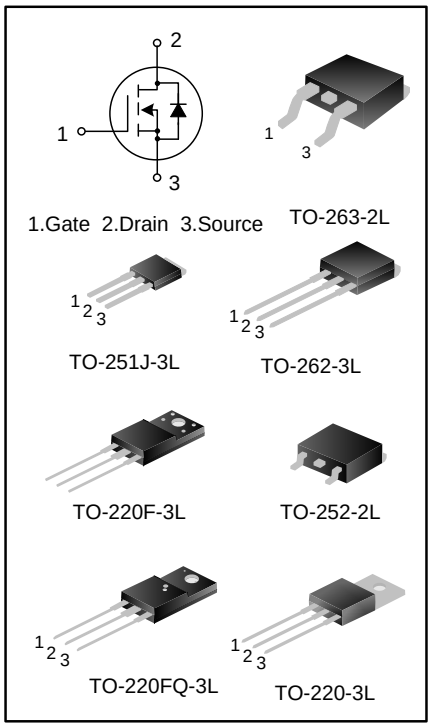
7A, 650V N-CHANNEL MOSFET

GENERAL DESCRIPTION

SVF7N65CF/D/MJ/K/S/FQ/T 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 suppliers, DC-DC converters and H-bridge PWM motor drivers.



FEATURES

- 7A, 650V, $R_{DS(on)(typ.)}$=1.1Ω@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

NOMENCLATURE

S V F X N E X X C X

- Silan VDMOS Code of F-Cell process
- Nominal current,using 1 or 2 digits: Example:4 denotes 4A, 10 denotes 10A, 08 denotes 0.8A
- N denotes N Channel
- Special Features indication, May be omitted. Example: E denotes embeded ESD structure
- Nominal Voltage,using 2 digits Example: 60 denotes 600V, 65 denotes 650V.
- REV.
- Package information. Example: F:TO-220F; FQ: TO-220FQ;D:TO-252; MJ:TO-251J; K:TO-262; S:TO-263;T:TO-220.

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing
SVF7N65CF	TO-220F-3L	SVF7N65CF	Halogen free	Tube
SVF7N65CD	TO-252-2L	SVF7N65C	Halogen free	Tube
SVF7N65CDTR	TO-252-2L	SVF7N65C	Halogen free	Tape & Reel
SVF7N65CMJ	TO-251J-3L	SVF7N65C	Halogen free	Tube
SVF7N65CK	TO-262-3L	SVF7N65CK	Halogen free	Tube
SVF7N65CS	TO-263-2L	SVF7N65CS	Halogen free	Tube
SVF7N65CSTR	TO-263-2L	SVF7N65CS	Halogen free	Tape & Reel
SVF7N65CFQ	TO-220FQ-3L	SVF7N65CFQ	Halogen free	Tube
SVF7N65CT	TO-220-3L	SVF7N65CT	Halogen free	Tube

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

Characteristics		Symbol	Ratings					Unit
			SVF7N65CF/FQ	SVF7N65CD	SVF7N65CMJ	SVF7N65CK/S	SVF7N65CT	
Drain-Source Voltage		V_{DS}	650					V
Gate-Source Voltage		V_{GS}	±30					V
Drain Current	T_C = 25°C	I_D	7.0					A
	T_C = 100°C		4.4					
Drain Current Pulsed		I_{DM}	28					A
Power Dissipation(T_C=25°C)		P_D	46	89	90	120	145	W
-Derate above 25°C			0.37	0.71	0.72	0.96	1.16	W/°C
Single Pulsed Avalanche Energy (Note 1)		E_{AS}	435					mJ
Operation Junction Temperature Range		T_J	-55～+150					°C
Storage Temperature Range		T_{stg}	-55～+150					°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Ratings					Unit
		SVF7N65CF/FQ	SVF7N65CD	SVF7N65CMJ	SVF7N65CK/S	SVF7N65T	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.7	1.4	1.39	1.04	0.86	°C/ W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.0	62.0	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	B_{VDSS}	V_{GS}=0V, I_D=250μA	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V	--	--	1.0	μA

