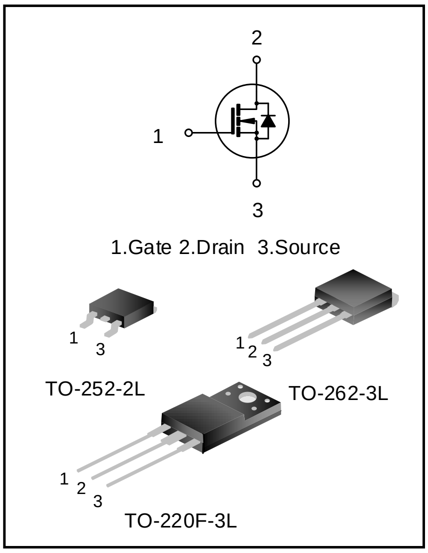
6A, 900V N-CHANNEL MOSFET

DESCRIPTION

SVF6N90AD(K)(F) 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 high avalanche breakdown resistance.

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



FEATURES

- 6A, 900V, $R_{DS(on)(typ.)}$=2.2Ω@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability
- 100% avalanche tested
- Pb-free lead plating
- RoHS compliant

KEY PERFORMANCE PARAMETERS

Characteristics	Ratings	Unit
V_{DS}	900	V
$V_{GS(th)}$	2.0~4.0	V
$R_{DS(on), max.}$	2.5	Ω
$I_{D.pulse}$	24	A
$Q_{g.typ.}$	23	nC

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SVF6N90ADTR	TO-252-2L	6N90AD	Halogen free	Tape & Reel
SVF6N90AK	TO-262-3L	SVF6N90AK	Halogen free	Tube
SVF6N90AF	TO-220F-3L	6N90AF	Halogen free	Tube

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

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Gate-source Voltage	V_{GS}	--	-30	--	30	V
Drain Current	I_D	T_C=25°C	--	--	6.0	A
		T_C=100°C	--	--	3.8	A
Drain Current Pulsed (Note 1)	I_{DM}	T_C=25°C	--	--	24	A
Power Dissipation (TO-252-2L) (Note 2)	P_D	T_C=25°C	--	--	139	W
Power Dissipation (TO-262-3L) (Note 2)	P_D	T_C=25°C	--	--	169	W
Power Dissipation (TO-220F-3L) (Note 2)	P_D	T_C=25°C	--	--	29	W
Single Pulsed Avalanche Energy	E_{AS}	L=10mH, V_{DD}=100V, R_G=25Ω, starting temperature T_J=25°C	--	--	239	mJ
Single pulse avalanche current	I_{AS}	--	--	--	6.6	A
Reverse Diode dv/dt	dv/dt	V_{DS}=0~700V, I_{SD}<=I_S, T_J=25°C	--	--	4.5	V/ns
MOS dv/dt Ruggedness	dv/dt	V_{DS}=0~700V	--	--	50	V/ns
Operation Junction Temperature Range	T_J	--	-55	--	150	°C
Storage Temperature Range	T_{stg}	--	-55	--	150	°C
Continuous Diode Forward Current	I_S	T_C=25°C, integral reverse P-N junction diode in the MOSFET	--	--	6.0	A
Diode Pulse Current	$I_{S,pulse}$		--	--	24	A
Maximum Diode Commutation Speed	di/dt	V_{DS}=0~400V, I_{SD}<= I_S, T_J=25°C	--	--	250	A/µs

THERMAL CHARACTERISTICS

Table 1. TO-252-2L (SVF6N90AD) thermal characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{θJC}$	--	--	--	0.9	°C/W
Thermal Resistance, Junction-ambient	$R_{θJA}$	--	--	--	62.0	°C/W
Soldering Temperature (SMD)	T_{sold}	Reflow soldering: 10±1sec, 3times	--	--	260	°C

Table 2. TO-262-3L (SVF6N90AK) thermal characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{θJC}$	--	--	--	0.74	°C/W
Thermal Resistance, Junction-ambient	$R_{θJA}$	--	--	--	62.5	°C/W
Soldering Temperature (in line)	T_{sold}	15^{+2}_{-0} sec，1time	--	--	260	°C

Table 3. TO-220F-3L (SVF6N90AF) thermal characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{θJC}$	--	--	--	4.31	°C/W
Thermal Resistance, Junction-ambient	$R_{θJA}$	--	--	--	62.5	°C/W
Soldering Temperature (in line)	T_{sold}	15^{+2}_{-0} sec，1time	--	--	260	°C

