

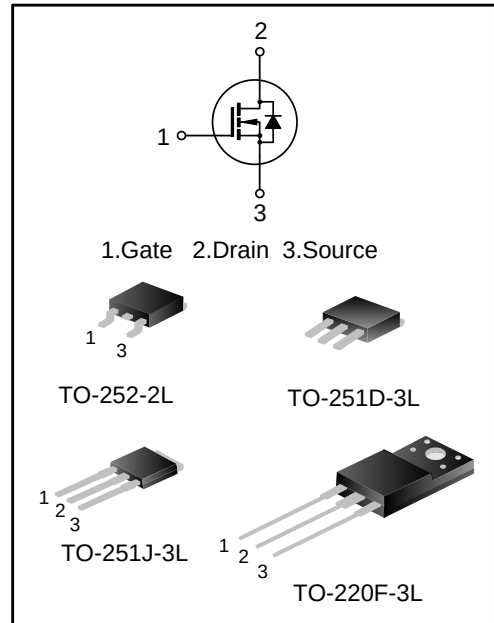
4A, 650V N-CHANNEL MOSFET

DESCRIPTION

SVF4N65F/M/MJ/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 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

- 4A, 650V, $R_{DS(on)(typ.)}=2.3\Omega@V_{GS}=10V$
- Low gate charge
- Low C_{rss}
- Fast switching
- Improved dv/dt capability



ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SVF4N65F	TO-220F-3L	SVF4N65F	Pb free	Tube
SVF4N65MJ	TO-251J-3L	SVF4N65MJ	Halogen free	Tube
SVF4N65M	TO-251D-3L	SVF4N65M	Halogen free	Tube
SVF4N65DTR	TO-252-2L	SVF4N65D	Halogen free	Tape&Reel

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, $T_A=25^{\circ}\text{C}$)

Characteristics		Symbol	Ratings			Unit
			SVF4N65F	SVF4N65MJ	SVF4N65M/D	
Drain-Source Voltage		V _{DS}	650			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	30	79	77	W
-Derate above 25°C			0.24	0.63	0.62	W/°C
Single Pulsed Avalanche Energy (Note1)		E _{AS}	215			mJ
Operation Junction Temperature Range		T _J	-55~+150			°C
Storage Temperature Range		T _{stg}	-55~+150			°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Ratings			Unit
		SVF4N65F	SVF4N65MJ	SVF4N65M/D	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	4.17	1.58	1.62	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.0	62.0	$^{\circ}\text{C/W}$

ELECTRICAL CHARACTERISTICS (UNLESS OTHERWISE NOTED, $T_J=25^{\circ}\text{C}$)

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain -Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	--	--	1.0	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$	--	--	± 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	$R_{DS(on)}$	$V_{GS}=10V, I_D=2A$	--	2.3	2.7	Ω
Input Capacitance	C_{iss}	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$	--	430	--	pF
Output Capacitance	C_{oss}		--	55	--	
Reverse Transfer Capacitance	C_{rss}		--	4.1	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=325V, V_{GS}=10V, R_G=25\Omega, I_D=4A$ (Notes 2,3)	--	9.9	--	ns
Turn-on Rise Time	t_r		--	26	--	
Turn-off Delay Time	$t_{d(off)}$		--	28	--	
Turn-off Fall Time	t_f		--	26	--	
Total Gate Charge	Q_g	$V_{DD}=520V, V_{GS}=10V, I_D=4A$ (Notes 2,3)	--	13	--	nC
Gate-Source Charge	Q_{gs}		--	2.7	--	
Gate-Drain Charge	Q_{gd}		--	6.3	--	

