



## 11A, 600V SUPER JUNCTION MOS POWER TRANSISTOR

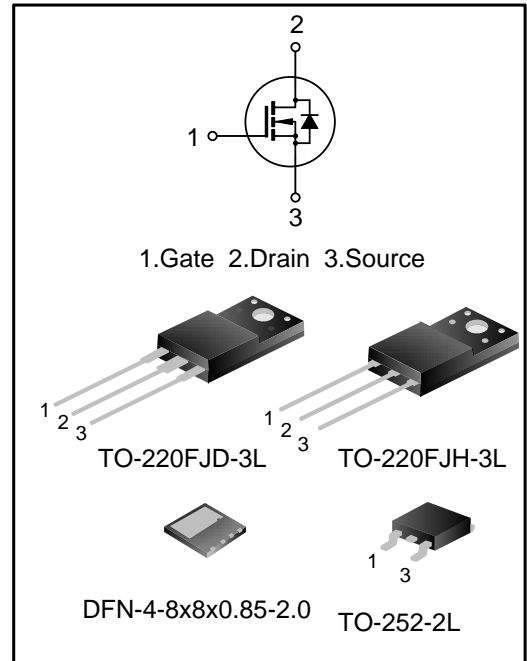
### DESCRIPTION

SVS60R360FJH(FJD)(D)(L8A)E3 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, i.e., suitable for hard and soft switching topologies.

### FEATURES

- ◆ 11A, 600V,  $R_{DS(on)(typ.)}=0.3\Omega@V_{GS}=10V$
- ◆ New revolutionary high voltage technology
- ◆ Ultra low gate charge
- ◆ Periodic avalanche rated
- ◆ Extreme dv/dt rated
- ◆ High peak current capability
- ◆ 100% avalanche tested
- ◆ Pb-free lead plating
- ◆ RoHS compliant



### KEY PERFORMANCE PARAMETERS

Characteristics	Ratings	Unit
$V_{DS}$	600	V
$V_{GS(th)}$	2.0~4.0	V
$R_{DS(on),max.}$	0.36	$\Omega$
$I_{D,pulse}$	44	A
$Q_{g,typ.}$	27	nC

### ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SVS60R360FJHE3	TO-220FJH-3L	6036FJHE3	Halogen free	Tube
SVS60R360FJDE3	TO-220FJD-3L	60R360FDE3	Halogen free	Tube
SVS60R360DE3TR	TO-252-2L	60R36DE3	Halogen free	Tape&Reel
SVS60R360L8AE3TR	DFN-4-8x8x0.85-2.0	60R360E3	Halogen free	Tape&Reel



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

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Voltage	V <sub>DS</sub>	--	600	--	--	V
Gate-source Voltage (Static)	V <sub>GS</sub>	--	-30	--	30	V
Gate-source Voltage (Dynamic)	V <sub>GS</sub>	AC(f>1 Hz)	-30	--	30	V
Drain Current	I <sub>D</sub>	T <sub>C</sub> =25°C	--	--	11	A
		T <sub>C</sub> =100°C	--	--	7	A
Drain Current Pulsed (Note 1)	I <sub>DM</sub>	T <sub>C</sub> =25°C	--	--	44	A
Power Dissipation (TO-220FJH-3L) (TO-220FJD-3L) (Note 2)	P <sub>D</sub>	T <sub>C</sub> =25°C	--	--	31	W
Power Dissipation (TO-252-2L) DFN-4-8x8x0.85-2.0 (Note 2)	P <sub>D</sub>	T <sub>C</sub> =25°C	--	--	104	W
Single Pulsed Avalanche Energy	E <sub>AS</sub>	L=79mH, V <sub>DD</sub> =100V, R <sub>G</sub> =25Ω, starting temperature T <sub>J</sub> =25°C	--	--	310	mJ
Single Pulsed Avalanche Current	I <sub>AS</sub>	--	--	--	2.6	A
Reverse Diode dv/dt	dv/dt	V <sub>DS</sub> =0~400V, I <sub>SD</sub> <= I <sub>S</sub> , T <sub>J</sub> =25°C	--	--	50	V/ns
MOSFET dv/dt Ruggedness	dv/dt	V <sub>DS</sub> =0~480V	--	--	100	V/ns
Operation Junction Temperature Range	T <sub>J</sub>	--	-55	--	150	°C
Storage Temperature Range	T <sub>stg</sub>	--	-55	--	150	°C
Continuous Diode Forward Current	I <sub>S</sub>	T <sub>C</sub> =25°C, integral reverse P-N junction diode in the MOSFET	--	--	11	A
Diode Pulse Current	I <sub>S,pulse</sub>		--	--	44	A
Maximum Diode Commutation Speed	di/dt	V <sub>DS</sub> =0~400V, I <sub>SD</sub> <=I <sub>S</sub> , T <sub>J</sub> =25°C	--	--	250	A/μs



