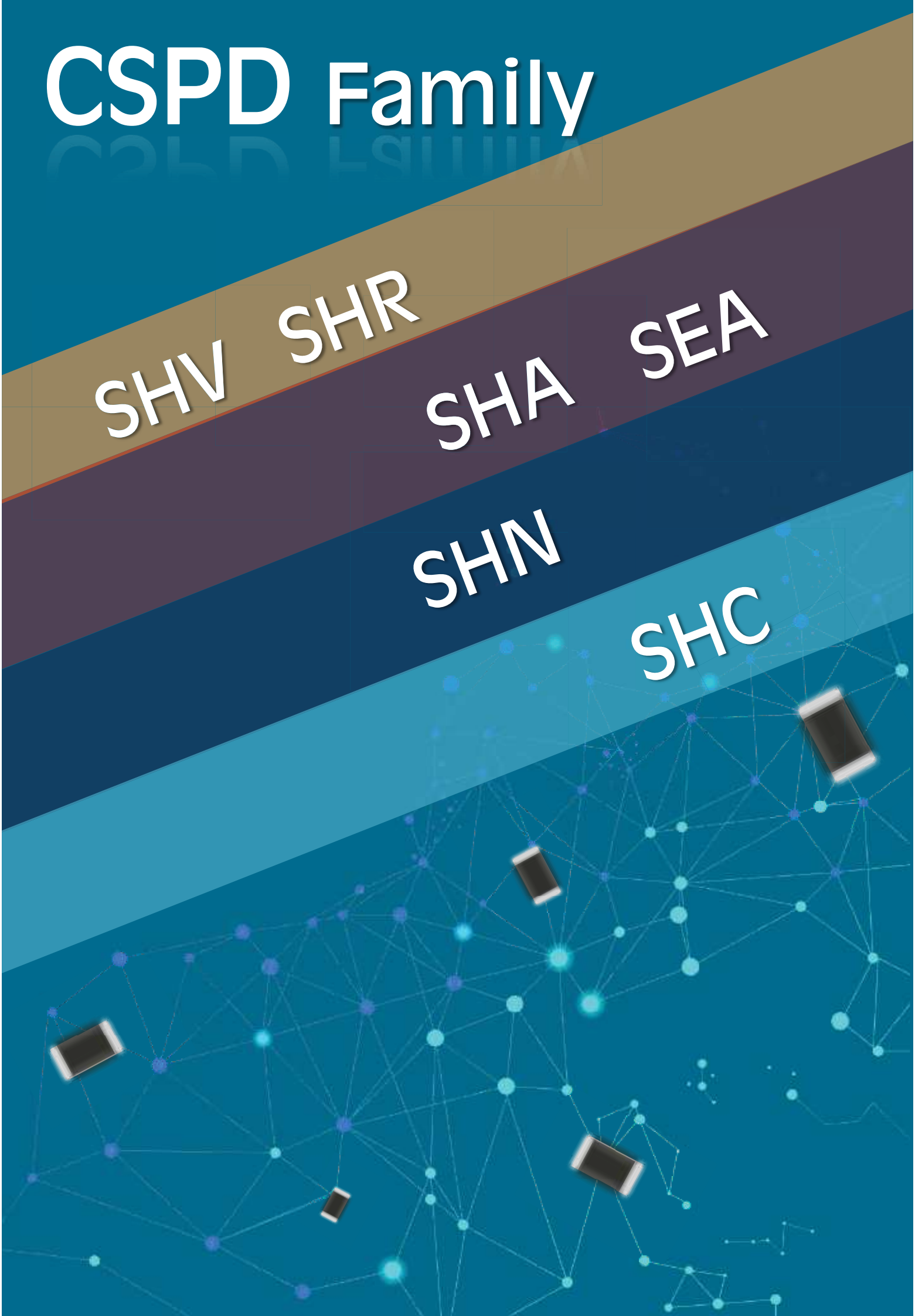
CSPD Family

SHV SHR

SHA SEA

SHN

SHC



CSPD Family

CERAMIC

SHV Series (LED Lighting / AC Power)

Requirement

LED Lighting is generally driven in two ways: switch-type drive and linear drive. Although the switch-type drive can obtain good current control accuracy and high overall efficiency, due to production efficiency and application requirements, linear drive applications have gradually become the mainstream in recent years. Most of the traditional LED lighting surge solutions are used. MOV (DIP Varistor) protects, when a surge voltage (flow) occurs, MOV will quickly decrease from high impedance to low impedance, providing a conduction path to conduct energy to the earth, but MOV still has some problems, such as excessive volume. It is not easy to assemble, and the product is more susceptible to cracking.

Description

SFI has developed a dedicated SHV series of multi-function overvoltage protectors for LED lighting.

SHV provides "small size SMD patch" packaging, which is the world's smallest chip package with high collapse pressure and high flow capacity.

It has passed UL and TUV certification and has been mass-produced SHV protection components.

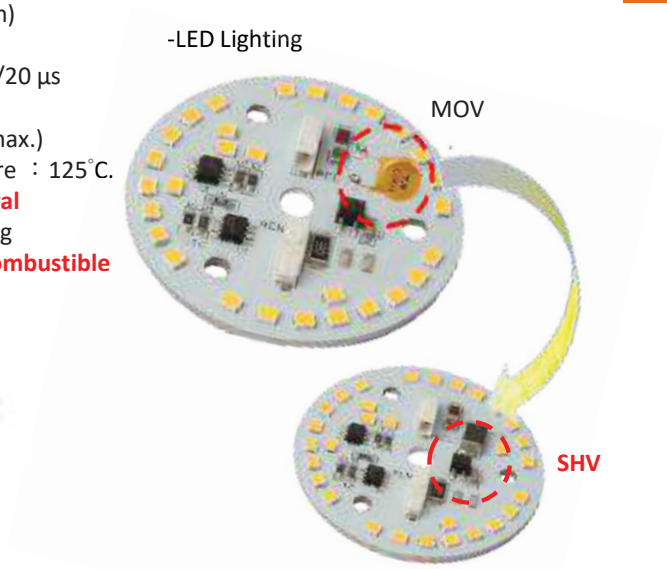
LED manufacturers use.

