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 Network (SHN) Series
Lot No.	

SFI Electronics Technology Inc.

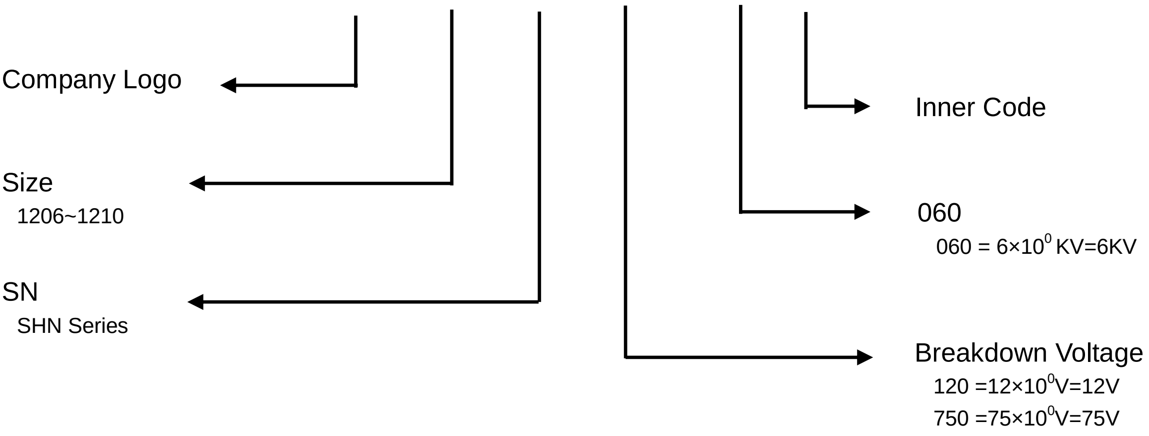
ADDRESS : No.6, Lane 340, Shan-Ying Road, Guishan, Tao Yuan, Taiwan

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

Quality Control	Document Control	Business Issue	
TÜVRheinland® CERTIFIED ISO 9001:2008 ISO 14001:2004 ISO/TS 16949:2009 Management System www.tuv.com ID 1100008833	REV : G	Prepared	Check
	SFI Electronics Technology INC. 2015.10. 07 Issue Date Document Control Center		

1. Part Number Identification

SFI 1206 SN 120 – 060 K



Company Logo

Size
1206~1210

SN
SHN Series

Inner Code

060
060 = 6×10^{0} KV=6KV

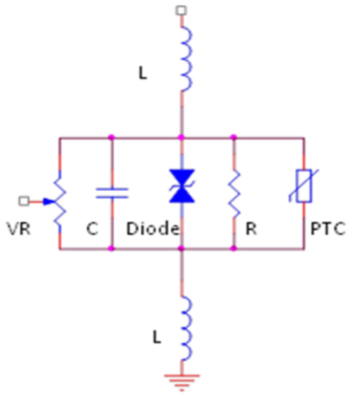
Breakdown Voltage
120 =12×10^{0}V=12V
750 =75×10^{0}V=75V

1.1 Features of SHN Series

1. RoHS compliant
2. SMD type body size 1206~1210
3. Meet IEC61000-4-5 / K21 standards
4. Bidirectional and symmetrical V/I characteristics
5. Large withstanding surge current capability : 4~6KV (@10/700)
6. Excellent low leakage current
7. Operating temperature range : -55~+125℃
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**



1.2 Performance Characteristics

Part No.	Working Voltage (Max.)		Breakdown Voltage	Clamping Voltage (Max.)	Surge Current (10/700μs) (Max.)	Surge Voltage (10/700μs) (Max.)
Symbol	V_{AC}	V_{DC}	V_B	V_C	I_{Peak}	V_{Surge}
Unit	AC	DC	V	V	A	KV
SFI1206SN120-040K	6	9	12(12~20)	30	100	4
SFI1206SN120-060K	6	9	12(12~20)	30	150	6
SFI1210SN470-040K	30	38	47(±10%)	75	100	4
SFI1210SN470-060K	30	38	47(±10%)	75	150	6
SFI1210SN750-040K	48	60	75(±10%)	100	100	4
SFI1210SN750-060K	48	60	75(±10%)	100	150	6

