



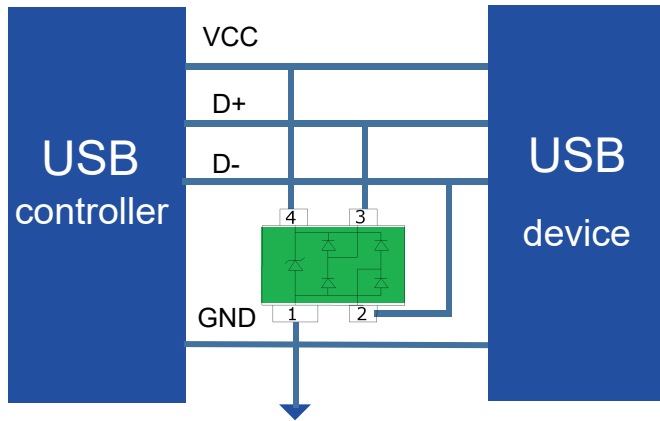
电路保护方案选型手册(2018)

 SALLTECH

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深圳市萨瑞微电子有限公司

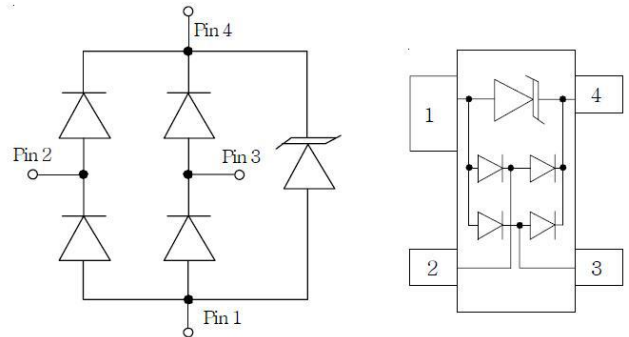
USB2.0 (Universal Serial Bus2.0, 通用串行总线) 是一种应用在计算机领域的新型接口技术。USB2.0接口具有传输速度更快, 支持热插拔的特点。目前已经在各类外部设备中广泛的被采用。

USB设备和PHY经常遭受因瞬态过电压的干扰而工作异常或损坏。USB2.0传输速率可大480Mbps, 而在使用ESD TVS做静电防护时, 需考虑结电容对信号传输的影响。萨瑞微推出的USB2.0专用TVS 阵列器件, 防护方案如下:



萨瑞SEH0503S1 USB2.0静电保护方案

- Ultra low capacitance: 0.3pF typical · ·
- Working voltage: 5V·
- Low clamping voltage·
- Protects two data lines and one power line
- Complies with following standards:
 - IEC 61000-4-2 (ESD) immunity test
Air discharge: $\pm 25kV$
Contact discharge: $\pm 20kV$
 - IEC61000-4-4 (EFT) 40A (5/50ns)
 - IEC61000-4-5 (Lightning) 5A (8/20 μs)



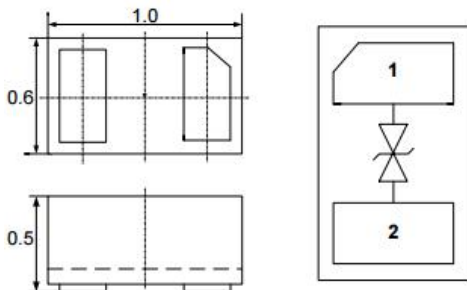
Circuit Diagram

Pin Schematic

SEH0503S1

考虑到器件的通用性, 萨瑞推出了DFN1006-2封装的5V TVS, 其结电容典型值为2.5PF. 可作为静电防护装置应用在大部分的串口电路中。

- Ultra small package: 1.0x0.6x0.5mm
- Ultra low capacitance: 2.5pF typical ·
- Protects one date or power line·
- Working voltage: 5V·
- Low clamping voltage·
- 2-pin leadless package ·
- Complies with following standards:
 - IEC 61000-4-2 (ESD) immunity test
Air discharge: $\pm 15kV$
Contact discharge: $\pm 8kV$
 - IEC61000-4-4 (EFT) 40A (5/50ns)



