



Approval Sheet

Customer Information

Customer :			
Part Name :			
Part No. :			
Model No. :			
	Company	Purchase	R&D

Vendor Information

Name:	SFI Electronics Technology INC.
Part Name	Chip Surge Protection Device (CSPD) Series
Part No.	Super High Voltage (SHV) Series
Lot No.	

SFI Electronics Technology INC.

Address : No.6, Lane 340, Shan-Ying Road , Guishan,Tao Yuan Taiwan

TEL: 886-3-3506998 FAX: 886-3-3507689 E-mail: sfi@sfi.com.tw

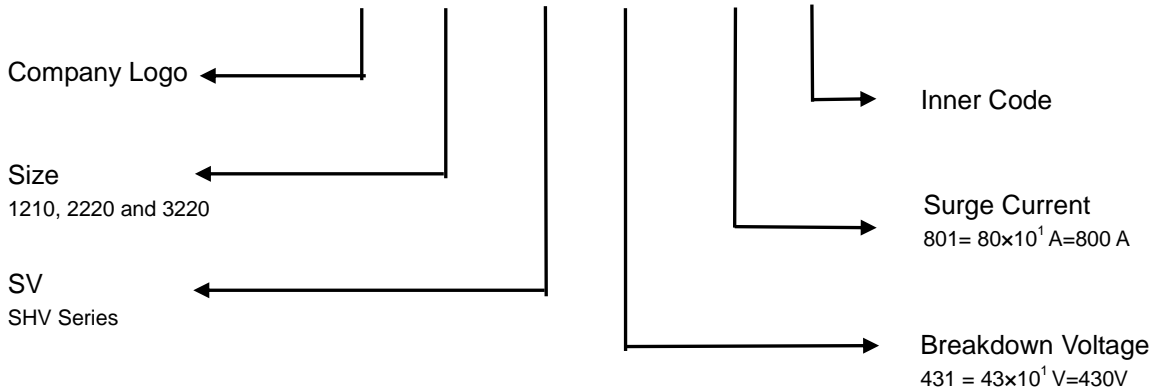
Quality Control	Document Control	Business Issue	
 ISO 9001:2008 ISO TS16949:2009 ISO 14001:2004	REV : E	Prepared	Check
	 2013.11.06 Issue Date Document Control Center		

Part No. :	SFI SHV Series	Document No.	AS-RDSHV186-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 1 -					



1. Part Number Identification

SFI 2220 SV 431 -801 A

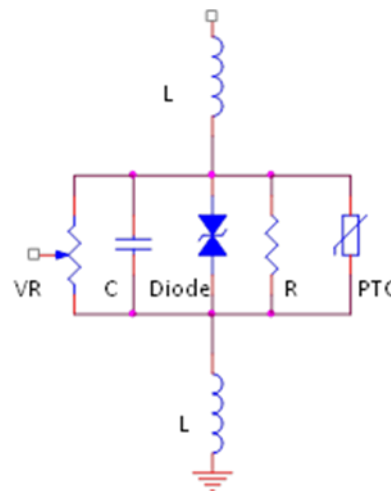


1.1 Features of SHV Series

1. RoHS compliant
2. SMD type Body size 1210, 2220 and 3220
3. Meet IEC61000-4-5 Standard
4. Bidirectional and symmetrical V/I characteristics
5. Large withstanding surge current capability : 200~800A (@8/20 μ s)
6. Operating temperature range : -55 ~ +85° C
7. Multi-Layers construction provides higher power dissipation

Equivalent Circuit

- ☆L Body Inductance
- ☆C Device Capacitance
- ☆VR Voltage Variable Resistor
- ☆R Insulation Resistor
- ☆Diode Voltage clamped
- ☆PTC For low leakage current



Part No. :	SFI SHV Series	Document No.	AS-RDSHV186-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 2 -					