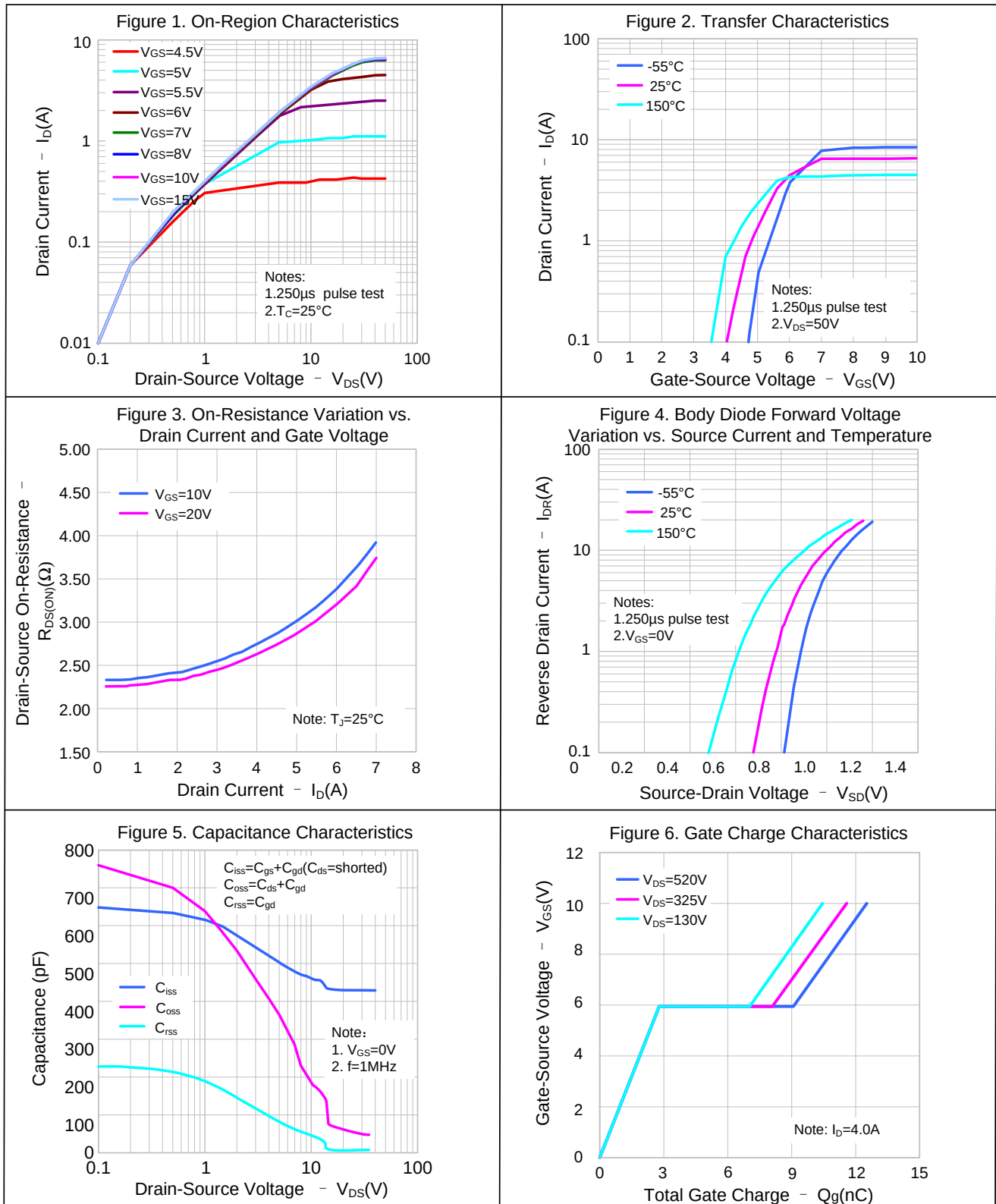
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	4.0	A
Pulsed Source Current	I_{SM}		--	--	16	
Diode Forward Voltage	V_{SD}	$I_S=4.0A, V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	T_{rr}	$I_S=4.0A, V_{GS}=0V, di_F/dt=100A/\mu s$ (Note 2)	--	450	--	ns
Reverse Recovery Charge	Q_{rr}		--	1.9	--	μC

Notes:

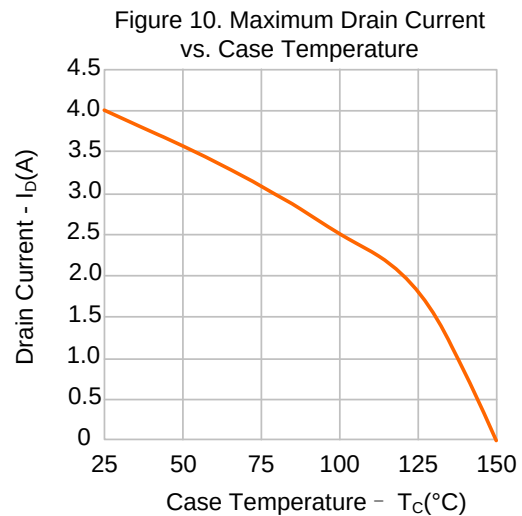
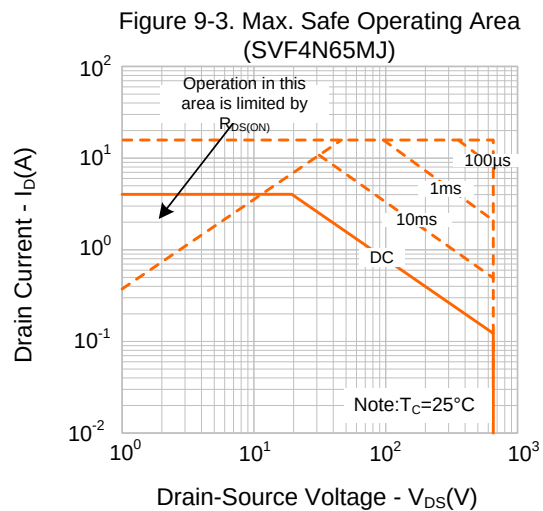
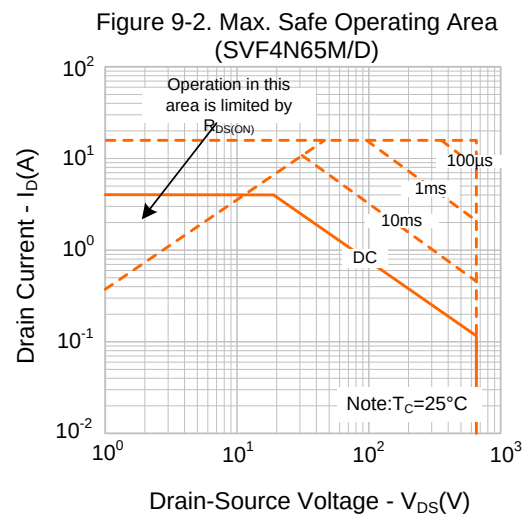
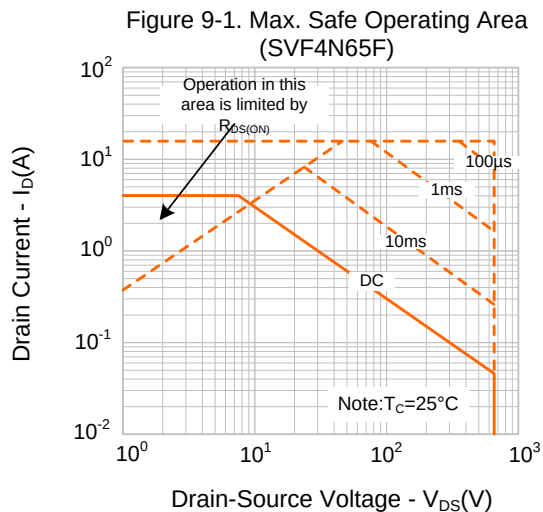
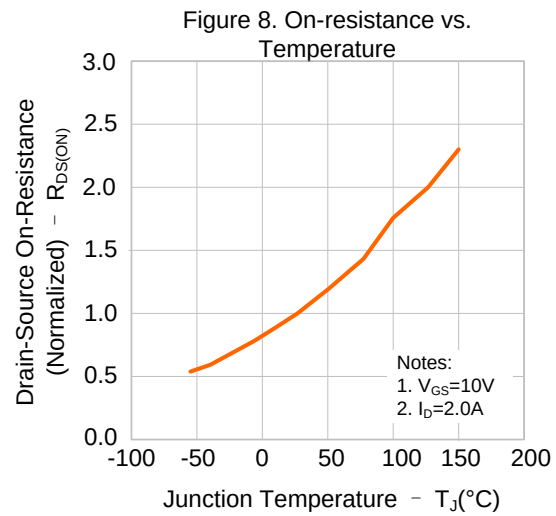
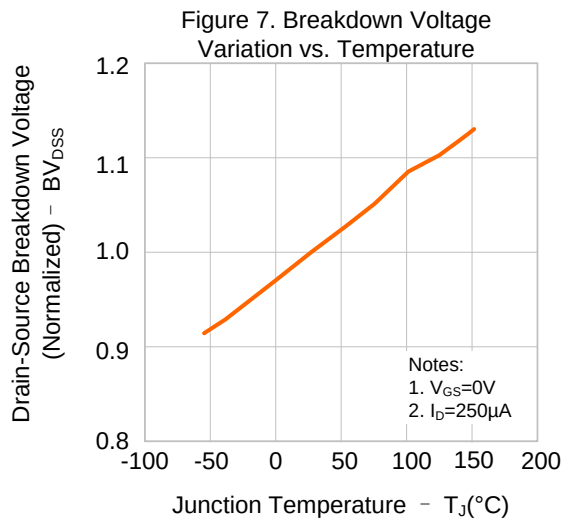
1. $L=30mH, I_{AS}=3.6A, V_{DD}=100V, R_G=25\Omega$, starting $T_J=25^{\circ}\text{C}$;
2. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$;
3. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS



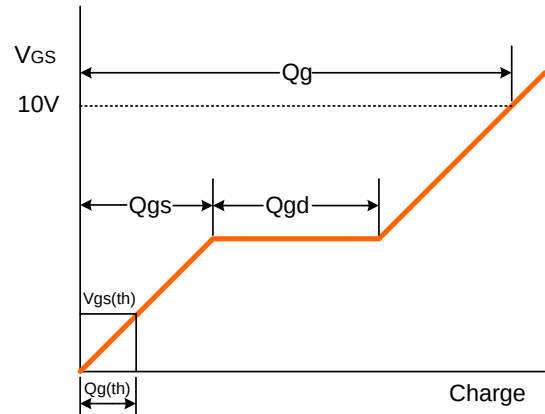
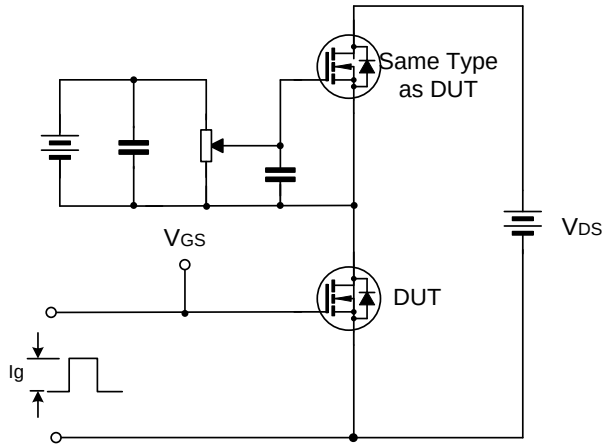


TYPICAL CHARACTERISTICS (CONTINUED)

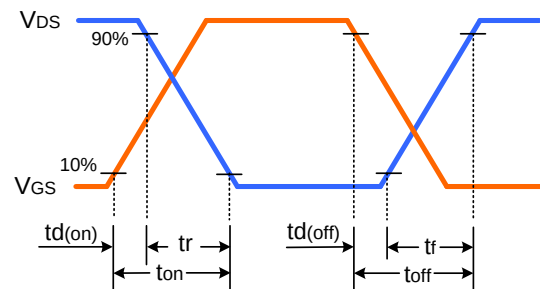
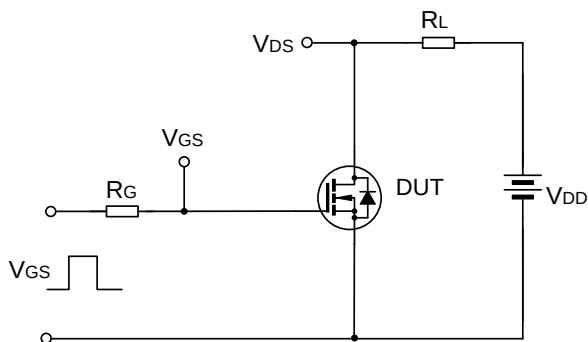