Features

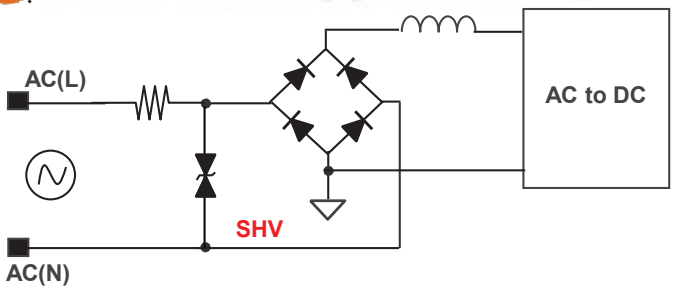
-Size：0806~3220(Inch)
-Meet ：IEC61000-4-5
1.2/50 μs or 8/20 μs
-BDV ：170V~680V
-Peak surge：3000A(max.)
-Operating temperature ：125°C.
-UL 1449 /TUV approval
-Bi-directional clamping
-SMD package, non-combustible

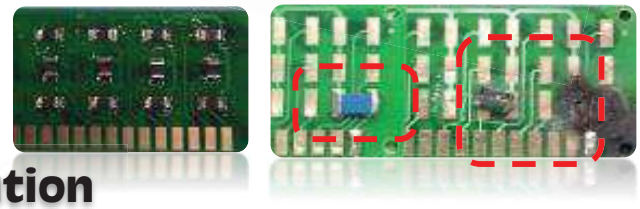
Application Area

-LED Lighting



Reference Application Circuit





Comparison with Other Solution

	SFI SHV	LixxxlFxxx	EPXXX
			
Construction	Displaced electrodes	Displaced electrodes	Plastic encapsulated
Size compare	0806 available(inch)	3220(inch)	3225(inch)
UL test compare (Need pass 15 times)	Pass	Pass	Pass
High temperature	Good	Bad	Bad
High humidity	Good	Bad	Bad
Termination	Ag/Ni/ Sn	Ag/Pt	Tinned copper

The current overvoltage surge protection parts are using plastic epoxy, after thermal shock, products will be degraded and burned. SHV series won't have situation such this.

High humidity and high temperature (Reliable)
After IEC environment test condition at 85°C and high humidity 40°C 95% load test, the variation of BDV is under 10%

CSPD Family

CERAMIC

SHV Series (LED Lighting / AC Power)

CSPD SHV

Specification

All specification is base on datasheets and subject to change without notice.

Size	Part No.	Working Voltage		Breakdown Voltage	Clamping Voltage	Surge Current	Typical Cap.
		V_{AC}	V_{DC}	V_B(1mA)	V_c(max.)	I_{peak}(8/20μS)	C(1KHz)
0806	0806SV271-201A	175V	225V	270V(±10%)	450V	200A	90pF
1206	1206SV391-101A	250V	320V	390V(±10%)	647V	100A	40pF
1210	1210SV271-801A	175V	225V	270V(±10%)	450V	800A	350pF
1812	1812SV271-202A	175V	225V	270V(±10%)	450V	2000A	860pF
	1812SV471-102A	300V	385V	470V(±10%)	775V	1000A	300pF
2220	2220SV271-801A	175V	225V	270V(±10%)	450V	800A	350pF
	2220SV471-202A	300V	385V	470V(±10%)	775V	2000A	700pF
	2220SV681-801A	420V	560V	680V(±10%)	1120V	800A	210pF
3220	3220SV271-501A	175V	225V	270V(±10%)	450V	500A	340pF
	3220SV471-302A	300V	385V	470V(±10%)	775V	3000A	750pF
	3220SV511-252A	315V	410V	510V(±10%)	845V	2500A	600pF
	3220SV821-102A	500V	650V	820V(±10%)	1350V	1000A	1100pF

SHV-UL + TUV Series Specification

All specification is base on datasheets and subject to change without notice.

Size	Part No.	Working Voltage		Breakdown Voltage	Clamping Voltage	Surge Current	Typical Cap.
		V_{AC}	V_{DC}	V_B(1mA)	V_c(max.)	I_{peak}(8/20μS)	C(1KHz)
0806	0806SV431-101A	275V	350V	430V(±10%)	705V	100A	45pF
1206	1206SV431-201A	275V	350V	430V(±10%)	705V	200A	60pF
1210	1210SV431-501A	275V	350V	430V(±10%)	705V	500A	200pF
1812	1812SV431-801A	275V	350V	430V(±10%)	705V	800A	340pF
	1812SV471-501A	300V	385V	470V(±10%)	775V	500A	200pF
	1812SV471-801A	300V	385V	470V(±10%)	775V	800A	310pF
2220	2220SV431-501A	275V	350V	430V(±10%)	705V	500A	215pF
	2220SV431-801A	275V	350V	430V(±10%)	705V	800A	305pF
	2220SV471-501A	300V	385V	470V(±10%)	775V	500A	195pF
	2220SV471-801A	300V	385V	470V(±10%)	775V	800A	290pF

CSPD Family

CERAMIC

SHV Series (LED Lighting / AC Power)

CSPD SHV

CSPD SHV

Specification (for UL Certification)

Underwriters Laboratories

All specification is base on datasheets and subject to change without notice.

