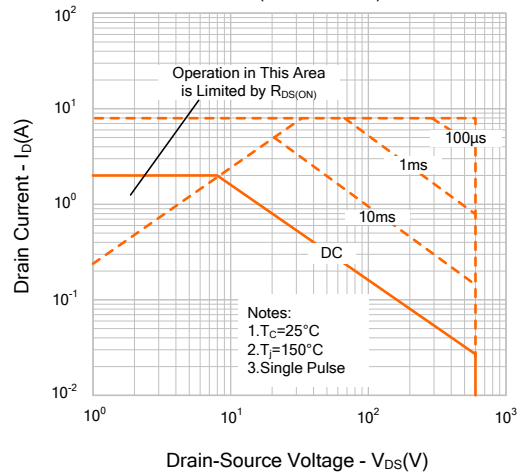
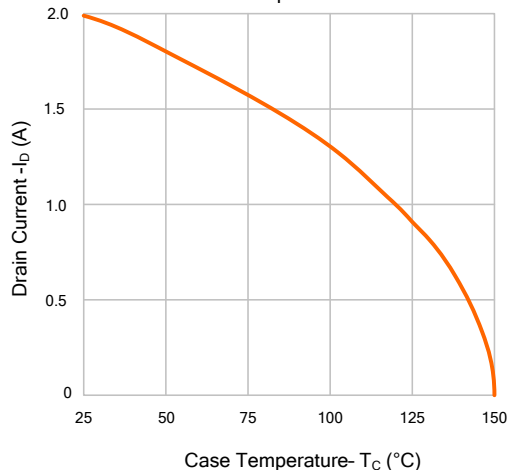


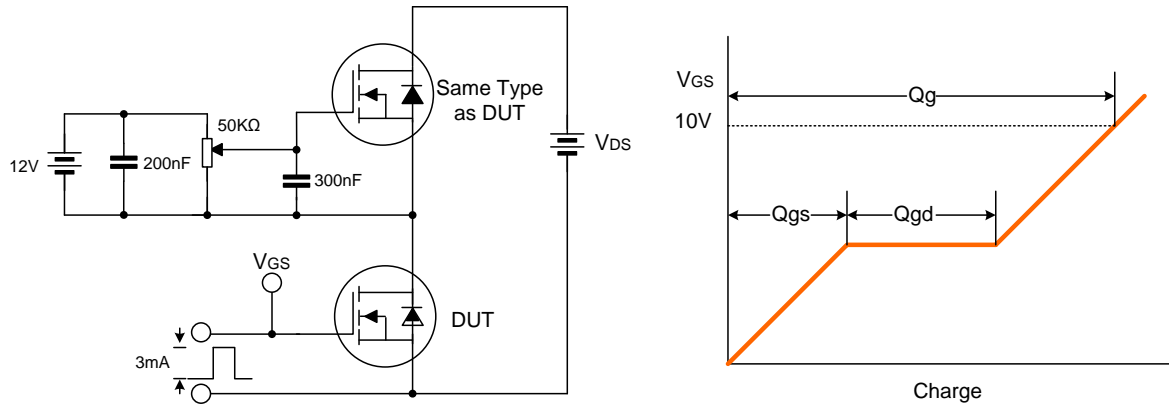
Figure 10. Max. Drain Current vs. Case Temperature