Package Dimensions

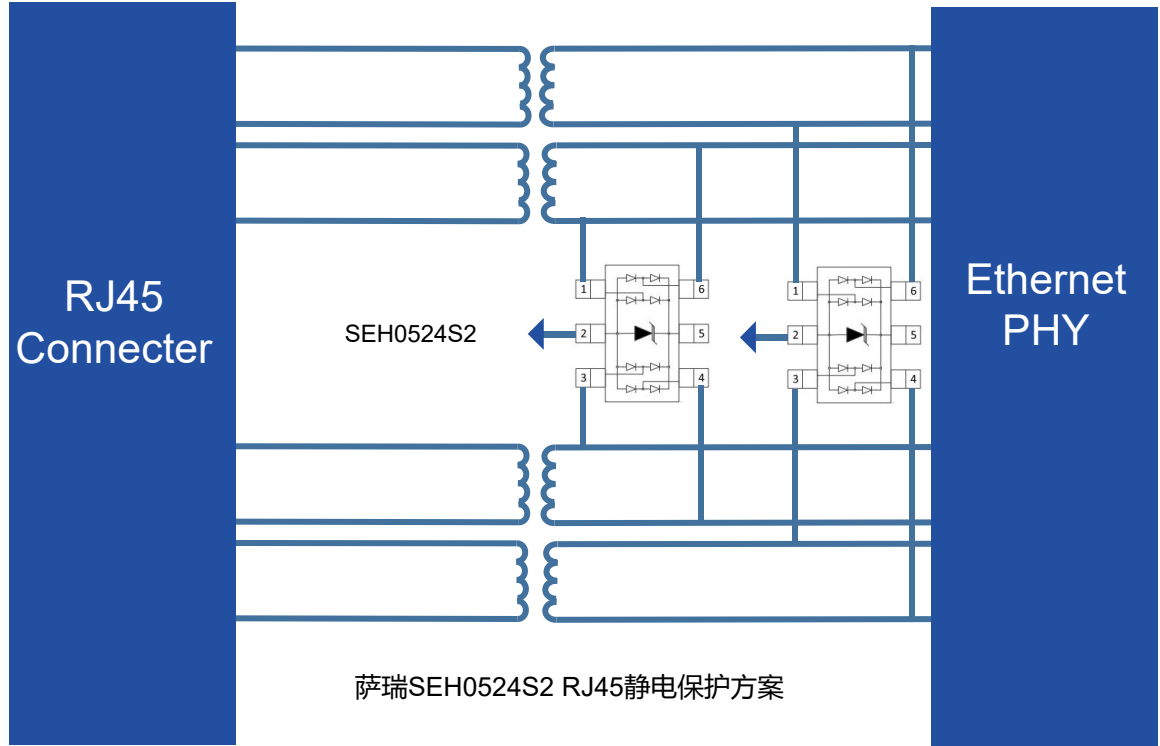
Circuit and Pin Schematic

SEH0501P1

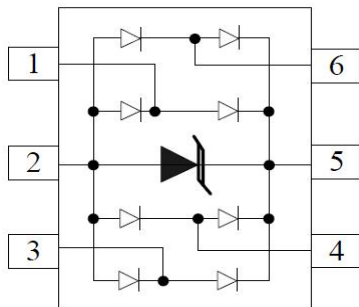
SEH0503S1		
V_{RWM}	5V Max	
V_{BR}	6V Min	$I_T=1mA$
I_R	0.5uA Max	$V_{RWM} = 5.0V$
V_C	10V	$I_{PP} = 1A$ (8 x 20 μs pulse), pin1 or pin2 to pin3
	15V	$I_{PP} = 5A$ (8 x 20 μs pulse), pin1 or pin2 to pin3
C_J	0.6pF Max	$V_R = 0V, f = 1MHz$, between I/O pins, between pin3 and pin4