**THERMAL CHARACTERISTICS**

Table1. Thermal characteristics of TO-220FJH-3L/TO-220FJD-3L (SVS60R360FJH/FJDE3)

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	R <sub>θJC</sub>	--	--	--	4.1	°C/W
Thermal Resistance, Junction-ambient	R <sub>θJA</sub>	--	--	--	62.5	°C/W
Soldering Temperature (in line)	T <sub>sold</sub>	15 <sup>+2</sup> <sub>-0</sub> sec, 1time	--	--	260	°C

Table2. Thermal characteristics of TO-252-2L/ DFN-4-8x8x0.85-2.0 (SVS60R360D/L8AE3)

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	R <sub>θJC</sub>	--	--	--	1.2	°C/W
Thermal Resistance, Junction-ambient	R <sub>θJA</sub>	--	--	--	62.0	°C/W
Soldering Temperature (SMD)	T <sub>sold</sub>	Reflow soldering: 10±1sec, 3times Wave soldering: 10 <sup>+2</sup> <sub>-0</sub> sec, 1time	--	--	260	°C



**ELECTRICAL CHARACTERISTICS (UNLESS OTHERWISE NOTED, T<sub>J</sub>=25°C)**

**Static characteristics**

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	600	--	--	V
Drain-source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	--	--	1.0	μA
		V <sub>DS</sub> =600V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	--	1.5	--	
Gate-source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	--	--	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	2.0	--	4.0	V
Static Drain-source On State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =5.5A	--	0.3	0.36	Ω
Gate Resistance	R <sub>G</sub>	f=1MHz	--	3.7	--	Ω

**Dynamic characteristics**

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Input Capacitance	C <sub>iss</sub>	f=1MHz, V <sub>GS</sub> =0V, V <sub>DS</sub> =100V	--	929	--	pF
Output Capacitance	C <sub>oss</sub>		--	38	--	
Reverse Transfer Capacitance	C <sub>rss</sub>		--	1.0	--	
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =300V, V <sub>GS</sub> =10V, R <sub>G</sub> =10Ω, I <sub>D</sub> =11A (Notes 3,4)	--	14	--	ns
Turn-on Rise Time	t <sub>r</sub>		--	30	--	
Turn-off Delay Time	t <sub>d(off)</sub>		--	43	--	
Turn-off Fall Time	t <sub>f</sub>		--	25	--	
Total Gate Charge	Q <sub>g</sub>	V <sub>DD</sub> =480V, V <sub>GS</sub> =10V, I <sub>D</sub> =11A (Notes 3,4)	--	27	--	nC
Gate-source Charge	Q <sub>gs</sub>		--	7.4	--	
Gate-drain Charge	Q <sub>gd</sub>		--	12	--	
Gate-plateau Voltage	V <sub>plateau</sub>		--	6.7	--	V

