

12A, 650V N-CHANNEL MOSFET

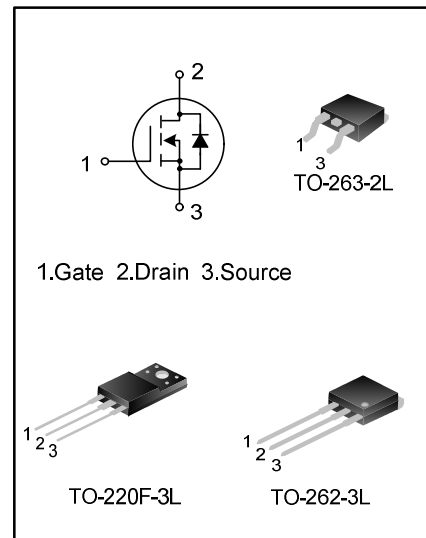
GENERAL DESCRIPTION

SVF12N65F/K/S 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

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



ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing
SVF12N65F	TO-220F-3L	SVF12N65F	Pb free	Tube
SVF12N65K	TO-262-3L	SVF12N65K	Pb free	Tube
SVF12N65S	TO-263-2L	SVF12N65S	Halogen free	Tube
SVF12N65STR	TO-263-2L	SVF12N65S	Halogen free	Tape & Reel

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

Characteristics	Symbol	Ratings			Unit
		SVF12N65F	SVF12N65K	SVF12N65S	
Drain-Source Voltage	V _{DS}	650			V
Gate-Source Voltage	V _{GS}	±30			V
Drain Current	I _D	T _C = 25°C			A
		T _C = 100°C			
Drain Current Pulsed	I _{DM}	48			A
Power Dissipation(T _C =25°C) -Derate above 25°C	P _D	51	209	210	W
		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
		SVF12N65F	SVF12N65K	SVF12N65S	
Thermal Resistance, Junction-to-Case	R _{θJC}	2.44	0.6	0.60	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	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)	--	25.80	--	ns
Turn-on Rise Time	t _r		--	46.40	--	
Turn-off Delay Time	t _{d(off)}		--	82.26	--	
Turn-off Fall Time	t _f		--	42.13	--	
Total Gate Charge	Q _g	V _{DS} =520V, I _D =12A, V _{GS} =10V (Note 2,3)	--	32.5	--	nC
Gate-Source Charge	Q _{gs}		--	7.37	--	
Gate-Drain Charge	Q _{gd}		--	14.2	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction	--	--	12	A
Pulsed Source Current	I_{SM}	Diode in the MOSFET	--	--	48	
Diode Forward Voltage	V_{SD}	$I_S=12A, V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	T_{rr}	$I_S=12A, V_{GS}=0V,$	--	562	--	ns
Reverse Recovery Charge	Q_{rr}	$di_F/dt=100A/\mu S$ (Note 2)	--	5.12	--	μC

Notes:

1. $L=30mH, I_{AS}=6.0A, V_{DD}=100V, R_G=25\Omega,$ 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

