BOURNS®

Circuit protection solutions manual 电路保护方案手册

BOURNS®

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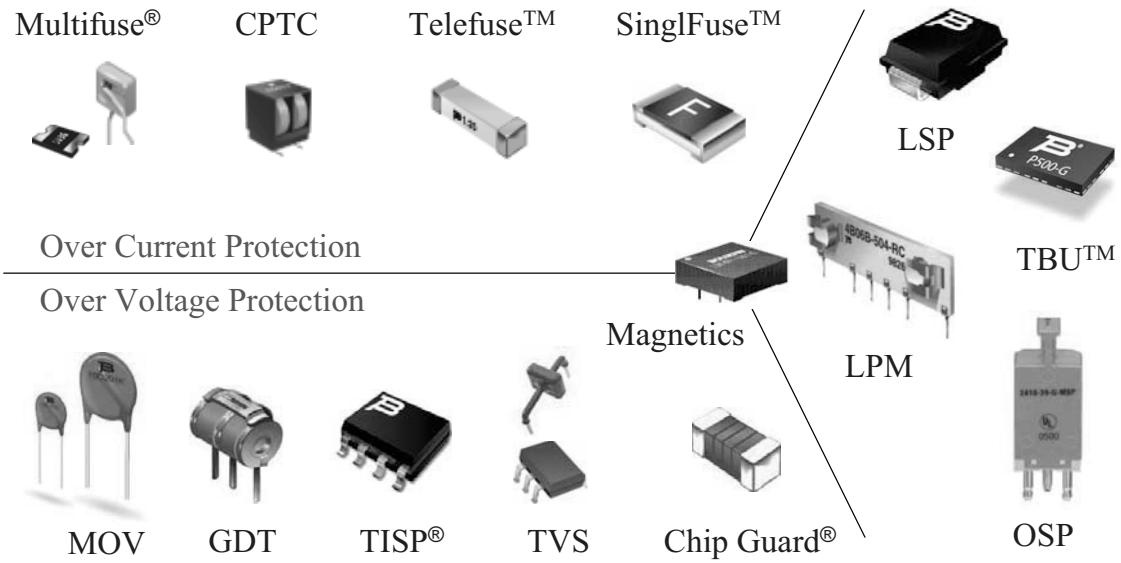
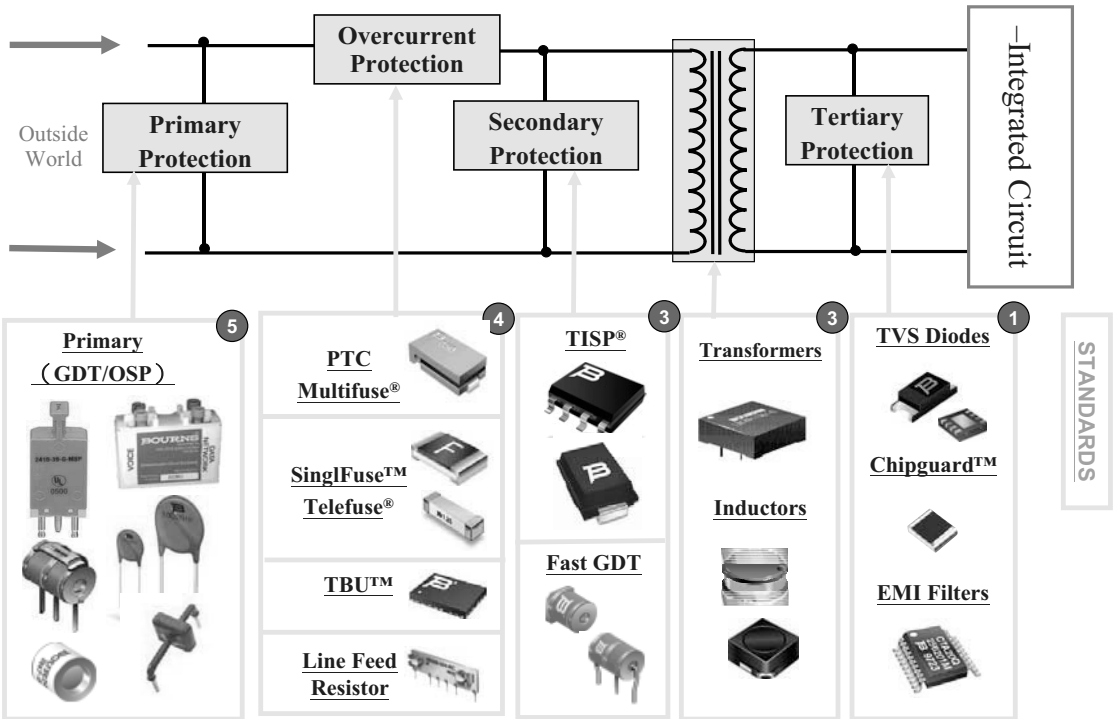
电路保护的概述
Circuit Protection Overview