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

Static characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250µA	900	--	--	V
Drain-source Leakage Current	I_{DSS}	V_{DS}=900V, V_{GS}=0V, T_J=25°C	--	--	1.0	µA
		V_{DS}=900V, V_{GS}=0V, T_J=125°C	--	4.0	--	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	2.0	--	4.0	V
Static Drain-source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=3.0A	--	2.2	2.5	Ω
Gate Resistance	R_G	f=1MHz	--	3.1	--	Ω

Dynamic characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{iss}	f=1MHz, V_{GS}=0V, V_{DS}=25V	--	930	--	pF
Output Capacitance	C_{oss}		--	82	--	
Reverse Transfer Capacitance	C_{rss}		--	4.9	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=450V, V_{GS}=10V, R_G=25Ω, I_D=6.0A (Notes 3, 4)	--	16	--	ns
Turn-on Rise Time	t_r		--	30	--	
Turn-off Delay Time	$t_{d(off)}$		--	57	--	
Turn-off Fall Time	t_f		--	33	--	
Total Gate Charge	Q_g	V_{DD}=720V, V_{GS}=10V, I_D=6.0A (Notes 3, 4)	--	23	--	nC
Gate-source Charge	Q_{gs}		--	6.2	--	
Gate-drain Charge	Q_{gd}		--	9.7	--	
Gate-plateau Voltage	$V_{plateau}$		--	5.9	--	V

Reverse diode characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_{SD}	I_S=6.0A, V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=6.0A, V_{GS}=0V, dI_F/dt=100A/µs (Note 3)	--	635	--	ns
Reverse Recovery Charge	Q_{rr}		--	4.0	--	µC
Reverse Recovery Peak Current	I_{rrm}		--	14	--	A

Notes:

1. Pulse time 5µs;
2. The dissipation power will change with temperature, derating above 25°C: 1.11W/°C(TO-252-2L)/1.35W/°C (TO-262-3L)/0.23W/°C (TO-220F-3L);
3. Pulse Test: Pulse width ≤300µs, Duty cycle≤2%;
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. Output Characteristics

