



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 Current (SHC) 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

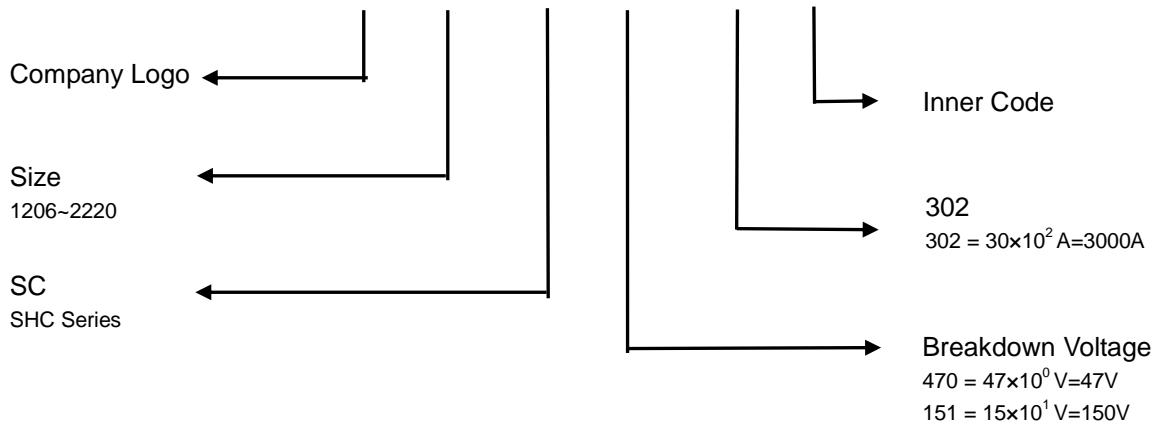
Quality Control	Document Control	Business Issue	
 ISO 9001:2008 ISO TS16949:2009 ISO 14001:2004	REV : E	Prepared	Check
			

Part No. :	SFI SHC Series	Document No.	AS-RDSHC183-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 SC 470 – 302 A

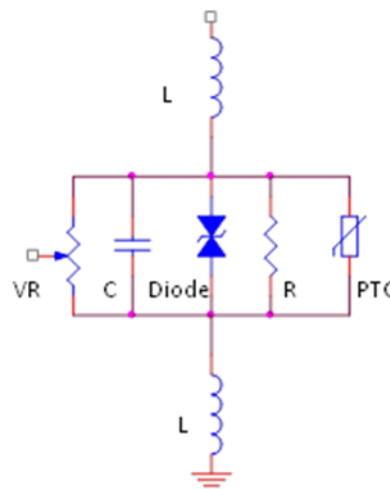


1.1 Features of SHC Series

1. RoHS compliant
2. SMD type Body size 1206 ~2220
3. Meet IEC61000-4-5 / K21 Standard
4. Bidirectional and symmetrical V/I characteristics
5. Large withstanding surge current capability : 500A ~3000A (@8/20μs)
6. Excellent low leakage current <15μA
7. Operating temperature range : -55 ~ +125°C
8. 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 SHC Series	Document No.	AS-RDSHC183-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 μ s) (*3)
	AC	DC			
Symbol	AC	DC	V (1mA)	V	A
SFI1206SC120-501A	6	9	12(12~20)	<25	500
SFI1206SC240-501A	14	18	24(\pm 10%)	< 45	500
SFI1206SC470-501A	30	38	47(\pm 10%)	< 85	500
SFI1206SC750-501A	48	60	75(\pm 10%)	< 100	500
SFI1210SC240-102A	14	18	24(\pm 10%)	< 45	1000
SFI1210SC470-102A	30	38	47(\pm 10%)	< 85	1000
SFI1210SC750-102A	48	60	75(\pm 10%)	< 100	1000
SFI1812SC240-202A	14	18	24(\pm 10%)	< 45	2000
SFI1812SC470-202A	30	38	47(\pm 10%)	< 85	2000
SFI1812SC750-202A	48	60	75(\pm 10%)	< 100	2000
SFI2220SC240-302A	14	18	24(\pm 10%)	< 45	3000
SFI2220SC470-302A	30	38	47(\pm 10%)	< 85	3000
SFI2220SC560-302A	35	45	56(\pm 10%)	<90	3000
SFI2220SC750-302A	48	60	75(\pm 10%)	< 100	3000
SFI2220SC820-302A	50	65	82(\pm 10%)	< 135	3000

* 1 The breakdown voltage was measured at 1 mA current.