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
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=3.5A	--	1.1	1.4	Ω
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHZ	--	789	--	pF
Output Capacitance	C_{oss}		--	98	--	
Reverse Transfer Capacitance	C_{rss}		--	9.0	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=325V, R_G=25Ω, I_D=7.0A (Note 2,3)	--	15.0	--	ns
Turn-on Rise Time	t_r		--	32.0	--	
Turn-off Delay Time	$t_{d(off)}$		--	51.0	--	
Turn-off Fall Time	t_f		--	32.5	--	
Total Gate Charge	Q_g	V_{DS}=520V, I_D=7.0A, V_{GS}=10V (Note 2,3)	--	21.2	--	nC
Gate-Source Charge	Q_{gs}		--	4.53	--	
Gate-Drain Charge	Q_{gd}		--	10.2	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	7.0	A
Pulsed Source Current	I_{SM}		--	--	28.0	
Diode Forward Voltage	V_{SD}	I_S=7.0A,V_{GS}=0V	--	--	1.4	V
Reverse Recovery Time	T_{rr}	I_S=7.0A,V_{GS}=0V, dI_F/dt=100A/μS(Note 2)	--	499	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.0	--	μC

Notes:

1. L=30mH, I_{AS}=5.0A, 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

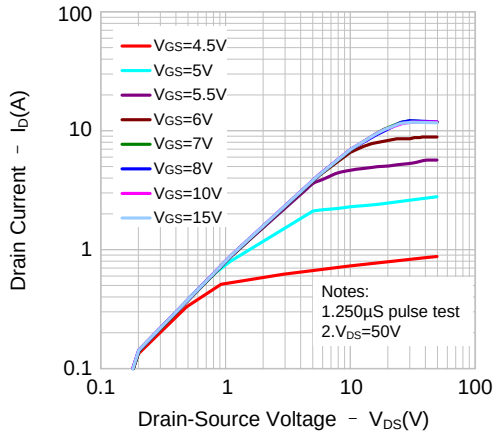


Figure 2. Transfer Characteristics

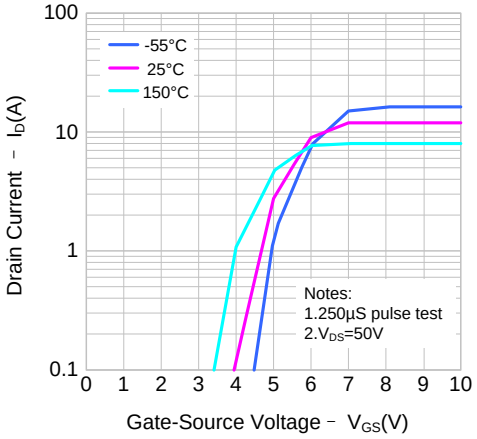


Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

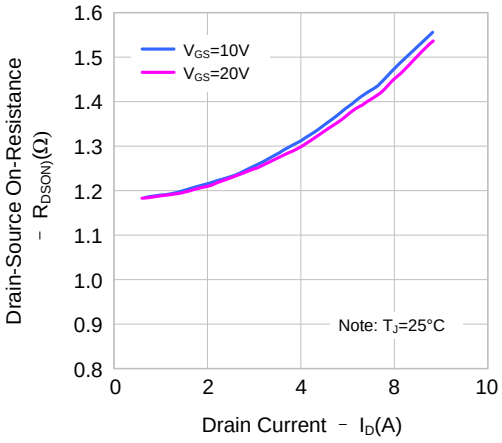


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

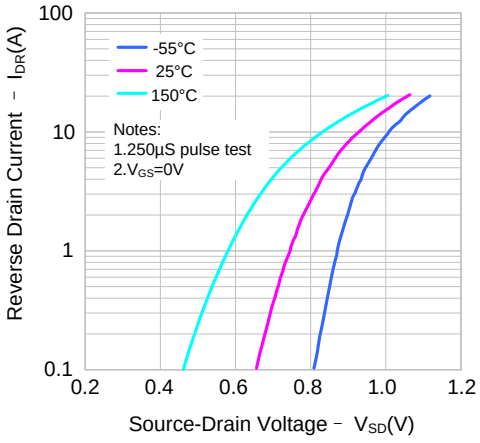


Figure 5. Capacitance Characteristics

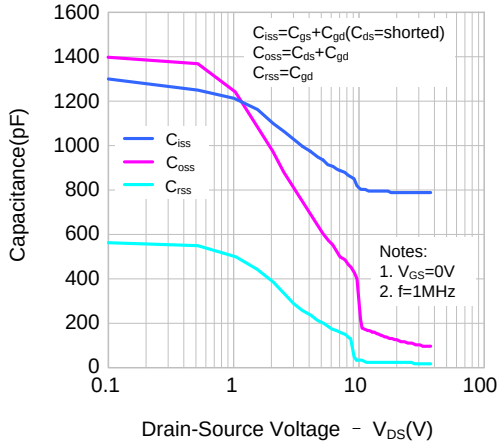
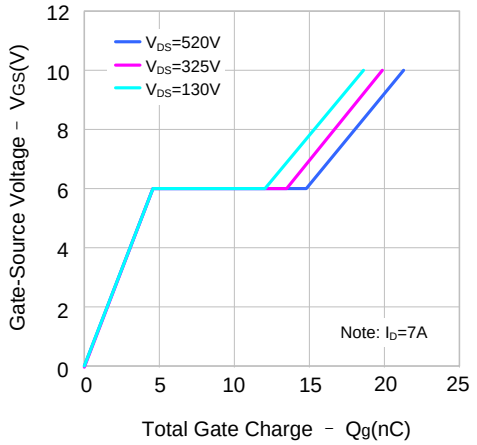


Figure 6. Gate Charge Characteristics



TYPICAL CHARACTERISTICS (continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

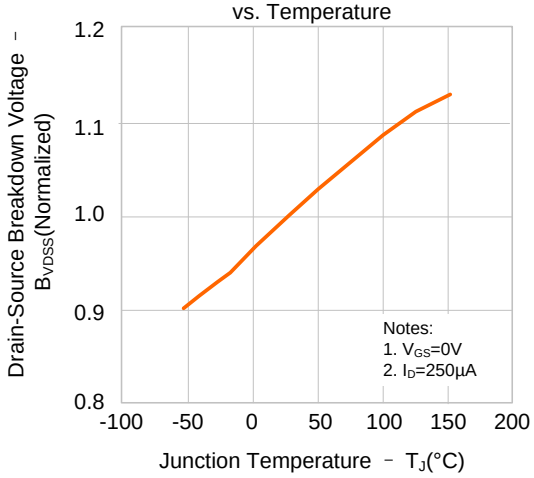


Figure 8. On-resistance Variation vs. Temperature

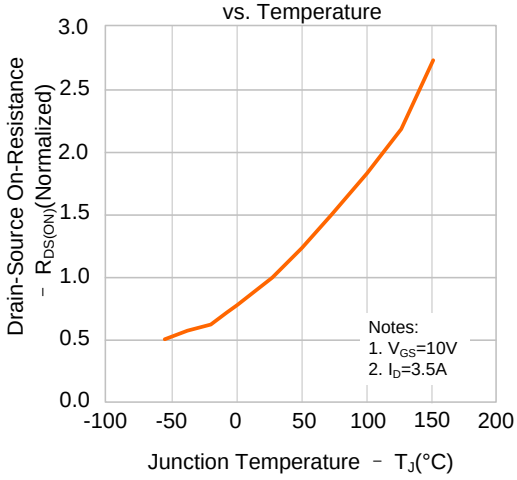


Figure 9-1. Max. Safe Operating Area(SVF7N65CF/FQ)

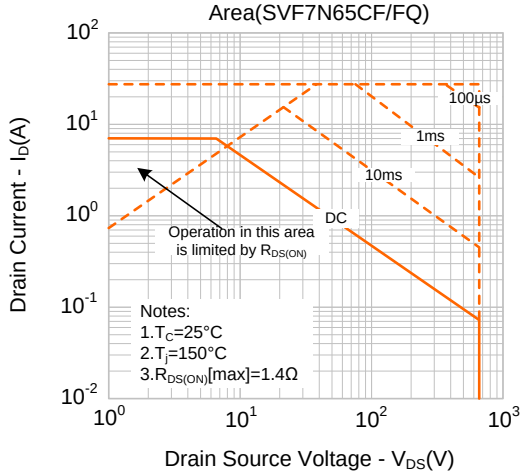


Figure 9-2. Max. Safe Operating Area(SVF7N65CD)