Size	Part No.	Working Voltage		Breakdown Voltage	Clamping Voltage	Surge Current	Typical Cap.
		V_{AC}	V_{DC}	V_B(1mA)	V_c(max.)	I_{peak}(8/20μS)	C(1KHz)
0806	0806SV241-201A	150V	200V	240V(±10%)	395V	200A	95pF
	0806SV431-101A	275V	350V	430V(±10%)	705V	100A	45pF
1206	1206SV241-351A	150V	200V	240V(±10%)	395V	350A	180pF
	1206SV431-201A	275V	350V	430V(±10%)	705V	200A	60pF
1210	1210SV241-201A	139V	195V	240V(±10%)	395V	200A	110pF
	1210SV391-201A	250V	320V	390V(±10%)	647V	200A	105pF
	1210SV471-251A	300V	385V	470V(±10%)	775V	250A	100pF
	1210SV471-501A	300V	385V	470V(±10%)	775V	500A	190pF
1812	1812SV271-102A	175V	225V	270V(±10%)	450V	1000A	600pF
	1812SV271-501A	175V	225V	270V(±10%)	450V	500A	275pF
	1812SV431-801A	275V	350V	430V(±10%)	705V	800A	340pF
	1812SV471-501A	300V	385V	470V(±10%)	775V	500A	200pF
	1812SV471-801A	300V	385V	470V(±10%)	775V	800A	310pF
2220	2220SV241-801A	139V	195V	240V(±10%)	395V	800A	430pF
	2220SV271-501A	175V	225V	270V(±10%)	450V	500A	390pF
	2220SV391-501A	250V	320V	390V(±10%)	647V	500A	235pF
	2220SV391-801A	250V	320V	390V(±10%)	647V	800A	320pF
	2220SV431-501A	275V	350V	430V(±10%)	705V	500A	215pF
	2220SV431-801A	275V	350V	430V(±10%)	705V	800A	305pF
	2220SV471-501A	300V	385V	470V(±10%)	775V	500A	195pF
	2220SV471-801A	300V	385V	470V(±10%)	775V	800A	290pF
3220	3220SV271-801A	175V	225V	270V(±10%)	450V	1000A	550pF
	3220SV431-801A	275V	350V	430V(±10%)	705V	1000A	490pF
	3220SV471-801A	300V	385V	470V(±10%)	775V	1000A	450pF
	3220SV681-102A	420V	560V	680V(±10%)	1120V	1000A	1300pF

CSPD Family

CERAMIC

SHV Series (LED Lighting / AC Power)

Specification (for TUV Certification)

All specification is base on datasheets and subject to change without notice.

Size	Part No.	Working Voltage		Breakdown Voltage	Clamping Voltage	Surge Current	Typical Cap.
		V_{AC}	V_{DC}	V_B(1mA)	V_c(max.)	I_{peak}(8/20μS)	C(1KHz)
0806	0806SV431-101A	275V	350V	430V(±10%)	705V	100A	45pF
1206	1206SV431-201A	275V	350V	430V(±10%)	705V	200A	60pF
	1206SV471-101A	300V	385V	470V(±10%)	775V	100A	30pF
	1206SV471-201A	300V	385V	470V(±10%)	775V	200A	55pF
	1206SV511-101A	315V	410V	510V(±10%)	845V	100A	35pF
1210	1210SV431-501A	275V	350V	430V(±10%)	705V	500A	200pF
	1210SV471-501A	300V	385V	470V(±10%)	775V	500A	190pF
	1210SV511-351A	315V	410V	510V(±10%)	845V	350A	12pF
1812	1812SV431-801A	275V	350V	430V(±10%)	705V	800A	340pF
	1812SV471-501A	300V	385V	470V(±10%)	775V	500A	200pF
	1812SV471-801A	300V	385V	470V(±10%)	775V	800A	310pF
2220	2220SV431-501A	275V	350V	430V(±10%)	705V	500A	215pF
	2220SV431-801A	275V	350V	430V(±10%)	705V	800A	305pF
	2220SV471-501A	300V	385V	470V(±10%)	775V	500A	195pF
	2220SV471-801A	300V	385V	470V(±10%)	775V	800A	290pF
	2220SV471-182A	300V	385V	470V(±10%)	775V	1800A	600pF

SHR Series Specification

All specification is base on datasheets and subject to change without notice.

Size	Part No.	Working Voltage		Breakdown Voltage	Clamping Voltage	Ring Wave	Typical Cap.
		V_{AC}	V_{DC}	V_B(1mA)	V_c(max.)	I_{peak}(8/20μS)	C(1KHz)
0604	0604SR271-2R5K	175V	225V	270V(±10%)	450V	2.5KV	20pF

CSPD Family

CERAMIC

SHA Series (Automotive Application)

CSPD SHA

Requirement

Automotive electronics require safety certification. Currently, the car manufacturer must pass the ISO7637 pulse 5a test, the so-called Load dump test. Because this specification has a so-called destructive experimental wave, the reason for this regulation is because when the car starts, the engine Drive the battery to the battery, and then use the 12V or 24V power supply from the electric cigarette lighter to use the electronic products in the car. Once the car electronics are off, the engine will directly charge the car's electronic products, which will cause fire or safety hazard. Car manufacturers have demanded that automotive electronics require the adoption of this regulation.

Description

SHA series special for worst environment design, for customer to choice operating temperature, it also meet **AEC-Q200** requirement, This type have several advantages, technology for multilayer to provide large **surface area** and **small size,** for mostly application **replace bigger** surface TVS diode. Besides, this series have more wide operating than zener diode.

SHA automotive zener diode using **Nano glass technology coating**，no need plastic cover and also **smallest**

Features

-Size：0806~4032(Inch)
-Meet STD：ISO7637/ISO16750 Pulse5A/B
-BDV ：24V~75V
-Load Dump ：1.5J~160J
-Operating temperature ：125°C.
-Meet AECQ 200/ PPAP
-Bi-directional clamping
-IATF 16949

Application Area

-All ECU DC Power
-ADAS
-Car Lighting
-Muti-Media System
-GPS Navigator
-T-Box
-OBU

Comparison with Other Solution

General (Load Dump) solution：

1.Using MOV (Disk Varistor), after thermal shock -40 ~ 90°C/72hr, the surface will be broken. This is caused by Epoxy not withstand high temperature and will burn after continuous using. (Figure 1)
2.Test TVS axial type, the part is broken. (Figure 2)
3.Test TVS SMD type, it will be peeled off at terminals.(Figure 3)

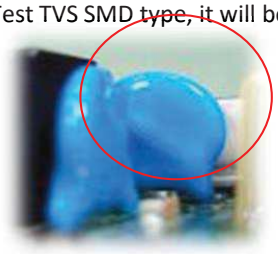
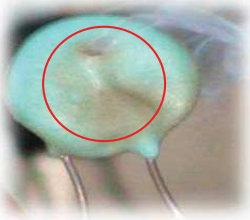