* 2 The clamping voltage was measured at standard current, 1206(1A), 1210(2.5A), 1812(5A) and 2220(10A).

* 3 The surge current was tested at 8/20 μ s waveform.



1.3 Reference Data

Part Number	Non-linear Coefficient	Leakage current		Capacitance (*4)	Response Time	Operation Ambient Temperature	Storage Temperature
		before Surge Test	After Surge Test				
Symbol	α	μA	μA	PF(at 1 KHz)	T_{rise}	$^{\circ}C$	$^{\circ}C$
SFI1206SC120-501A	20	10	80	3500	<1ns	-55~+125	-55~+150
SFI1206SC240-501A	20	10	80	2300			
SFI1206SC470-501A	30	10	80	690			
SFI1206SC750-501A	.30	10	80	300			
SFI1210SC240-102A	20	15	80	2300			
SFI1210SC470-102A	30	10	80	1550			
SFI1210SC750-102A	30	10	80	930			
SFI1812SC240-202A	20	15	80	4500			
SFI1812SC470-202A	30	15	80	2100			
SFI1812SC750-202A	30	15	80	1650			
SFI2220SC240-302A	20	15	80	5500			
SFI2220SC470-302A	35	15	80	8000			
SFI2220SC560-302A	35	15	80	3500			
SFI2220SC750-302A	40	15	80	2000			
SFI2220SC820-302A	40	15	80	2000			

* 4 The capacitance value only for customer reference, it's not formal specification.

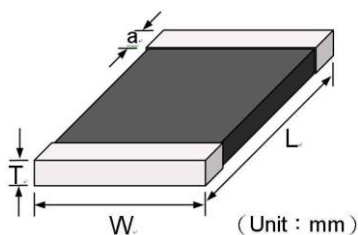
* 5 The components shall be employed within 1 year, in the nitrogen condition.



1.4 Other Data

Parameter	Symbol	Value	Unit
Body		Nano Special Ceramic	
End Termination		Ag/Ni/Sn(1206~2220)	
Packaging		Reel	
Marking		None	
Lead Content		<1000	ppm

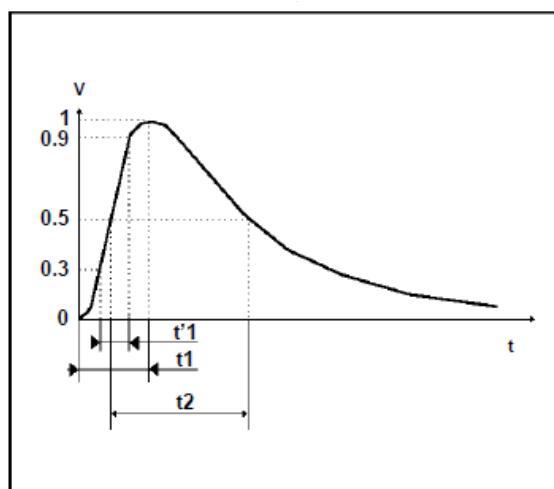
2 . Mechanical Characteristics



Model	1206 Series	1210 Series	1812 Series	2220 Series
Length(L)	3.2 +0.6/-0.2mm	3.2 +0.6/-0.2mm	4.5 +0.6/-0.2mm	6.0 +0.7/-0.3mm
Width(W)	1.6 +0.4/-0.2mm	2.5 +0.4/-0.2mm	3.2 +0.5/-0.2mm	5.3 +0.5/-0.3mm
Thickness(T)	1.90 mm Max	2.60 mm Max	3.50 mm Max	3.60 mm Max
Termination(a)	0.50±0.2mm	0.5±0.25mm	0.5+0.35/-0.1mm	0.5+0.35/-0.1mm