SEH0501P1		
V_{RWM}	5V Max	
V_{BR}	6V Min	$I_T=1mA$
I_R	0.5uA Max	$V_{RWM} = 5.0V$
V_C	10V	$I_{PP} = 1A$ (8 x 20 μs pulse), pin1 or pin2 to pin3
C_J	2.5pF Max	$V_R = 0V, f = 1MHz$, between I/O pins, between pin1 and pin2

以太网在目前的电信/电子产品中越来越多的被采用，作为一个标准的通讯接口，且支持长距离传输的高速通讯接口，网络接口极易遭受快速瞬态过电压的威胁，以及更长持续时间的雷电脉冲损坏。萨瑞推出的SEH0524S2 瞬态保护管阵列器件，可以为以太网口提供有效的保护。



- Ultra low capacitance: 0.5pF typical ·
- Ultra low leakage: nA level
- Working voltage: 5V·
- Low clamping voltage·
- Up to 4 data lines and one power line protects ·
- Complies with following standards:
 - IEC 61000-4-2 (ESD) immunity test
Air discharge: ±15kV
Contact discharge: ±15kV
 - IEC61000-4-4 (EFT) 40A (5/50ns)
 - IEC61000-4-5 (Lightning) 4A (8/20μs)



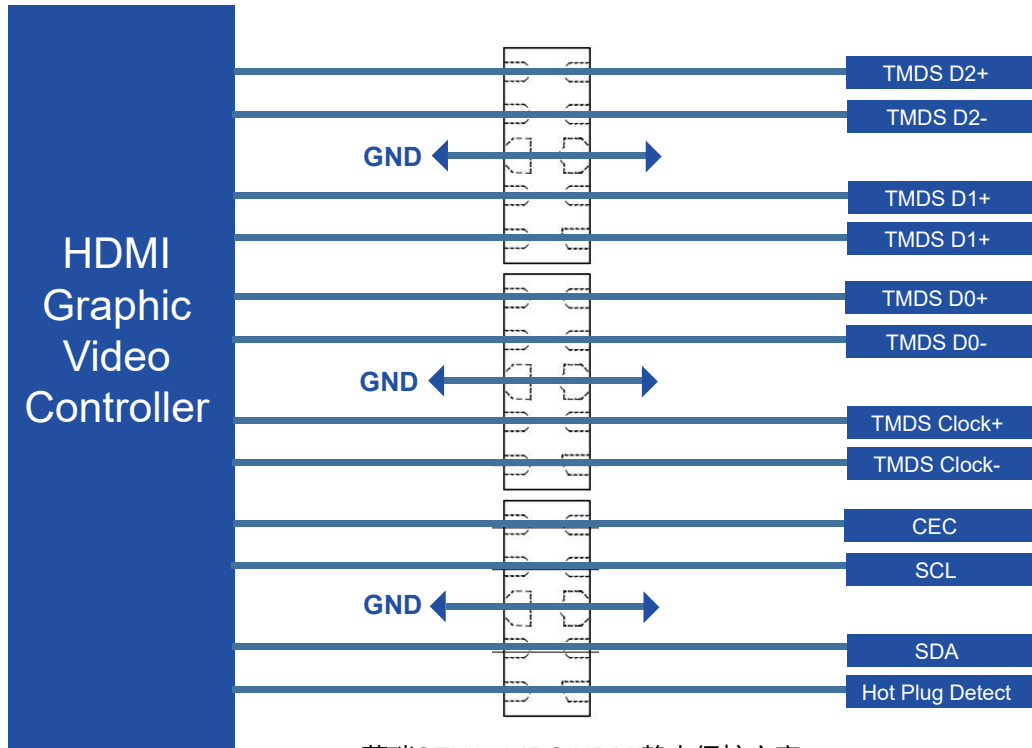
SOT-23-6L (Top View)