1.2 Performance Characteristics

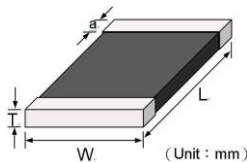
Part Number	Working Voltage		Breakdown Voltage ^(*1)	Clamping Voltage ^(*2)	Surge Current (8/20 μs) (1 time) ^(*3)	Surge Current (8/20 μs) (15 time) ^(*3)	Max Energy (10/1000 μs)	Capacitance ^(*4)	Safety Approvals	
	AC	DC							UL	cUL
Symbol	AC	DC	V (1mA)	V	A	A	J	pF(at 1 KHz)		
SFI1210SV391-201A	250	320	390(±10%)	647	200	100	7.2	105	√	
SFI2220SV391-501A	250	320	390(±10%)	647	500	250	19.8	235	√	
SFI2220SV431-501A	275	350	430(±10%)	705	500	250	21.6	215	√	
SFI2220SV471-501A	300	385	470(±10%)	775	500	250	23.7	195	√	
SFI2220SV391-801A	250	320	390(±10%)	647	800	500	31.8	320	√	
SFI2220SV431-801A	275	350	430(±10%)	705	800	500	34.7	305	√	√
SFI2220SV471-801A	300	385	470(±10%)	775	800	500	38.0	290	√	√
SFI3220SV431-801A	275	350	430(±10%)	705	800	500	65.0	490	√	√
SFI3220SV471-801A	300	385	470(±10%)	775	800	500	71.2	450	√	√

- * 1 The breakdown voltage was measured at 1 mA current.
- * 2 The clamping voltage was measured at standard current 1210(2.5A), 2220(10A) and 3220(10A).
- * 3 The surge current was tested at 8/20 μs waveform.
- * 4 The capacitance value only for customer reference, it's not formal specification.
- * 5 The components shall be employed within 1 year, in the nitrogen condition.

1.3 Other Data

Parameter	Symbol	Value	Unit
Body		Nano Special Ceramic	
End Termination		Ag/Ni/Sn	
Packaging		Reel	
Marking		None	
Lead Content		<1000	ppm

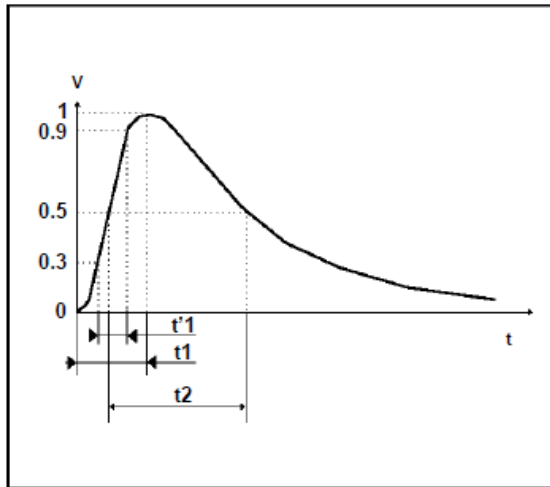
2. Mechanical Characteristics



Model	1210 Series	2220Series	3220 Series
Length(L)	3.2 +0.6/-0.2mm	6.0 +0.7/-0.3mm	8.1 +0.7/-0.3mm
Width(W)	2.5 +0.4/-0.2mm	5.3 +0.5/-0.3mm	5.3 +0.6/-0.3mm
Thickness(T)	2.60 mm Max	3.60 mm Max	3.70 mm Max
Termination(a)	0.5±0.25mm	0.5+0.35/-0.1mm	0.8+0.5/-0.1mm

Part No. :	SFI SHV Series	Document No.	AS-RDSHV186-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 3 -					