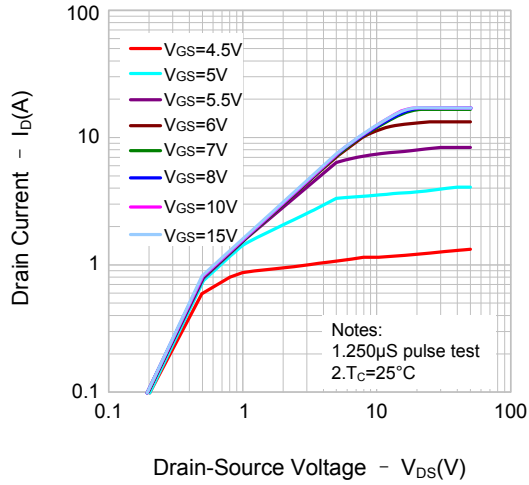


Figure 2. Transfer Characteristics

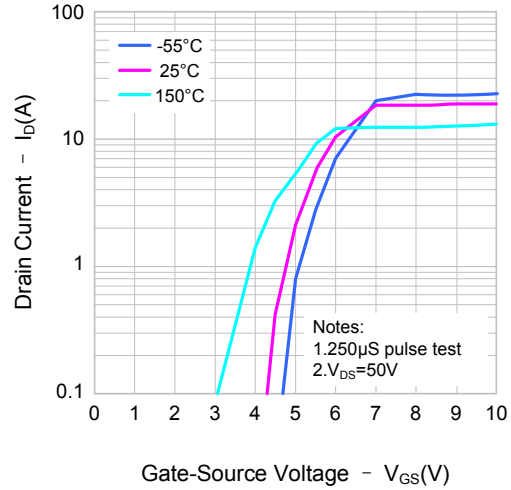


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

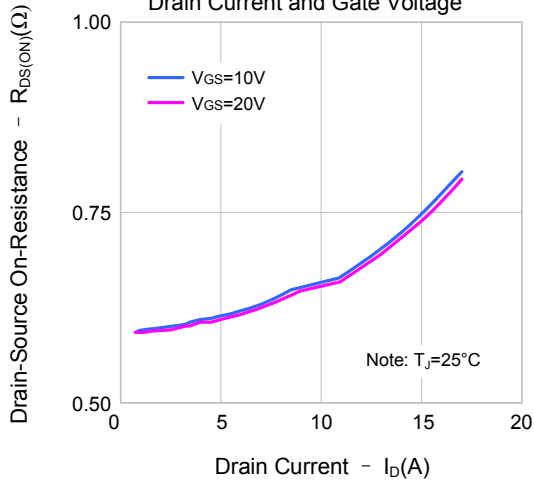


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

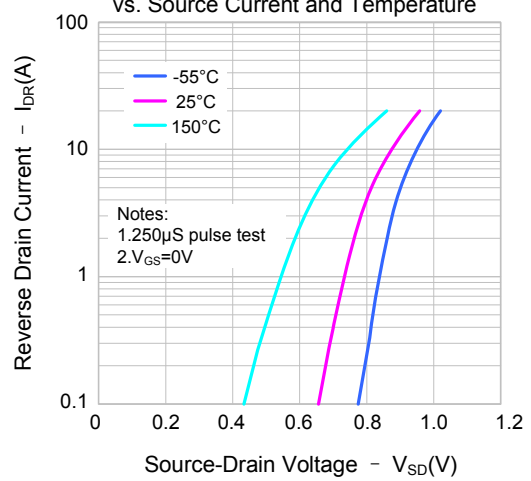


Figure 5. Capacitance Characteristics

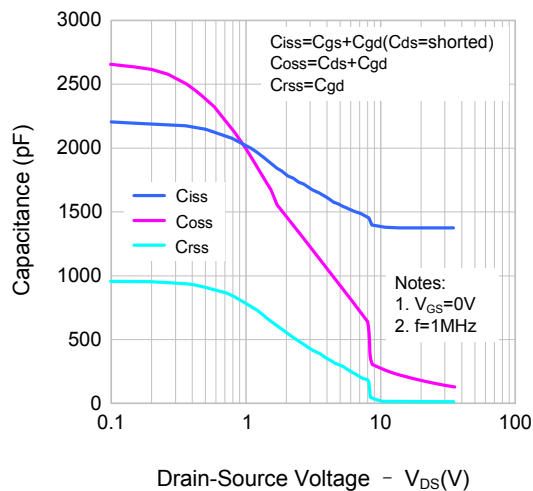
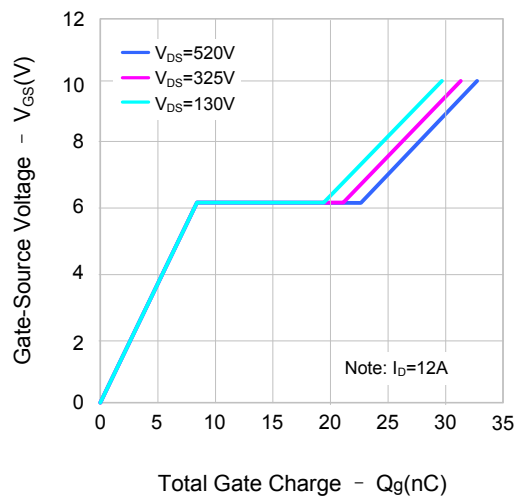


