

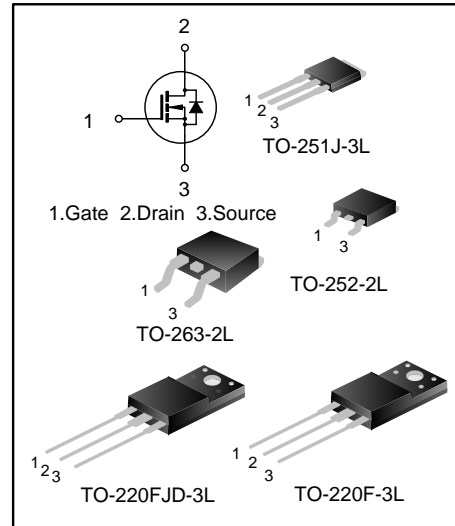
## 7A, 650V SUPER JUNCTION MOS POWER TRANSISTOR

### DESCRIPTION

SVSP7N65D(F)(MJ)(FJD)(S)D2 is an N-channel enhancement mode high voltage power MOSFETs produced using Silan's super junction MOS technology. It achieves low conduction loss and switching losses. It leads the design engineers to their power converters with high efficiency, high power density, and superior thermal behavior. Furthermore, it's universal applicable, for example, it is suitable for hard and soft switching topologies, Lighting, Adapters etc.

### FEATURES

- ◆ 7A,650V,  $R_{DS(on)(typ.)}=0.55\Omega@V_{GS}=10V$
- ◆ New revolutionary high voltage technology
- ◆ Ultra low gate charge
- ◆ Enhanced avalanche capability
- ◆ Extreme dv/dt rated
- ◆ High peak current capability



### ORDERING INFORMATION

Part No.	Package	Marking	Hazardous substance control	Packing Type
SVSP7N65DD2TR	TO-252-2L	P7N65DD2	Halogen free	Tape & Reel
SVSP7N65FD2	TO-220F-3L	P7N65FD2	Halogen free	Tube
SVSP7N65MJD2	TO-251J-3L	P7N65MJD2	Halogen free	Tube
SVSP7N65FJDD2	TO-220FJD-3L	P7N65FJD	Halogen free	Tube
SVSP7N65SD2	TO-263-2L	P7N65SD2	Halogen free	Tube

**ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, T<sub>A</sub>=25°C)**

Characteristics	Symbol	Ratings			Unit
		SVSP7N65D D2/MJD2	SVSP7N65FD2/ FJDD2	SVSP7N65SD 2	
Drain-Source Voltage	V <sub>DS</sub>	650			V
Gate-Source Voltage	V <sub>GS</sub>	±30			V
Drain Current	I <sub>D</sub>	T <sub>C</sub> =25°C			A
		T <sub>C</sub> =100°C			
Drain Current Pulsed	I <sub>DM</sub>	28			A
Power Dissipation (T <sub>C</sub> =25°C) -Derate above 25°C	P <sub>D</sub>	60	30	83	W
		0.48	0.24	0.7	W/°C
Single Pulsed Avalanche Energy (Note 1)	E <sub>AS</sub>	261			mJ
Reverse diode dv/dt (Note 2)	dv/dt	15			V/ns
MOSFET dv/dt ruggedness (Note 3)	dv/dt	50			V/ns
Operation Junction Temperature Range	T <sub>J</sub>	-55~+150			°C
Storage Temperature Range	T <sub>stg</sub>	-55~+150			°C

**THERMAL CHARACTERISTICS**

Characteristics	Symbol	Ratings			Unit
		SVSP7N65D D2/MJD2	SVSP7N65FD2/ FJDD2	SVSP7N65SD 2	
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	2.08	4.17	1.5	°C/W
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	62.0	62.5	62.5	°C/W