3. Surge Wave Form



10/700μs waveform current

IEC61000-4-5 Standards

SEVERITY LEVEL	t1 (=1.67t'1)	t2
1	8 μs	20 μs
2	10 μs	1000 μs

4. Environmental Reliability Test

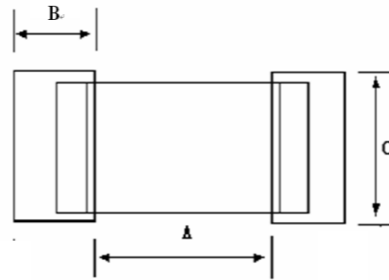
Item	Requirement	Test condition
High Temperature Storage	1. Breakdown voltage change : within ±10% 2. No mechanical damage	1. Temperature : 125±2°C 2. Time : 1000±2 hours 3. Test after placing in ambient temperature for 24 hours.
Low Temperature Storage	1. Breakdown voltage change : within ±10% 2. No mechanical damage	1. Temperature : -40±2°C 2. Time : 1000±2 hours 3. Test after placing in ambient temperature for 24 hours.
Temperature Cycle	1. Breakdown voltage change : within ±10% 2. No mechanical damage	1. Step 1 : -40±3°C; time : 30±3min 2. Step 2 : 25°C; time : 1 hour 3. Step 3 : 125±3°C; time : 30±3min 4. Step 4 : 25°C; time : 1 hour 5. Number of cycle : 5 times 6. Test after placing in ambient temperature for 24 hours.
High Temperature Load	1. Breakdown voltage change : within ±10% 2. No mechanical damage	1. Temperature : 85±2°C 2. Rated working voltage applied 3. Time : 1000±2 hours 4. Test after placing in ambient temperature for 24 hours.
Damp Heat Load/ Humidity Load	1. Breakdown voltage change : within ±10% 2. No mechanical damage	1. Temperature : 40±2°C 2. Humidity : 90~95% RH 3. Rated working voltage applied 4. Time : 500±2 hours 5. Test after placing in ambient temperature for 24 hours.

5. Soldering Recommendations

5.1 Recommended solder pad layout

(Unit : mm)

	A	B	C
1210	1.8~2.5	1.3~2.0	2.2~3.0
2220	3.8~4.6	1.3~2.2	4.8~5.5
3220	6.2~7.0	1.6~2.6	4.8~5.8

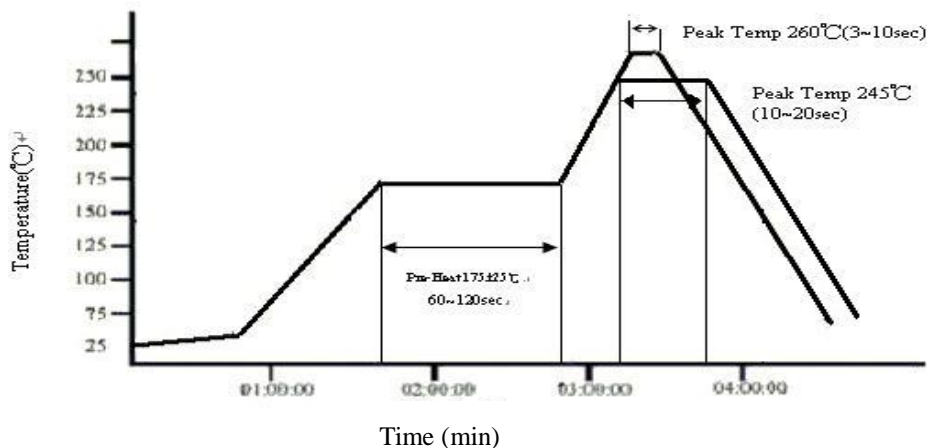


5.2 The SIR test of the solder paste shall be done (Based on JIS-Z-3284)

5.3 Steel plate and foot distance printing

Foot distance printing (mm)	Steel Plate thickness (mm)
> 0.65mm	0.18mm
0.65mm~0.5mm	0.15mm
0.50mm~0.40mm	0.12mm
<=0.40 mm	0.10mm

5.4 The IR Reflow and Temperature of Soldering for Pb Free



☆ IR reflow Pb Free Process suggestion profile

- (1) The solder recommend is Sn96.5/Ag 3.5 of 120 to 150 μ m
- (2) Ramp-up rate (217°C to Peak) + 3°C/second max
- (3) Temp. maintain at 175 \pm 25°C 180 seconds max
- (4) Temp. maintain above 217 °C 60-150 seconds
- (5) Peak temperature range 245°C +20°C / -10 °C time within 5 °C of actually peak temperature 10~20 seconds
- (6) Ramp down rate +6 °C/second max.