**Reverse diode characteristics**

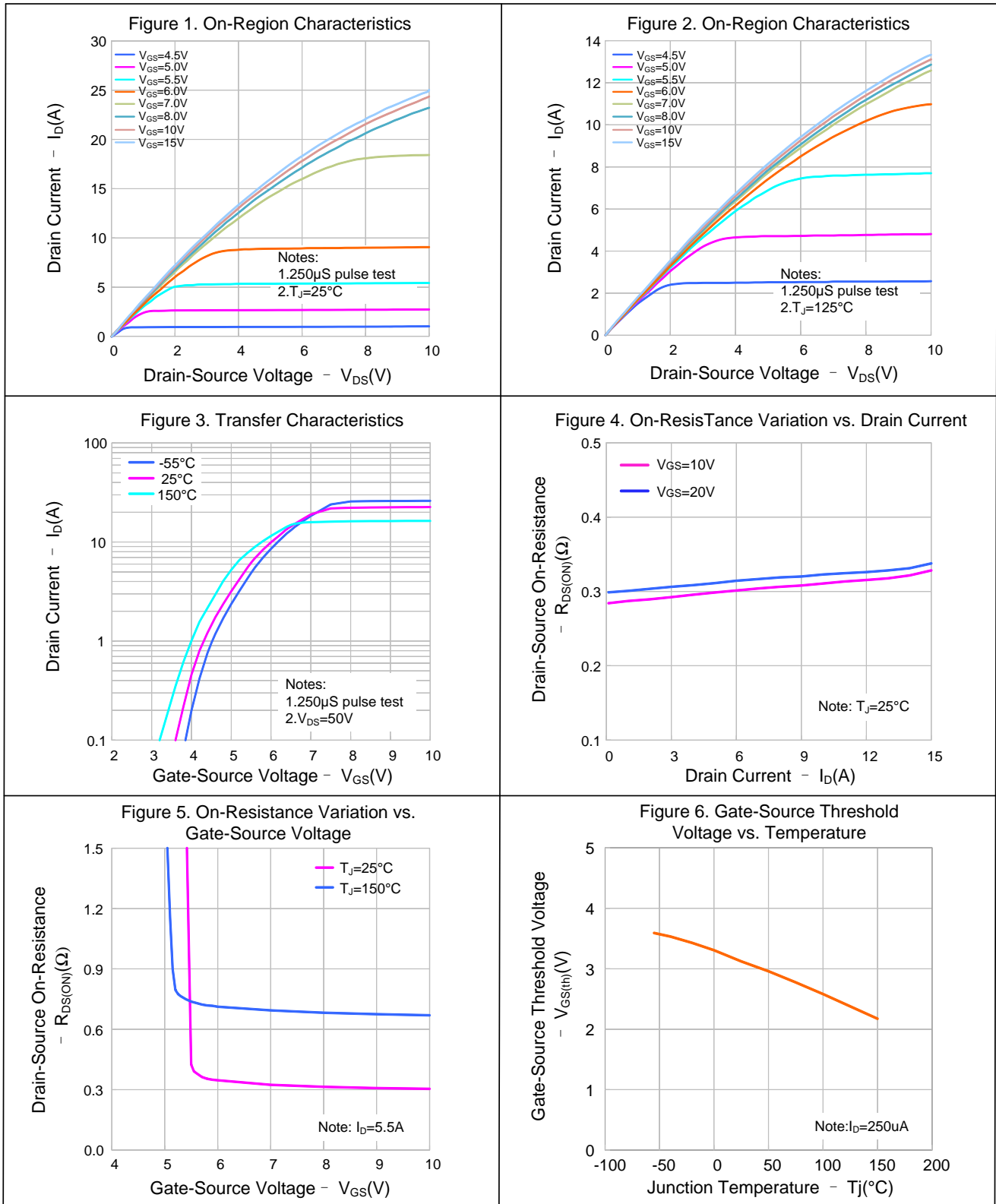
Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =11A, V <sub>GS</sub> =0V	--	--	1.4	V
Reverse Recovery Time	T <sub>rr</sub>	I <sub>S</sub> =11A, V <sub>GS</sub> =0V, di/dt=100A/μs (Note 3)	--	306	--	ns
Reverse Recovery Charge	Q <sub>rr</sub>		--	3.7	--	μC
Reverse Recovery Peak Current	I <sub>rrm</sub>		--	24	--	A

**Notes:**

1. Pulse time 5μs;
2. The dissipation power will change with temperature, derating above 25°C:  
0.24W/°C(TO-220FJH-3L)(TO-220FJD-3L)/ 0.83W/°C(TO-252-2L)( DFN-4-8x8x0.85-2.0);
3. Pulse Test: Pulse width ≤300μs, Duty cycle≤2%;
4. Essentially independent of operating temperature.