Figure1



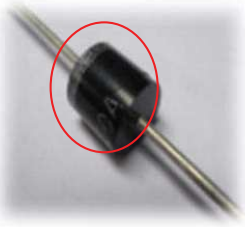


Figure 2

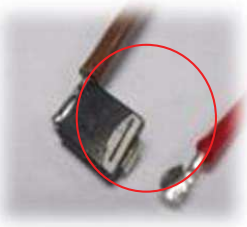
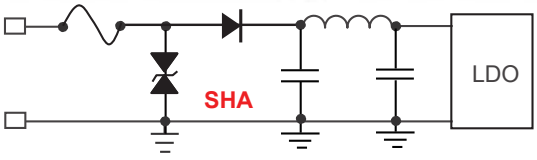
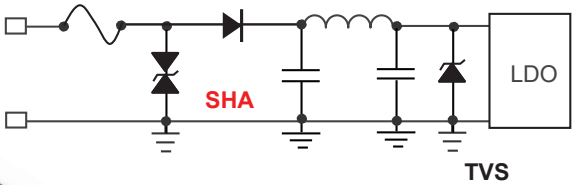


Figure 3

Reference Application Circuit



The single Stage Load Dump Protection Application for 12 V system



The twice Stages Load Dump Protection Application for 24 V system
(Due to Clamping Voltage issue)

CSPD Family

CERAMIC

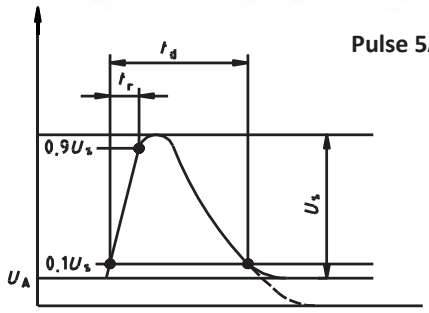
SHA Series (Automotive Load Dump Test STD.

CSPD SHA

CSPD SHA

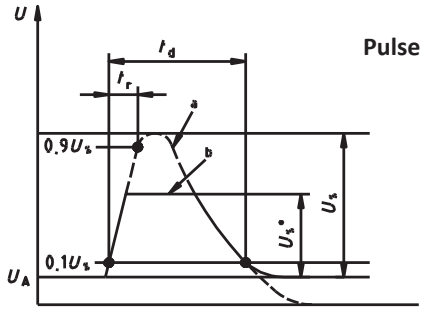
ISO 7637-2 Pulse 5A/5B

Pulse 5A



	12V	24V
Us	65V~ 87V	123V~ 174V
Ri	0.5Ω~4Ω	1Ω~8Ω
td	40ms~400 ms	100ms~350 ms
tr	(10 +0/−5)ms	

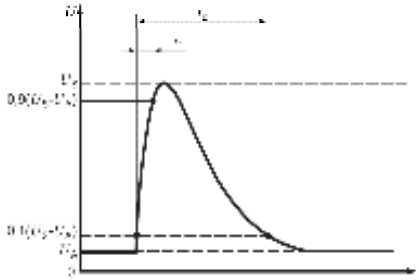
Pulse 5B



	12V	24V
Us	65V~ 87V	123V~ 174V
Us*	Defined by Customer	
td	Same as 5A	

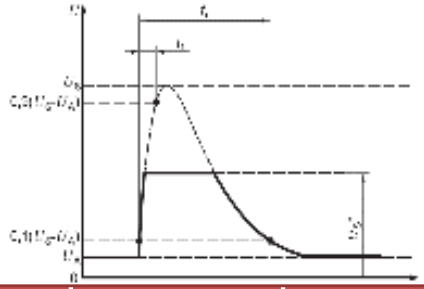
ISO 16750-2 Test A/B

Test A



	12V	24V
Us	79V~ 101V	151V~ 202V
Ri	0.5Ω~4Ω	1Ω~8Ω
td	40ms~400 ms	100ms~350 ms
tr	(10 +0/−5)ms	

Test B



	12V	24V
Us	79V~ 101V	151V~ 202V
Us*	35V	65V
td	Same as 5A	

* All the input voltage include Ua value(14V/ 28V)

Compare with ISO7637-2 & ISO16750-2

Parameter	ISO16750-2			ISO7637-2		
	12V	24V	Pulse(min)	12V	24V	Pulse (min)
Us(V)	79≦Us≦101 (65+14) ≦US≦(87+14)	151≦Us≦202 (123+28) ≦Us≦(174+28)	10 times (Duration 1 minute)	65≦Us≦87	123≦Us≦174	1 time
Us*(V)	35(14+21)	65(28+37)		By Customer	By Customer	
Ua(V)	14	28		13.5	27	
Ri(Ω)	0.5≦Ri≦4	1≦Ri≦8		0.5≦Ri≦4	1≦Ri≦8	
Td(ms)	40≦Td≦400	100≦Td≦350		40≦Td≦400	100≦Td≦350	
Tr(ms)	10/-5	10/-5		10/-5	10/-5	

CSPD Family

CERAMIC

SHA Series (Automotive)

CSPD SHA

CSPD SHA

Specification(System for 12V)

All specification is base on datasheets and subject to change without notice.

	Part No.	Working Voltage	Breakdown Voltage	Clamping Voltage	Peak Current	Load Dump	Jump Start Voltage
		V_{DC}(max.)	V_B(1mA)	V_C(max.)	I_{Peak}(8/20μs)	W_{LD}	V_{JUMP}
0805	0805SA240- 1R5J	16V	24V(±10%)	40V	200A (for +/- 1 time)	1.5J (for 10 times)	24.5V/5min
0806	0806SA240-060J	16V	24V(±10%)	40V	300A (for +/- 1 time)	6J (for 10 times)	24.5V/5min
	0806SA300-090J	16V	30V(±10%)	48V	300A (for +/- 1 time)	9J (for 10 times)	30.0V/5min
	0806SA330-090J	16V	33V(±10%)	53V	300A (for +/- 1 time)	9J (for 10 times)	32.5V/5min
1206	1206SA240-030J	16V	24V(±10%)	40V	400A (for +/- 1 time)	3J (for 10 times)	24.5V/5min
	1206SA240-060J	16V	24V(±10%)	40V	500A (for +/- 1 time)	6J (for 10 times)	24.5V/5min
	1206SA330-060J	16V	33V(±10%)	53V	200A (for +/- 1 time)	6J (for 10 times)	32.5V/5min
	1206SA360-090J	16V	36V(±10%)	55V	500A (for +/- 1 time)	9J (for 10 times)	35.0V/5min
1210	1210SA240-060J	16V	24V(±10%)	40V	800A (for +/- 1 time)	6J (for 10 times)	24.5V/5min
	1210SA240-120J	16V	24V(±10%)	40V	1000A (for +/- 1 time)	12J(for 10 times)	24.5V/5min
	1210SA360-120J	16V	36V(±10%)	55V	800A (for +/- 1 time)	12J (for 10 times)	35.0V/5min
1812	1812SA240-120J	16V	24V(±10%)	40V	1600A (for +/- 1 time)	12J (for 10 times)	24.5V/5min
	1812SA240-250J	16V	24V(±10%)	40V	2000A (for +/- 1 time)	25J (for 10 times)	24.5V/5min
	1812SA360-250J	16V	36V(±10%)	55V	2000A (for +/- 1 time)	25J (for 10 times)	35.0V/5min
2220	2220SA240-500J	16V	24V(±10%)	40V	5000A (for +/- 1 time)	50J (for 10 times)	24.5V/5min
	2220SA330-500J	16V	33V(±10%)	53V	5000A (for +/- 1 time)	50J (for 10 times)	32.5V/5min
	2220SA360-500J	16V	36V(±10%)	55V	4000A (for +/- 1 time)	50J (for 10 times)	35.0V/5min
3220	3220SA240-800J	16V	24V(±10%)	40V	5500A (for +/- 1 time)	80J (for 10 times)	24.5V/5min
4032	4032SA240-161J	16V	24V(±10%)	40V	6000A (for +/- 1 time)	160J (for 10 times)	24.5V/5min

