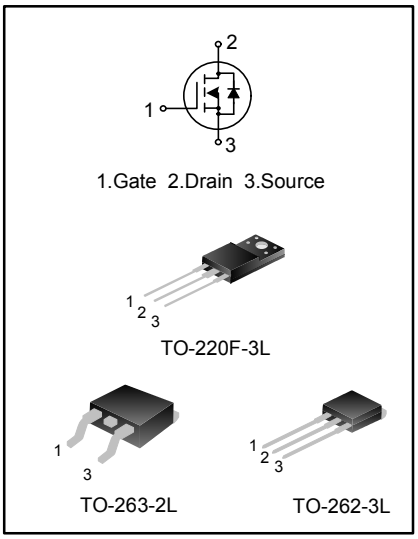
12A, 650V N-CHANNEL MOSFET

GENERAL DESCRIPTION

SVF12N65CF/K/S 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 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

- 12A,650V,$R_{DS(on)(typ.)}$=0.64Ω@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing
SVF12N65CF	TO-220F-3L	SVF12N65CF	Halogen free	Tube
SVF12N65CK	TO-262-3L	SVF12N65CK	Halogen free	Tube
SVF12N65CS	TO-263-2L	12N65CS	Halogen free	Tube
SVF12N65CSTR	TO-263-2L	12N65CS	Halogen free	Tape &Reel

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

Characteristics		Symbol	Ratings			Unit
			SVF12N65 CF	SVF12N65 CK	SVF12N65 CS	
Drain-Source Voltage		V_{DS}	650			V
Gate-Source Voltage		V_{GS}	±30			V
Drain Current	T_C = 25°C	I_D	12			A
	T_C = 100°C		7.6			
Drain Current Pulsed		I_{DM}	48			A
Power Dissipation(T_C=25°C)		P_D	51	209	210	W
-Derate above 25°C			0.41	1.67	1.68	W/°C
Single Pulsed Avalanche Energy (Note 1)		E_{AS}	790			mJ
Operation Junction Temperature Range		T_J	-55～+150			°C
Storage Temperature Range		T_{stg}	-55～+150			°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Ratings			Unit
		SVF12N65 CF	SVF12N65 CK	SVF12N65 CS	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.44	0.6	0.60	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.5	62.5	°C/W

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

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Drain -Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, 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=6.0A	--	0.64	0.8	Ω
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHz	--	1390	--	pF
Output Capacitance	C_{oss}		--	156	--	
Reverse Transfer Capacitance	C_{rss}		--	15.2	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=325V, I_D=12A, V_{GS}=10V, R_G=24Ω (Note 2,3)	--	26	--	ns
Turn-on Rise Time	t_r		--	39	--	
Turn-off Delay Time	$t_{d(off)}$		--	75	--	
Turn-off Fall Time	t_f		--	39	--	
Total Gate Charge	Q_g	V_{DS}=520V,I_D=12A, V_{GS}=10V (Note 2,3)	--	30	--	nC
Gate-Source Charge	Q_{gs}		--	10	--	
Gate-Drain Charge	Q_{gd}		--	9.4	--	

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	--	--	12	A
Pulsed Source Current	I_{SM}		--	--	48	
Diode Forward Voltage	V_{SD}	I_S=12A,V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=12A,V_{GS}=0V, dI_F/dt=100A/μS (Note 2)	--	551	--	ns
Reverse Recovery Charge	Q_{rr}		--	5.2	--	μC

Notes:

1. L=30mH, I_{AS}=6.0A, V_{DD}=100V, 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

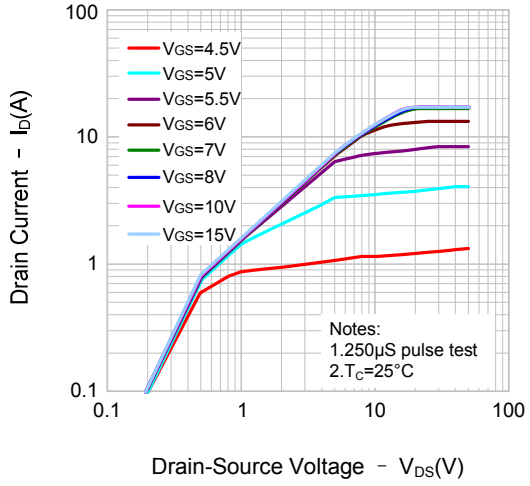


Figure 2. Transfer Characteristics

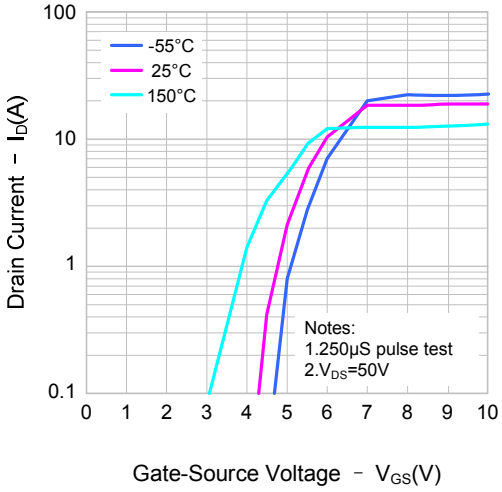


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

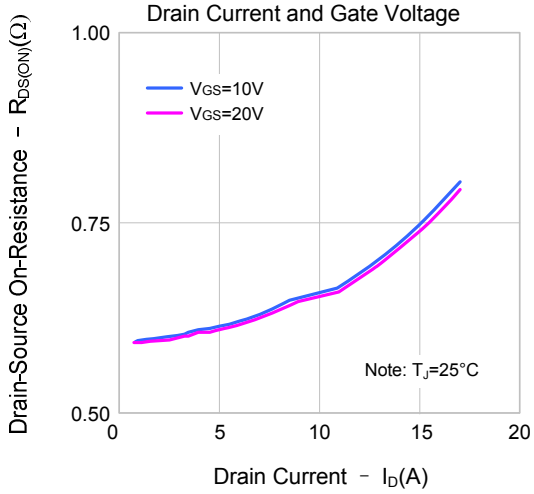


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

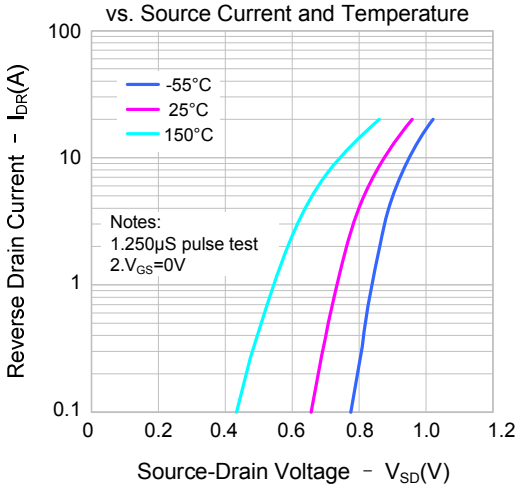


Figure 5. Capacitance Characteristics

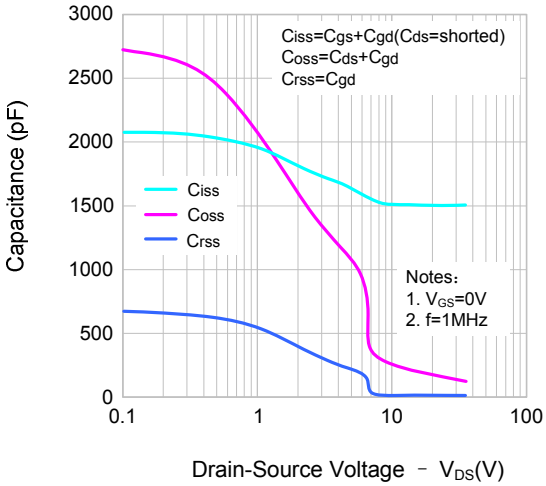
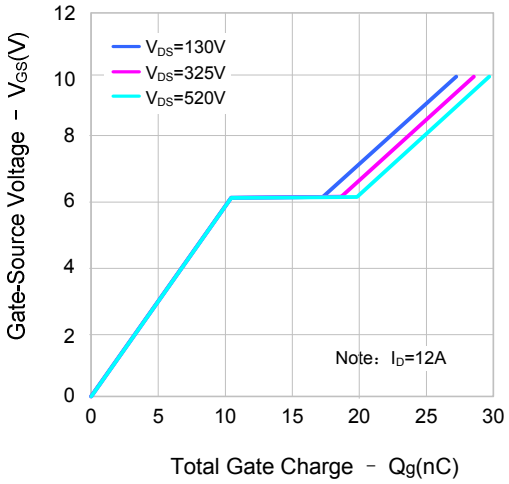