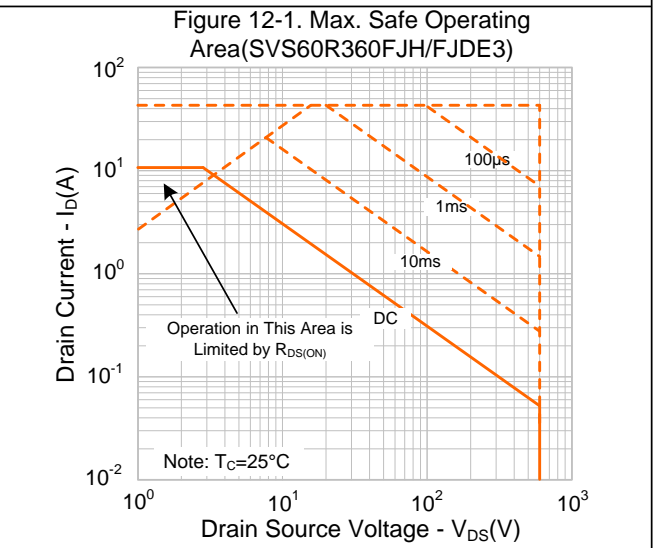
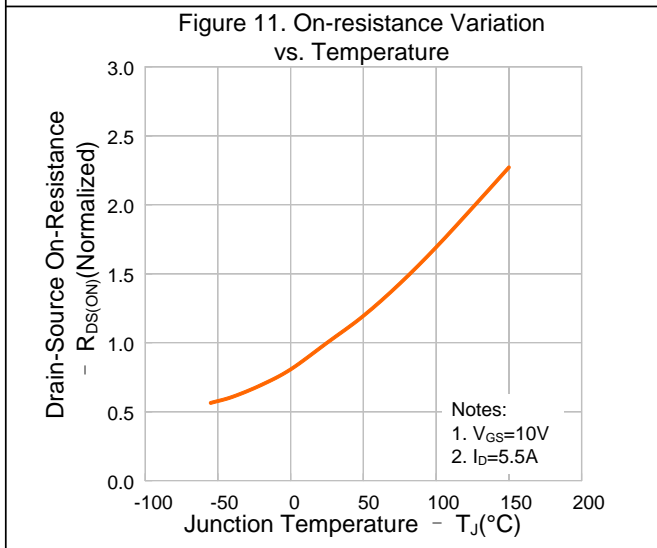
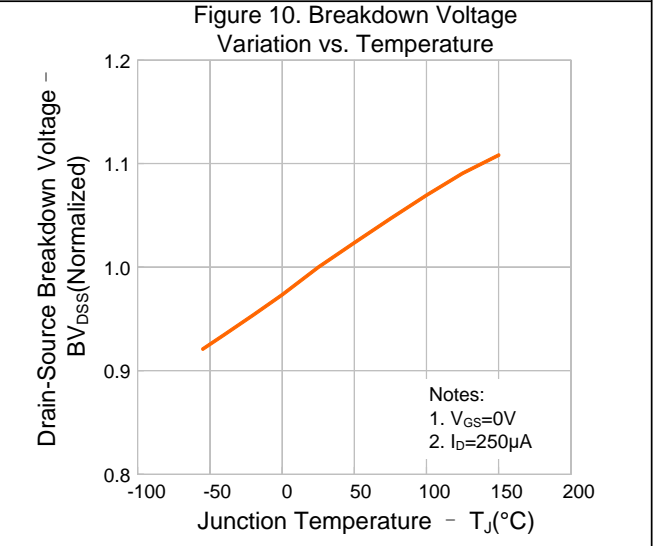
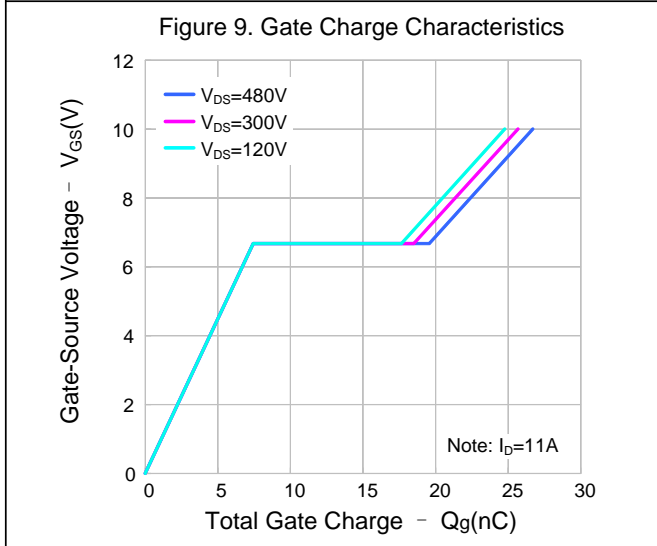
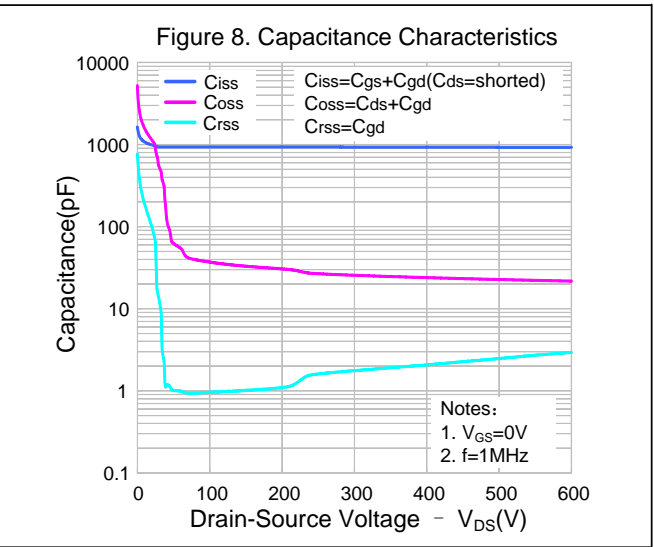
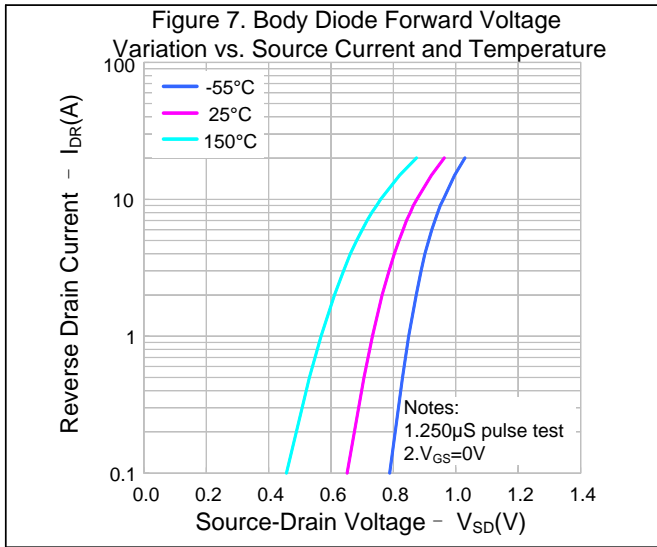