CSPD Family

CERAMIC

SHA Series (Automotive)

CSPD SHA

Specification(System for 24V)

All specification is base on datasheets and subject to change without notice.

	Part No.	Working Voltage	Breakdown Voltage	Clamping Voltage	Peak Current	Load Dump	Jump Start Voltage
		V_{DC}(max.)	V_B(1mA)	V_C(max.)	I_{Peak}(8/20μs)	W_{LD}	V_{JUMP}
1206	1206SA470-030J	34V	47V(±10%)	77V	200A (for +/- 1 time)	3.0J (for 10 times)	45.0V/5min
1210	1210SA470-120J	34V	47V(±10%)	77V	500A (for +/- 1 time)	12J (for 10 times)	45.0V/5min
1812	1812SA470-250J	34V	47V(±10%)	77V	2000A (for +/- 1 time)	25J (for 10 times)	45.0V/5min
2220	2220SA470-250J	34V	47V(±10%)	77V	3000A (for +/- 1 time)	25J (for 10 times)	45.0V/5min
	2220SA470-500J	34V	47V(±10%)	77V	4000A (for +/- 1 time)	50J (for 10 times)	45.0V/5min
3220	3220SA470-800J	34V	47V(±10%)	77V	4500A (for +/- 1 time)	80J (for 10 times)	45.0V/5min
	3220SA510-800J	34V	47.6~56.1	83.5V	4500A (for +/- 1 time)	80J (for 10 times)	50.6V/5min
4032	4032SA470-161J	36V	45~53	77V	6000A (for +/- 1 time)	160J (for 10 times)	48V/5min

Specification(System for 12/24V)

All specification is base on datasheets and subject to change without notice.

	Part No.	Working Voltage	Breakdown Voltage	Clamping Voltage	Peak Current	Load Dump	Jump Start Voltage
		VDC(max.)	VB(1mA)	VC(max.)	IPeak(8/20μs)	W_{LD}	V_{JUMP}
1206	1206SA360-090V	24V	36V(±10%)	55V	500A (for +/- 1 time)	9J (for 10 times)	35.0V/5min
1210	1210SA360-120V	24V	36V(±10%)	55V	800A (for +/- 1 time)	12J (for 10 times)	35.0V/5min
1812	1812SA360-250V	24V	36V(±10%)	55V	2000A (for +/- 1 time)	25J (for 10 times)	35.0V/5min
2220	2220SA360-500V	24V	36V(±10%)	55V	4000A (for +/- 1 time)	50J (for 10 times)	35.0V/5min
4032	4032SA360-161V	24V	36V(±10%)	55V	6000A (for +/- 1 time)	160J (for 10 times)	35.0V/5min

CSPD Family

CERAMIC

SHN Series (Telecom/ Ethernet Non-PoE Application)

CSPD SHN

Requirement

Now more popular in networking application in indoor and outdoor security all need for the overvoltage and lightning protected. The interface of RJ45, the circuit is 4 wires protection (1,2/3,6). In order to have full protection for 8 wires (1, 2; 3,6; 4,5; 7,8） and prevent the surge attacked, our CSPD products have the good characteristic and small size devices conjunction with the wires and will protect devices.

Description

SHN Now more popular in networking application in indoor and outdoor security all need for the overvoltage and lightning protected. The interface of RJ45, the circuit is 4 wires protection (1,2/3,6).

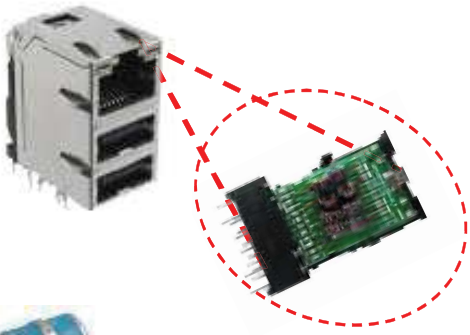
In order to have full protection for 8 wires (1,2; 3,6; 4,5;7,8） and prevent the surge attacked, our CSPD products have the good characteristic and small size devices conjunction with the wires and will protect devices.

Features

-Size： 1206~1812
-Meet IEC61000-4-5 10*700 us 4~8KV
-Faster response time <0.5ns
-No extinguish problem
-Bi-direction

Application

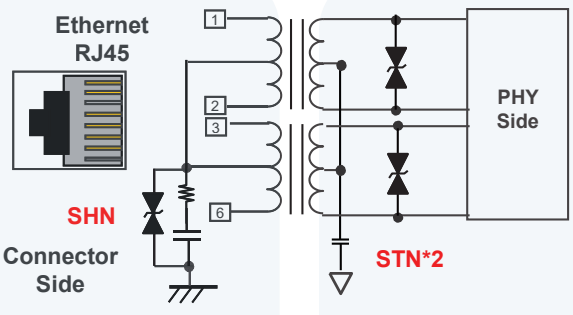
-Ethernet Device
-HUB/Switch/IAD
-RJ45 Socket