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

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
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	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	--	--	$\pm 100$	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	$R_{DS(on)}$	$V_{GS}=10V, I_D=3.5A$	--	0.55	0.64	$\Omega$
Gate resistance	$R_g$	$f=1\text{MHz}$	--	11	--	$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS}=100V, V_{GS}=0V,$ $f=1.0\text{MHz}$	--	423	--	pF
Output Capacitance	$C_{oss}$		--	27	--	
Reverse Transfer Capacitance	$C_{rss}$		--	1.9	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=325V, I_D=7.0A,$ $V_{GS}=10V, R_G=24\Omega$ (Note 4,5)	--	10	--	ns
Turn-on Rise Time	$t_r$		--	29	--	
Turn-off Delay Time	$t_{d(off)}$		--	44	--	
Turn-off Fall Time	$t_f$		--	26	--	
Total Gate Charge	$Q_g$	$V_{DS}=520V, I_D=7.0A,$ $V_{GS}=10V$ (Note 4,5)	--	16	--	nC
Gate-Source Charge	$Q_{gs}$		--	3.6	--	
Gate-Drain Charge	$Q_{gd}$		--	8.3	--	

**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	
Diode Forward Voltage	$V_{SD}$	$I_S=7.0A, V_{GS}=0V$	--	--	1.4	V
Reverse Recovery Time	$T_{rr}$	$I_S=7.0A, V_{GS}=0V,$ $di_f/dt=100A/\mu s$ (Note 4)	--	346	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	2.5	--	$\mu C$

**Notes:**

- $L=79\text{mH}, I_{AS}=2.4A, V_{DD}=100V, R_G=25\Omega,$  starting temperature  $T_J=25^{\circ}\text{C};$
- $V_{DS}=0\sim 400V, I_{SD}\leq 7.0A, T_J=25^{\circ}\text{C};$
- $V_{DS}=0\sim 480V;$
- Pulse Test: Pulse width  $\leq 300\mu s,$  Duty cycle  $\leq 2\%;$
- Essentially independent of operating temperature.