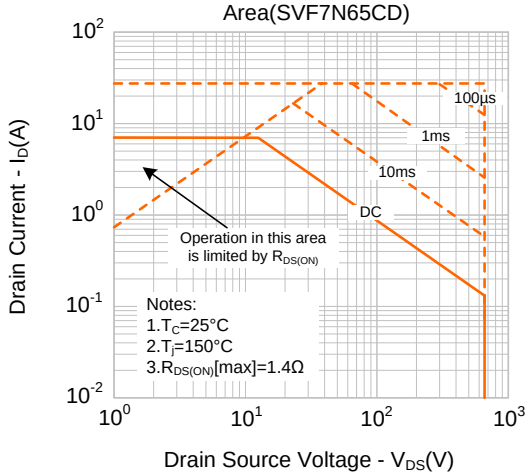


Figure 9-3. Max. Safe Operating Area(SVF7N65CMJ)

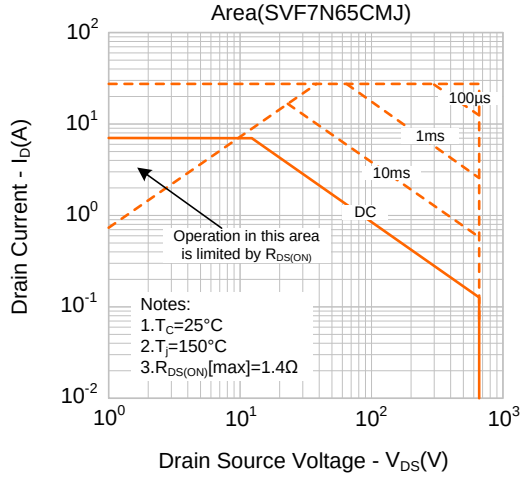
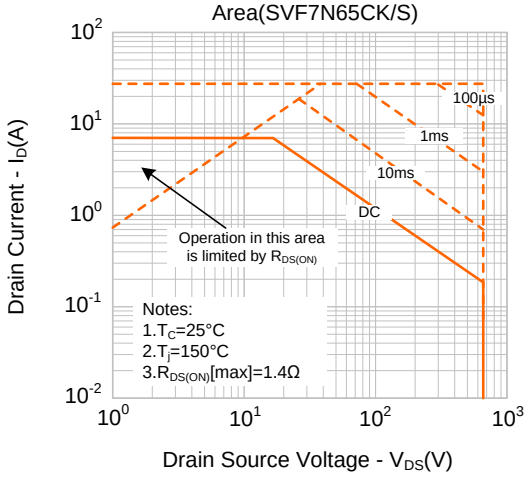


Figure 9-4. Max. Safe Operating Area(SVF7N65CK/S)



TYPICAL CHARACTERISTICS (continued)

Figure 9-5. Max. Safe Operating Area(SVF7N65CT)

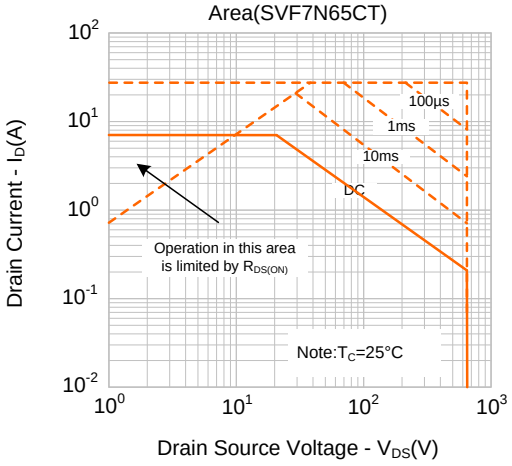
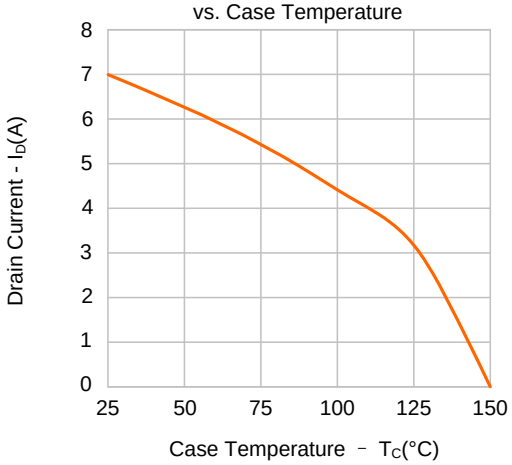
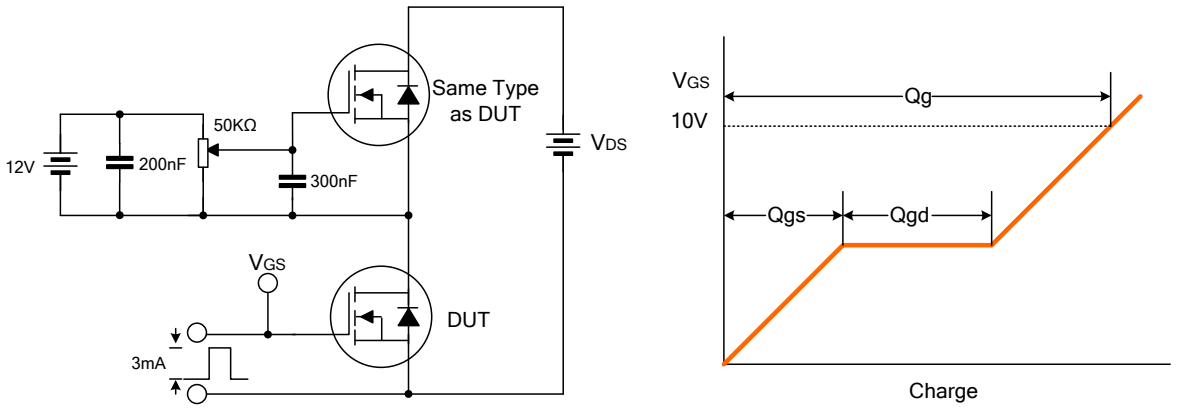