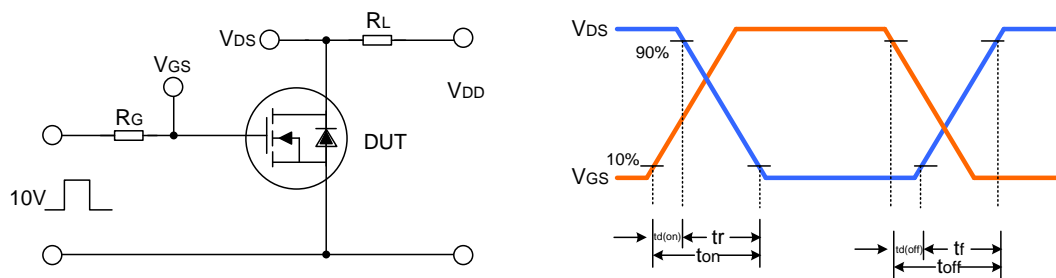


## TYPICAL TEST CIRCUIT

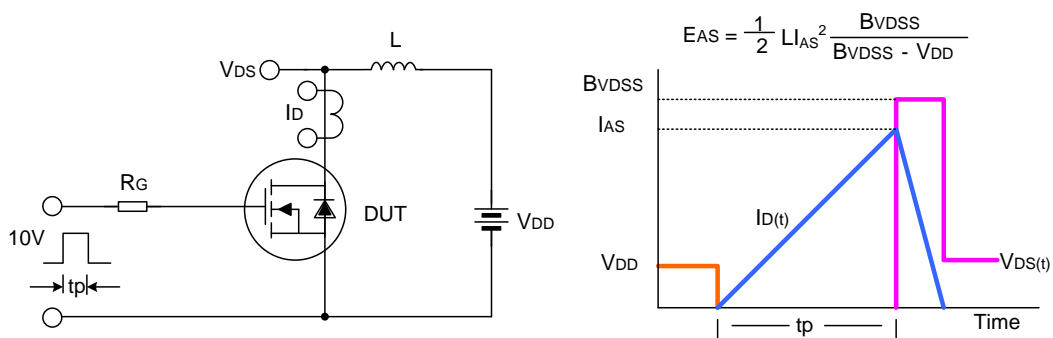
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform

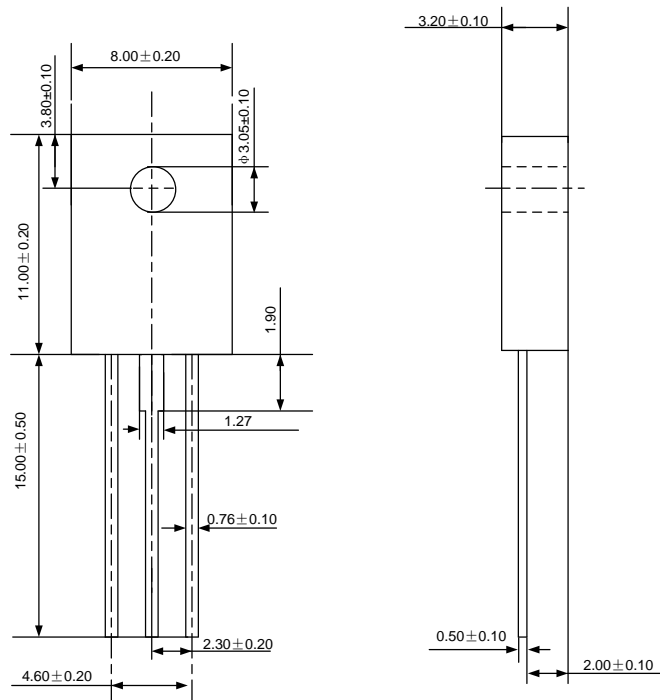




## PACKAGE OUTLINE

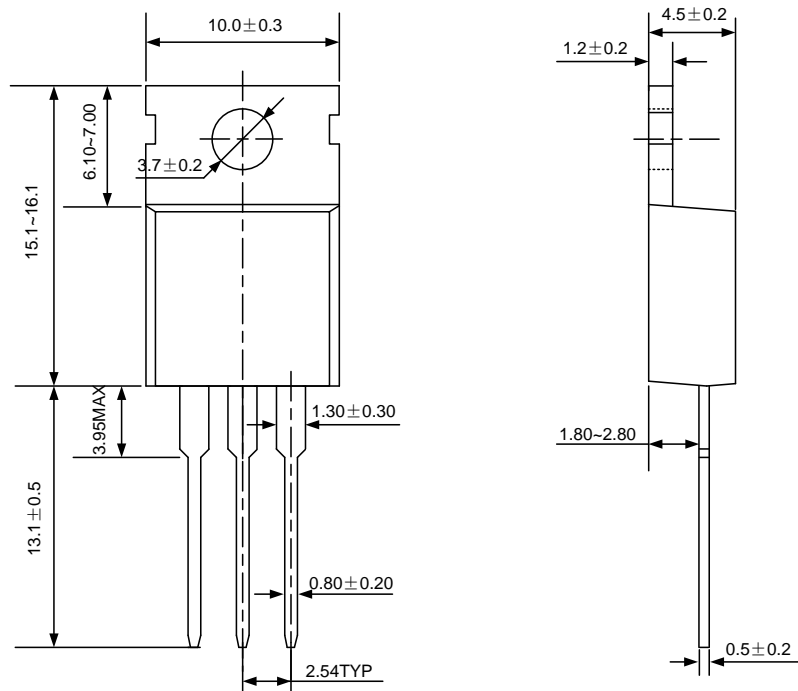
TO-126F-3L

UNIT: mm



TO-220-3L

UNIT: mm



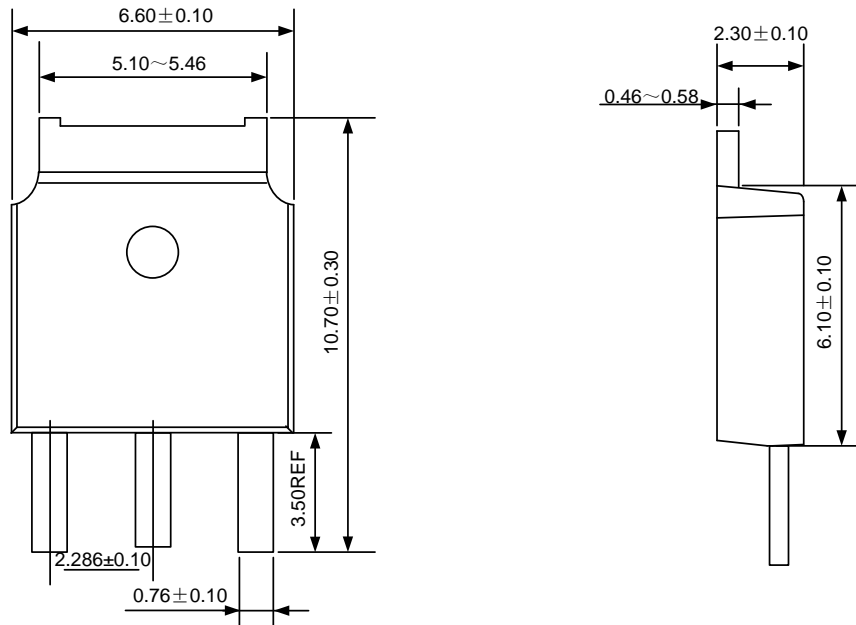




**PACKAGE OUTLINE (continued)**

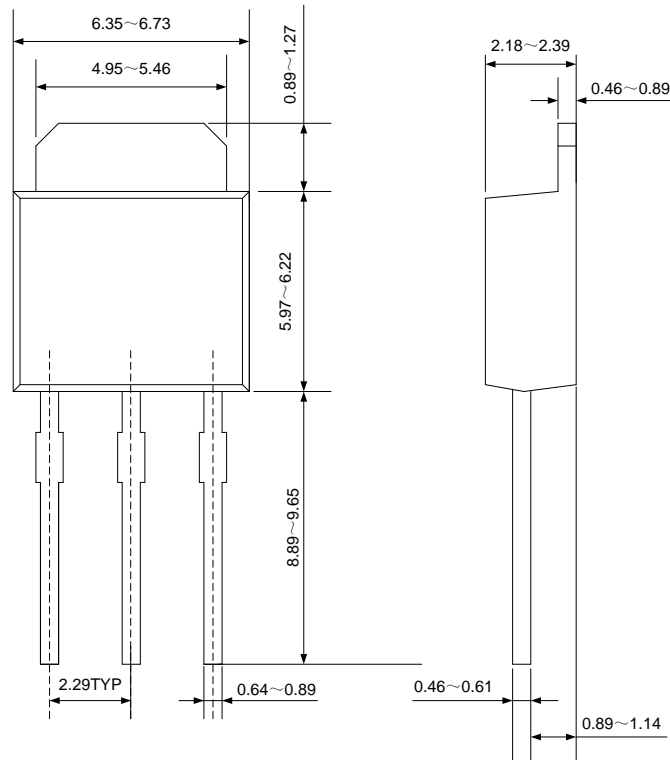