**TYPICAL CHARACTERISTICS**

Figure 1. On-Region Characteristics

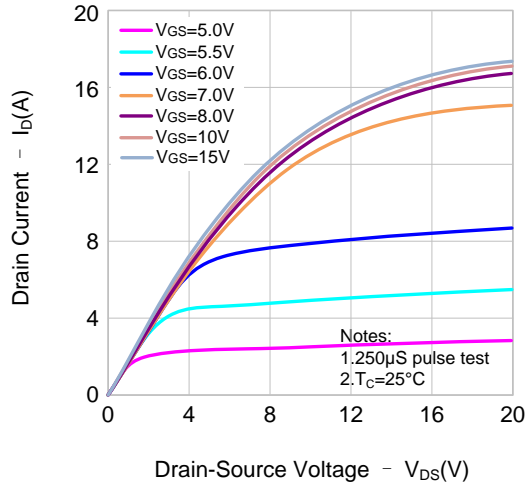


Figure 2. Transfer Characteristics

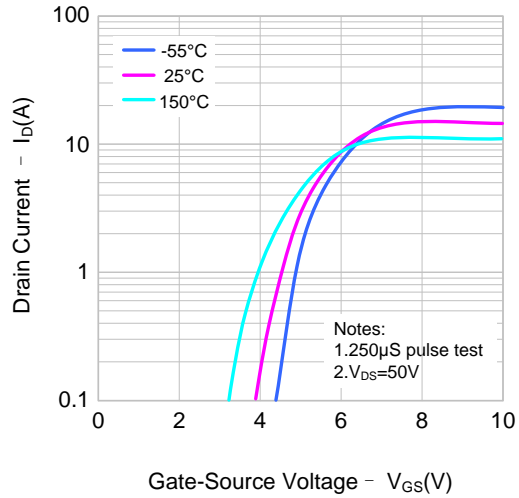


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

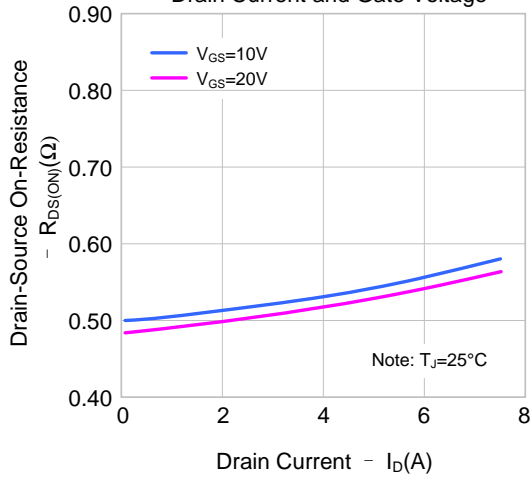


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

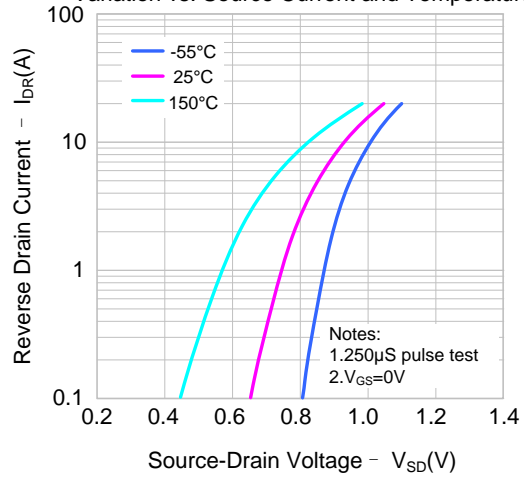


Figure 5. Capacitance Characteristics

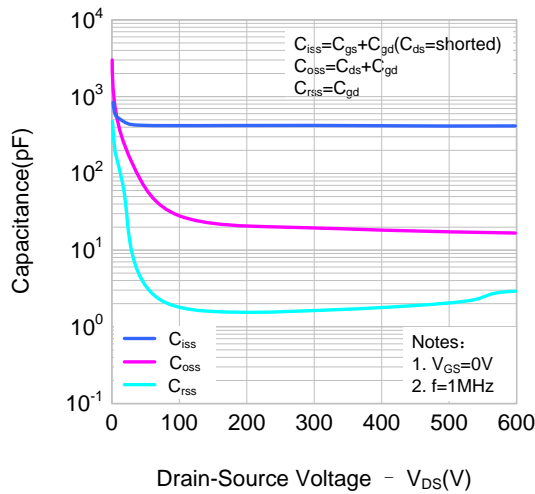
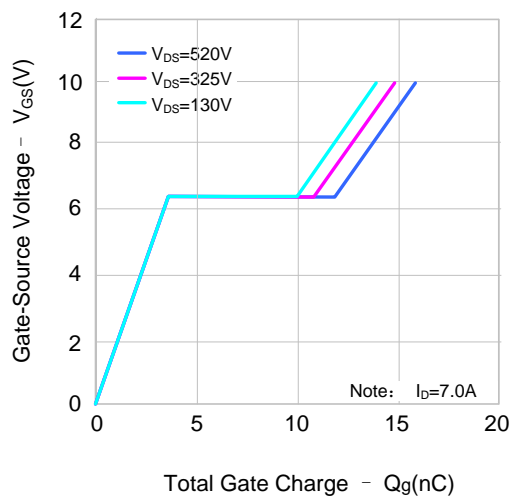


Figure 6. Gate Charge Characteristics





TYPICAL CHARACTERISTICS (CONTINUED)