1 Bourns® Protection Device





数据通讯
Data communication

TBU-CA065-200-WH

2031-23T-SM-RPLF

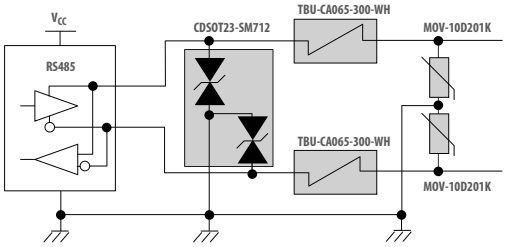
CDSOT23-SM712

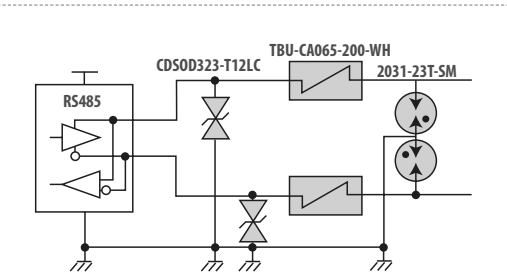
Design Kit

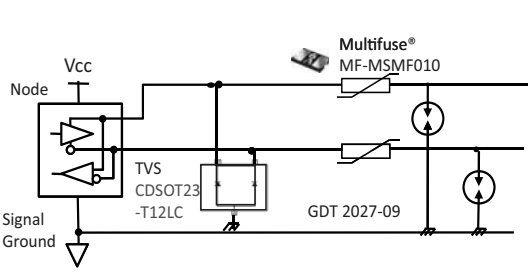
PN-DESIGNKIT-26

1 RS-485 - Serial Port - ESD / EFT / Surge Protection

- RS–485采用差分信号负逻辑，+2V ~ +6V表示“0”，– 6V ~ – 2V表示“1”。RS485现在多采用的是两线制接线方式，这种接线方式为总线式拓朴结构，在同一总线上最多可以挂接32个结点。在RS–485通信网络中一般采用的是主从通信方式，即一个主机带多个从机。
- 采用BOURNS的保护方案，可通过IEC61000–4–2 ESD Level 4（8KV/15KV）、IEC61000–4–4 EFT和IEC61000–4–5 Surge/Lightning 测试标准。







GDT:
2027–09–SM–RPLF
2026–09–C4LF
2036–09–SM–RPLF
2035–09–SM–RPLF
2030–23T–SM–RPLF
2031–23T–SM–RPLF

PPTC:
MF–MSMF010

TVS:
CDSOT23–SM712
CDSOD323–T12LC
CDSOD323–T12C

TBU:
TBU–CA065–200–WH
TBU–CA065–300–WH

2 Ethernet - ESD Protection

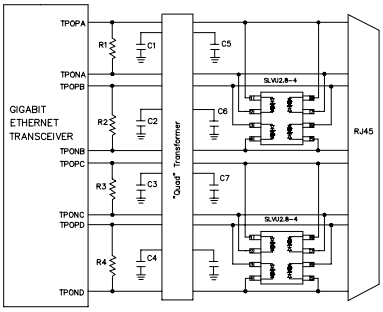
CDNBSO8-SLVU2.8-4

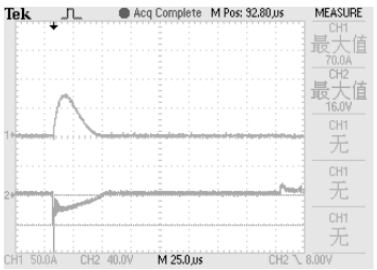
PT61020EL
Quad Transformer

Design Kit

PN-DESIGNKIT 1

- 以太网最广泛使用的包括10BASE–T、100BASE–TX和1000BASE–T，速率分别为10 Mbit/s, 100 Mbit/s, and 1000 Mbit/s (1 Gbit/s)。这三种标准都使用相同的连接头。更高速的设计几乎都兼容较低速的标准，因此在大多数情况下不同速率标准的设备可以自由混合使用。
- 采用BOURNS的保护方案，可通过IEC61000–4–2 ESD Level 4(8KV/15KV)测试标准。