SEH0524S2

SEH0524S2		
V_{RWM}	5V Max	
V_{BR}	6V Min	$I_T=1mA$
I_R	0.5uA Max	$V_{RWM} = 5.0V$
V_C	9V	$I_{PP} = 1A (8 \times 20\mu s \text{ pulse}), \text{pin1 or pin2 to pin3}$
	15V	$I_{PP} = 5A (8 \times 20\mu s \text{ pulse}), \text{pin1 or pin2 to pin3}$
C_J	0.5pF Type	$V_R = 0V, f = 1MHz, \text{ between I/O pins}$

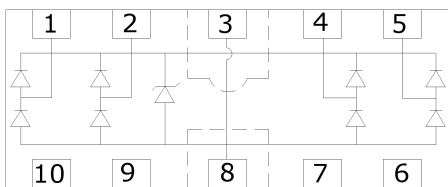
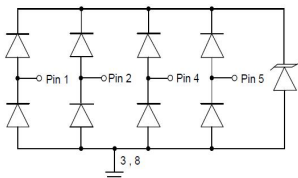
SEL0504S2		
V_{RWM}	5V Max	
V_{BR}	6V Min	$I_T=1mA$
I_R	0.5uA Max	$V_{RWM} = 5.0V$
V_C	15V	$I_{PP} = 1A (8 \times 20\mu s \text{ pulse}), \text{pin1 or pin2 to pin3}$
	20V	$I_{PP} = 25A (8 \times 20\mu s \text{ pulse})$
C_J	1.5pF Type	$V_R = 0V, f = 1MHz, \text{ between I/O pins}$

HDMI2.0接口芯片是一种对ESD和外部的线缆插拔瞬态电压脉冲非常敏感的接口芯片。增加接口保护电路是一种常见的解决方案。



萨瑞SEU0524PC HDMI静电保护方案

- Ultra low capacitance: 0.3pF typical ·
- No insertion loss to 3.0GHz·
- Working voltage: 5V·
- Low clamping voltage·
- Up to 4 lines protects ·
- Complies with following standards:
 - IEC 61000-4-2 (ESD) immunity test
Air discharge: ±15kV
Contact discharge: ±15kV
 - IEC61000-4-4 (EFT) 40A (5/50ns)
 - IEC61000-4-5 (Lightning) 5A (8/20μs)