Figure 10. Maximum Drain Current vs. Case Temperature

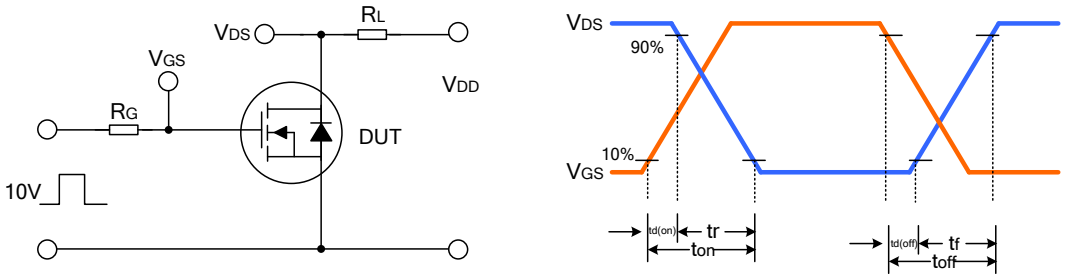


TYPICAL TEST CIRCUIT

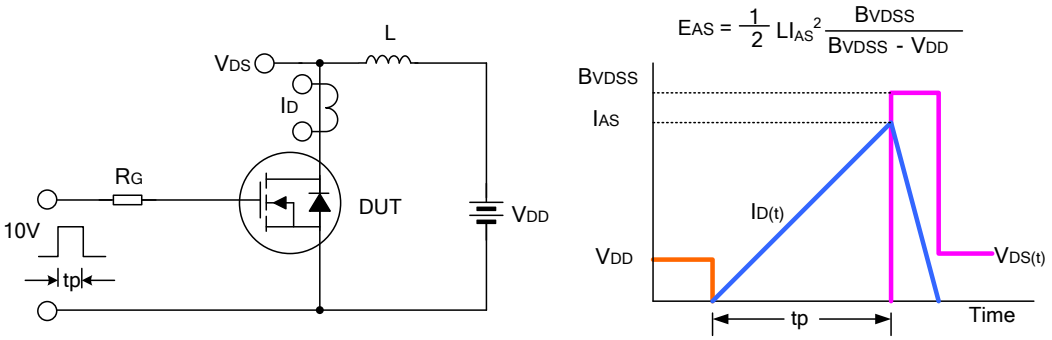
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