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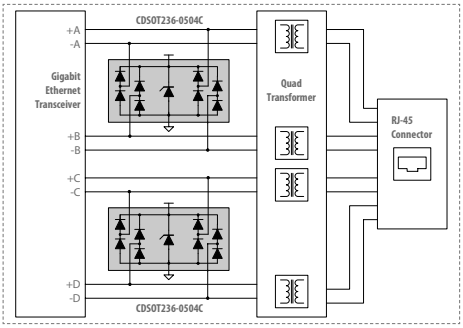
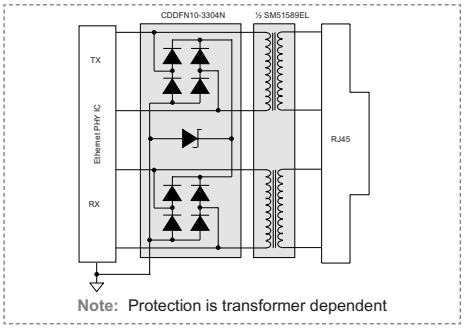




Note: Protection is transformer dependent

TVS:
CDSOT236–0504C
CDDFN10–3304N
CDNBS08–SLVU2.8–4
CD143A–SR05LC

ChipGuard:
CG0402MLC–05LG
CG0603MLC–05LE
CG0603MLU–05E

Transformer:
PT61020EL

PT61020L
Quad Transformer

TBU-DT085-200-WH

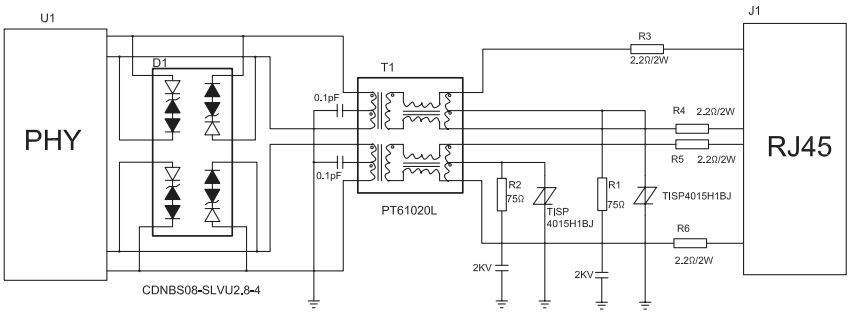
CDSOT236-0504C

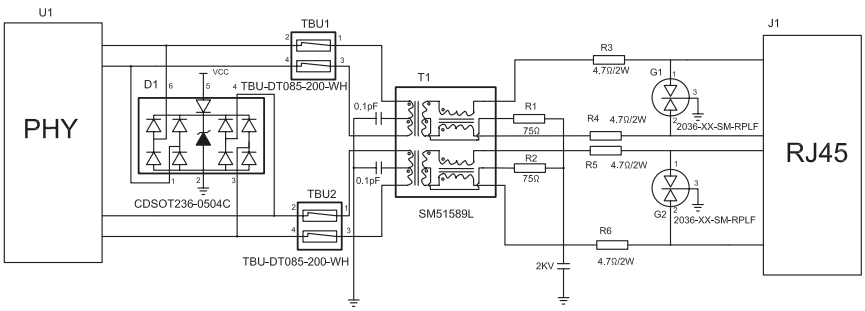
Design Kit

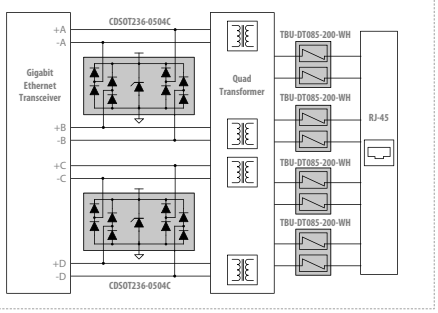
PN-DESIGNKIT-23

3 Ethernet - Power Contact and Surge Protection

● 采用BOURNS的保护方案，可通过IEC61000–4–2 ESD Level 4 ESD和Telcordia GR–1089–CORE Lightning and Power测试标准。