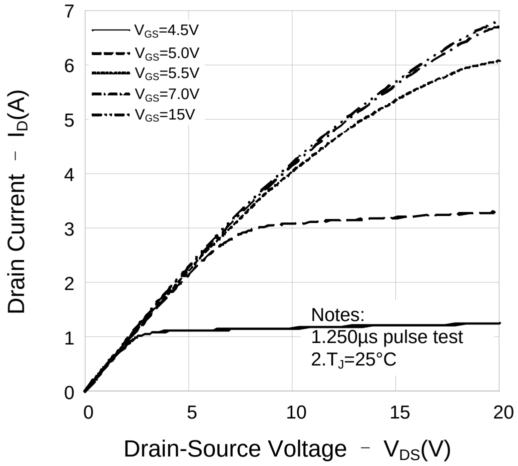


Figure 2. Output Characteristics

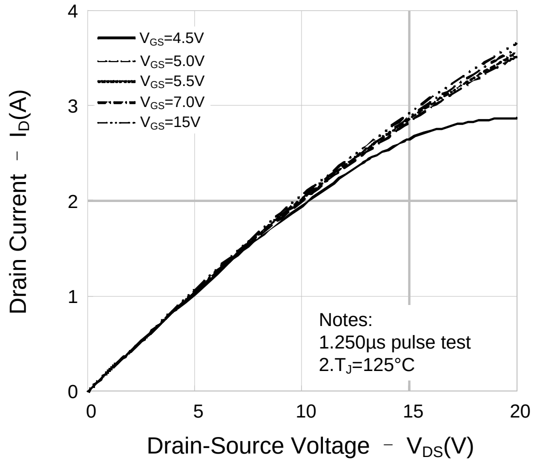


Figure 3. Transfer Characteristics

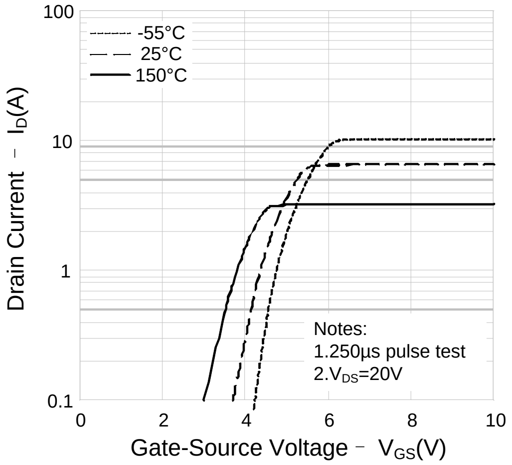


Figure 4. On-Resistance Variation vs. Drain Current

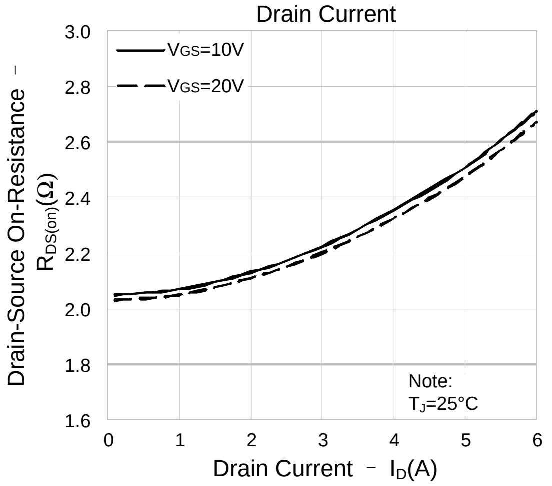


Figure 5. On-Resistance Variation vs. Gate-Source Voltage

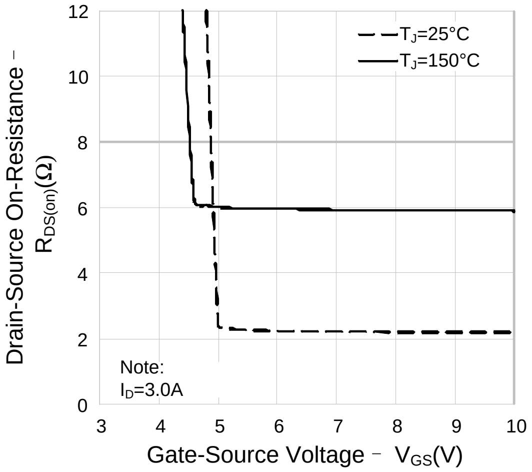
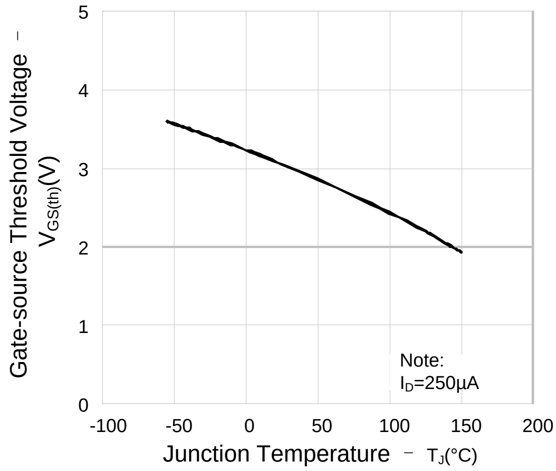


Figure 6. Gate-source Threshold Voltage vs. Temperature



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Body Diode Forward Voltage Variation vs. Source Current and Temperature