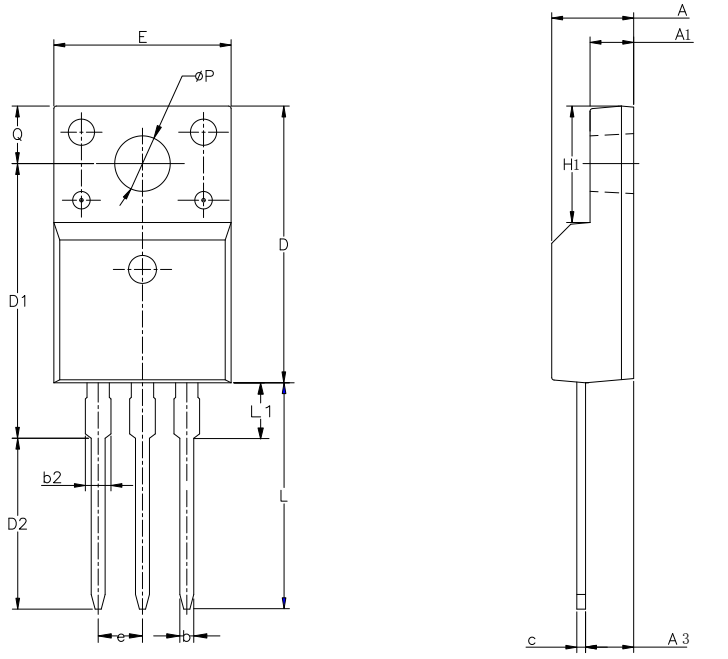
Unclamped Inductive Switching Test Circuit & Waveform



PACKAGE OUTLINE

TO-220F-3L

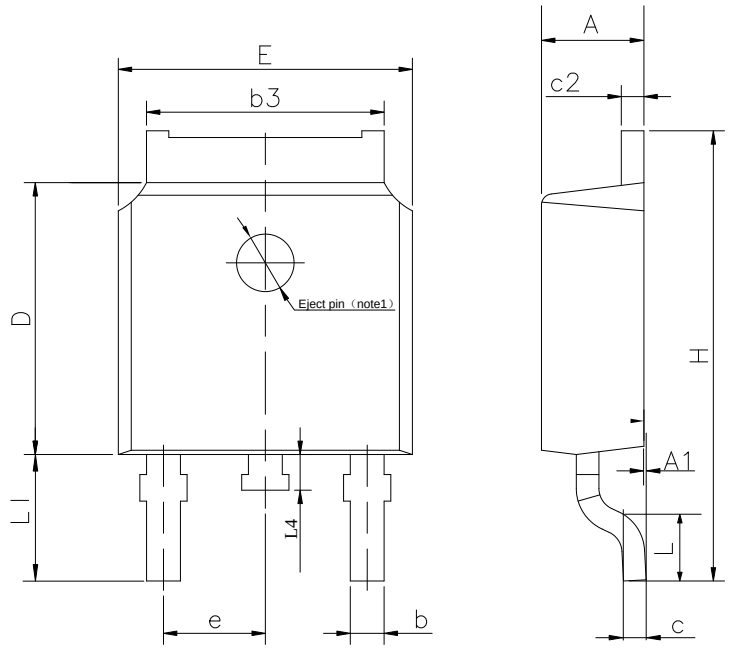
UNIT: mm



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-252-2L

UNIT: mm

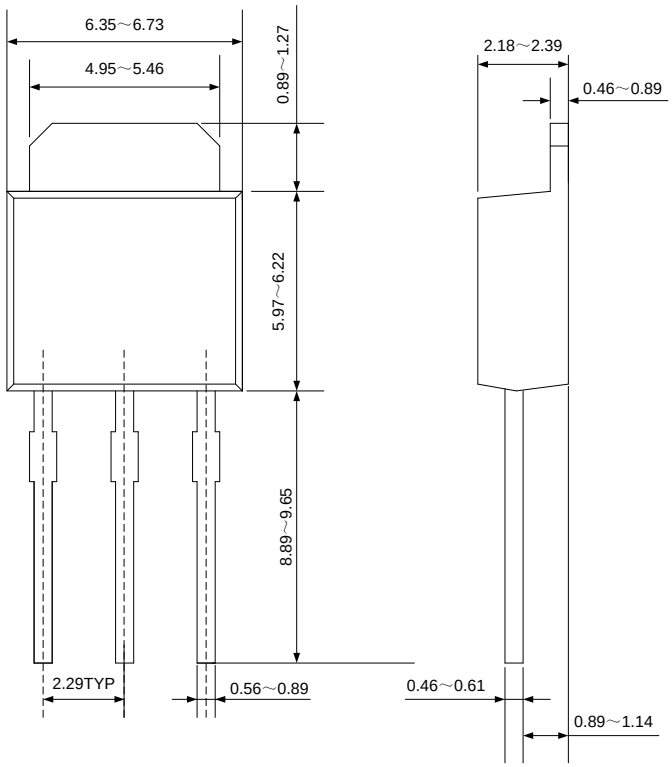


SYMBOL	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	---	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	---	0.65
c2	0.45	---	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e	2.30TYP		
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1	2.90REF		
L4	0.60	0.80	1.00