TVS:
CDSOT236–0504C
CDDFN10–3304N
CDNBS08–SLVU2.8–4
CD143A–SR05LC

ChipGuard:
CG0402MLC–05LG
CG0603MLC–05LE
CG0603MLU–05E

TISP:
TISP4015H1BJ

TBU：
TBU–DT085–200–WH

Transformer:
PT61020EL
SM51589L

GDT:
2027–09–SM–RPLF
2026–09–C4LF
2036–09–SM–RPLF

数据通讯
Data communication


CDSOT236-0504C


CDNBS04-B08200


SMBJ58A

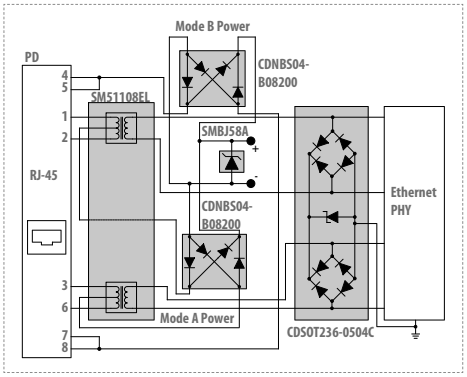

SM51108EL

Design Kit


PN-DESIGNKIT-34

4 10/100 Base-T Power over Ethernet (PoE) PD Unit Protection

- POE 是 Power Over Ethernet(以太网供电)，指的是在现有的以太网Cat.5布线基础架构不作任何改动的情况下，在为一些基于IP的终端(如IP电话机、指纹门禁系统、无线局域网接入点AP、网络摄像机等)传输数据信号的同时，还能为此类设备提供直流(一般48v)供电的技术。
- 采用BOURNS的保护方案，可通过IEEE802.3af 与 IEEE802.11af 和IEC 61000–4–2 Level 4 (8 kV/15 kV) 测试标准。



TVS:
CDSOT236–0504C
SMBJ58A

Bridge Rectifiers:
CDNBS04–B08200

Transformer:
SM51108EL


CDSOT236-0504C


MF-SMDF050-2

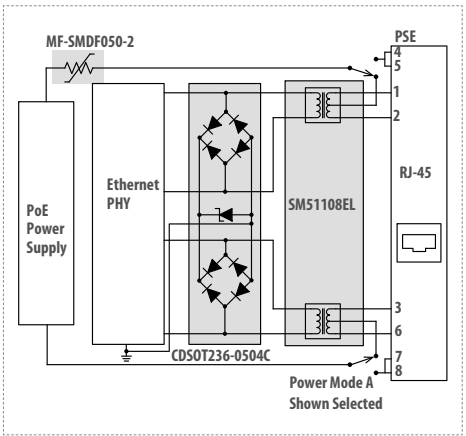

SM51108EL

Design Kit


PN-DESIGNKIT-35

5 10/100 Base-T Power over Ethernet (PoE) PSE Unit Protection

- 采用BOURNS的保护方案，可通过IEEE802.3af 与 IEEE802.11af 和IEC 61000–4–2 Level 4 (8 kV/15 kV) 测试标准。



TVS:
CDSOT236–0504C

PPTC:
MF–SMDF050–2

Transformer:
SM51108EL


MF-NSMF075


CG0603MLC-05LE

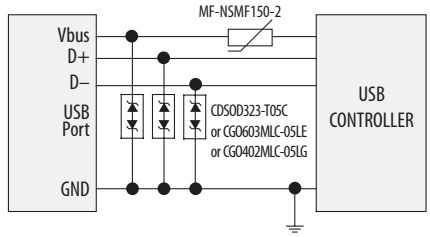

CD143A-SR05LC

Design Kit

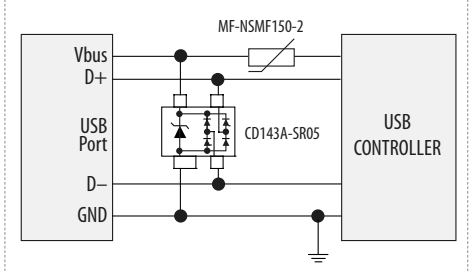
PN-DESIGNKIT 3

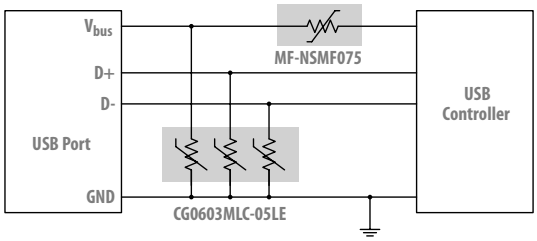
6 USB 2.0 - ESD & Overcurrent Protection