Figure 6. Gate Charge Characteristics



TYPICAL CHARACTERISTICS (continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

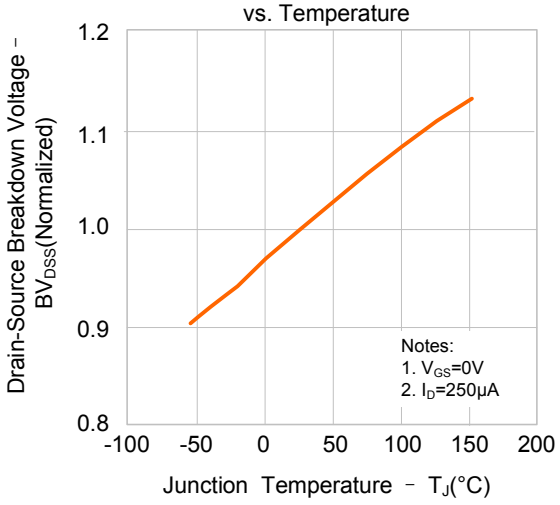


Figure 8. On-resistance vs. Temperature

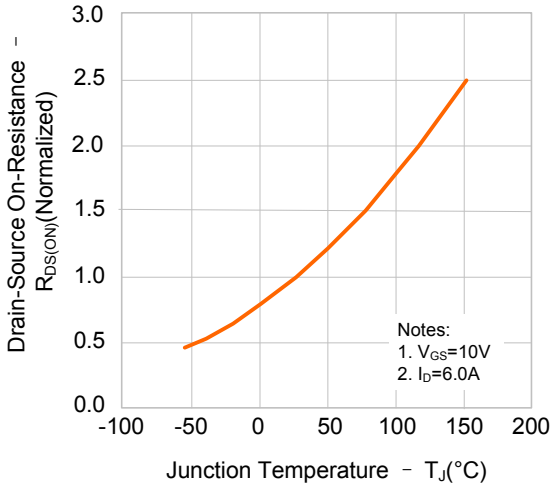


Figure 9-1. Max. Safe Operating Area(SVF12N65CF)

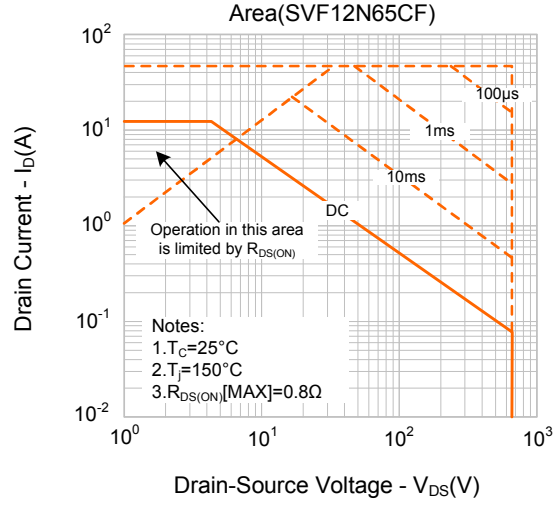


Figure 9-2. Max. Safe Operating Area(SVF12N65CK)