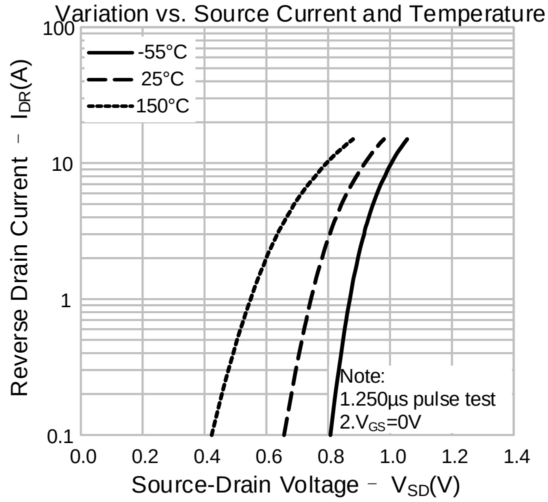


Figure 8. Capacitance Characteristics

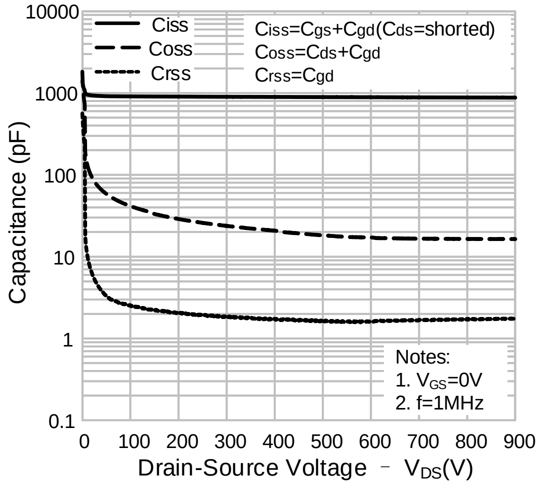


Figure 9. Gate Charge Characteristics

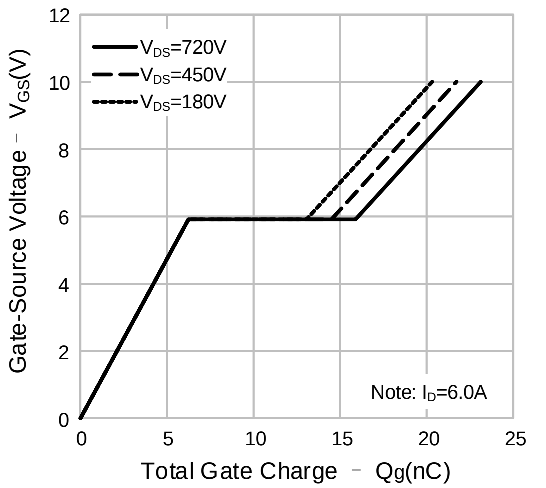


Figure 10. Breakdown Voltage Variation vs. Temperature

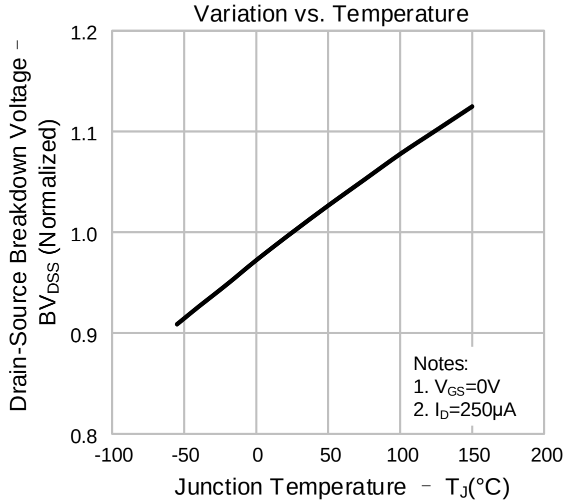


Figure 11. On-resistance Variation vs. Temperature

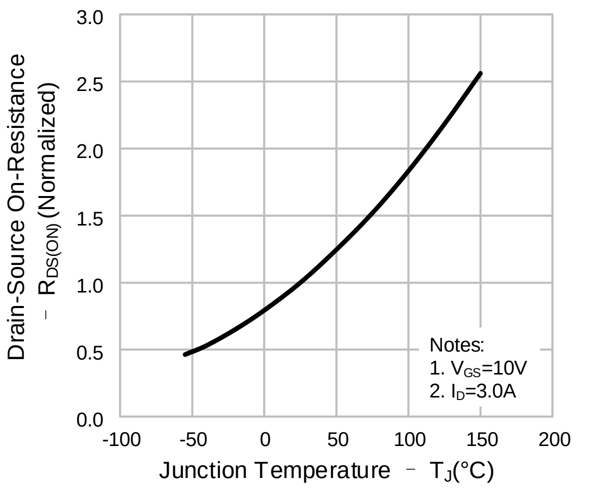
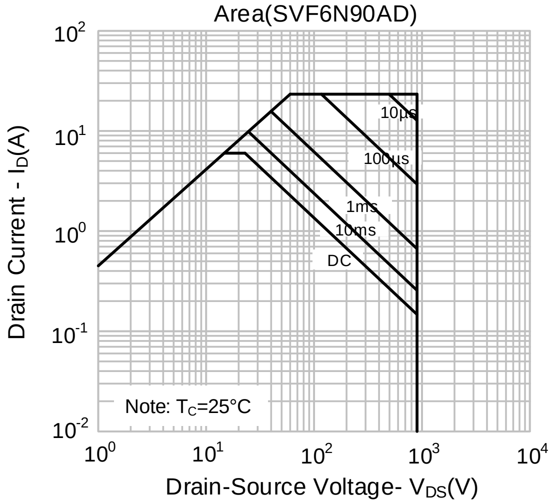


Figure 12-1. Max. Safe Operating Area(SVF6N90AD)



TYPICAL CHARACTERISTICS (CONTINUED)