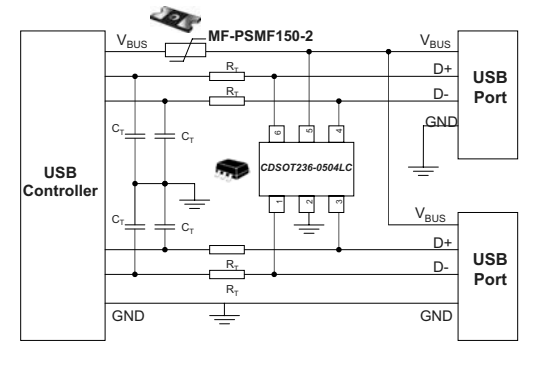
- USB ,是英文Universal Serial BUS(通用串行总线)的缩写，而其中文简称为“通串线，是一个外部总线标准，用于规范电脑与外部设备的连接和通讯。是应用在PC领域的接口技术。USB接口支持设备的即插即用和热插拔功能。USB是在1994年底由英特尔、康柏、IBM、Microsoft等多家公司联合提出的。USB版本经历了多年的发展，到现在市场上常见的为USB2.0 和USB3.0版本。
- 采用BOURNS的保护方案，可通过USB 2.0、 UL60950和IEC 61000–4–2 Level 4 (8 kV/15 kV)测试标准。