1.3 Reference Data

Part No.	Non-linear Coefficient	Leakage Current at V_B × 80%		Capacitance (1KHz)	Response Time	Operation Ambient Temperature	Storage Temperature Range
		at initial state	after reality test				
Symbol	α	I_{VB}	I_{VBA}	C	T_{rise}	T_{OPT}	T_{STG}
Unit		μA	μA	pF	ns	℃	℃
SFI1206SN120-040K	20	<10	<80	3200	<1	-55~+125	-55~+150
SFI1206SN120-060K	20	<10	<80	3850			
SFI1210SN470-040K	30	<10	<80	1400			
SFI1210SN470-060K	30	<10	<80	1670			
SFI1210SN750-040K	30	<10	<80	1000			
SFI1210SN750-060K	30	<10	<80	1300			

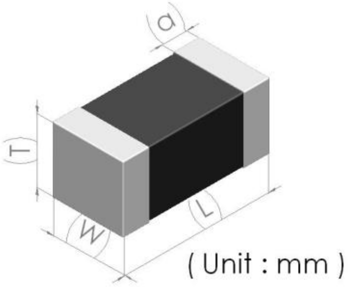
1.4 Other Data

Parameter	Value	Unit
Body	Nano special ceramic	
End termination	Ag/Ni/Sn	
Packaging	Reel	
Complies with standards	IEC61000-4-5 ITU-T K20, K21	
Complies with RoHs standard	Yes	
Marking	None	
Lead content	＜1000	ppm

Notes :

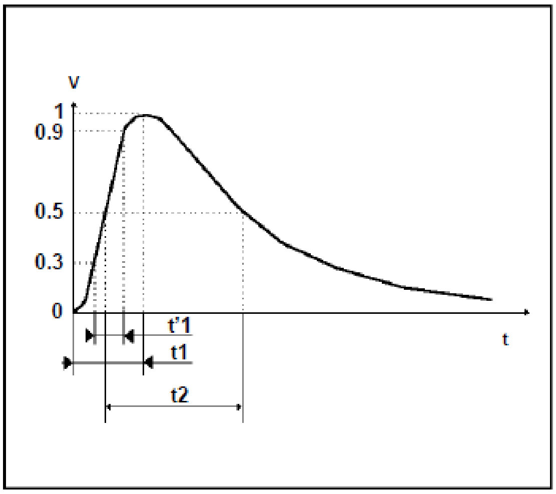
∗1 The breakdown voltage was measured at 1mA.
∗2 The clamping voltage was measured at 8/20μs standard current, 1206(1A) and 1210(2.5A).
∗3 The surge current was tested at 10/700μs waveform, Ri=40ohm. Common-mode testing is to test all data lines while the GND.
∗4 The capacitance value only for customer reference, it’s not formal specification.
∗5 The components shall be employed within 1 year, in the nitrogen condition.

2. Mechanical Characteristics



Model	1206 Series	1210 Series
Length(L)	3.20 +0.60/-0.20	3.20 +0.60/-0.20
Width(W)	1.60 +0.40/-0.20	2.50 +0.40/-0.20
Thickness(T)	1.90 max.	2.60 max.
Termination(a)	0.50±0.20	0.50±0.25