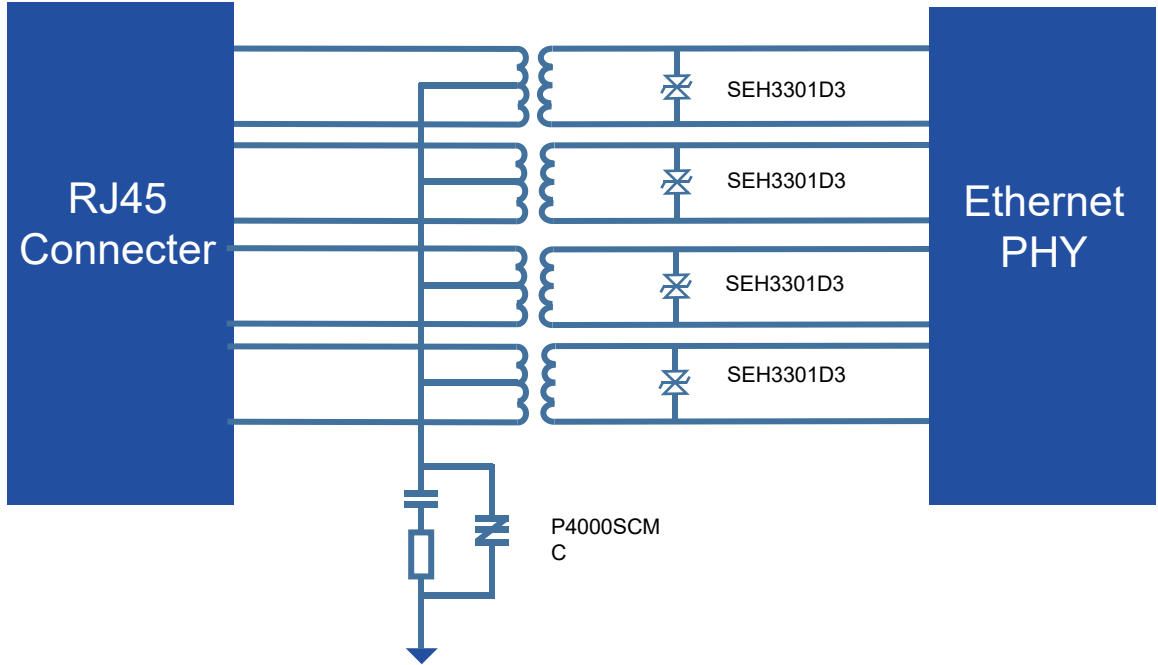


SEU0524PC

SEU0524PC		
V_{RWM}	5V Max	
V_{BR}	6V Min	$I_T=1mA$
I_R	0.5uA Max	$V_{RWM} = 5.0V$
V_C	9V	$I_{PP} = 1A (8 \times 20\mu s \text{ pulse}), \text{pin1 or pin2 to pin3}$
	15V	$I_{PP} = 5A (8 \times 20\mu s \text{ pulse}), \text{pin1 or pin2 to pin3}$
C_J	0.3pF Max	$V_R = 0V, f = 1MHz, \text{ between I/O pins}$

SEU0501P0		
V_{RWM}	5V Max	
V_{BR}	6V Min	$I_T=1mA$
I_R	0.5uA Max	$V_{RWM} = 5.0V$
V_C	12V	$I_{PP} = 1A (8 \times 20\mu s \text{ pulse}), \text{pin1 or pin2 to pin3}$
	25V	$I_{PP} = 4A (8 \times 20\mu s \text{ pulse})$
C_J	0.3pF Max	$V_R = 0V, f = 1MHz$

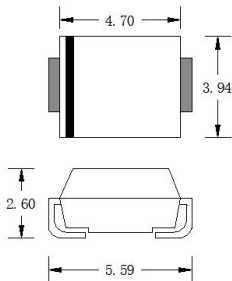
用于无线网络接入设备的WLAN接口，有可能出现建筑外布线的状况，此时，WLAN接口及其容易遭遇雷电浪涌干扰而损坏。以太网接口采用高频差分信号传输通讯，网口芯片及其容易遭受差分过电压能量而损坏。萨瑞推出的TSPD加TVS的保护方案，可以实现雷电共模浪涌防护和差分过电压防护，有效解决网口浪涌风险。



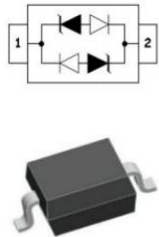
萨瑞网口浪涌防护方案

萨瑞提供的TSPD浪涌防护器件，是应对10/700uS浪涌过电压的优秀方案。可提供2KV/4KV/6KV/8KV的浪涌防护能力。考虑到可能出现的电力线搭接/感应风险，网口常用的器件型号为P4000SCMC。配合次级的TVS，可以有效抑制因为网络变压器中心抽头不对称而形成的差分过电压风险。

Type	V_{DRM}	I_{DRM}	V_S	I_S	V_T	I_T	C_O	I_H
	Min.	Max.	Max.	Max.	Max.		Typ.	Typ.
	V	μA	V	mA	V	A	pF	mA
P4000SCMC	360	5	460	800	4	2.2	45	150