Figure 6. Gate Charge Characteristics



TYPICAL CHARACTERISTICS (continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

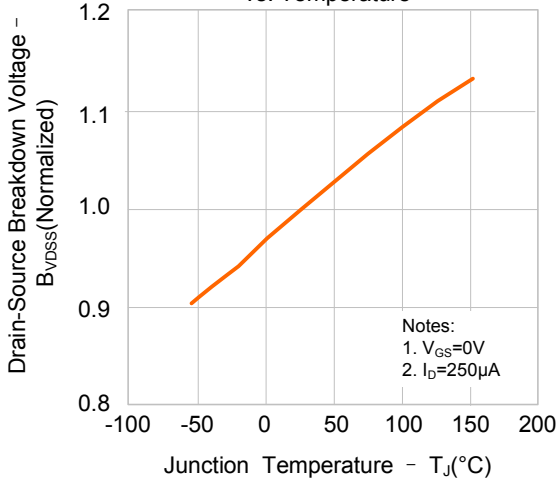


Figure 8. On-resistance vs. Temperature

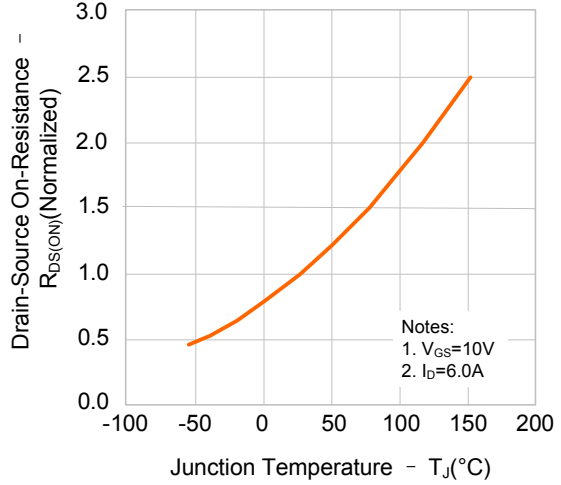


Figure 9-1. Max. Safe Operating Area(SVF12N65F)

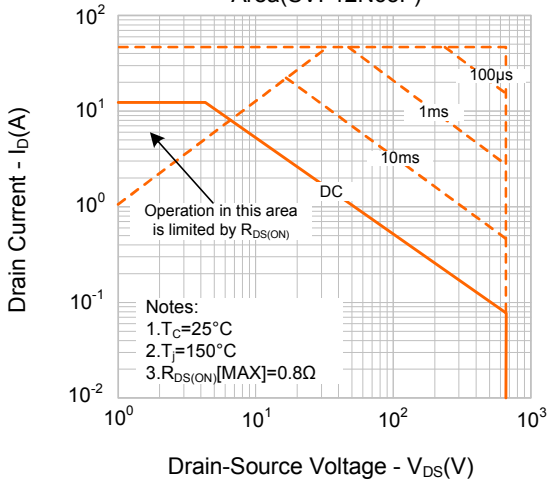


Figure 9-2. Max. Safe Operating Area(SVF12N65K)

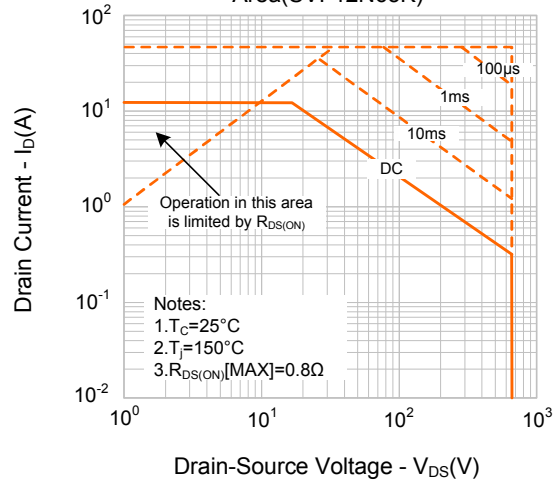


Figure 9-3. Max. Safe Operating Area(SVF12N65S)

