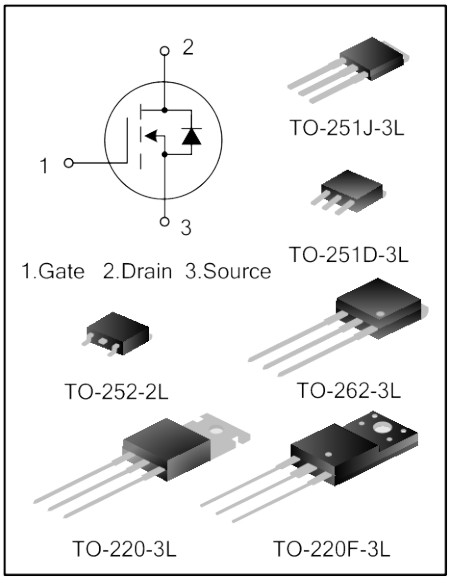
4A, 600V N-CHANNEL MOSFET

GENERAL DESCRIPTION

SVF4N60D/F/FG/T/K/M/MJ 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.

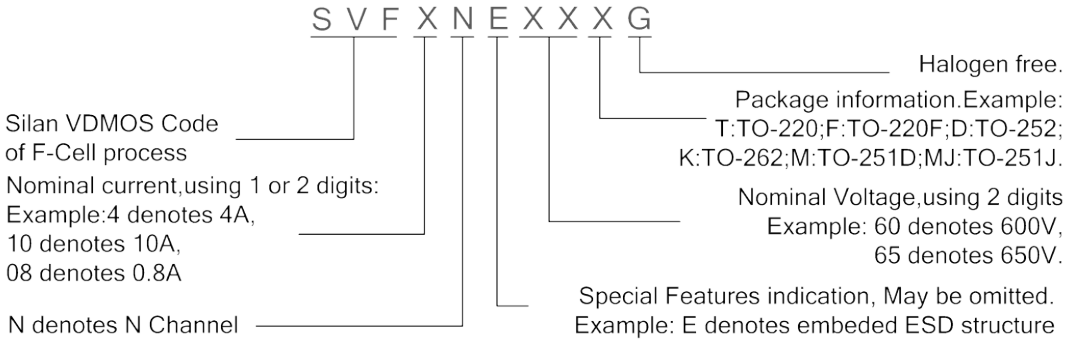
These devices are widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.



FEATURES

- 4A, 600V, $R_{DS(on)(typ)}$=2.0Ω@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

NOMENCLATURE



ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SVF4N60T	TO-220-3L	SVF4N60T	Pb free	Tube
SVF4N60F	TO-220F-3L	SVF4N60F	Pb free	Tube
SVF4N60FG	TO-220F-3L	SVF4N60FG	Halogen free	Tube
SVF4N60K	TO-262-3L	SVF4N60K	Pb free	Tube
SVF4N60D	TO-252-2L	SVF4N60D	Pb free	Tube
SVF4N60DTR	TO-252-2L	SVF4N60D	Pb free	Tape & Reel
SVF4N60MJ	TO-251J-3L	SVF4N60MJ	Pb free	Tube
SVF4N60M	TO-251D-3L	SVF4N60M	Pb free	Tube

ABSOLUTE MAXIMUM RATINGS (T_C=25°C unless otherwise noted；reference only)

Characteristics		Symbol	Ratings					Unit
			SVF4N 60T	SVF4N 60F(G)	SVF4N 60D/M	SVF4N 60MJ	SVF4N 60K	
Drain-Source Voltage		V_{DS}	600					V
Gate-Source Voltage		V_{GS}	±30					V
Drain Current	T_C=25°C	I_D	4.0					A
	T_C=100°C		2.5					
Drain Current Pulsed		I_{DM}	16					A
Power Dissipation(T_C=25°C)		P_D	100	33	77	86	95	W
-Derate above 25°C			0.8	0.26	0.62	0.69	0.76	W/°C
Single Pulsed Avalanche Energy(Note 1)		E_{AS}	217					mJ
Operation Junction Temperature Range		T_J	-55～+150					°C
Storage Temperature Range		T_{stg}	-55～+150					°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Ratings					Unit
		SVF4N 60T	SVF4N 60F(G)	SVF4N 60D/M	SVF4N 60MJ	SVF4N 60K	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.25	3.85	1.61	1.45	1.32	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	120	110	110	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise noted, reference only)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=250μA	600	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=600V, V_{GS}=0V	--	--	1.0	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=2A	--	2.0	2.4	Ω
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHZ	--	449.7	--	pF
Output Capacitance	C_{oss}		--	57	--	
Reverse Transfer Capacitance	C_{rss}		--	2.0	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=300V,I_D=4A, R_G=25Ω (Note2,3)	--	16.8	--	ns
Turn-on Rise Time	t_r		--	26.2	--	
Turn-off Delay Time	$t_{d(off)}$		--	37.4	--	
Turn-off Fall Time	t_f		--	20.2	--	
Total Gate Charge	Q_g	V_{DS}=480V,I_D=4A, V_{GS}=10V (Note 2,3)	--	8.16	--	nC
Gate-Source Charge	Q_{gs}		--	2.63	--	
Gate-Drain Charge	Q_{gd}		--	3.01	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N	--	--	4.0	A
Pulsed Source Current	I_{SM}	Junction Diode in the MOSFET	--	--	16	A
Diode Forward Voltage	V_{SD}	I_S=4.0A,V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=4.0A,V_{GS}=0V,	--	441.53	--	ns
Reverse Recovery Charge	Q_{rr}	dI_F/dt=100A/μs (Note 2)	--	1.98	--	μC