**TO-251D-3L**

**UNIT: mm**



**TO-251J-3L**

**UNIT: mm**

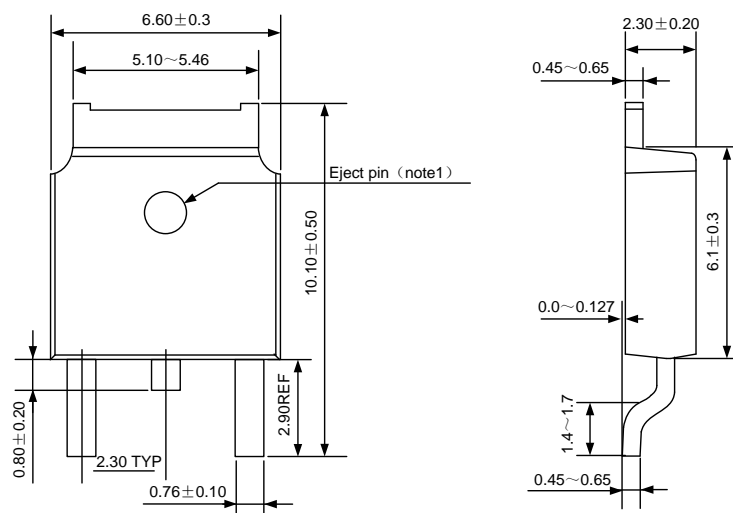




**PACKAGE OUTLINE (continued)**

**TO-252-2L(1)**

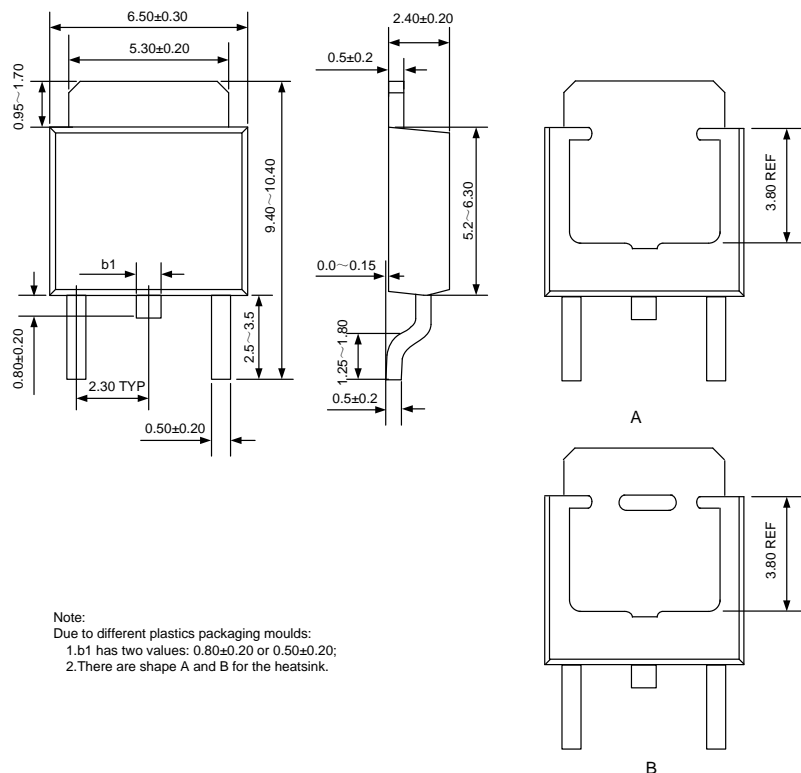
**UNIT: mm**



**NOTE 1 :** There are two conditions for this position:has an eject pin or has no eject pin.