3. Surge Wave Form



10/700µs waveform current

K21 Standard

SEVERITY LEVEL	t1 (=1.67t'1)	t2
1	10 µs	700 µs

4. Enviromental Reliability Test

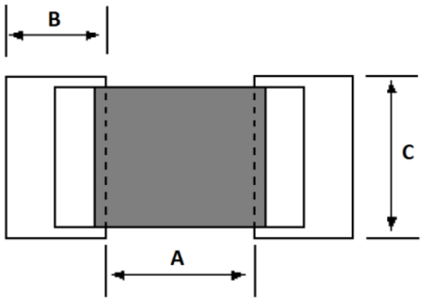
Item	Requirement	Test condition
High Temperature Storage	1.Breakdown voltage change : within ±10% 2.No mechanical damage	1.Temperature : 150±2℃ 2.Time : 1000±2 hours 3.Test after placing in ambient temperature for 24 hours.
Low Temperature Storage	1.Breakdown voltage change : within ±10% 2.No mechanical damage	1.Temperature : -40±2℃ 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℃; time : 30±3min 2.Step 2 : 25℃; time : 1 hour 3.Step 3 : 125±3℃; time : 30±3min 4.Step 4 : 25℃; 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 : 125±2℃ 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℃ 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	2.5~3.3

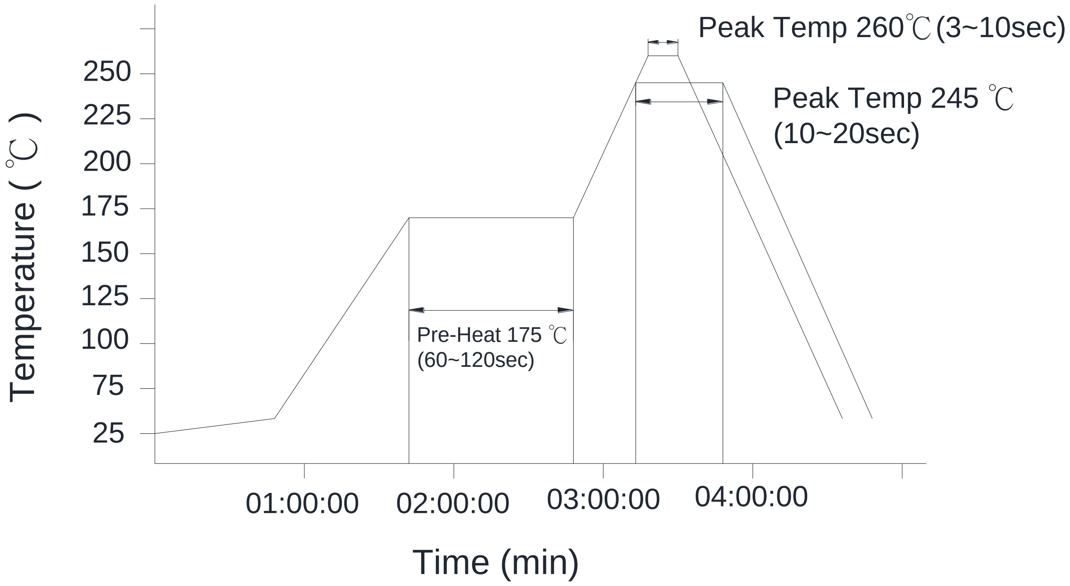


5.2 The SIR test of the solder paste shall be done (Based on JIS-Z-3284)

5.3 Steel plate and foot distance printing

Foot distance printing (mm)	Steel plate thickness (mm)
≧0.65mm	0.18mm
0.50~0.65mm	0.15mm
0.40~0.50mm	0.12mm
≦0.40mm	0.10mm

5.4 The IR reflow and temperature of soldering for Pb free process



☆ **IR reflow Pb free process suggestion profile**

(1) The solder recommend is Sn96.5/Ag3.5, and thickness recommend as shown in table 5.3

(2) Ramp-up rate (217℃ to peak) +3℃/second max.

(3) Temp. maintain at 175±25℃ 180 seconds max.

(4) Temp. maintain above 217℃ 60~150 seconds

(5) Peak temperature range 245 +20℃/-10℃ within 5℃ of actually peak temperature (t_p) 10~20 seconds

(6) Ramp down rate -6℃/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.

5.5 Resistance to soldering heat and 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 cracking or breaking 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 (with preheating)

(1) Solder

0.12~0.18mm thread solder (Sn96.5:Ag3.5) with soldering flux in the core, and rosin-based 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℃ 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 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 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 conditions caused by the ultrasonic waves.

(1) Frequency 29MHz max.

(2) Radiated power 20W/liter max.