Notes:

1. L=30mH, I_{AS}=3.45A, V_{DD}=155V, R_G=25Ω, starting T_J=25°C;
2. Pulse Test: Pulse width ≤300μs,Duty cycle≤2%;
3. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

Figure 1. On-Region Characteristics

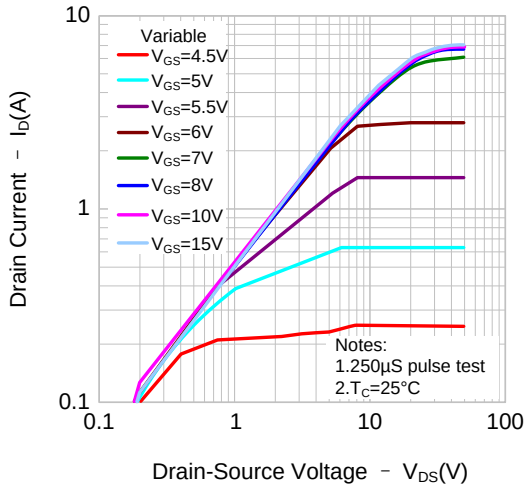


Figure 2. Transfer Characteristics

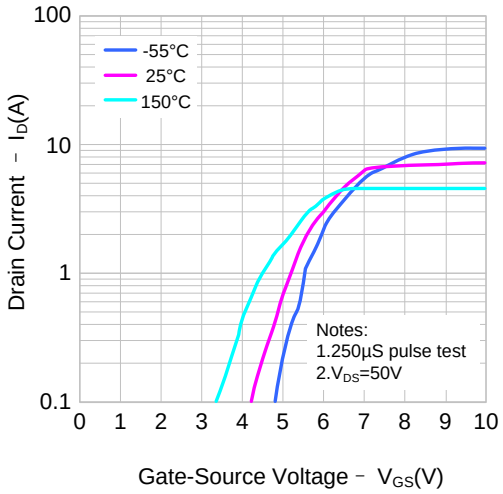


Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

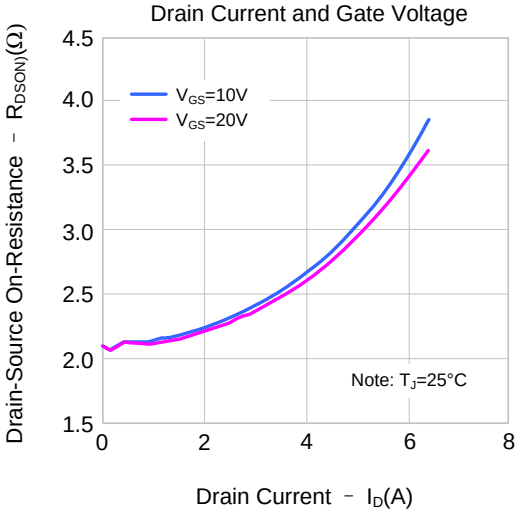
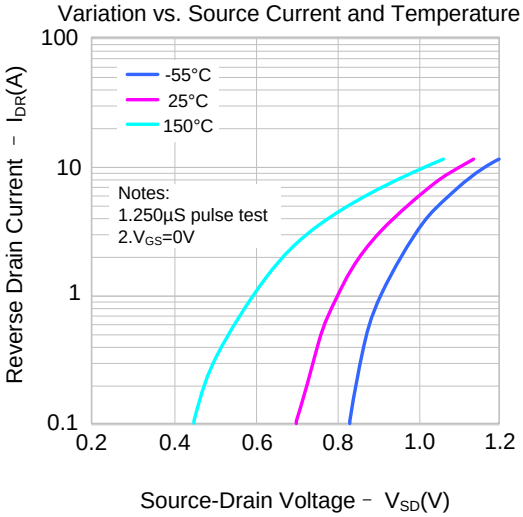


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature



TYPICAL CHARACTERISTICS(continued)