Part No. :	SFI SHV Series	Document No.	AS-RDSHV186-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 5 -					



※Perform adequate test in advance as the reflow temperature profile will vary according to the conditions of the manufacturing process, and the specification of the reflow furnace.

5.5 Resistance to Soldering Heat-High Temperature Resistance:260,10sec- 3 times.

5.6 Hand Soldering

In hand soldering of the SHN devices. Large temperature gradient between preheated the SHN devices and the tip of soldering iron may cause electrical failures and mechanical damages such as crackings or breakings of the devices. The soldering shall be carefully controlled and carried out so that the temperature gradient is kept minimum with following recommended conditions for hand soldering.

5.6.1 Recommended Soldering Condition 1

- (1) Solder :
0.12~0.18mm Thread solder (Sn96.5:Ag3.5) with soldering flux in the core.
Rosin-based and non-activated flux is recommended.
- (2) Preheating
The SHN devices shall be preheated so that Temperature Gradient between the devices and the tip of soldering iron is 150°C or below.
- (3) Soldering Iron
Rated Power of 20w max with 3mm soldering tip in diameter.
Temperature of soldering iron tip 380°C max, 3-5sec (The required amount of solder shall be melted in advance on the soldering tip.)
- (4) Cooling
After soldering. The SHN devices shall be cooled gradually at room ambient temperature.

5.6.2 Recommended Soldering Condition 2 (Without preheating)

- (1) Solder iron tip shall not directly touch to ceramic dielectrics.
- (2) Solder iron tip shall be fully preheated before soldering while soldering iron tip to the external electrode of the SHN devices.

5.7 Post Soldering Cleaning

5.7.1 Residues of corrosive soldering fluxes on the PC board after cleaning may greatly have influences on the electrical characteristic and the reliability (such as humidity resistance)of the SHN devices which have been mounted on the board. It shall be confirmed that the characteristic and the reliability of the devices are not affected by the applied cleaning conditions.

5.7.2. When an ultrasonic cleaning is applied to the mounted SHN devices on PC Boards.

Following conditions are recommended for preventing failures or damages of the devices due to the large vibration energy and the resonance caused by the ultrasonic waves.

- (1) Frequency 29MHz max
- (2) Radiated Power 20w/lithr max
- (3) Period 5minuets max

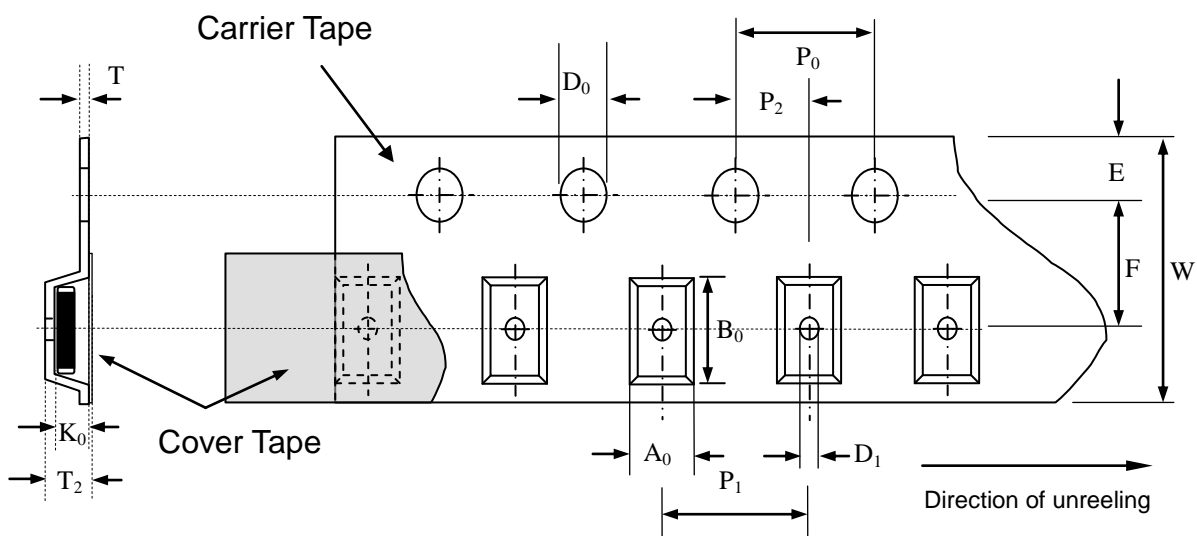
Part No. :	SFI SHV Series	Document No.	AS-RDSHV186-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 6 -					