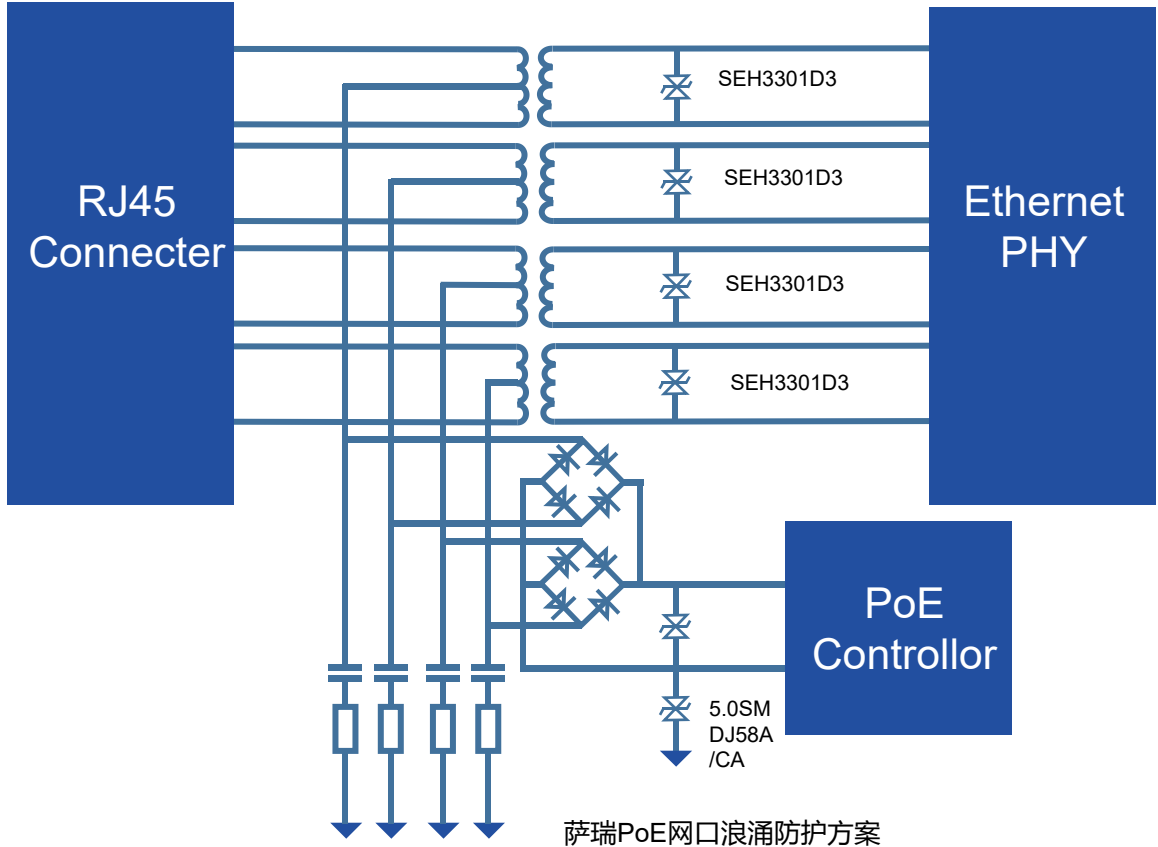
P4200SC



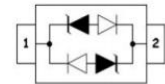
SEH3301D3						
Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Working Voltage	VRWM			3.3	V	
Breakdown Voltage	VBR	4.0			V	$I_T = 1mA$
Reverse Leakage Current	IR			20	μA	$VRWM = 3.3V$
Clamping Voltage	VC		7.0		V	$IPP = 1A (8 \times 20\mu S \text{ pulse})$
Clamping Voltage	VC		19		V	$IPP = 20A (8 \times 20\mu S \text{ pulse})$
Junction Capacitance	CJ		0.8		pF	$VR = 0V, f = 1MHz$