Figure 5. Capacitance Characteristics

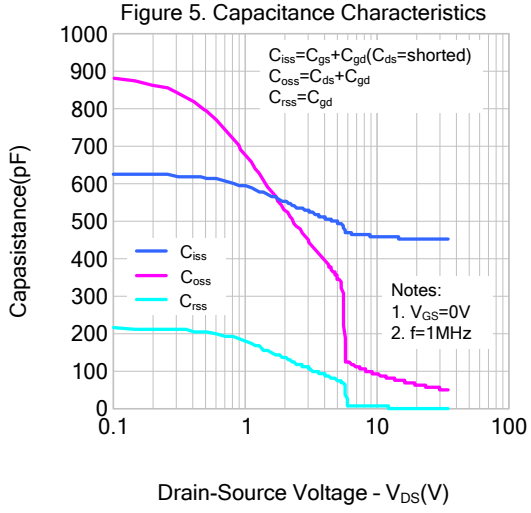


Figure 6. Gate Charge Characteristics

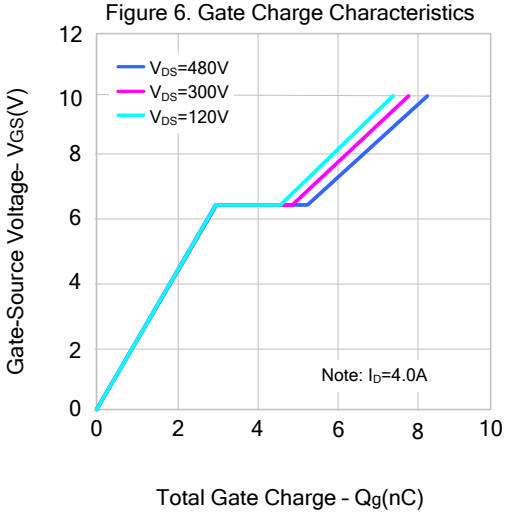


Figure 7. Breakdown Voltage Variation vs. Temperature

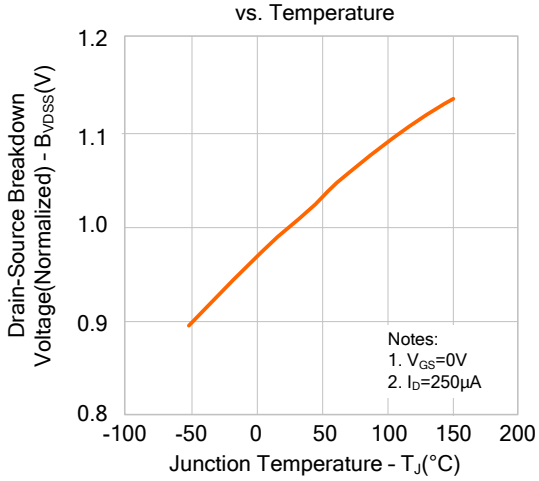


Figure 8. On-resistance Variation vs. Temperature

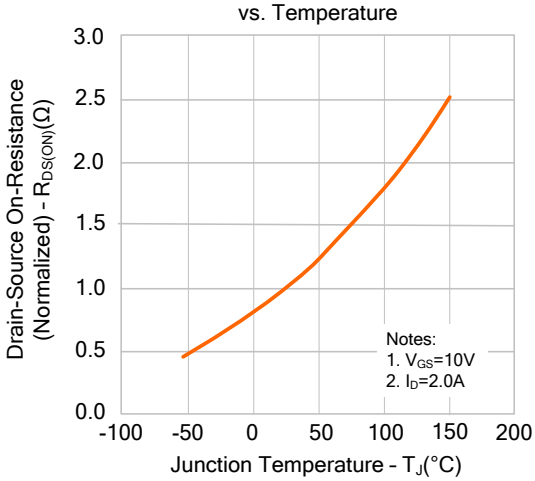


Figure 9-1. Max. Safe Operating Area(SVF4N60T)

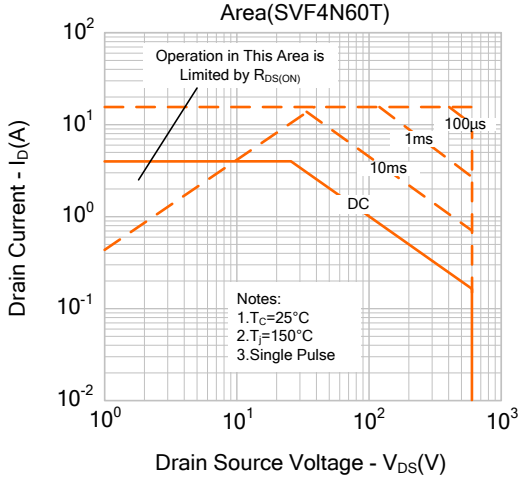
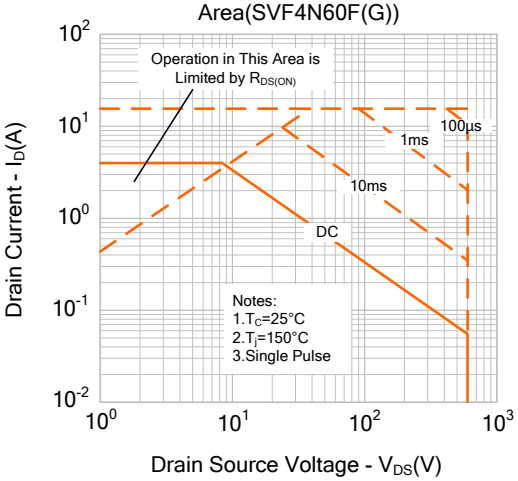