Figure 7. Breakdown Voltage Variation vs. Temperature

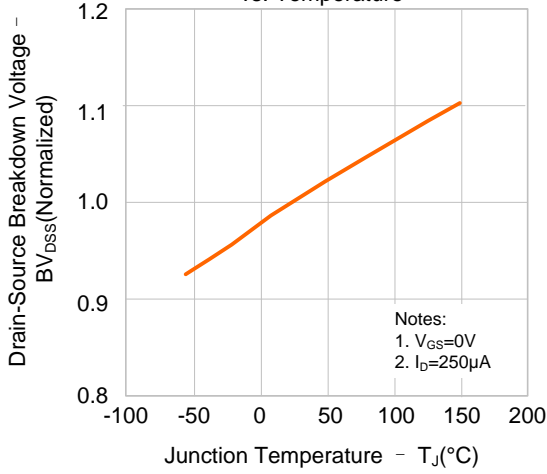


Figure 8. On-resistance Variation vs. Temperature

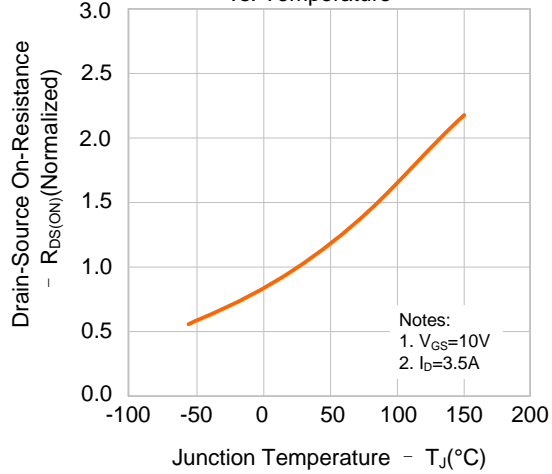


Figure 9-1. Max. Safe Operating Area (SVSP7N65DD2/MJD2)

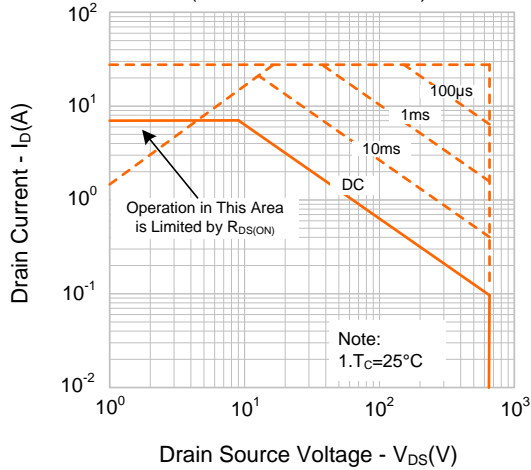


Figure 9-2. Max. Safe Operating Area (SVSP7N65FD2/FJDD2)

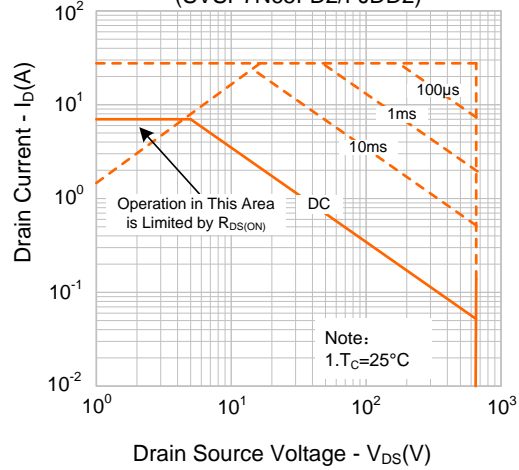
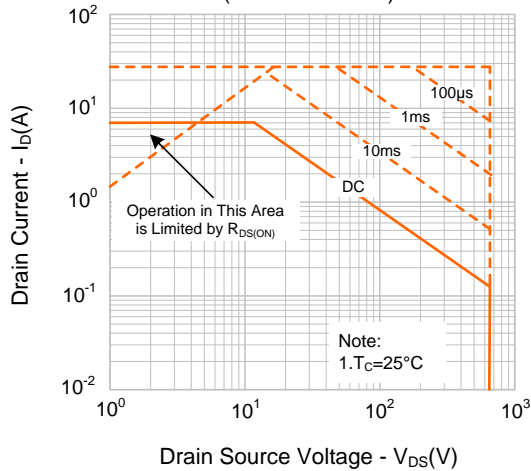
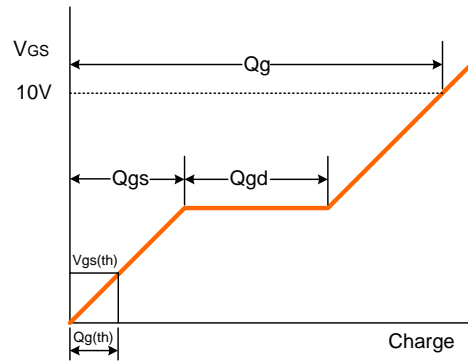
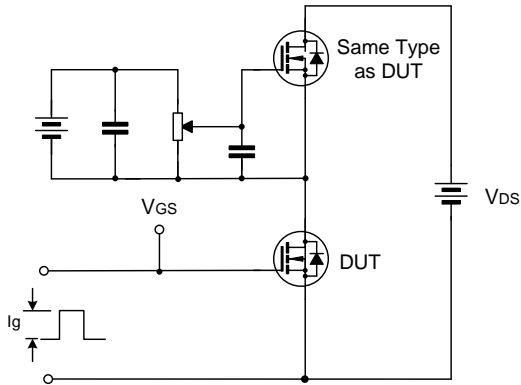