SEH3301D3

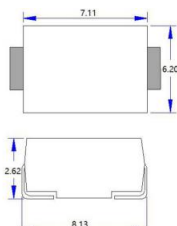
用于无线网络接入设备的WLAN接口，当用于室外布网时，会用到PoE网络接口供电，此类网口在做浪涌防护方式是，要同时兼顾网口通讯线和直流电源线的防护。大功率TVS是这类防护需求的最好选择。萨瑞推出PoE大功率防护TVS，可为客户提供多等级的浪涌防护方案。



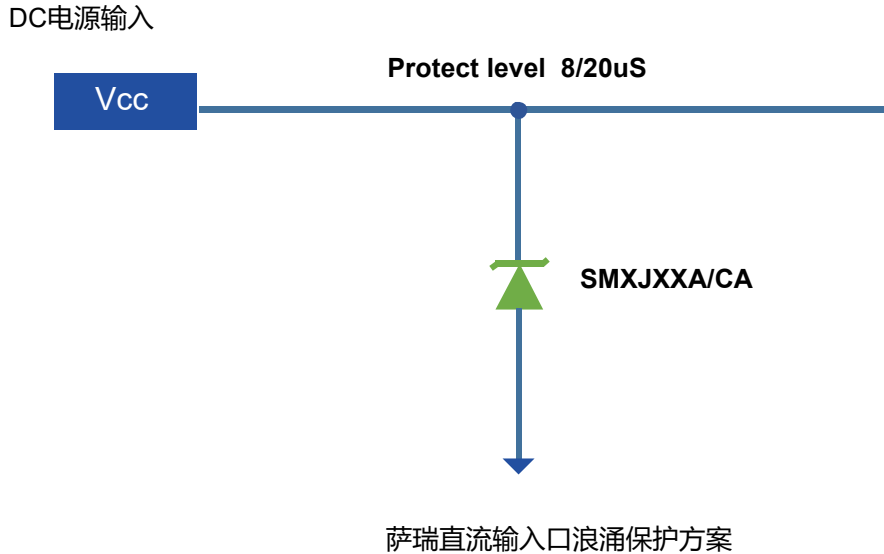
SEH3301D3						
Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Working Voltage	VRWM			3.3	V	
Breakdown Voltage	VBR	4.0			V	IT = 1mA
Reverse Leakage Current	IR			20	uA	VRWM = 3.3V
Clamping Voltage	VC		7.0		v	IPP = 1A (8 x 20uS pulse)
Clamping Voltage	VC			19	V	IPP = 20A (8 x 20uS pulse)
Junction Capacitance	CJ		0.8		pF	VR = 0V, f = 1MHz



5.0SMDJ Series 5000W DO-214AB										
Part Number		Marking		VR	IR@VR	VBR@IT		IT	VC@Ipp	Ipp①
Uni-Polar	Bi-Polar	Uni	Bi	V	μA	Min (V)	Max (V)	mA	Max(V)	A
5.0SMDJ58A	5.0SMDJ58CA	5.0SMDJ58A	5.0SMDJ58CA	58.0	5	64.4	71.2	1	93.6	53.5



直流电源输入接口，在常见的电子设备中有非常广泛的应用。这些直流点输入接口，也是瞬态过电压能量进入电子系统的途径和放电点之一。因为电网电压瞬态波动，和热插拔电源接口等原因，瞬态的过电压脉冲可能会损坏后级负载。为直流电源端口增加防护器件，是个有效的解决方案。方案如下图：



对于大功率TVS，萨瑞提供的产品系列如下：

SOD123 封装	SMFXXA	200W
SOD123 封装	P4SMFXXA	400W
DO-214AC封装	SMAJXXA	400W
DO-214AA封装	SMBJXXA	600W
DO-214AB封装	SMCJXXA	1500W
DO-214AB封装	SMDJXXA	3000W
DO-214AB封装	5.0SMDJXXA	5000W

可依据实际使用情况选择电压等级和防护等级。