TYPICAL TEST CIRCUIT

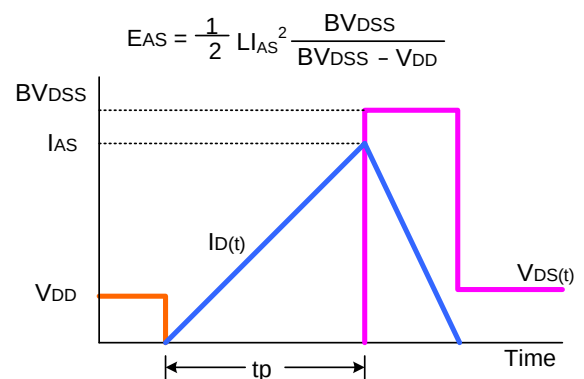
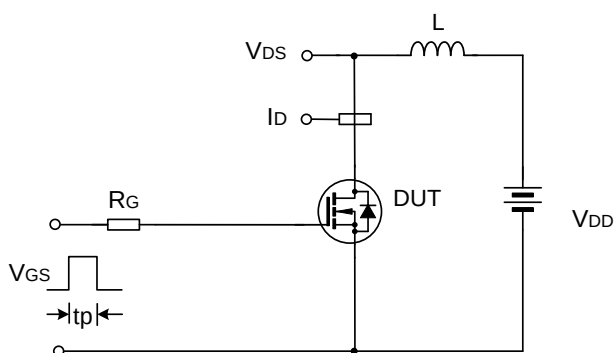
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



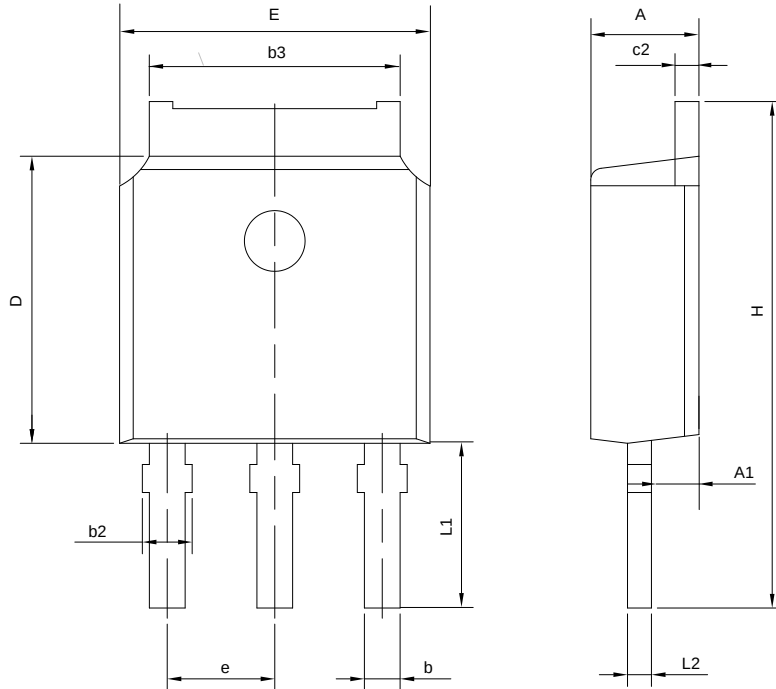
Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