Figure 9-2. Max. Safe Operating Area(SVF4N60F(G))



TYPICAL CHARACTERISTICS (continued)

Figure 9-3. Max. Safe Operating Area(SVF4N60D/M)

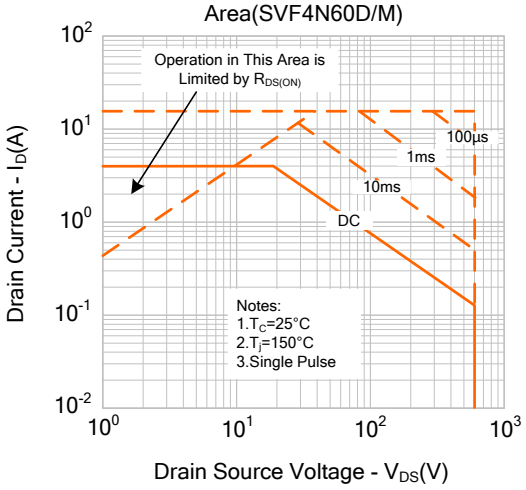


Figure 9-4. Max. Safe Operating Area(SVF4N60MJ)

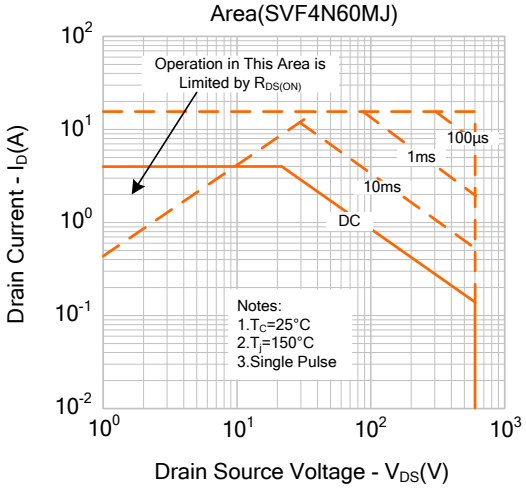


Figure 9-5. Max. Safe Operating Area(SVF4N60K)

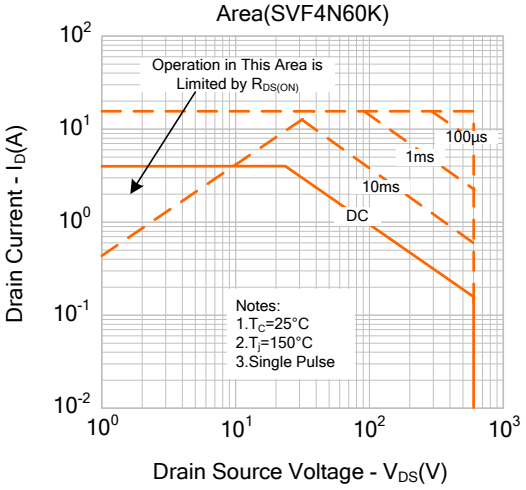
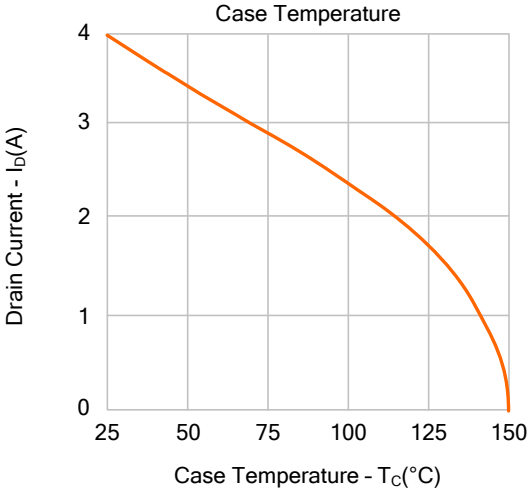
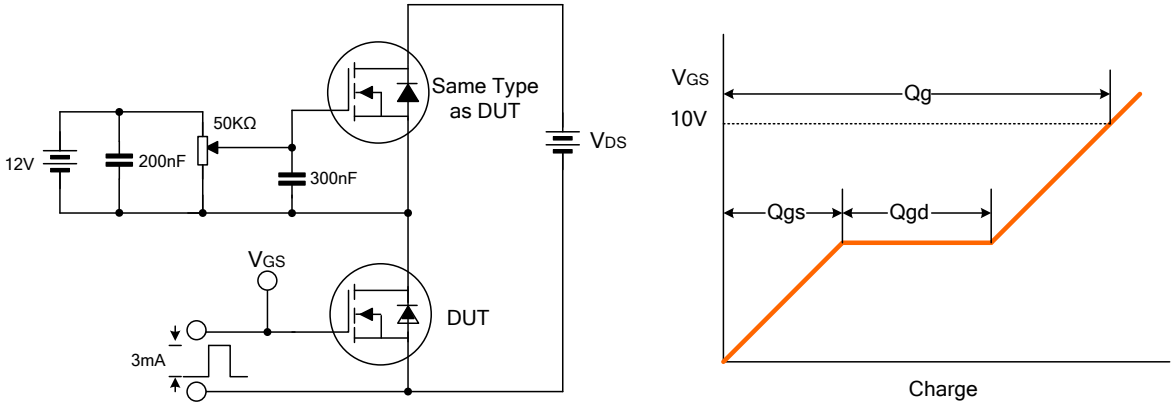