TYPICAL CHARACTERISTICS



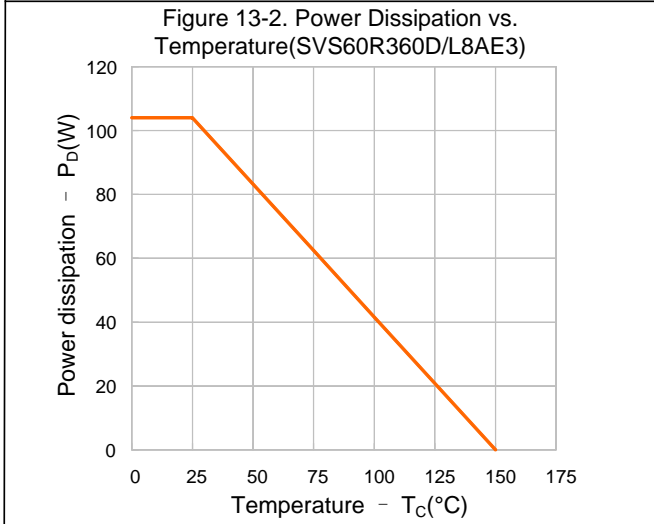
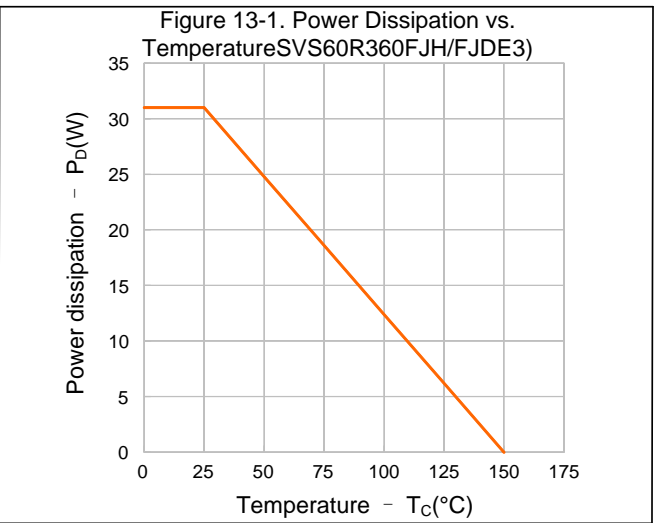
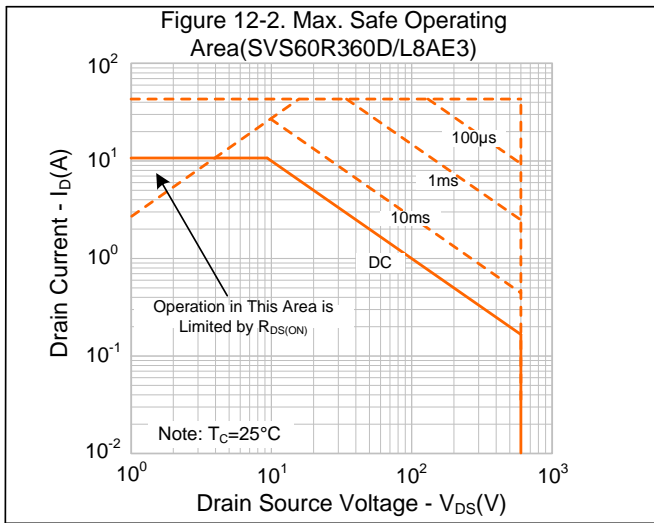


