



SFI Electronics Technology

SMD Transient Voltage Suppressors

APPROVAL SHEET

Customer Information

Customer :			
Part Name :			
Part No. :			
Model No. :			
COMPANY	PURCHASE	R&D	

Vendor Information

Name:	SFI ELECTRONICS TECHNOLOGY CORP. INC.
Part Name	Chip TVS
Part No.	SFI0603- 120E220NP
Lot No.	

SFI ELECTRONICS TECHNOLOGY INC.

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

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

Quality Control	Document Control	Business Issue	
	REV : A	Prepared	Check
			



SFI Electronics Technology

SMD Transient Voltage Suppressors

PART NO. SFI0603-120E220NP

1.1 Technology Data	Symbol		Value	Unit
Maximum allowable continuous AC voltage at 50-60 Hz	V_{RMS}		8	V
Maximum allowable continuous DC voltage	V_{DC}		12	V
Varistor voltage measured * ₁	V_V		18~33	V
Typical capacitance value measured at 1K Hz	C		22	pF
Typical capacitance value tolerance			30	%
Maximum ESD allowable clamping Voltage* ₂	V_{CLAMP}	<	22	V
Leakage current at V_{DC} * ₃ (At initial state)	I_{LDC}	<	0.1	uA
Leakage current at V_{DC} * ₃ (After ESD Test)	I_{LDCA}	<	2	uA

1.2 Reference Data

Maximum Energy Absorption * ₄	E	<	0.05	J
Response time	T_{rise}	<	1	ns
Leakage current at $V_V \times 80\%$ (At initial state)	I_{V_V}	<	50	uA
Leakage current at $V_V \times 80\%$ (After reality Test)	$I_{V_V A}$	<	200	uA
Operating ambient temperature			-55~ +85	°C
Storage temperature			-55~+125	°C
Reflow solder profile temperature(Recommend)			225	°C

1.3 Other Data

Body	ZnO
End termination	Ag/Pd/Pt
Packaging	Reel
Complies with Standard	IEC61000-4-2
Procedure	Solgel
Marking	None

Notes :

- * 1 The varistor voltage was measured at 1 mA current , tolerance at +-15%
- * 2 The Clamping voltage was measured at ESD strike during the transition from high to low impedance IEC61000-4-2. 30A@8KV,level4, after initiation of pulse, all test in contact discharge mode °
- * 3 The Leakage current was measured working voltage °
- * 4 The Energy only for customer reference °

Part No. :	SFI0603 - 120E220NP	Document No.	AS-RD0603ME012	REV.	A
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 2 -					

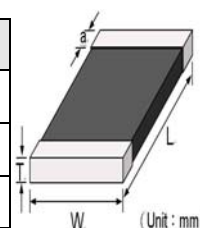


SFI Electronics Technology

SMD Transient Voltage Suppressors

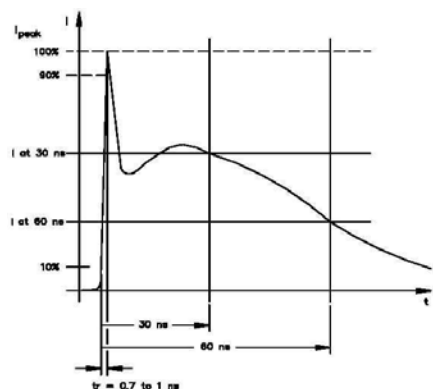
2 .Size

Model	0402(1005)	0603(1608)	0805(2012)	1206(3216)	1210(3225)	1812(4532)	2220(5750)
Length(L)	1.00 ±0.10	1.60±0.15	2.00±0.20	3.20±0.20	3.20±0.20	4.50±0.20	5.70±0.20
Width(W)	0.50 ±0.10	0.80±0.10	1.25±0.15	1.60±0.15	2.50±0.20	3.20±0.20	5.00±0.20
Thickness(T)	0.60 max	0.90 max	1.20 max	1.50 max	1.50 max	2.00 max	2.50 max