Figure 10. Maximum Drain Current vs. Case Temperature

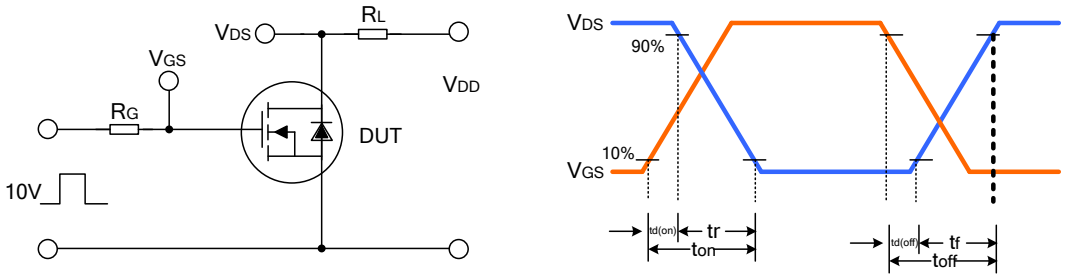


TYPICAL TEST CIRCUIT

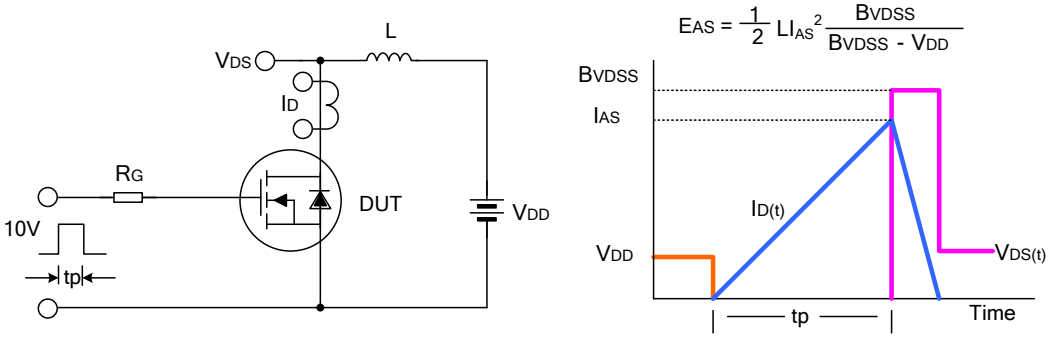
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