TO-251D-3L

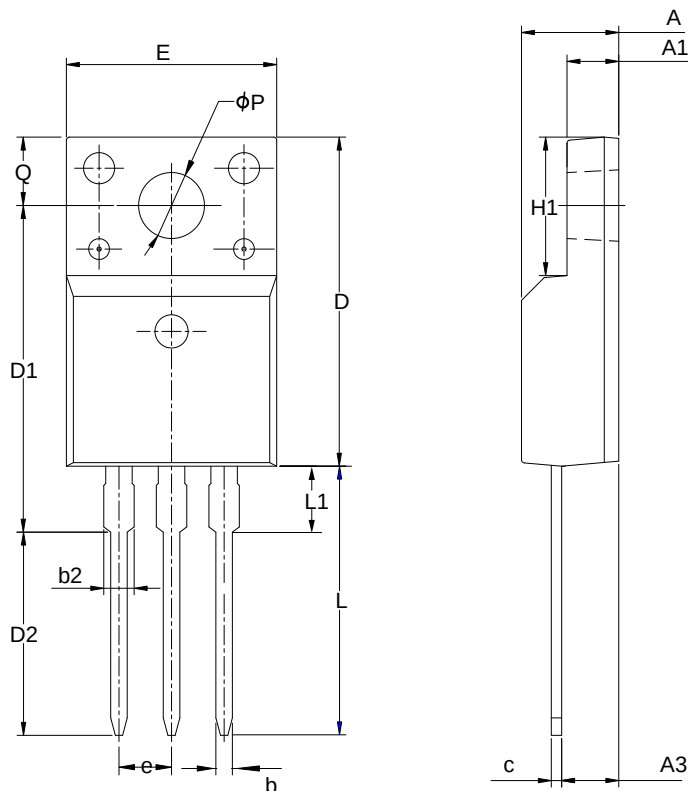
UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.20	2.30	2.40
b	0.66	—	0.86
b2	0.72	—	0.90
b3	5.10	5.33	5.46
c2	0.46	—	0.60
D	6.00	6.10	6.20
e	2.186	2.286	2.386
H	10.40	10.70	11.00
L1	3.50 REF		
L2	0.508 BSC		

TO-220F-3L

UNIT: mm

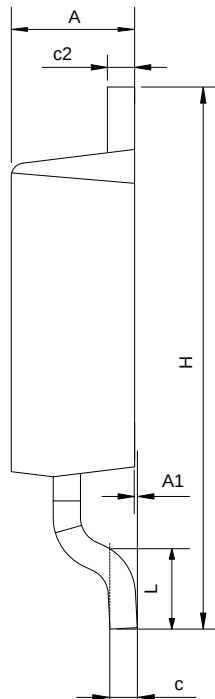
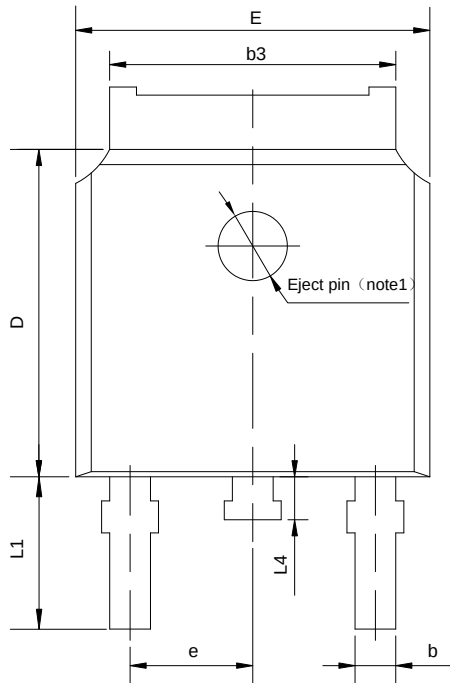


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.70	0.80	0.90
b2	—	—	1.47
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	15.30	15.75	16.30
D2	9.30	9.80	10.30
E	9.73	10.16	10.36
e	2.54BSC		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	—	—	3.50
ΦP	3.00	3.18	3.40
Q	3.05	3.30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

PACKAGE OUTLINE (CONTINUED)

TO-252-2L

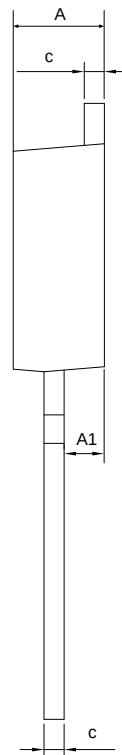
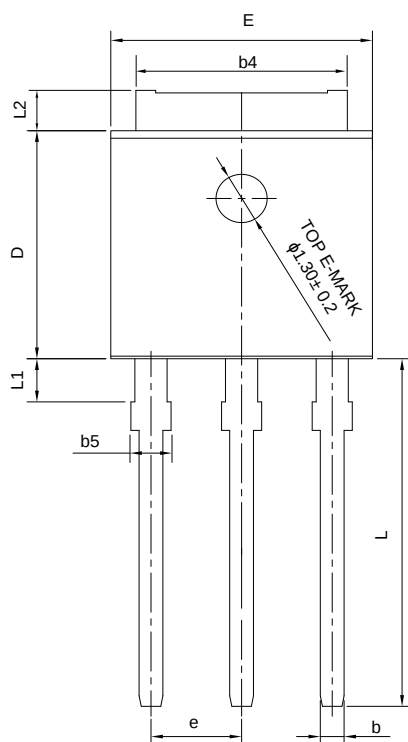
UNIT: mm