3. ESD Wave Form

IEC61000-4-2 Standards



SEVERITY LEVEL	AIRDIRCHARGE	DIRECT DISCHARGE
1	2 KV	2 KV
2	4 KV	4 KV
3	8 KV	6 KV
4	15 KV	8 KV

IEC 61000-4-2 Compliant ESD Current Pulse Waveform

4. Enviromental Reliability Test

Characteristic	Test method and description			
High Temperature Storage	The specimen shall be subjected to $150 \pm 2^{\circ}\text{C}$ for 1000 ± 12 hours in a thermostatic bath without load and then stored at room temperature and humidity for 1 to 2 hours. The change of varistor voltage shall be within 10 % .			
Temperature Cycle	The temperature cycle of specified temperature shall be repeated five times and then stored at room temperature and humidity for one or two hours. the change of varistor voltage shall be within 10 % and mechanical damage shall be examined.	Step	Temperature	Period
		1	$-40 \pm 3^{\circ}\text{C}$	30Min \pm 3
		2	Room Temperature	1~2 hours
		3	$125 \pm 2^{\circ}\text{C}$	30Min \pm 3
		4	Room Temperature	1~2 hours
High Temperature Load	After being continuously applied the maximum allowable voltage at $125 \pm 2^{\circ}\text{C}$ for 1000 ± 2 hours, the specimen shall be stored at room temperature and humidity for one or two hours, the change of varistor voltage shall be within 10% .			
Damp Heat Load/ Humidity Load	The specimen should be subjected to $40 \pm 2^{\circ}\text{C}$, 90 to 95 % RH enviroment, and the maximum allowable voltage applied for 1000 hours, then stored at room temperature and humidity for one or two hours. the change of varistor voltage shall be within 10%			
Low Temperature Storage	The specimen should be subjected to $40 \pm 2^{\circ}\text{C}$, without load for 1000 hours and then stored at room temperature for one or two hours. the change of varistor voltage shall be within 10 %			

Part No. :	SFI0603 - 120E220NP	Document No.	AS-RD0603ME012	REV.	A
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 3 -					

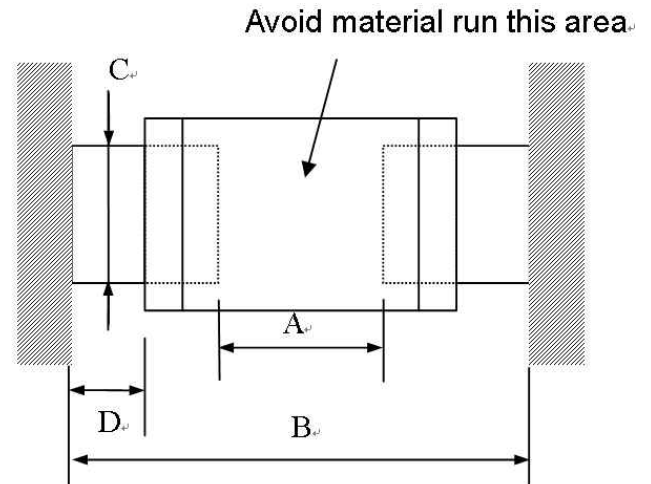


5. Soldering Recommendations

5.1 Recommended solder pad layout

(Unit : mm)

	A	B	C	D
0402	0.4~0.6	1.6~1.8	0.5~0.6	0.2~0.4
0603	0.8~1.2	2.5~3.0	0.6~1.0	0.3~0.6
0805	1.0~1.5	3.2~3.8	1.2~1.4	0.3~0.6
1206	1.8~2.5	4.2~5.8	1.2~1.6	0.4~0.8
1210	1.8~2.5	4.2~5.8	1.8~2.5	0.5~1.0
1812	2.5~3.5	5.5~6.1	2.3~3.2	0.6~1.1
2220	3.5~4.6	6.0~7.2	4.8~5.5	1.2~2.3