Figure 12-2. Max. Safe Operating Area(SVF6N90AK)

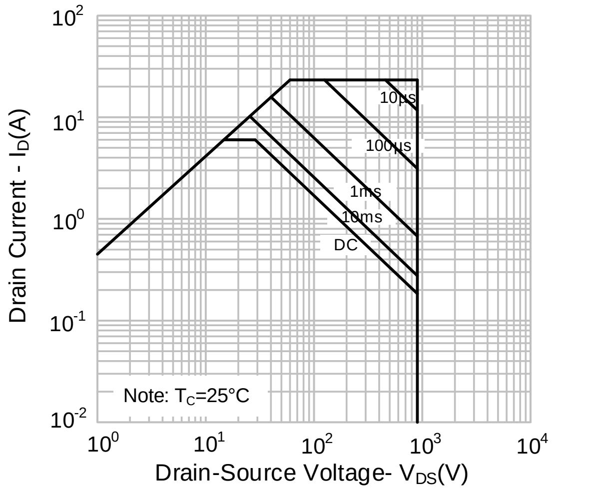


Figure 12-3. Max. Safe Operating Area(SVF6N90AF)

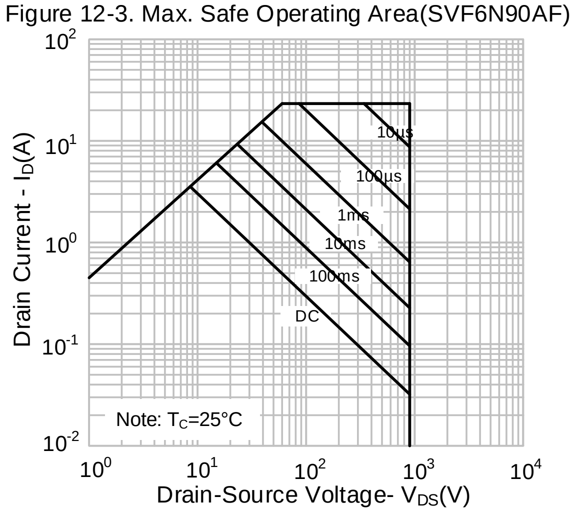


Figure 13-1. Power Dissipation vs. Temperature(SVF6N90AD)

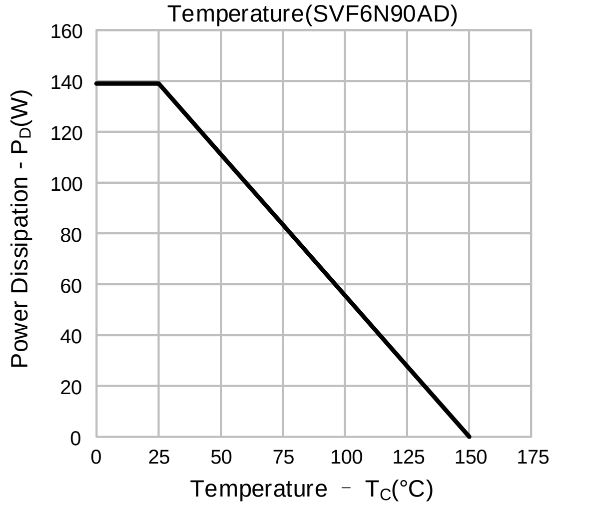


Figure 13-2. Power Dissipation vs. Temperature(SVF6N90AK)

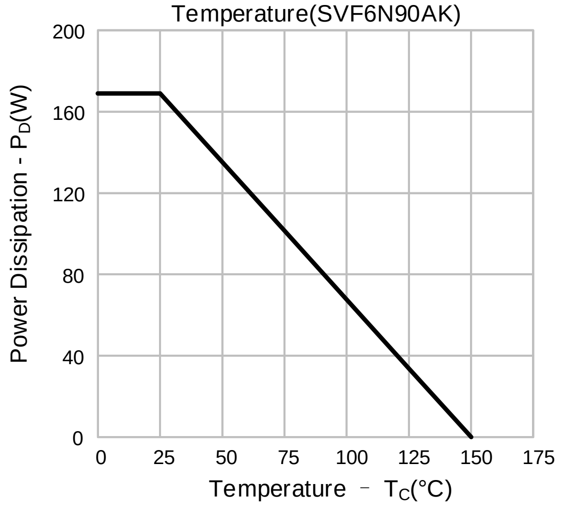


Figure 13-3. Power Dissipation vs. Temperature(SVF6N90AF)