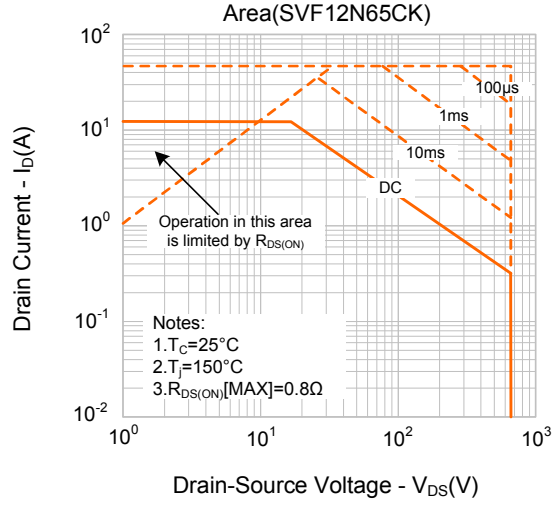


Figure 9-3. Max. Safe Operating Area(SVF12N65CS)

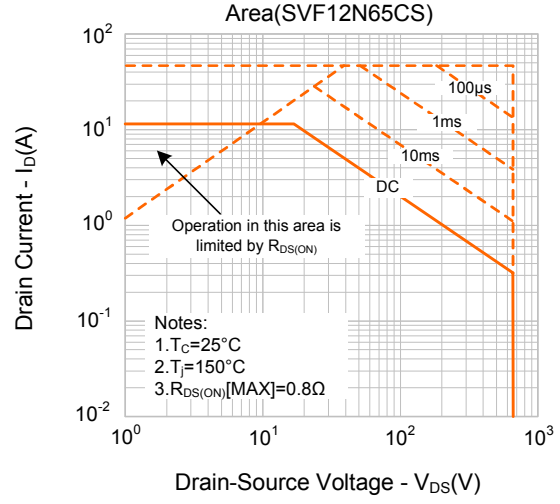
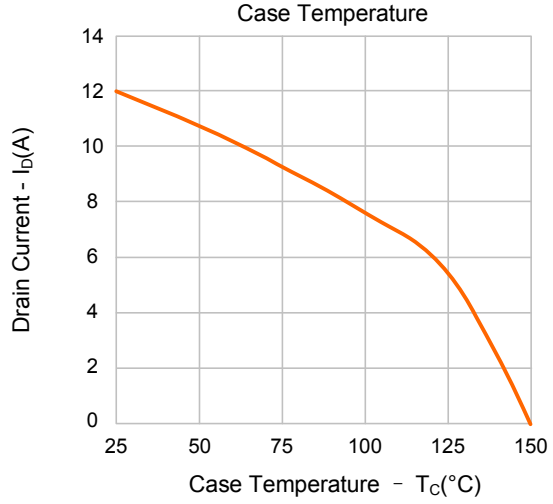
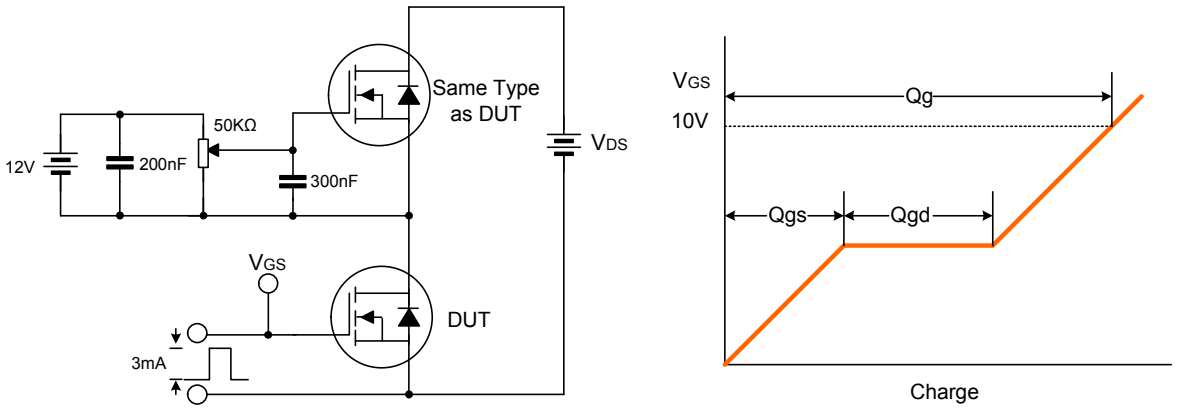