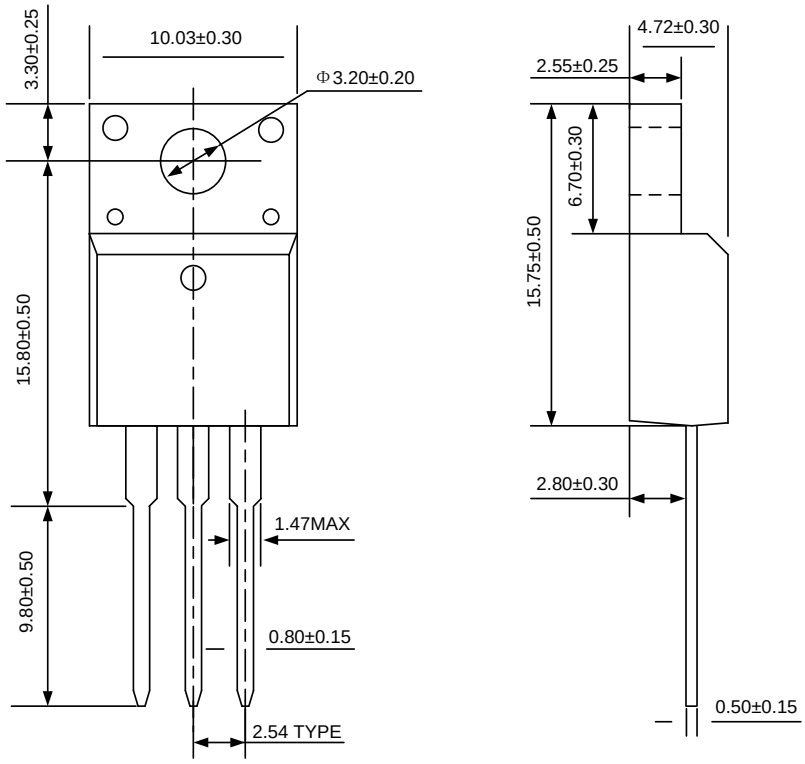


Unclamped Inductive Switching Test Circuit & Waveform

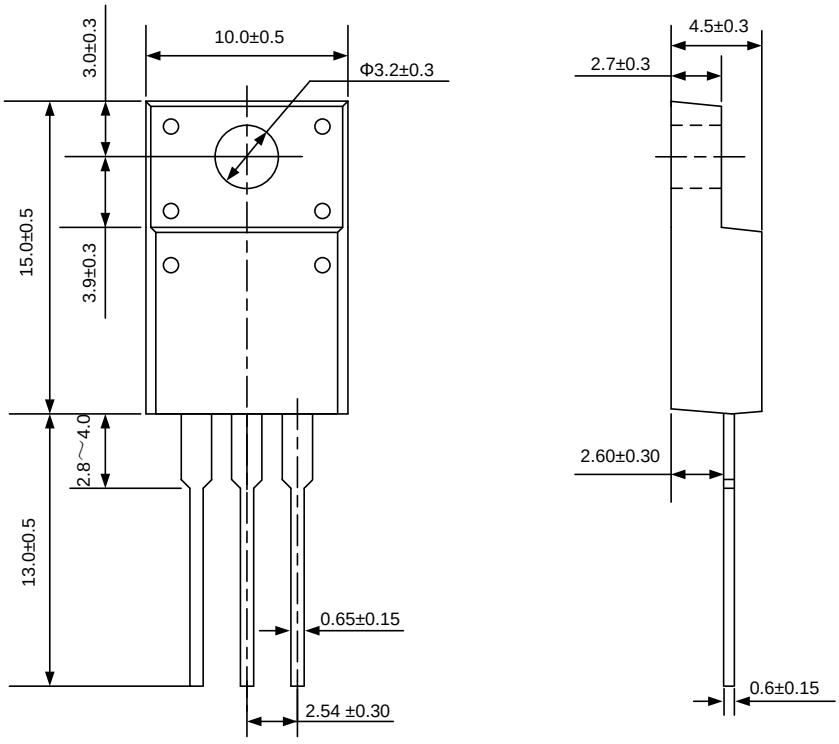


PACKAGE OUTLINE

TO-220F-3L(1) UNIT: mm

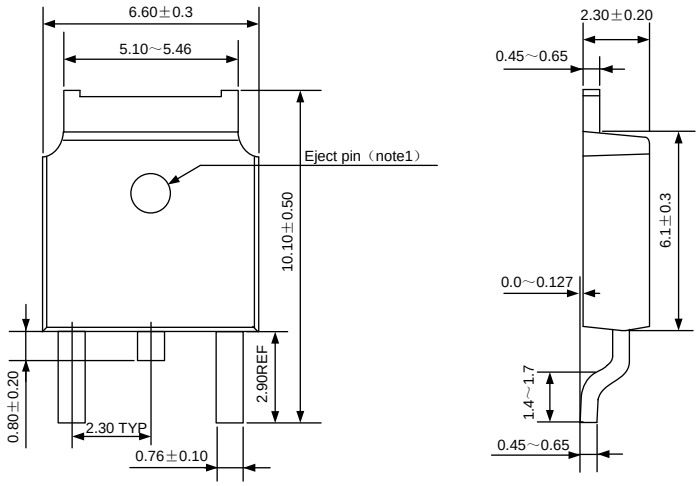


TO-220F-3L(2) UNIT: mm



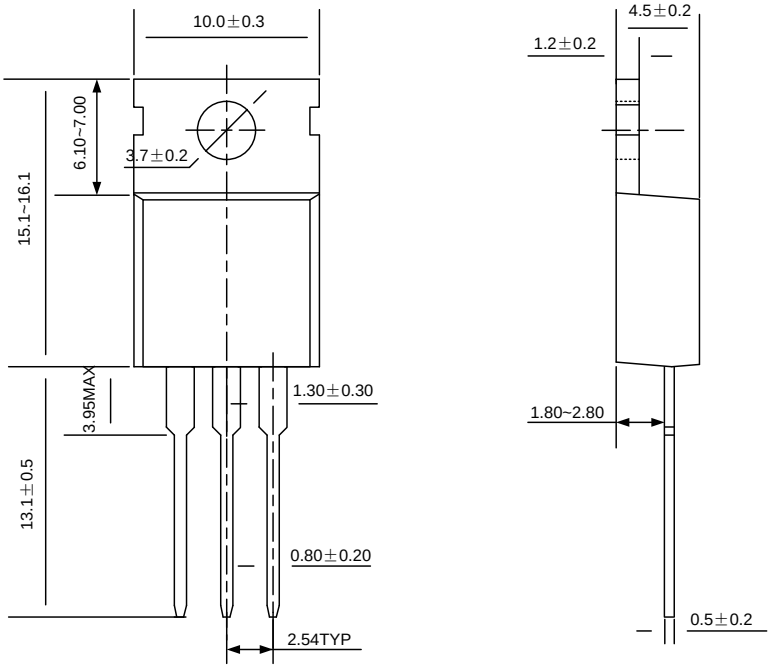
PACKAGE OUTLINE (continued)