(3) Period 5minuets max.

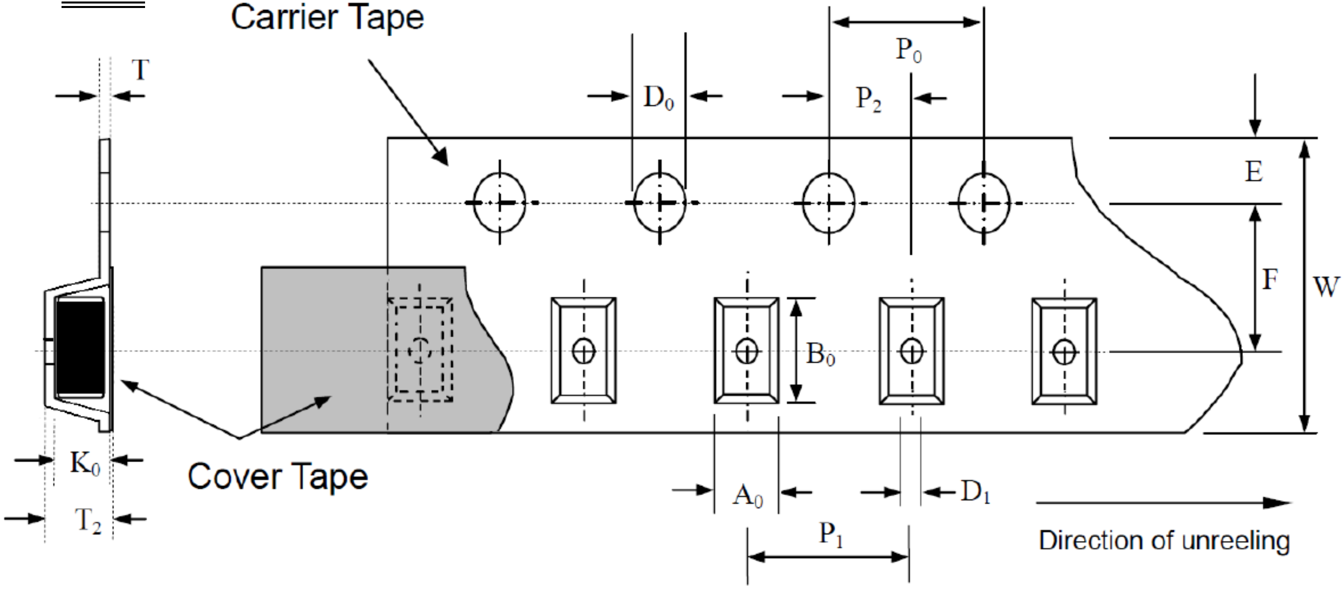
6. Packaging Specification

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.