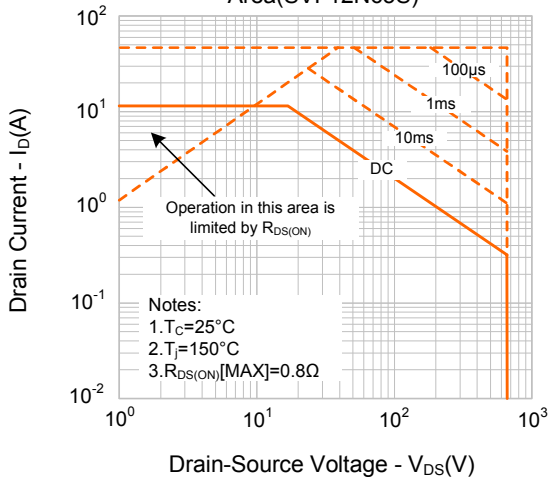
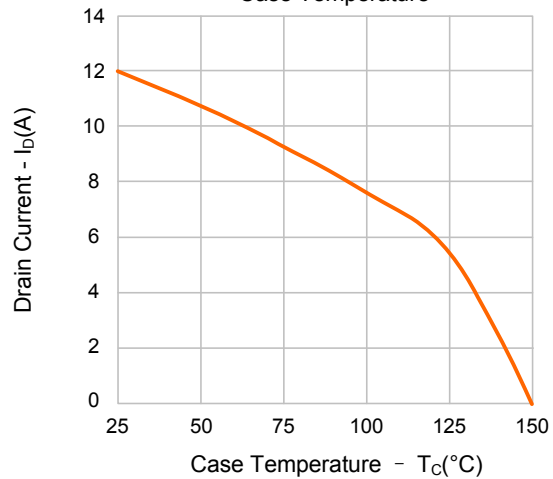
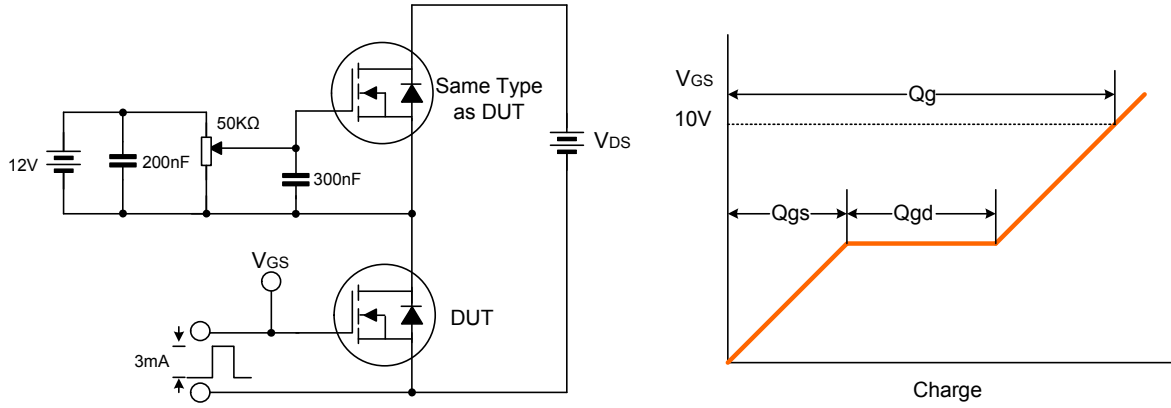