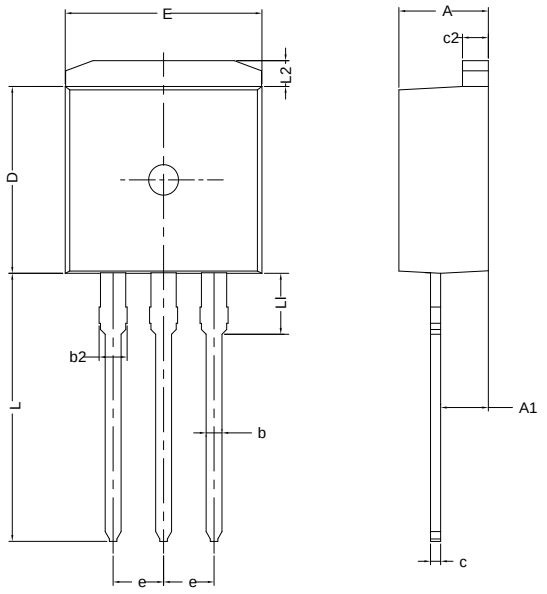
NOTE1 : There are two conditions for this position:has an eject pin or has no eject pin.

PACKAGE OUTLINE

TO-251J-3L **UNIT: mm**



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

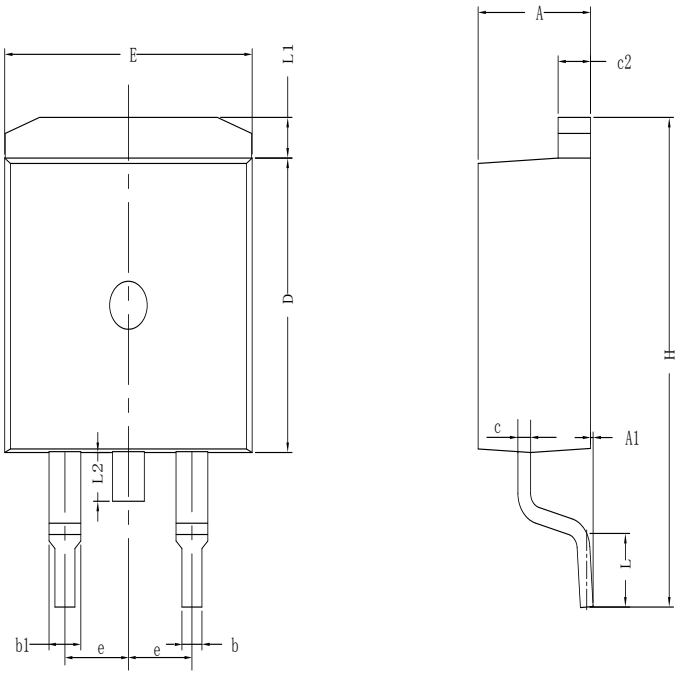


SYMBOL	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	2.20	---	2.92
b	0.71	0.80	0.97
b2	1.20	---	1.50
c	0.34	---	0.76
c2	1.22	1.30	1.35
D	8.38	---	9.30
E	9.80	10.16	10.54
e		2.54 BSC	
L	12.80	---	14.10
L1	2.80	3.30	4.06
L2	1.12	---	1.42