3. Surge Wave Form



8/20 μ s waveform current

IEC61000-4-5 Standards

SEVERITY LEVEL	t1 (=1.67t'1)	t2
1	8 μ s	20 μ s

4. Enviromental Reliability Test

Item	Requirement	Test condition
High Temperature Storage	1.Breakdown voltage change : within $\pm 10\%$ 2.No mechanical damage	1.Temperature : $150\pm 2^{\circ}\text{C}$ 2.Time : 1000 ± 2 hours 3.Test after placing in ambient temperature for 24 hours.
Low Temperature Storage	1.Breakdown voltage change : within $\pm 10\%$ 2.No mechanical damage	1.Temperature : $-40\pm 2^{\circ}\text{C}$ 2.Time : 1000 ± 2 hours 3.Test after placing in ambient temperature for 24 hours.
Temperature Cycle	1.Breakdown voltage change : within $\pm 10\%$ 2.No mechanical damage	1.Step 1 : $-40\pm 3^{\circ}\text{C}$; time : 30 ± 3 min 2.Step 2 : 25°C ; time : 1 hour 3.Step 3 : $125\pm 3^{\circ}\text{C}$; time : 30 ± 3 min 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 $\pm 10\%$ 2.No mechanical damage	1.Temperature : $125\pm 2^{\circ}\text{C}$ 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 $\pm 10\%$ 2.No mechanical damage	1.Temperature : $40\pm 2^{\circ}\text{C}$ 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.

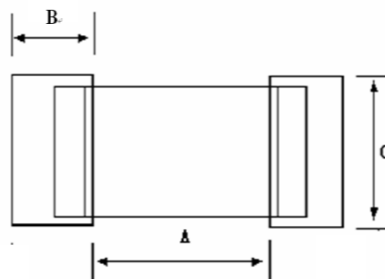


5. Soldering Recommendations

5.1 Recommended solder pad layout

(Unit : mm)

	A	B	C
1206	1.8~2.5	1.2~1.8	1.5~2.0
1210	1.8~2.5	1.3~2.0	2.2~3.0
1812	2.5~3.3	1.3~2.2	2.8~3.6
2220	3.8~4.6	1.3~2.2	4.8~5.5

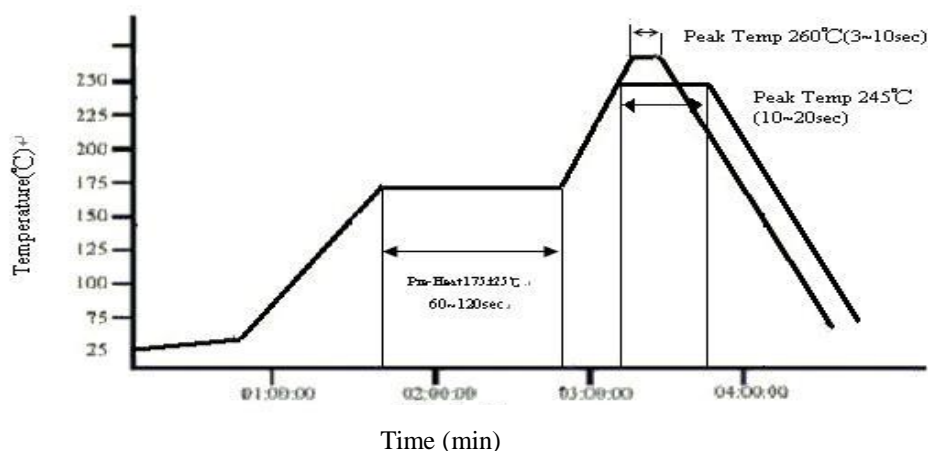


5.2 The SIR test of the solder paste shall be done (Based on JIS-Z-3284)

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.

※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.

Part No. :	SFI SHC Series	Document No.	AS-RDSHC183-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 7 -					



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

5.6 Hand Soldering

In hand soldering of the SHC devices. Large temperature gradient between preheated the SHC 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 SHC devices shall be preheated so that Temperature Gradient between the devices and the tip of soldering iron is 150℃ or below.
- (3) Soldering Iron
Rated Power of 20w max with 3mm soldering tip in diameter.
Temperature of soldering iron tip 380℃ max, 3-5sec (The required amount of solder shall be melted in advance on the soldering tip.)
- (4) Cooling
After soldering. The SHC 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 SHC 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 SHC 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 SHC 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