**TO-252-2L(2)**

**UNIT: mm**



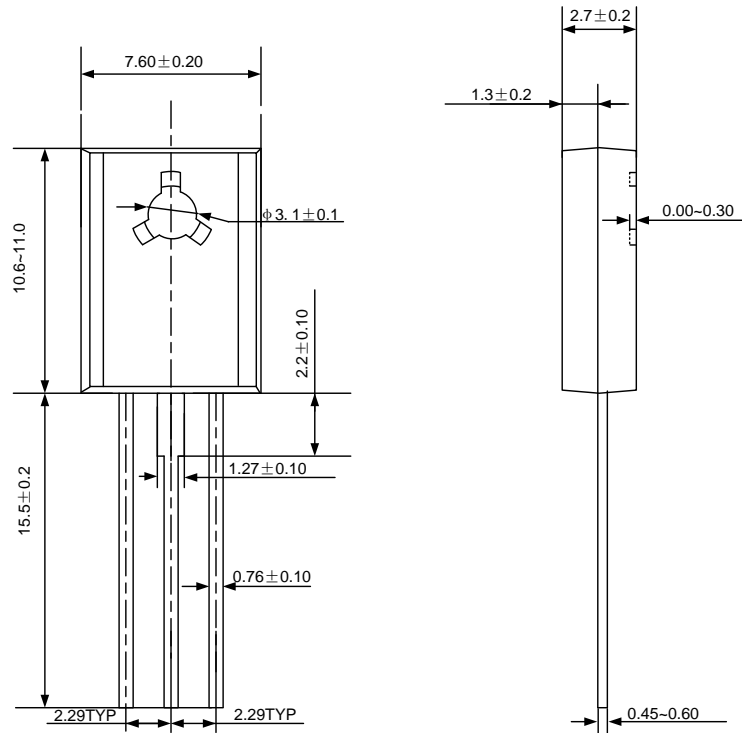
Note:  
Due to different plastics packaging moulds:  
1. b1 has two values:  $0.80 \pm 0.20$  or  $0.50 \pm 0.20$ ;  
2. There are shape A and B for the heatsink.