Figure 10. Max. Drain Current vs. Case Temperature

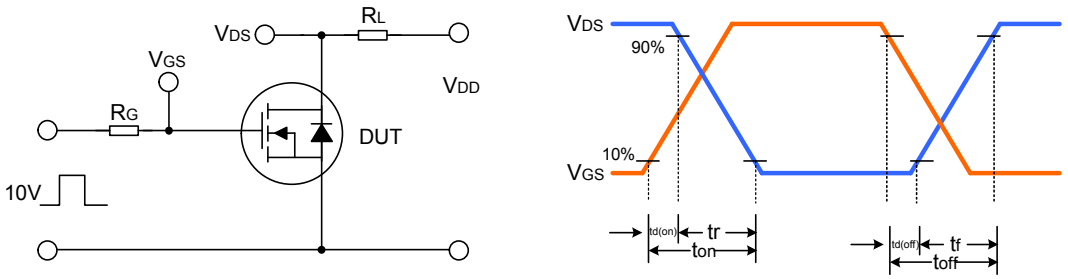


TYPICAL TEST CIRCUIT

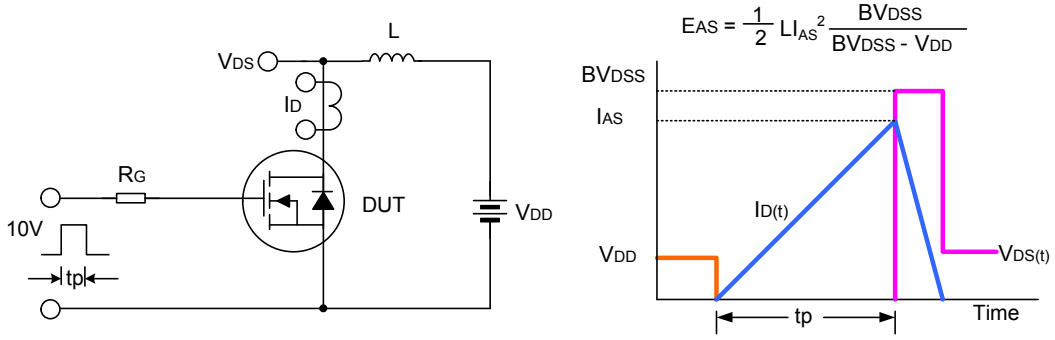
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



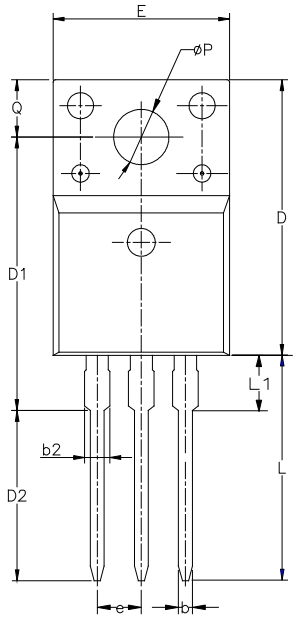
Unclamped Inductive Switching Test Circuit & Waveform