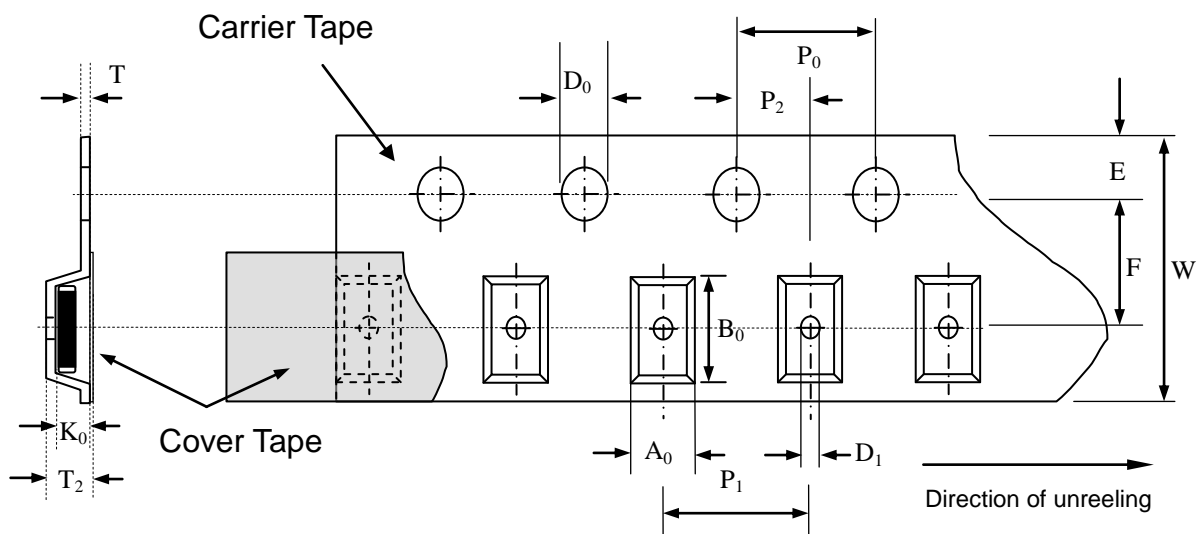
Part No. :	SFI SHC Series	Document No.	AS-RDSHC183-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 — 8 —					

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.

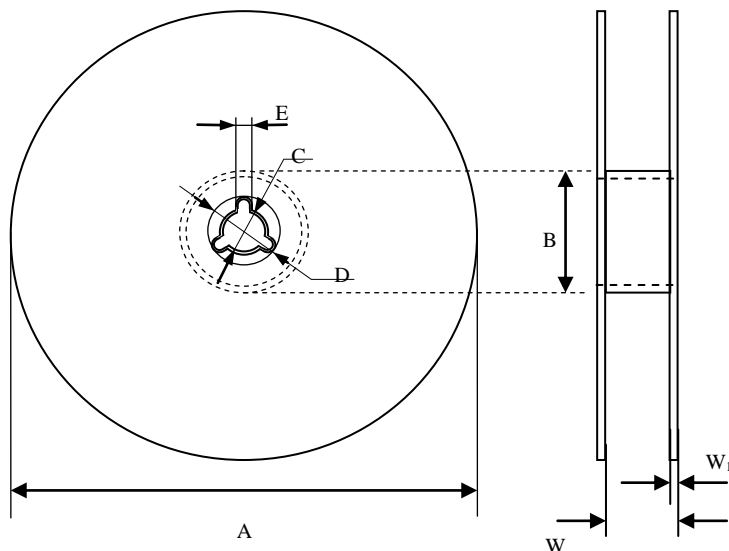
6.3 Both the head and the end portion of the taping shall be empty for reel package and SMT auto-pickup machine. And a normal paper tape shall be connected in the head of taping for the operator to handle.



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
1206	2.10	3.90	2.10	0.22	2.32	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
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
1812	3.80	5.25	3.60	0.25	3.40	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50
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



7.Reel Dimension



Symbol	A	B	C	D	E	W	W ₁
1206	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
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
1812	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
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

8.Standard Packaging

Size	1206	1210	1812	2220
Pcs	2000	1500	500	500

Part No. :	SFI SHC Series	Document No.	AS-RDSHC183-LF	REV.	E
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 — 10					