TYPICAL CHARACTERISTICS (CONTINUED)





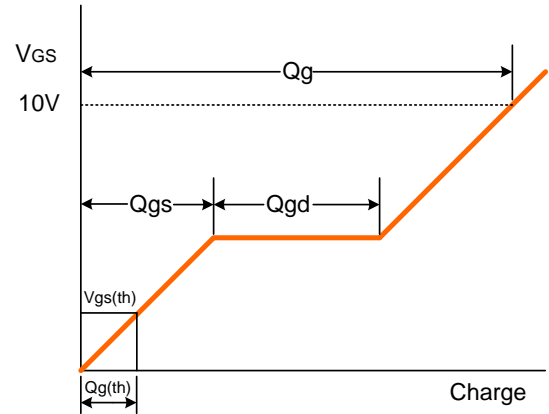
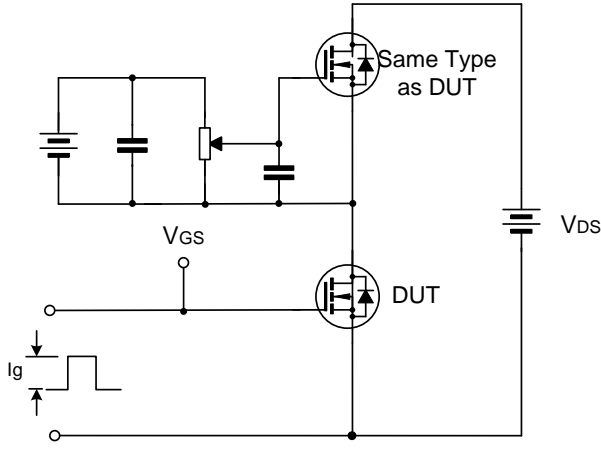
**TYPICAL CHARACTERISTICS (CONTINUED)**



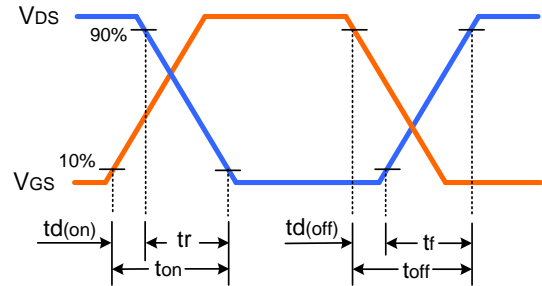
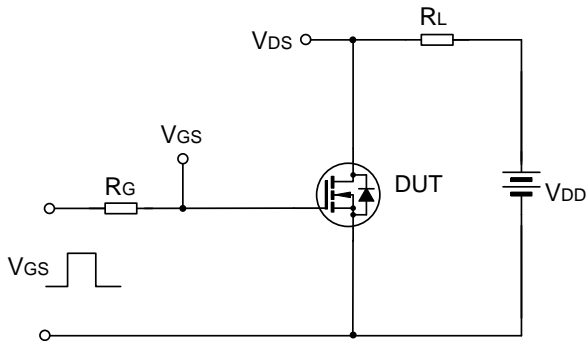


TYPICAL TEST CIRCUIT

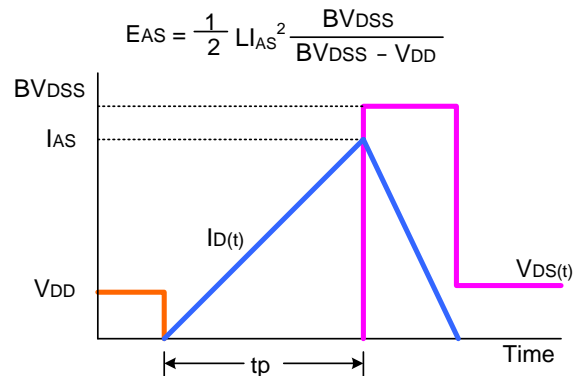
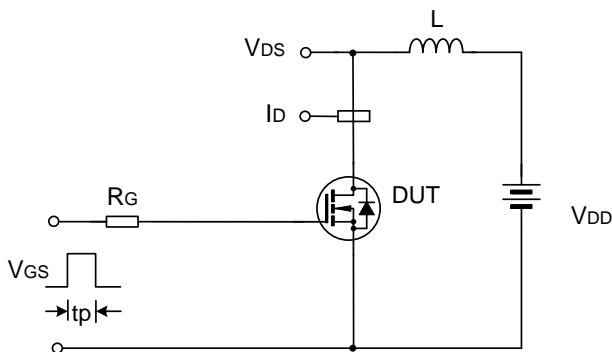
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform

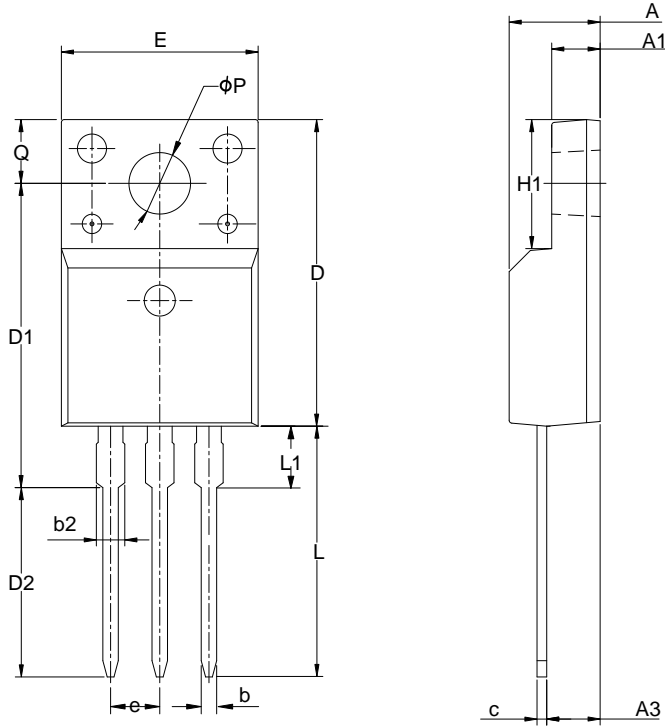






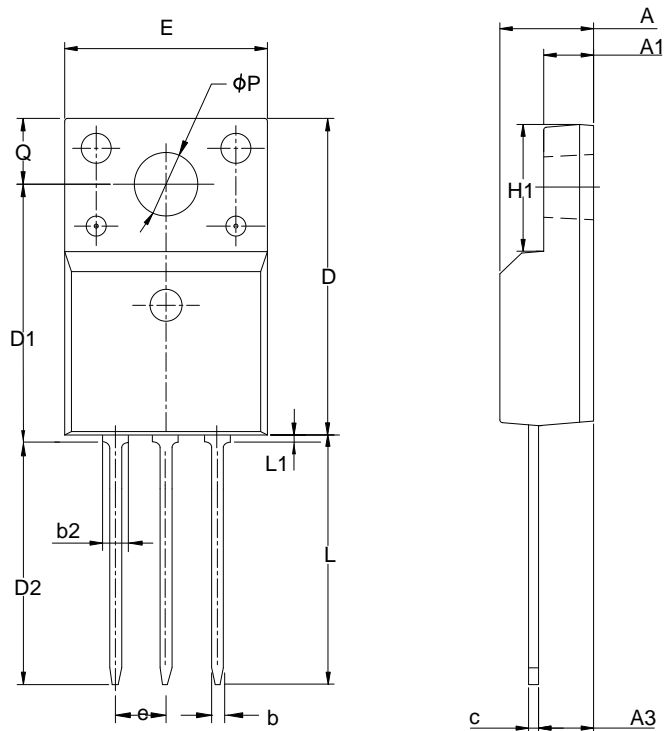
**PACKAGE OUTLINE**

**TO-220FJD-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	0.55	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	2.54BSC		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	—	—	2.00
$\phi P$	3.00	3.18	3.40
Q	3.05	3.30	3.55