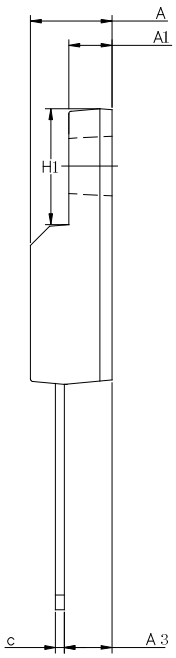


PACKAGE OUTLINE

TO-220F-3L

UNIT: mm

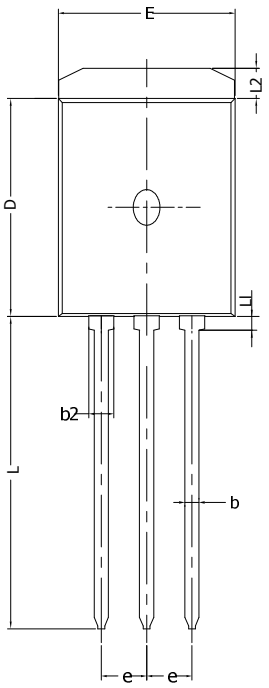


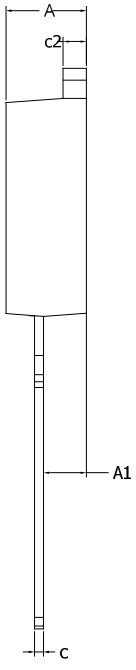


SYMBOL	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.70	0.80	0.90
b2	—	—	1.47
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	15.30	15.75	16.30
D2	9.30	9.80	10.30
E	9.73	10.16	10.36
e	2.54BCS		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	/	/	3.50
øP	3.00	3.18	3.40
Q	3.05	3.30	3.55

TO-262-3L

UNIT: mm

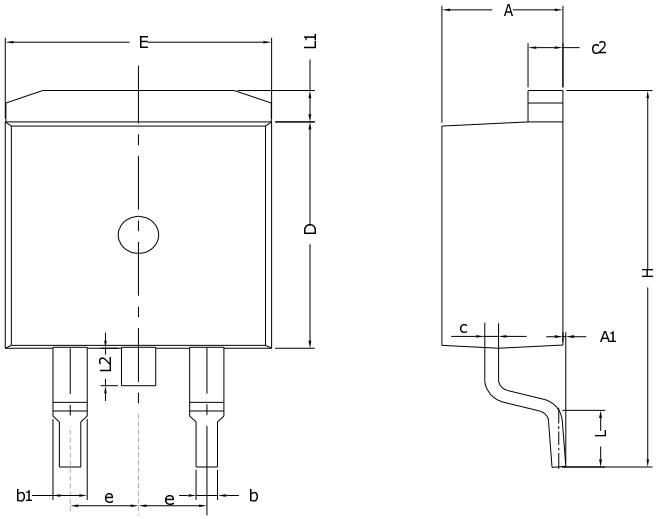




SYMBOL	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	2.20	---	2.92
b	0.71	0.80	0.90
b2	1.20	---	1.50
c	0.34	---	0.65
c2	1.22	1.30	1.35
D	8.38	---	9.30
E	9.80	10.16	10.54
e	2.54 BSC		
L	12.80	---	14.10
L1	---	---	0.75
L2	1.12	---	1.42

PACKAGE OUTLINE(continued)

TO-263-2L **UNIT: mm**



SYMBOL	MIN	NOM	MAX
A	4.30	4.57	4.72
A1	0	0.1	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

Part No.:	SVF12N65CF/K/S	Document Type:	Datasheet
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Rev.: 2.2

Revision History:

1. Update Figure1

Rev.: 2.1

Revision History:

1. Modify characteristics of Capacitance and Fig 5
2. Update the package outline of TO-262-3L

Rev.: 2.0

Revision History:

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

Rev.: 1.9

Revision History:

1. Update characteristics
2. Update figure 5 and 6
3. Update the package outline of TO-262-3L

Rev.: 1.8

Revision History:

1. Delete the package outline of TO-262L-3L
2. Update the solid figure of TO-220FQ-3L

Rev.: 1.7

Revision History:

1. Update the package outline of TO-262-3L

Rev.: 1.6

Revision History:

1. Modify the Typical Characteristics

Rev.: 1.5

Revision History:

1. Add the package of TO-262L-3L
2. Add the package of TO-220FQ-3L
3. Modify the package outline of TO-262-3L and TO-263-2L

Rev.: 1.4

Revision History:

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

Rev.: 1.3

Revision History:

1. Modify the package information
2. Add the package of TO-263-2L and related information

Rev.: 1.2

Revision History:

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

Rev.: 1.1

Revision History:

1. Modify the thermal characteristics

Rev.: 1.0

Revision History:

1. First release