Figure 10. Max. Drain Current vs. Case Temperature

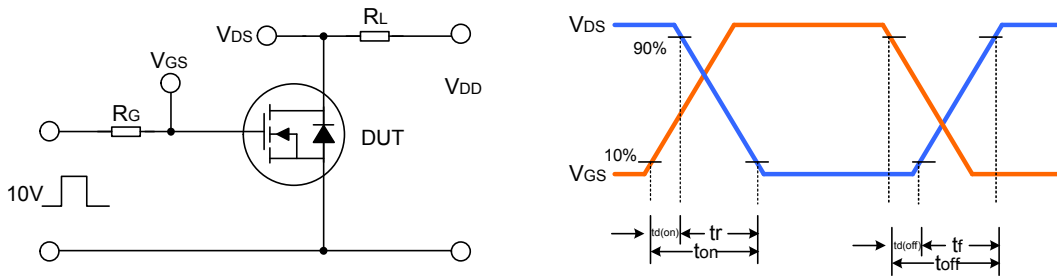


TYPICAL TEST CIRCUIT

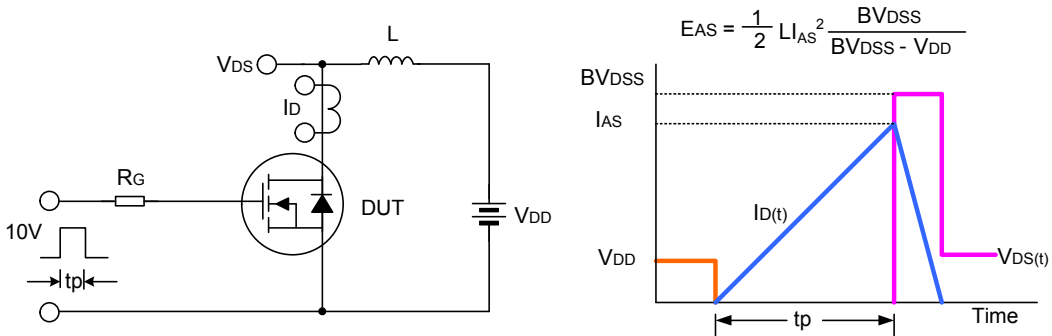
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



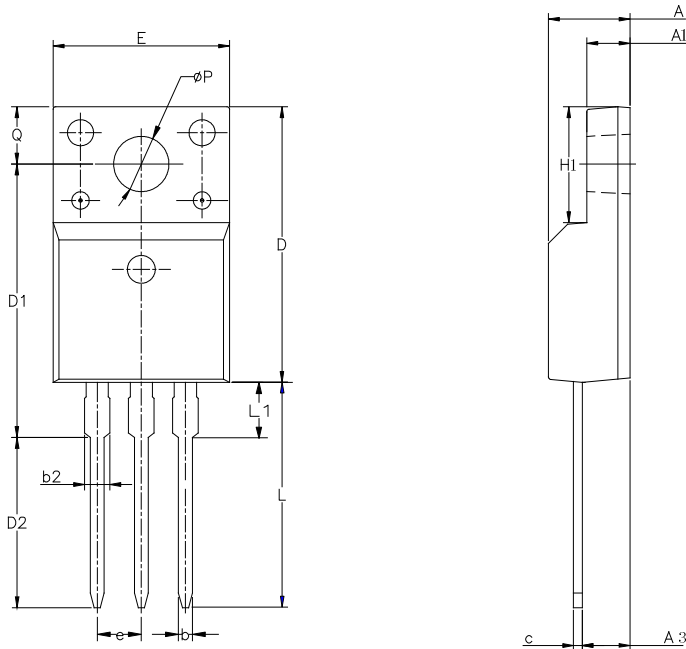
Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