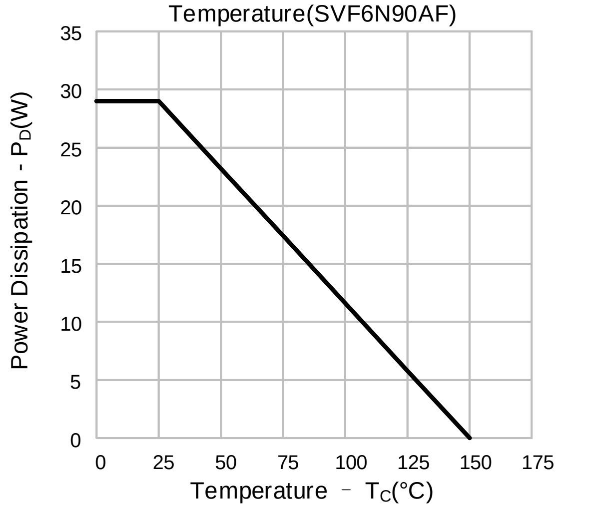
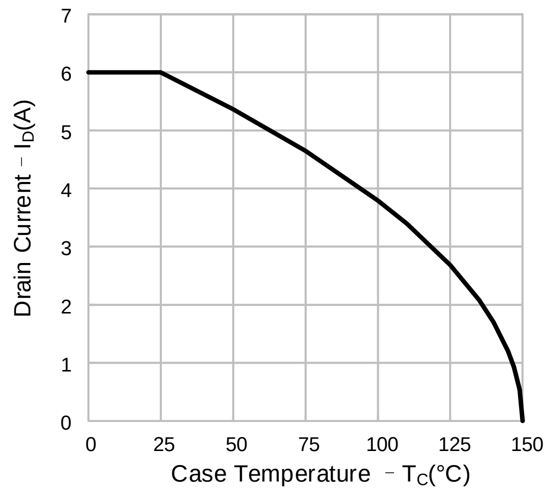
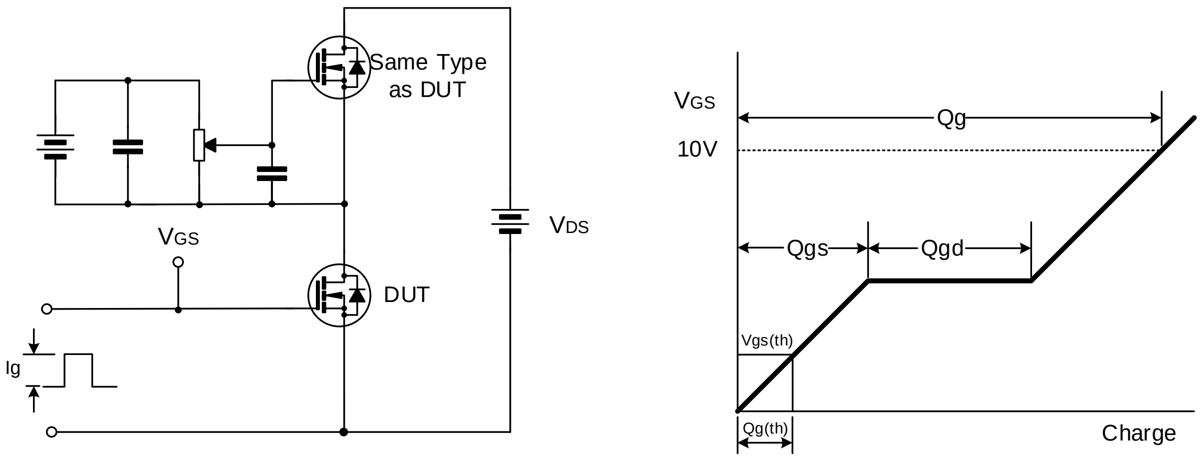