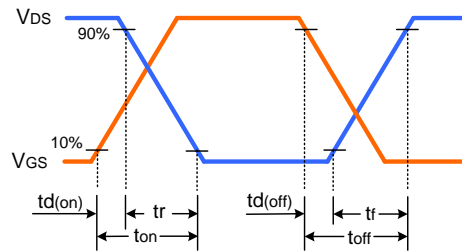
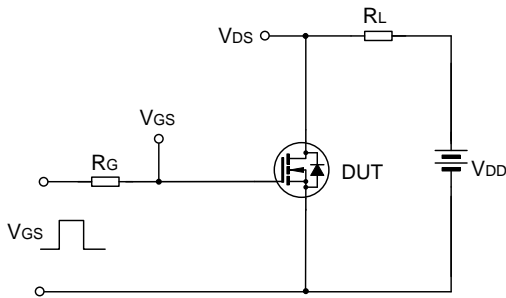
Figure 9-3. Max. Safe Operating Area (SVSP7N65SD2)



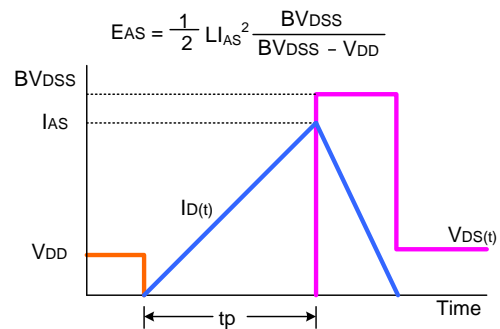
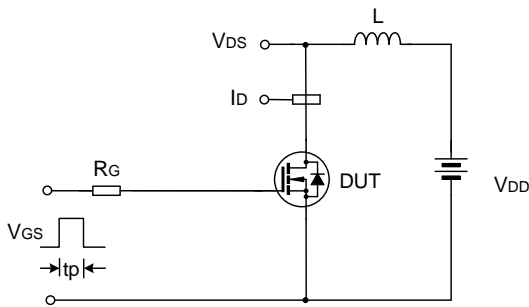
**TYPICAL TEST CIRCUIT**



Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

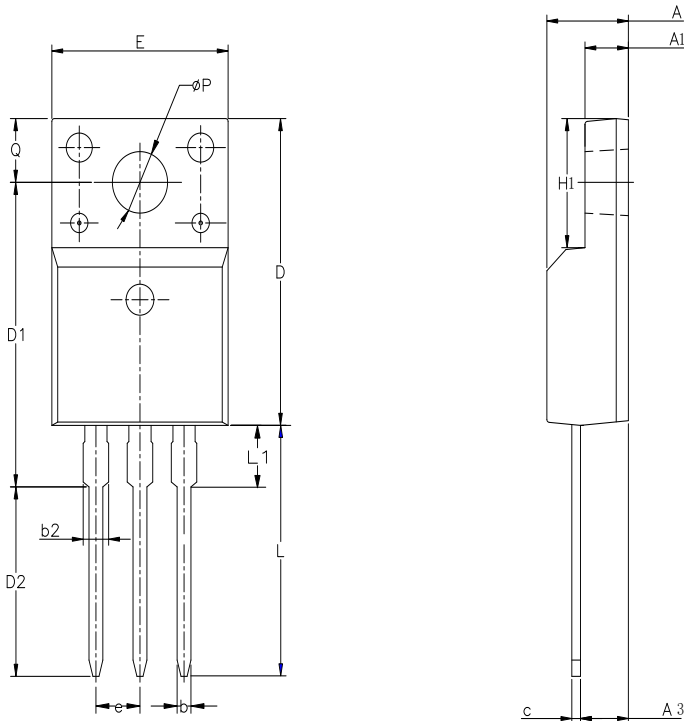


Unclamped Inductive Switching Test Circuit & Waveform

**PACKAGE OUTLINE**

**TO-220F-3L**

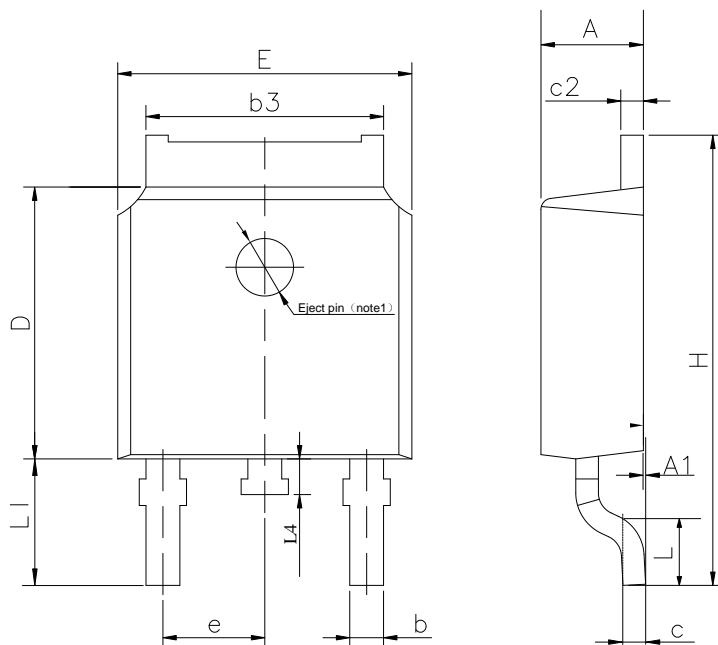
**UNIT: mm**



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
$\phi P$	3.00	3.18	3.40
Q	3.05	3.30	3.55

**TO-252-2L**

**UNIT: mm**



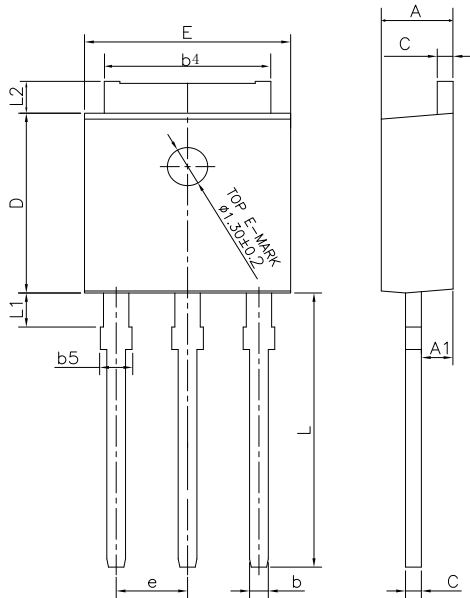
SYMBOL	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	---	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	---	0.65
c2	0.45	---	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e	2.30TYP		
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1	2.90REF		
L4	0.60	0.80	1.00