Comparison with Other Solution

CSPD vs GDT				
Function	CSPD		(GDT)	GDT
Size	1206, 1210	Φ5 x5.6	1206(3216)	1812(4532)
BDV	12 V	75V	200V	75V
Clamping Voltage	<25 V	>300V	>500V	>300V
Surge (10/700μs)	6 KV	6 KV	4 KV	4 KV
Respond time	<1 ns	> 500ns	>100 ns	>100 ns
Extinguishment	No	Yes	Yes	Yes

Reference Application Circuit Non-PoE



Common Mode(L-G)

Differential Mode(L-L)

Ethernet (RJ45) surge protection		
	Pass Level	Part No.
L-G	6KV	SFI1206SN120-060K
L-G	4KV	SFI1206SN120-040K
L-L	2KV	SFI0402TN050-1R5A-11
L-L	2KV	SFI0603TN050-1R5A-11

CSPD Family

CERAMIC

SHN Series (Telecom/ Ethernet with PoE)

Requirement

Power over Ethernet (PoE) is a technology which transfer power and data through Ethernet cables. They are including telecom systems, IP phone, wireless station, IP camera, hub, computers which get power by PoE. Therefore, it must be use surge protection for Ethernet RJ45 connectors. In telecom systems are connected by Ethernet and will also have the surge or voltage problem caused by power off by the surge. The surge protective device and pass the overvoltage to earth and clamp the voltage to avoid the system damage and broken. Now the standard of 100/1000M of Ethernet speed requirement and these precise devices protected is more important.

Description

SFI has developed a dedicated in the Telecom PoE SHN series. SHN provides "small size SMD patch" packaging, which is the world's smallest chip package with fast response and high flow capacity, and avoids the problem of flameout caused by GDT. The current SHN protection components have been widely used by Netcom manufacturers.

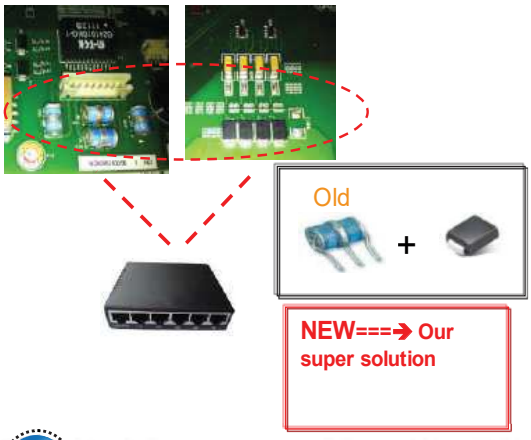
Features

-Size： 1210
-Meet IEC61000-4-5
-Faster response time <0.5ns than GDT
-No extinguish problem
-Bi-directional

Application

-AP Router/Switch
-IAD
-IP CAM
-Others

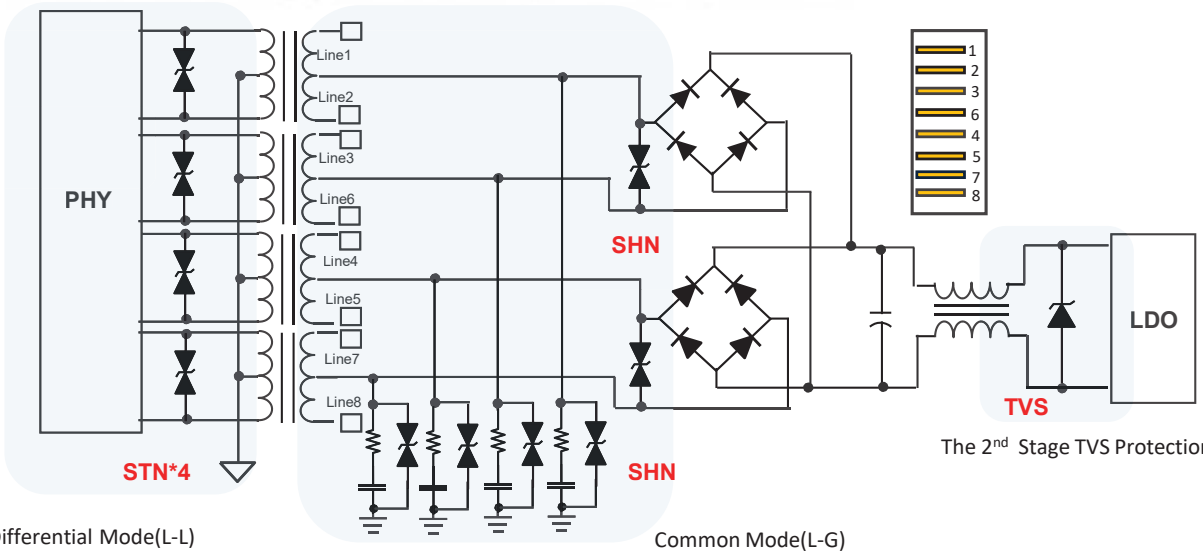
Comparison Traditional Solution



GDT Disadvantage ： On application of PoE, due to the arc voltage is less than working after GDT discharge. Because the GDT will break and burn out and short, it becomes huge damage due to it's extinguish problem. In order to solve the issue, it's usually to put series of varistors or Sidactor after GDT to prevent extinguishment.

Our SHN strong characteristics：
1. Chip size
2. High flow ability
3. Low clamping volt
4. Quick response time and provide better solution than that.

Reference Application Circuit for PoE



The 2nd Stage TVS Protection

Differential Mode(L-L)

	Pass Level	Part No.
L-L	2KV	SFI0402TN050-1R5A-11
L-L	2KV	SFI0603TN050-1R5A-11

Common Mode(L-G)

	Pass Level	Part No.
L-G	6KV	SFI1210SN750-060K
L-G	4KV	SFI1210SN750-040K

CSPD Family

CERAMIC

SHN Series (Telecom/ Ethernet)

Specification

All specification is base on datasheets and subject to change without notice.