TO-220F-3L

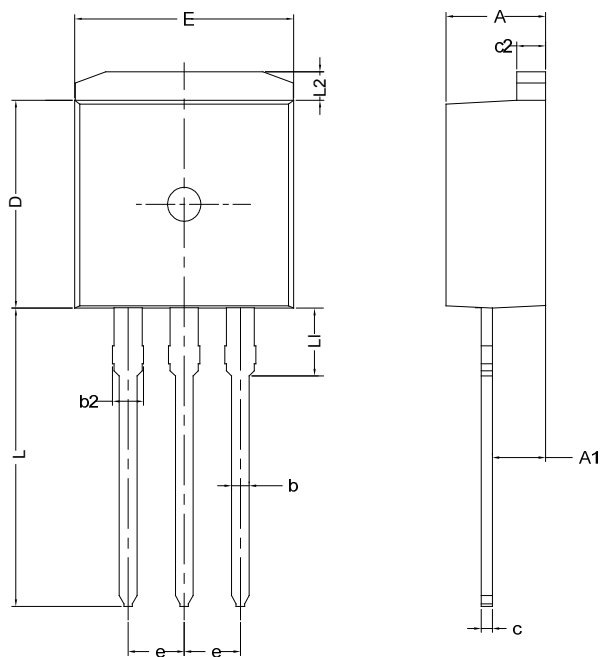
UNIT: mm



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
ϕP	3.00	3.18	3.40
Q	3.05	3.30	3.55

TO-262-3L

UNIT: mm

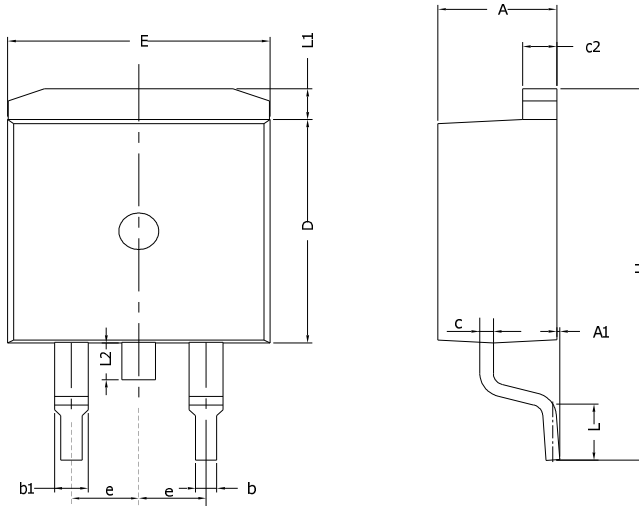


SYMBOL	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	2.20	---	2.92
b	0.71	0.80	0.97
b2	1.20	---	1.50
c	0.34	---	0.76
$c2$	1.22	1.30	1.35
D	8.38	---	9.30
E	9.80	10.16	10.54
e	2.54BSC		
L	12.80	---	14.10
L1	2.80	3.30	4.06
L2	1.12	---	1.42

PACKAGE OUTLINE(continued)

TO-263-2L

UNIT: mm



SYMBOL	MIN	NOM	MAX
A	4.30	4.57	4.72
A1	0	0.10	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

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Part No.: SVF12N65F/K/S Document Type: Datasheet
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Rev.: 2.9

Revision History:

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

Rev.: 2.8

Revision History:

1. Modify the Electrical characteristics

Rev.: 2.7

Revision History:

1. Revise the hazardous substance control of TO-262-3L from halogen free to Pb free

Rev.: 2.6

Revision History:

1. Add the ordering information

Rev.: 2.5

Revision History:

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

Rev.: 2.4

Revision History:

1. Modify the thermal characteristics

Rev.: 2.3

Revision History:

1. Modify the ordering information

Rev.: 2.2

Revision History:

1. Add the pin No.

Rev.: 2.1

Revision History:

1. Modify the ordering information
1. Change the schematic diagram of MOS

Rev.: 1.9

Revision History:

1. Modify "PACKAGE OUTLINE"

Rev.: 1.8

Revision History:

1. Modify "TYPICAL CHARACTERISTICS (continued)"

Rev.: 1.7

Revision History:

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

Rev.: 1.6

Revision History:

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

Rev.: 1.5

Revision History:

1. Modify the typ. Value of $R_{DS(on)}$
 1. Modify the values of T_{rr} and Q_{rr}
-

Rev.: 1.3

Revision History:

1. Add the halogen free information of SVF12N65F
-

Rev.: 1.2

Revision History:

1. Modify "ELECTRICAL CHARACTERISTICS" and the capacitance characteristic curve
-

Rev.: 1.1

Revision History:

1. Modify "PACKAGE OUTLINE"
 1. Original
-
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