TO-252-2L UNIT: mm



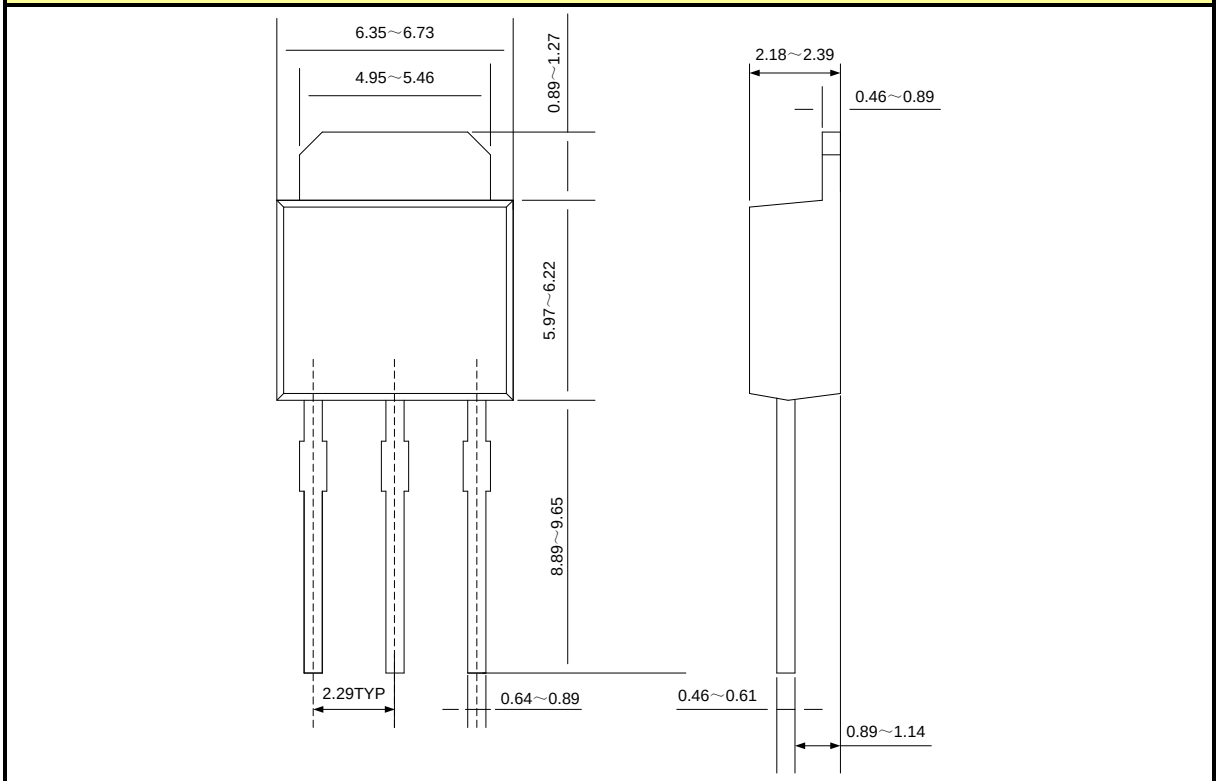
NOTE1 : There are two conditions for this position:has an eject pin or has no eject pin.