6. Packaging Specification

6.1 Carrier tape and transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.

6.2 The adhesion of the heat-sealed cover tape shall be 40 +20/-15 grams.

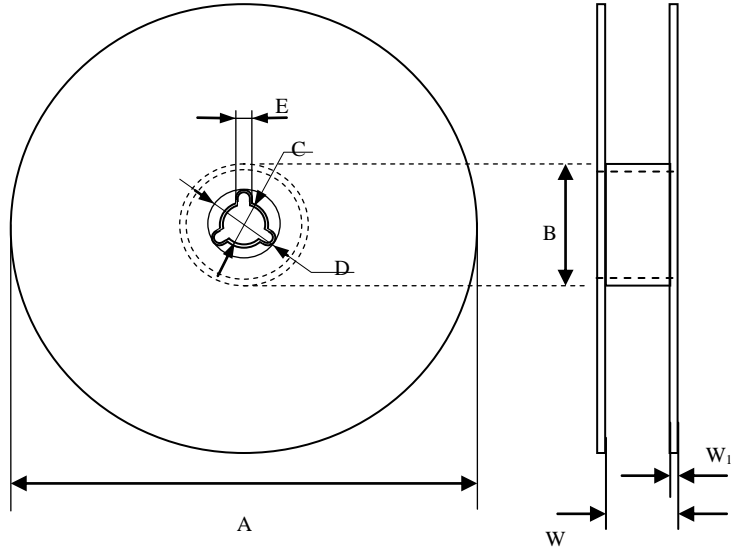
6.3 Both the head and the end portion of the taping shall be empty for reel package and SMT auto-pickup machine. And a normal paper tape shall be connected in the head of taping for the operator to handle.



Symbol	A_0 ± 0.10	B_0 ± 0.10	K_0 ± 0.10	T ± 0.05	T_2 ± 0.05	D_0 $+0.10$ -0.00	D_1 ± 0.05	P_1 ± 0.10	P_2 ± 0.05	P_0 ± 0.05	W ± 0.20	E ± 0.10	F ± 0.05
1210	3.00	3.90	2.70	0.22	2.87	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
2220	5.90	6.80	3.75	0.25	3.90	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50
3220	6.05	8.90	3.90	0.25	4.95	0.1	1.5	8.0	2.0	4.0	16.0	1.75	7.5

Part No. :	SFI SHV Series	Document No.	AS-RDSHV186-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 7 -					

7.Reel Dimension



Symbol	A	B	C	D	E	W	W ₁
1210	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.50	1.5±0.15
2220	178.0±1.0	60.2±0.5	13.0±0.5	21.0±0.2	2.5±0.5	13.6±0.2	1.5±0.15
3220	178.0±1.0	60.2±0.5	13.0±0.5	21.0±0.2	2.5±0.5	13.6±0.2	1.5±0.15

8.Standard Packaging

Size	1210	2220	3220
Pcs	1500	500	500