Size	Part No.	Working Voltage	Breakdown Voltage(*1)	Clamping Voltage(*2)	Surge Voltage	Surge Current(*3)	Typical Capacitance(*4)
		V_{DC}	V_B(1mA)	V_C(max)	V_{Surge} (10/700μs)	I_{Peak} (10/700μs)	C(1KHz)
0806	0806SN750-010K	60V	75V(±10%)	100V	1KV	300A	180pF
1206	1206SN120-040K	9V	12V(12~20)	30V	4KV	100A	3200pF
	1206SN120-060K	9V	12V(12~20)	30V	6KV	150A	3850pF
1210	1210SN470-040K	38V	47V(±10%)	75V	4KV	100A	1400pF
	1210SN470-060K	38V	47V(±10%)	75V	6KV	150A	1670pF
	1210SN750-080K	60V	75V(±10%)	105V	8KV	200A	1350pF
	(*6)1210SN750-040K-UL	60V	75V(±10%)	100V	4KV	100A	1000pF
	(*6)1210SN750-060K-UL	60V	75V(±10%)	100V	6KV	150A	1300pF
	1210SN820-060S	60V	67.5V(min)	100V	6KV	150A	1350pF
1812	1812SN471-030K	385V	470V(±10%)	775V	3KV	75A	300pF

Notes：

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

＊2 The Clamping voltage was measured at 8/20 μs standard current, 0805~1206(1A),1210(2.5A),1812(5A) ,2220(10A)

＊3 The surge current was tested at 10/700μs waveform, Ri=40 Ω. 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.

＊6 SFI1210SN750-040K & SFI1210SN750-060K with UL Certification

CSPD Family

CERAMIC

SHC Series (Bigger Current)

CSPD SHC

Description

Most applications in communications base voltage of 48VDC voltage, lightning likely path through a coaxial cable or antenna to damage to the internal IC, will have a lot of power surges and voltage spikes on it. For a combination of lightning within base station power system, lightning protection circuit is relatively simple, but also more mature, usually in combination with through the DC side of the power flow to 15KA(8/20μs waveform) ways to DC SPD.

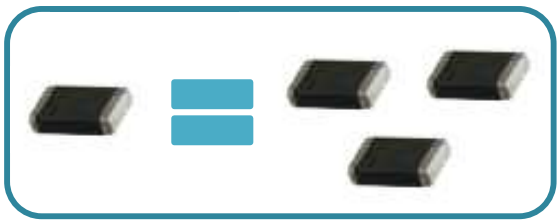
Features

-Size：0805~3220 (Inch)
-Meet：IEC61000-4-5
1.2/50μs and 8/20μs combined wave
-Respond ：< 0.5 ns
-BDV：24V~82V
-Peak surge current：200A~20KA
-Low leakage ：<1μA
-Operating temperature ：125˚C
-Bi-directional
-SMD package

Comparison with Other Solution

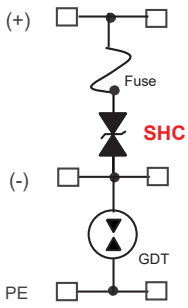
	SHC	Others
Circuit	(A)	(B)
Size	2220	2220
Surge	10KA	4.5KA
Usage	1~2 pcs	3~5 pcs
Total cost	Low	High
Space rate	1/3	1

Equal

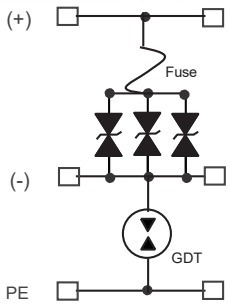


1 pcs (CSPD) = 3 pcs(Others)

Reference Application Circuit



(A)



(B)

Recommend Part No.

	Part Number	Working Voltage		Breakdown Voltage	Clamping Voltage	Surge Current (8/20 μs)
	Symbol	AC	DC	V（1mA）	V	A
	SFI2220SC750-103A	48	60	75(±10%)	＜100	10KA
★	SFI2220SC240-103A	14	18	24(±10%)	＜45	10KA
★	SFI3220SC240-203A	14	18	24(±10%)	＜45	20KA

CSPD Family

CERAMIC

SHC Series (Bigger Current)

CSPD SHC

CSPD SHC

Specification

All specification is base on datasheets and subject to change without notice.

	Part No.	Working Voltage	Breakdown Voltage(*1)	Clamping Voltage(*2)	Surge Current(*3)	Typical Capacitance(*4)
		V_{DC}(max.)	V_{BDV}(1mA)	V_C(max.)	I_{Peak}(8/20μs)	Cap.(1K$_{Hz}$)
1206	1206SC120-501A	9V	12V(12~20)	30V	500A	3500pF
	1206SC240-501A	18V	24V(±10%)	45V	500A	2300pF
	1206SC470-501A	38V	47V(±10%)	85V	500A	690pF
	1206SC560-102A	45V	56V(±10%)	90V	1000A	800pF
	1206SC750-501A	60V	75V(±10%)	100V	500A	300pF
1210	1210SC240-102A	18V	24V(±10%)	45V	1000A	2300pF
	1210SC470-102A	38V	47V(±10%)	85V	1000A	1550pF
	1210SC101-401A	85V	100V(±10%)	165V	400A	250pF
	1210SC750-182A	60V	75V(±10%)	100V	1800A	980pF
	1210SC750-102A-UL	60V	75V(±10%)	100V	1000A	930pF
1812	1812SC240-202A	18V	24V(±10%)	45V	2000A	4500pF
	1812SC470-202A	38V	47V(±10%)	85V	2000A	2100pF
	1812SC750-202A	60V	75V(±10%)	100V	2000A	1650pF
2220	2220SC240-302A	18V	24V(±10%)	45V	3000A	5500pF
	2220SC240-103A	16V	24V(24~30)	45V	10000A	18000pF
	2220SC470-502A	38V	47V(±10%)	85V	5000A	9900pF
	2220SC470-802A	38V	47V(±10%)	85V	8000A	7500pF
	2220SC680-802A	56V	68V(±10%)	100V	8000A	5600pF
	2220SC720-402A	58V	72V(±10%)	100V	4000A	4000pF
	2220SC750-302A	60V	75V(±10%)	100V	3000A	2000pF
	2220SC820-602A	65V	82V(±10%)	135V	6000A	3500pF
3220	3220SC240-203A	18V	24V(±10%)	45V	20000A	22000pF

Notes：

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

＊2 The Clamping voltage was measured at 8/20 μs standard current, 0806(1A) ,1206(1A) ,1210(2.5A) ,1812(5A) , 2220(10A) ,3220(10A) ,6420(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 nitrogen condition.