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



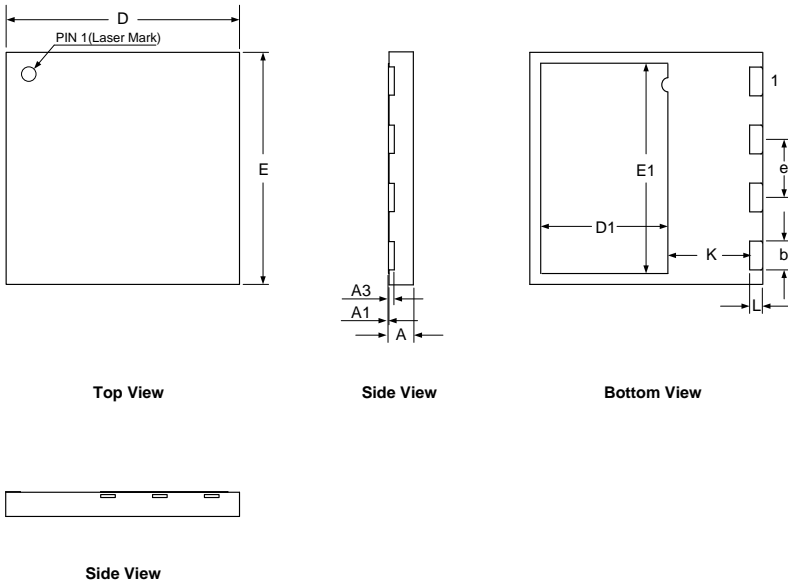
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.55	0.70	0.80
b2	—	—	1.29
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	12.87	13.07	13.27
D2	12.28	12.48	12.68
E	9.73	10.16	10.36
e	2.54BCS		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	—	—	0.85
$\phi P$	3.00	3.18	3.40
Q	3.05	3.30	3.55



PACKAGE OUTLINE(CONTINUED)

DFN-4-8x8x0.85-2.0

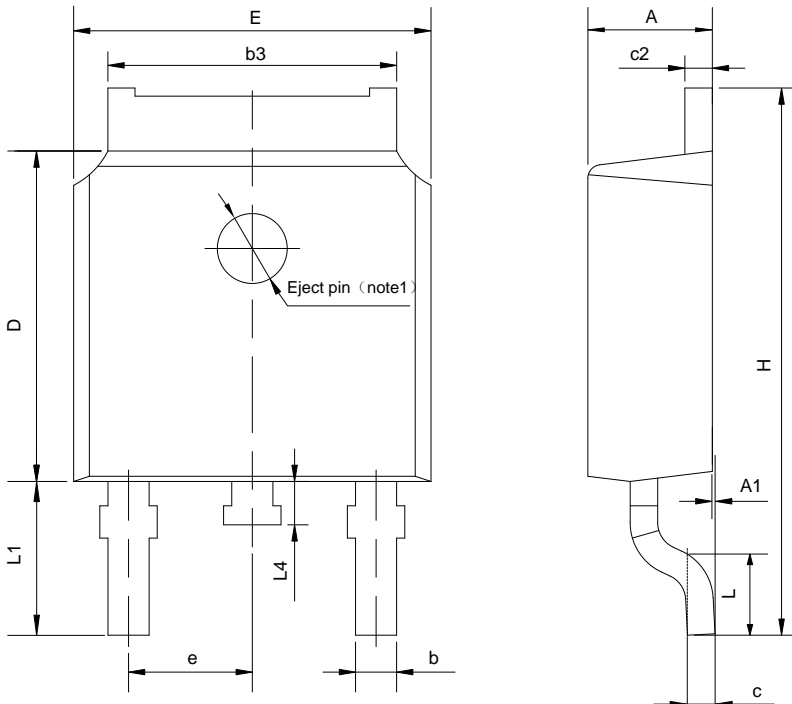
UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0.00	0.02	0.05
A3	0.20 REF		
b	0.90	1.00	1.10
D	7.90	8.00	8.10
D1	4.25	4.35	4.45
E	7.90	8.00	8.10
E1	7.10	7.20	7.30
e	1.90	2.00	2.10
K	2.65	2.75	2.85
L	0.40	0.50	0.60

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

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



## Important notice :

1. The instructions are subject to change without notice!
2. Customers should obtain the latest relevant information before placing orders and should verify that such information is complete and current. Please read the instructions carefully before using our products, including the circuit operation precautions.
3. Our products are consumer electronic products or the other civil electronic products.
4. 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.
5. It is strongly recommended to identify the trademark when buying our products. Please contact us if there is any question.
6. Product promotion is endless, our company will wholeheartedly provide customers with better products!
7. Website: <http://www.silan.com.cn>

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Part No.: SVS60R360FJH(FJD)(D)(L8A)E3

Document Type: Datasheet

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Rev.: 1.3

### Revision History:

1. Update package outline of DFN-4-8x8x0.85-2.0
- 

Rev.: 1.2

### Revision History:

1. Add SVS60R360L8AE3(DFN-4-8x8x0.85-2.0) package
  2. Update figures 12-1 and 13-1
- 

Rev.: 1.1

### Revision History:

1. Add SVS60R360FJDE3 (TO-220FJD-3L) and SVS60R360DE3 (TO-252-2L) package
  2. Update curve template
  3. Update important notice
- 

Rev.: 1.0

### Revision History:

1. First release
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