Figure 14.Drain Current vs. Case Temperature

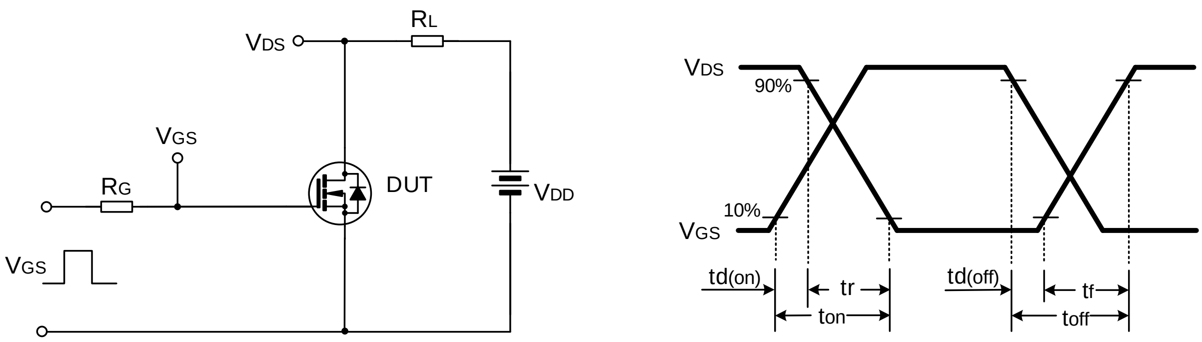


TYPICAL TEST CIRCUIT

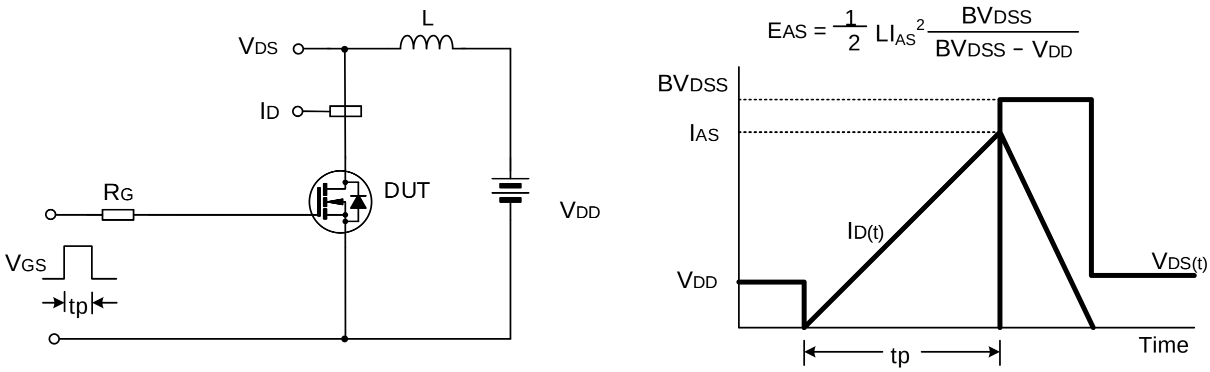
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