CSPD Family

CERAMIC

SEA Series (Automotive ESD)

CSPD SEA

Requirement

CAN Bus is automotive signal interface. It is widwly used in the automotive to transfer data between every electronic devices. It achieves a regional network control systems in whole vehicle and exchanges information between ECU electronic controls to become the automotive electronic control network. **SEA** series is designed for this request.

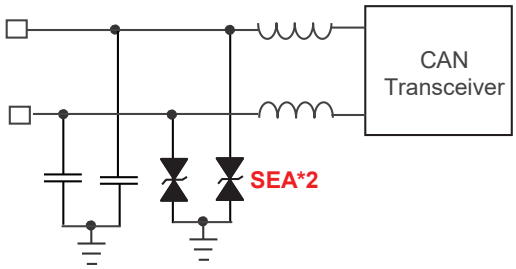
Features

-Compliant with IEC61000-4-2 contact +/-30 KV
-Different capacitance values correspond to the different speed signal bus (CAN Bus)
-Compatible with (ISO7637-2)
Pulse 1 (max. -50 V)/ Pulse 2 (max. 125 V)
Pulses 3A and 3B
-Operating temperature exceeds ：125 ° C
-Bi-directional
-Products with Lead-Free

Application Area

-CAN BUS system
-Other special requirements

Reference Application Circuit



SEA Specification

All specification is base on datasheets and subject to change without notice.

	Part No.	Stand-off Voltage	Breakdown Voltage	Clamping Voltage	Typical Capacitance	Leakage Current	ESD Ability
		V_{DC}(max.)	V_B(1mA)	V_C(max.)	C(1MHz)	I_{LDC}	V_{ESD}
0402	0402EA240-HSP	16V	28.0~38.0V	57V	15pF(±30%)	<0.8μA	25KV
	0402EA470-HSP	28V	48.0~72.0V	108V	15pF(±30%)	<0.8μA	25KV
0603	0603EA240-LSP	16V	28.0~38.0V	57V	50pF(±30%)	<0.8μA	25KV
	0603EA240-MSP	16V	28.0~38.0V	57V	25pF(±30%)	<0.8μA	25KV
	0603EA240-HSP	16V	28.0~38.0V	57V	10pF(±30%)	<0.8μA	25KV
	0603EA470-LSP	28V	48.0~72.0V	108V	50pF(±30%)	<0.8μA	25KV
	0603EA470-HSP	28V	48.0~72.0V	108V	15pF(±30%)	<0.8μA	25KV
	0603EA510-LSP	32V	52.0~76.0V	110V	50pF(±30%)	<0.8μA	25KV
	0603EA680-HSP	42V	70.0~95.0V	140V	15pF(±30%)	<0.8μA	25KV
	0603EA111-HSP	70V	110~140V	200V	15pF(±30%)	<0.8μA	25KV
0805	0805EA470-XSP	36V	42.3~51.7V	77V	200pF(±30%)	<2.0μA	25KV

CSPD Family

CERAMIC

SEH Series (Ultra Low Capacitance)

Feature

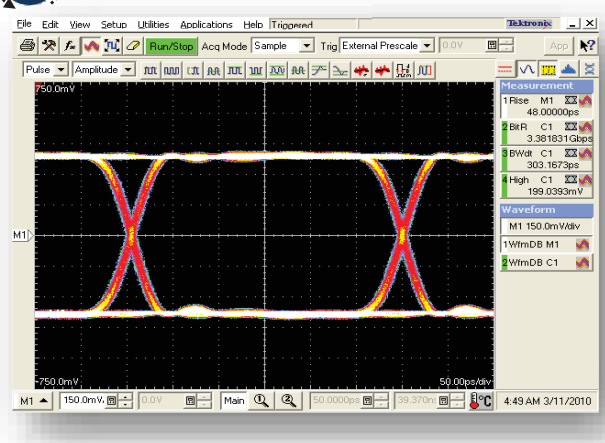
-Protection against high ESD voltages
-Compact size for EIA 0402 and 0603
-Quick response time (<0.5ns)
-Low capacitance (<0.05pF)
-Low leakage current
-Bi-directional
-RoHS compliance

Application Area

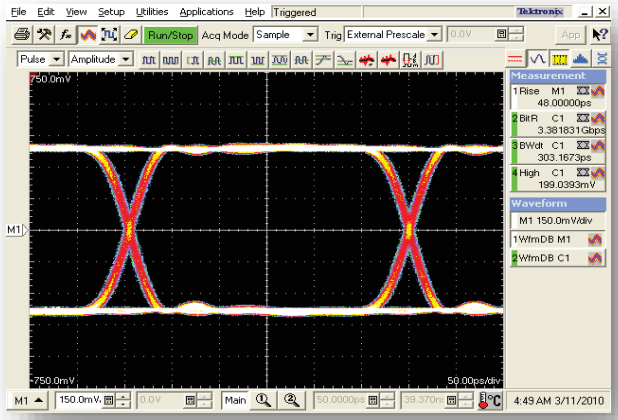
-USB2.0 / USB3.0 /HDMI /DVI
-Motherboard
-Notebook
-Smart Phone
-STB
-DSC, DV, Scanner

CSPD SEH

Characteristic



The Eye diagram of calibration for HDMI pattern (0.2pF at 3.4GHz)



The Eye diagram of calibration for HDMI pattern (0.05pF at 3.4GHZ)

Specification

All specification is base on datasheets and subject to change without notice.

	Part No. (Unit)	Working Voltage	ESD Trigger Voltage	Clamping Voltage At 30ns.	Leakage Current	Capacitance Value	ESD (Contact)	ESD (Air)
		V_{DC} (max.)	V_T(typ.)	Vc(typ.)	I_{LDC}	C(1MHz)	V_{ESD}	V_{ESD}
0402	0402EH060-0R20P	6V	300V	30V	<0.05μA	0.20pF	8KV	15KV
	0402EH120-0R20P	12V	300V	30V	<0.05μA	0.20pF	8KV	15KV
	0402EH240-0R20P	24V	300V	30V	<0.05μA	0.20pF	8KV	15KV
0603	0603EH060-0R20P	6V	300V	30V	<0.05μA	0.20pF	8KV	15KV
	0603EH120-0R20P	12V	300V	30V	<0.05μA	0.20pF	8KV	15KV
	0603EH240-0R20P	24V	300V	30V	<0.05μA	0.20pF	8KV	15KV