PACKAGE OUTLINE

TO-263-2L

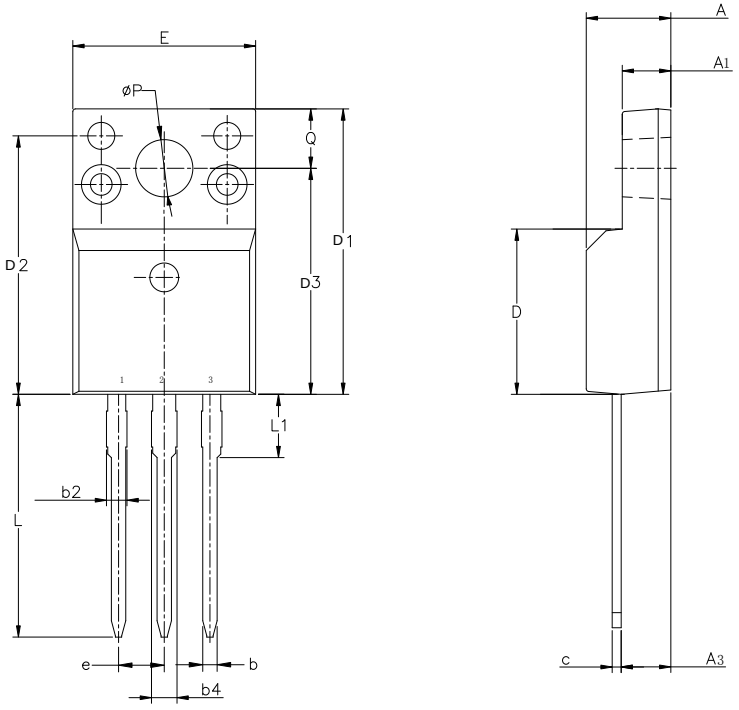
UNIT: mm



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

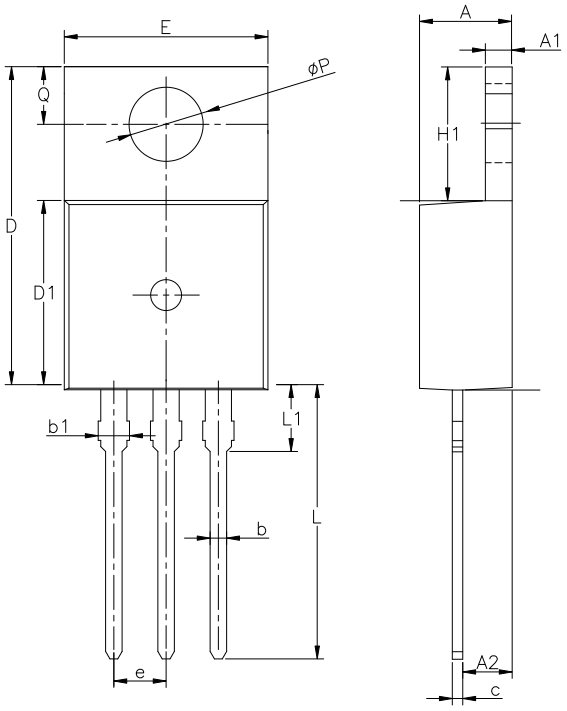
TO-220FQ-3L

UNIT: mm



SYMBOL	MIN	NOM	MAX
A	4.57	4.70	4.83
A1	2.57	2.70	2.83
A3	2.56	2.76	2.93
b	0.76	–	0.90
b2	0.96	–	1.19
b4	1.24	–	1.47
c	0.46	–	0.60
D	8.99	9.19	9.39
D1	15.80	15.87	16.13
D2	14.17	14.37	14.57
D3	12.30	12.57	12.87
E	9.96	10.16	10.36
e		2.54BSC	
L	13.20	13.50	13.70
L1	3.37	3.52	3.67
øP	3.08	3.18	3.28
Q	3.20	3.30	3.40

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



SYMBOL	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	1.00	1.30	1.50
A2	1.80	2.40	2.80
b	0.60	0.80	1.00
b1	1.00	—	1.60
c	0.30	—	0.70
D	15.10	15.70	16.10
D1	8.10	9.20	10.00
E	9.60	9.90	10.40
e	2.54BSC		
H1	6.10	6.50	7.00
L	12.60	13.08	13.60
L1	—	—	3.95
ϕP	3.40	3.70	3.90
Q	2.60	—	3.20

Part No.:	SVF7N65CF/D/MJ/K/S/FQ/T	Document Type:	Datasheet
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Rev.:	1.8	Author:	Yin Zi

Revision History:

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

Rev.:	1.7	Author:	Yin Zi

Revision History:

1. Modify the Typical Characteristics

Rev.:	1.6	Author:	Yin Zi

Revision History:

1. Modify the package of TO-252-2L

Rev.:	1.5	Author:	Yin Zi

Revision History:

1. Add the package of TO-220FQ-3L
2. Modify the package of TO-220F-3L

Rev.:	1.4	Author:	Yin Zi

Revision History:

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

Rev.:	1.3	Author:	Yin Zi

Revision History:

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

Rev.:	1.2	Author:	Yin Zi

Revision History:

1. Modify the thermal characteristics

Rev.:	1.1	Author:	Yin Zi

Revision History:

1. Add the package of TO-251J-3L

Rev.:	1.0	Author:	Yin Zi

Revision History:

1. First release