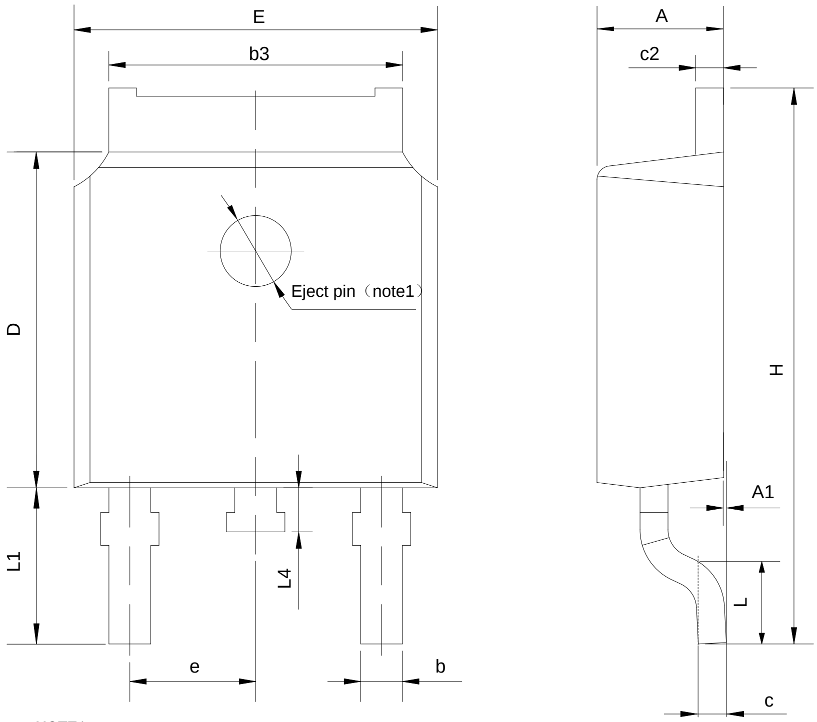


Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

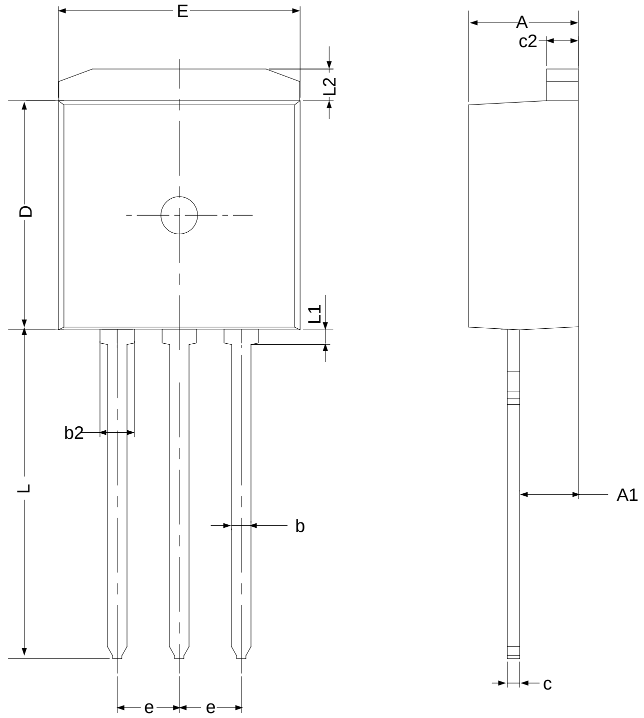
TO-252-2L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	—	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	—	0.65
c2	0.45	—	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e	2.30TYP		
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1	2.90REF		
L4	0.60	0.80	1.00

NOTE1：There are two conditions for this position:has an eject pin or has no eject pin.

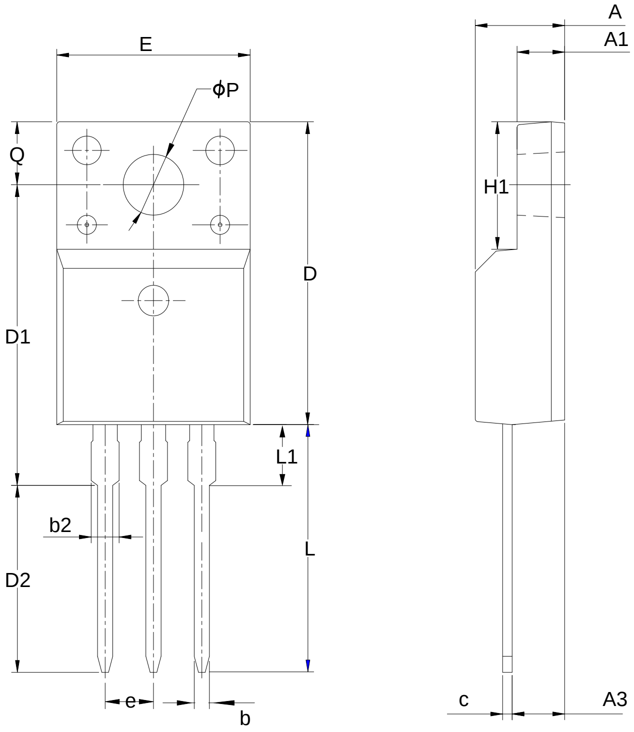
TO-262-3L **UNIT: mm**



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	2.20	—	2.92
b	0.71	0.80	0.90
b2	1.20	—	1.50
c	0.34	—	0.65
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	—	—	0.75
L2	1.12	—	1.42

PACKAGE OUTLINE (CONTINUED)

TO-220F-3L **UNIT: mm**



SYMBOL	MILLIMETER		
	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	2.54BSC		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	–	–	3.50
ϕP	3.00	3.18	3.40
Q	3.05	3.30	3.55

MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

Important notice :

1. **Silan reserves the right to make changes of this instruction without notice.**
2. **Customers should obtain the latest relevant information when purchasing and should verify whether such information is latest and complete. Please read this instruction and application manual and related materials carefully before using products, including the circuit operation precautions, etc.**
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7. **Please use and apply product in compliance with all applicable laws and regulations, including but not limited to trade control regulations etc. The product is civil electronic product, please do not use it in non-civil fields.**
8. **Product promotion is endless, our company will wholeheartedly provide customers with better products!**
9. **Website: http: //www.silan.com.cn**

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Rev.: 1.2

Revision History:

1. Add SVF6N90AF(TO-220F-3L) package
2. Update curve

Rev.: 1.1

Revision History:

1. Add SVF6N90AK(TO-262-3L) package
2. Update curve

Rev.: 1.0

Revision History:

1. First release