**PACKAGE OUTLINE (continued)**

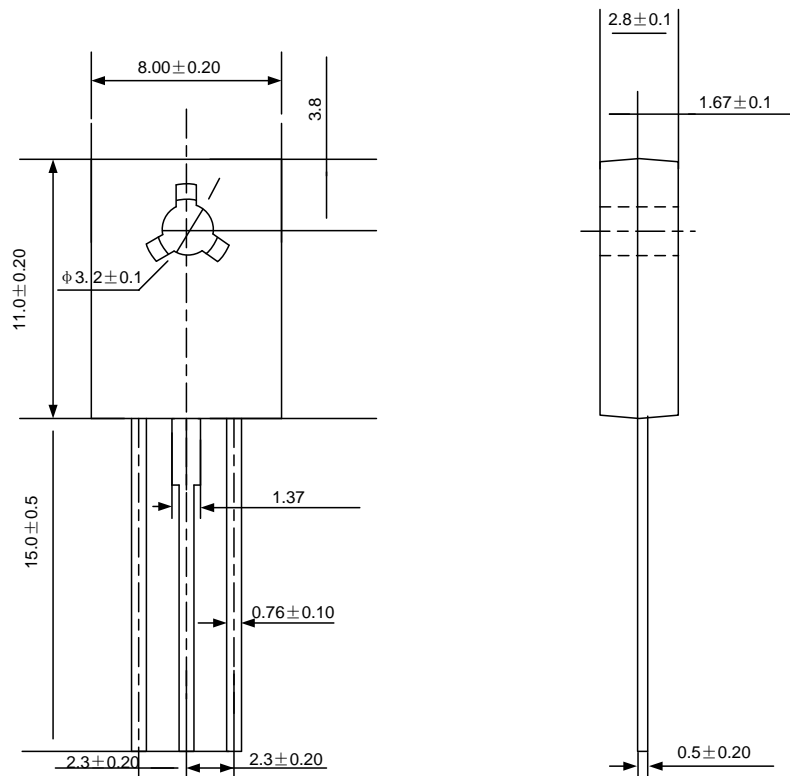
**TO-126-3L(1)**

**UNIT: mm**



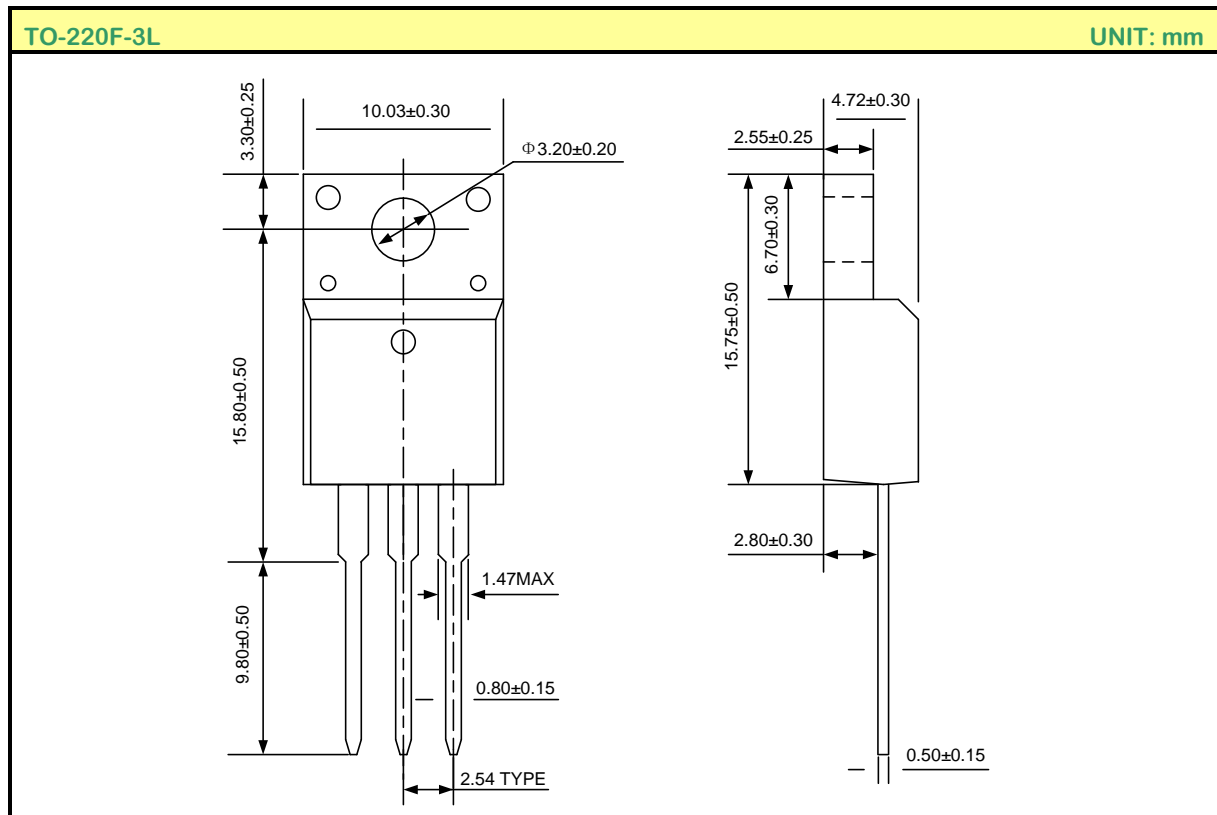
**TO-126-3L(2)**

**UNIT: mm**





**PACKAGE OUTLINE (continued)**



**Disclaimer:**

- Silan reserves the right to make changes to the information herein for the improvement of the design and performance without further 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!



## ATTACHMENT

### Revision History

Date	REV	Description	Page
2010.09.20	1.0	Original	
2010.10.21	1.1	Modify "TYPICAL CHARACTERISTICS", "PACKAGE OUTLINE", the template of Datasheet	
2011.06.28	1.2	Add the package of TO-251D-3L, TO-251J-3L, TO-126-3L	
2011.09.01	1.3	Modify "PACKAGE OUTLINE"	
2011.11.16	1.4	Delete the package of TO-251-3L	
2012.03.12	1.5	Add the halogen free information of SVF2N60F	
2012.06.04	1.6	Modify the values of $T_{rr}$ and $Q_{rr}$ ; Update the package outline of TO-251D-3L	
2012.07.17	1.7	Add the package of TO-126F-3L	
2012.11.13	1.8	Add the package of TO-126-3L(2)	
2012.12.17	1.9	Modify "PACKAGE OUTLINE"	
2013.02.05	2.0	Add the halogen free information of SVF2N60M	