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

TO-251J-3L

UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.18	2.30	2.39
A1	0.89	1.00	1.14
b	0.56	—	0.89
b4	4.95	5.33	5.46
b5	—	—	1.05
c	0.46	—	0.61
D	5.97	6.10	6.27
E	6.35	6.60	6.73
e	2.29 BCS		
L	8.89	9.30	9.65
L1	0.95	—	1.50
L2	0.89	—	1.27

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- The instructions are subject to change without notice! Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current.
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- Product promotion is endless, our company will wholeheartedly provide customers with better products!
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Rev.: 3.7

Revision History:

1. Update the electrical diagram and typical test circuit
 2. Update the template
-

Rev.: 3.6

Revision History:

1. Delete the package outline of TO-220-3L and TO-262-3L
-

Rev.: 3.5

Revision History:

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

Rev.: 3.4

Revision History:

1. Modify the Electrical characteristics and curves according to SVF4N65CA
 2. Delete package outline of TO-220F-3L(2)
 3. Update the package outline of TO-251J-3L
-

Rev.: 3.3

Revision History:

1. Modify the Electrical characteristics
 2. Delete TO-251-3L
-

Rev.: 3.2

Revision History:

1. Modify the Hazardous Substance Control of TO-262-3L
 2. Modify the package outline of TO-251J-3L (1.1version) and TO-251D-3L (1.5version)
-

Rev.: 3.1

Revision History:

1. Modify the ordering information
 2. Modify the package outline of TO-262-3L
-

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Rev.: 3.0

Revision History:

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

Rev.: 2.9

Revision History:

1. Modify the electrical characteristics G_{fs}
 2. Modify the ordering information
-

Rev.: 2.8

Revision History:

1. Modify the package information of TO-220F-3L
 2. Modify the package information of TO-252-2L
 3. Modify the package information of TO-220-3L
 4. Modify the electrical characteristics G_{fs}
-

Rev.: 2.7

Revision History:

1. Modify the thermal characteristics
-

Rev.: 2.6

Revision History:

1. Modify the ordering information
-

Rev.: 2.5

Revision History:

1. Add the Min. and Max. values of C_{iss}
-

Rev.: 2.4

Revision History:

1. Modify the ordering information
-

Rev.: 2.3

Revision History:

1. Modify the package outline of TO-251J-3L
-

Rev.: 2.2

Revision History:

1. Modify the ordering information
-

Rev.: 2.1

Revision History:

1. Modify the electrical characteristics and typical characteristics
 2. Add the package of TO-251-3L
-

Rev.: 2.0

Revision History:

1. Change the schematic diagram of MOS

Part No.: SVF4N65F/M/MJ/D

Document Type: Datasheet

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Rev.: 1.9

Revision History:

1. Modify the package outline of TO-251D-3L

Rev.: 1.8

Revision History:

1. Modify "PACKAGE OUTLINE"

Rev.: 1.7

Revision History:

1. Modify "ORDERING INFORMATION"

Rev.: 1.6

Revision History:

1. Modify "PACKAGE OUTLINE"

Rev.: 1.5

Revision History:

1. Add the halogen free information of SVF4N65MJ

Rev.: 1.4

Revision History:

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

Rev.: 1.3

Revision History:

1. Modify the typ. Value of $R_{DS(on)}$
2. Delete the package of TO-251-3L, Add the package of TO-251J-3L

Rev.: 1.2

Revision History:

1. Modify the values of T_{rr} and Q_{rr}

Rev.: 1.1

1. Add the package of TO-252-2L and TO-251D-3L

Rev.: 1.0

Revision History:

1. Original