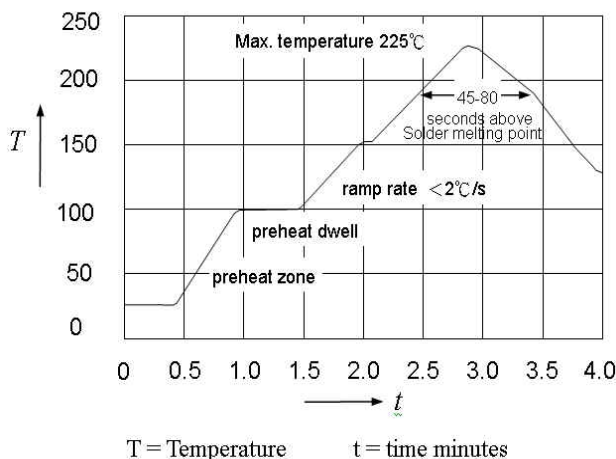


5.2 The solder paste shall be printed in a thickness of 150 to 200 μ m.

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

5.4 IR Soldering

Rapid heating, partial heating or rapid cooling will easily cause defect of the component. So preheating and gradual cooling process is suggested. IR soldering has the highest yields due to controlled heating rates and solder liquidus times. Make sure that the element is not subjected to a thermal gradient steeper than 4 degrees per second. 2 degrees per second is the ideal gradient. During the soldering process, pre- heating to within 100 degrees of the solders peak temperature is essential to minimize thermal shock.



(a) Preheat

1. The temperature rising speed is suggested to be 2~4°C/s.
2. Appropriate preheat time will be from 60 to 120 seconds.

(b) Heating

1. Careful about sudden rise in temperature as it may worsen the solder ability.
2. Set the peak temperature in the range from 215 °C to 225°C.

(c) Cooling

1. Careful about slow cooling as it may cause the position shift of component.

※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 Hand Soldering

In hand soldering of the Varistors. Large temperature gradient between preheated the Varistors 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.

5.5.1 Recommended Soldering Condition 1

- (1) Solder :
1mm Thread solder (sn63:pb37) with soldering flux in the core.
Rosin-based and non-activated flux is recommended.
- (2) Preheating
The Varistors shall be preheated so that Temperature Gradient between the devices and the tip of soldering iron is 150C or below.
- (3) Soldering Iron
Rated Power of 20w max with 3mm soldering tip in diameter.
Temperature of soldering iron tip 300C max (The required amount of solder shall be melted in advance on the soldering tip.)
- (4) Cooling
After soldering. The Varistors shall be cooled gradually at room ambient temperature.

5.5.2 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 Varistors.

5.6 Post Soldering Cleaning

- 5.6.1 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 Varistors 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.
- 5.6.2. When an ultrasonic cleaning is applied to the mounted Varistors 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. :	SFI0603 - 120E220NP	Document No.	AS-RD0603ME012	REV.	A
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 5 -					

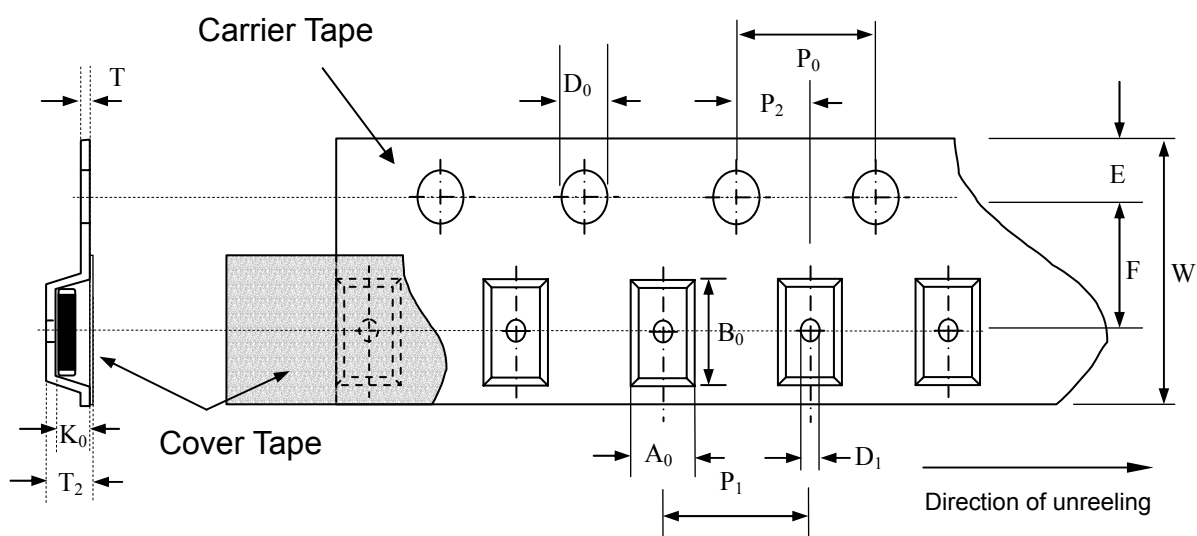


6. Packaging Specification

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 $40 \pm 20\%$ - 15grams.