TO-220-3L UNIT: mm

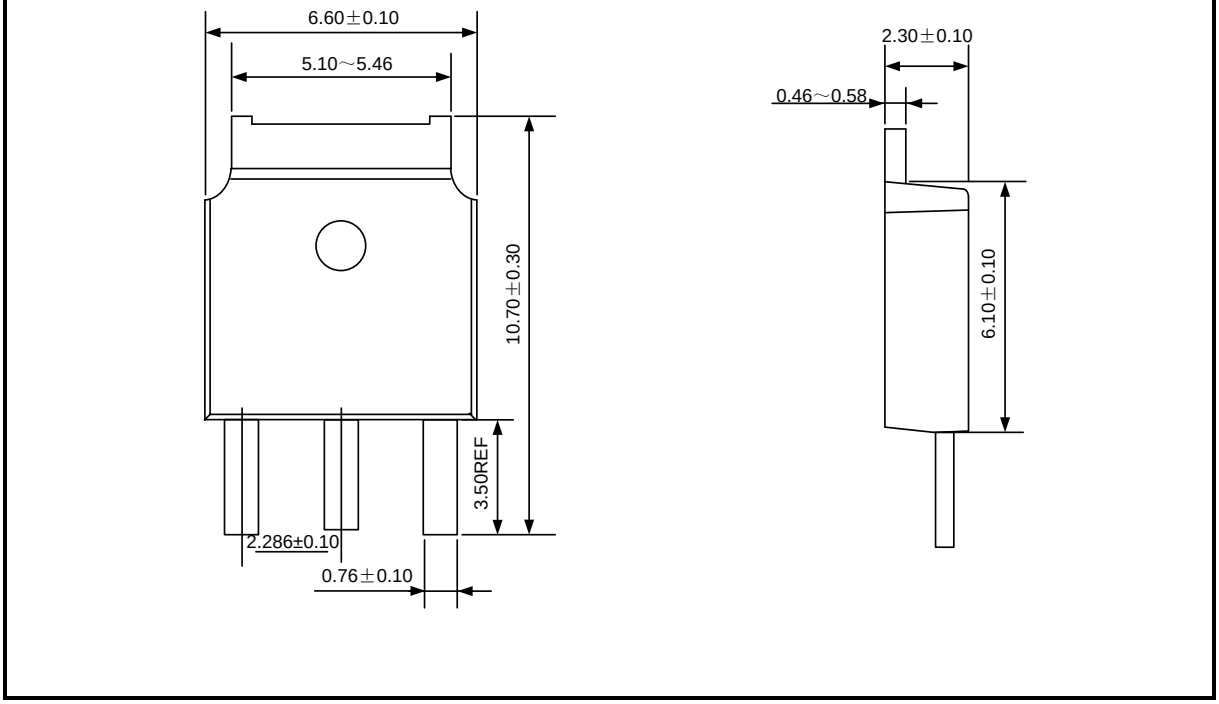


PACKAGE OUTLINE (continued)

TO-251J-3L UNIT: mm

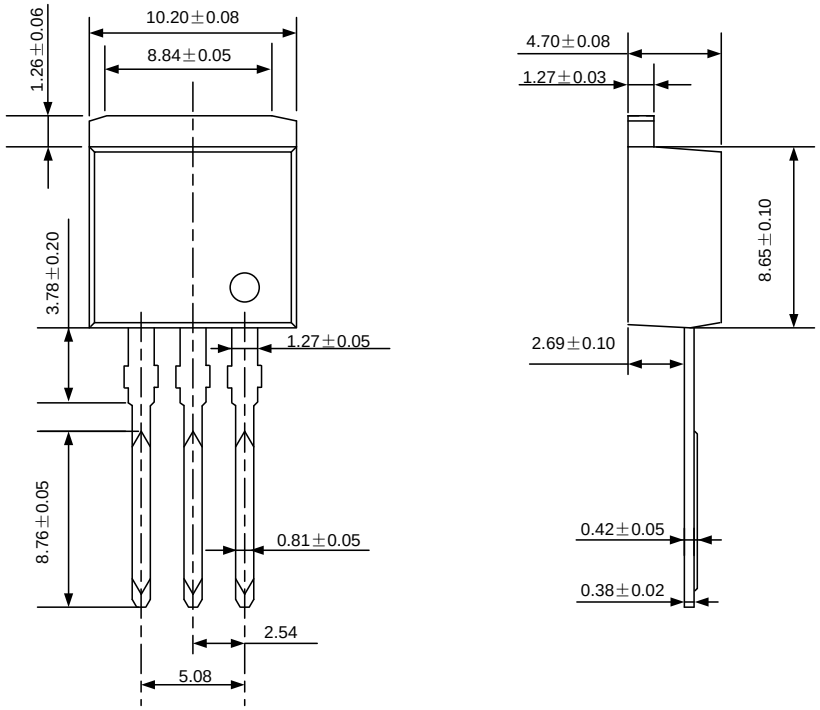


TO-251D-3L UNIT: mm



PACKAGE OUTLINE (continued)

TO-262-3L UNIT: mm



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- **Silan will supply the best possible product for customers!**

ATTACHMENT

Revision History

Date	REV	Description	Page
2010.12.13	1.0	Original	
2011.08.26	1.1	Add the packages of TO-251-3L and TO-251D-3L	
2012.01.18	1.2	Add the packages of TO-251J-3L and TO-262-3L; Delete the package of TO-251-3L	
2012.03.12	1.3	Add the halogen free information of SVF4N60F	
2012.03.22	1.4	The package outline of TO-220F-3L(1) and TO-220F-3L(2) are changed.	
2012.06.04	1.5	Modify the values of T_{rr} and $Q_{rr;}$ Update the package outline of TO-251D-3L	
2012.07.24	1.6	Modify “ELECTRICAL CHARACTERISTICS”	