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

**PACKAGE OUTLINE(CONTINUED)**

**TO-251J-3L**

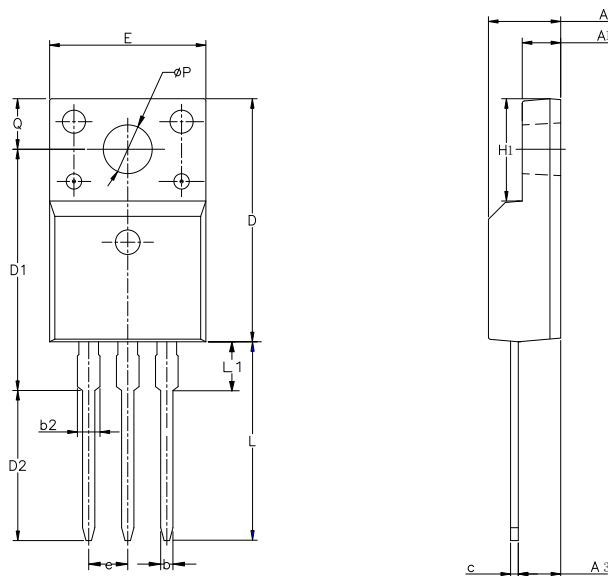
**UNIT: mm**



SYMBOL	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

**TO-220FJD-3L**

**UNIT: mm**



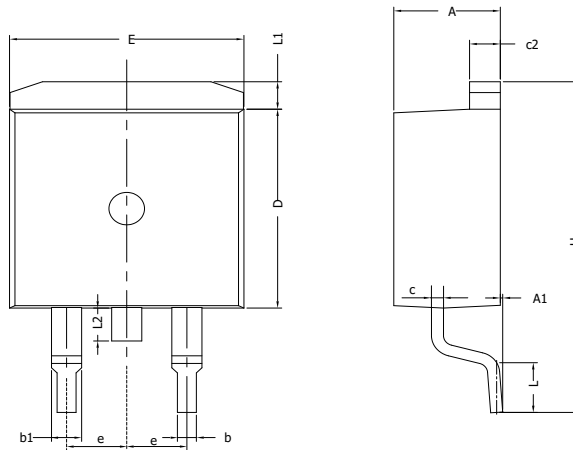
SYMBOL	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.55	0.70	0.85
b2	---	---	1.29
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	13.97	14.47	14.97
D2	10.58	11.08	11.58
E	9.73	10.16	10.36
e	2.54BCS		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	---	---	2.00
ØP	3.00	3.18	3.40
Q	3.05	3.30	3.55



**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

**Important notice :**

- 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.
- Our products are consumer electronic products, and / or civil electronic products.
- When using our products, please do not exceed the maximum rating of the products, otherwise the reliability of the whole machine will be affected. There is a certain possibility of failure or malfunction of any semiconductor product under specific conditions. The buyer is responsible for complying with safety standards and taking safety measures when using our products for system design, sample and whole machine manufacturing, so as to avoid potential failure risk that may cause personal injury or property loss.
- It is strongly recommended to identify the trademark when buying our products. Please contact us if there is any question.
- When exporting, using and reselling our products, buyer must comply with the international export control laws and regulations of China, the United States, the United Kingdom, the European Union and other countries & regions.
- Product promotion is endless, our company will wholeheartedly provide customers with better products!
- Website: <http://www.silan.com.cn>



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Rev.: 1.2

Revision History:

1. Modify Electrical schematic and TYPICAL TEST CIRCUIT
  2. Modify Fig 5
- 

Rev.: 1.1

Revision History:

1. Add TO-263-2L
- 

Rev.: 1.0

Revision History:

1. First release
- 
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