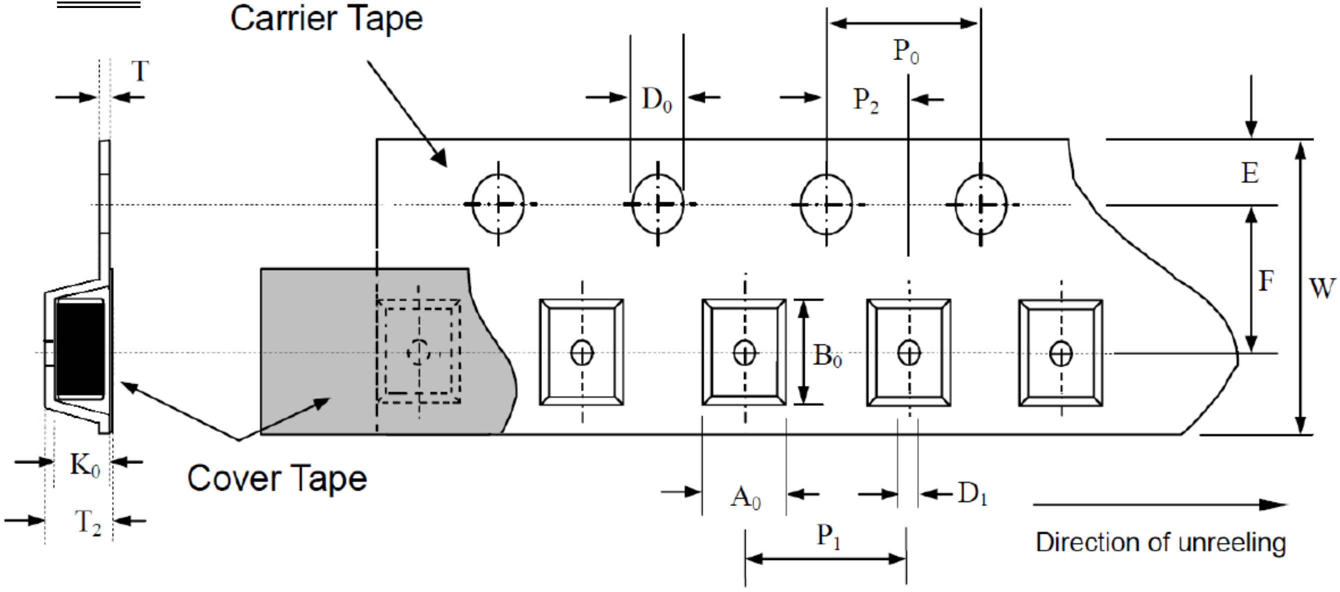
1206



(Unit : mm)

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	2.00	0.22	2.22	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50

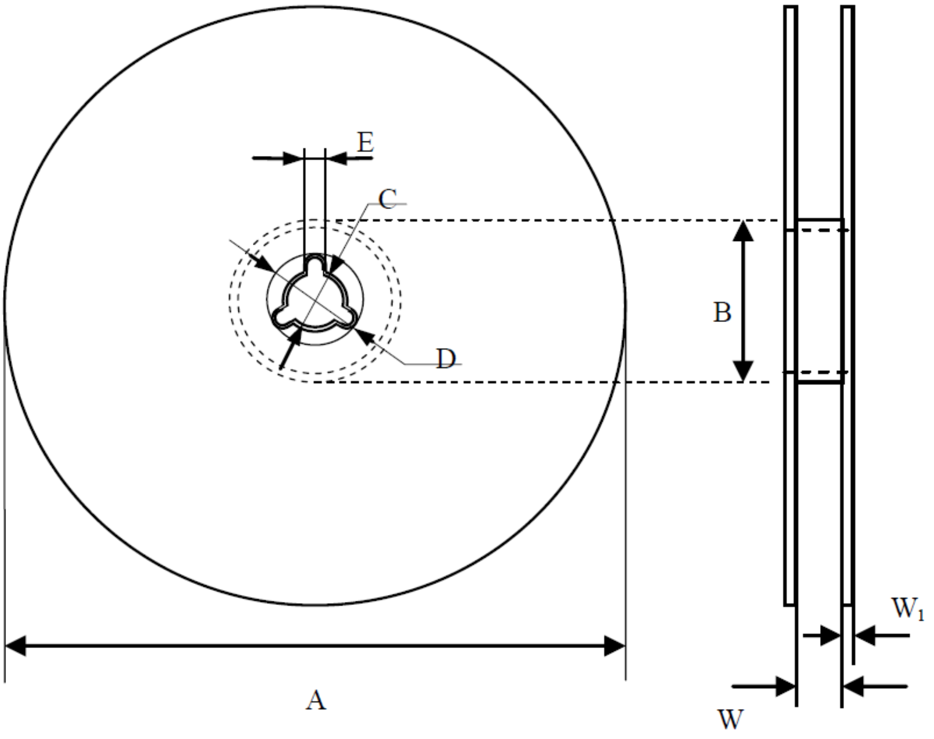
1210



(Unit : mm)

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	2.92	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50

7. Reel Dimension



(Unit : mm)

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±0.5	1.5±0.1
1210	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.5	1.5±0.1

8. Standard Packaging

Size	1206	1210
Pcs	2000	1500