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.



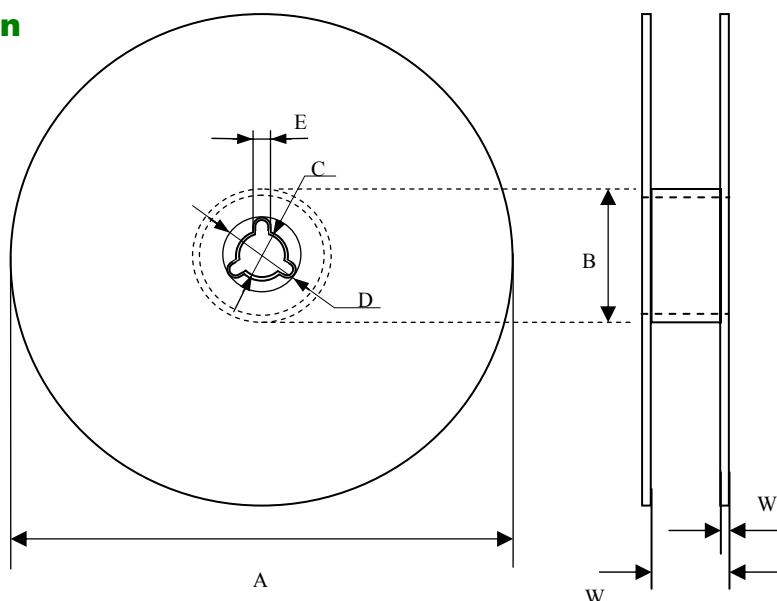
Symbol	A_0 ± 0.10	B_0 ± 0.10	K_0 ± 0.10	T ± 0.05	T_2 ± 0.05	D_0 $+0.10$ -0.00	D_1 ± 0.05	P_1 ± 0.10	P_2 ± 0.05	P_0 ± 0.05	W ± 0.20	E ± 0.10	F ± 0.05
0402	1.08	1.88	1.04	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
0603	1.08	1.88	1.04	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
0805	1.42	2.30	1.04	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1206	1.88	3.50	1.27	0.2	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1210	2.18	3.46	1.45	0.22	0.10	1.50	1.00	4.00	2.00	4.00	8.00	1.75	3.50
1812	3.66	4.95	1.74	0.25	0.10	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50
2220	5.10	5.97	2.80	0.25	0.10	1.50	1.50	8.00	2.00	4.00	12.00	1.75	5.50



SFI Electronics Technology

SMD Transient Voltage Suppressors


7. Reel Dimension




Symbol	A	B	C	D	E	W	W ₁
0402	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
0603	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
0805	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
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	60.0±0.5	13.5±0.1	21.0±0.2	2.0±0.5	13.6±0.2	1.5±0.15
2220	178.0±1.0	60.0±0.5	13.5±0.1	21.0±0.2	2.0±0.5	13.6±0.2	1.5±0.15

8. Label and marking Unit mm

8.1 The paper label shall be plastered on the obvious side of the reel, and the information show as right side

	SFI Electronics Technology
SFI P/N :	
CUS. P/N :	
W/V :	
T/V :	
LOT NO :	
WEEK CODE :	
Q`TY :	



Type	0402	0603	0805	1206	1210	1812	2220
Pcs/reel	10,000	4,000	3,000	3,000	2,000	1,000	1,000
Pcs/kg	850,000	168,000	66,000	31,500	18,500	7,600	4,200

Part No. :	SFI0603 - 120E220NP	Document No.	AS-RD0603ME012	REV.	A
http://www.sfi.com.tw E-mail : sfi@sfi.com.tw TEL:886-3-3506998 FAX :886-3-3507689 - 7 -					