Discrete Solution







TVS:
CD143A–SR05LC
CDSOT236–0504LC
CDFN10–0524P
CDSOD323T05LC

ChipGard：
CG0603MLC–05LF

PPTC:
MF–MSMF110–2
MF–MSMF150–2
MF–NSMF075


MF-NSMF200

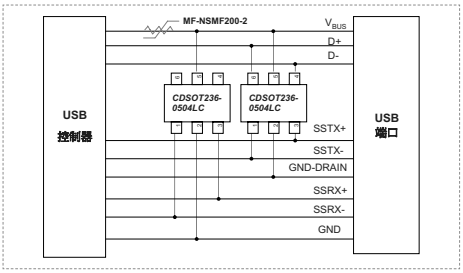

CG0402MLU-05

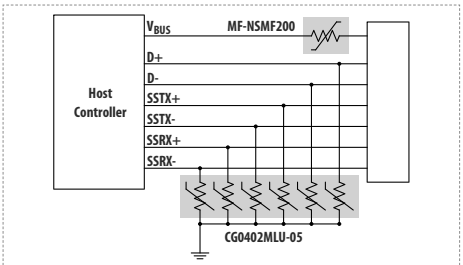
Design Kit

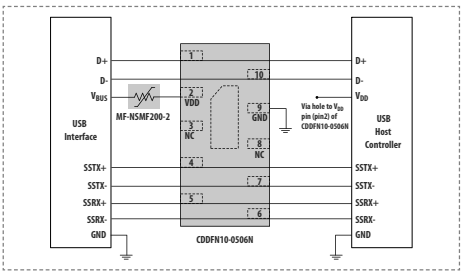

PN-DESIGNKIT 4

7 USB 3.0 - ESD & Overcurrent Protection

● 采用BOURNS的保护方案，可通过USB 3.0、 UL60950和IEC 61000–4–2 Level 4 (8 kV/15 kV) 测试标准。







TVS：
CDDFN10–0506N
CDSOT236–0504LC

ChipGard：
CG0402MLU–05LG

PPTC:
MF–MSMF110/150/200–2
MF–NSMF200


TBU-CA065-200-WH


2031-23T-SM-RPLF


CDSOT23-T12LC

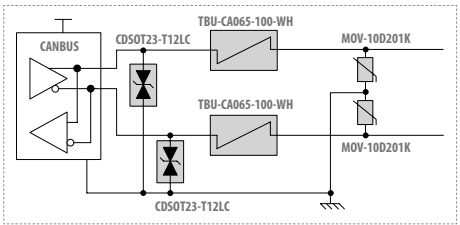
Design Kit

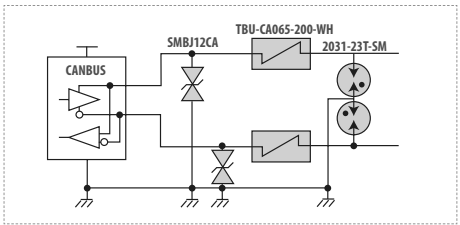

PN-DESIGNKIT-26

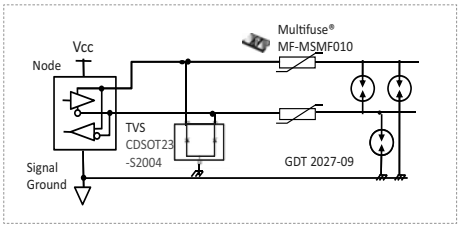
8 CAN-bus - Surge Protection

● CAN是控制器局域网络(Controller Area Network, CAN)的简称，是由研发和生产汽车电子的德国BOSCH公司开发了的，并最终成为国际标准。是国际上应用最广泛的现场总线之一。

● 采用BOURNS的保护方案，可通过IEC61000–4–4 EFT和IEC61000–4–5 Surge/Lightning 测试标准。







TVS:
CDSOD323–T12LC
CDSOD323–T12C

TBU:
TBU–CA065–200–WH
TBU–CA065–100–WH

PPTC:
MF–MSMF010

GDT:
2027–09–SM–RPLF
2026–09–C4LF
2036–09–SM–RPLF
2030–23T–SM–RPLF
2031–23T–SM–RPLF

数据通讯
Data communication


MF-MSMF075/24


SMBJ5.0A

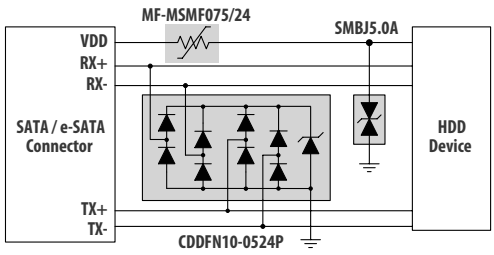

CDDFN10-0524P

Design Kit


PN-DESIGNKIT-28

9 SATA HDD Interface - Data & Power Protection

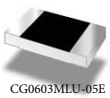
- SATA HDD是硬盘的一种接口方式，供电电压为5V或者12V。
- 采用BOURNS的保护方案，可通过IEC 61000–4–2 ESD Level 4, 8 kV 测试标准。



TVS:
CDDFN10–0524P
CDSOD323–T05LC
SMBJ5.0A(5V)
SMBJ12A(12V)

PPTC:
MF–MSMF075/24


MF-SM150/33-2

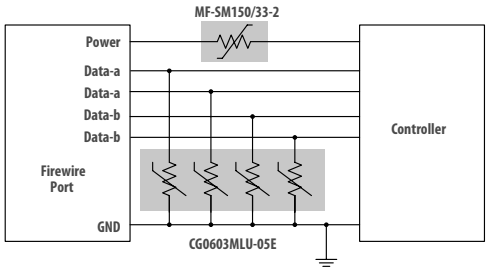

CG0603MLU-05E

Design Kit


PN-DESIGNKIT-25

10 IEEE 1394B - Firewire / iLink Protection

- IEEE1394接口最初由Apple公司提出(称为“火线”技术)并在1995年由IEEE(电气与电子工程师协会)正式制定为总线标准，它与USB接口在外形以及大部分功能上都具有惊人的相似点。IEEE1394目前有两个版本，即通常所使用的IEEE1394a和发展中的更高速的IEEE1394b。IEEE1394通常有两种接口方式，一种是六角型的六针接口，另一种是四角的四针接口，其区别就在于六针接口除了两条一对共两对的数据线外还多了一对电源线，可直接向外设供电，多使用于苹果机和台式电脑，而四针接口多用于DV或笔记本电脑等设备。
- 采用BOURNS的保护方案，可通过IEEE 1394B (2002)和IEC61000–4–2 Level 4测试标准。



TVS:
CDDFN10–0524P
CD143A–SR05LC

Chip Guard:
CG0402MLC–05LG
CG0603MLC–05LE
CG0603MLU–05E

PPTC:
MF–SM150/33–2

音频/视频
Audio/Video


TBU-CA065-200-WH


2031-23T-SM-RPLF

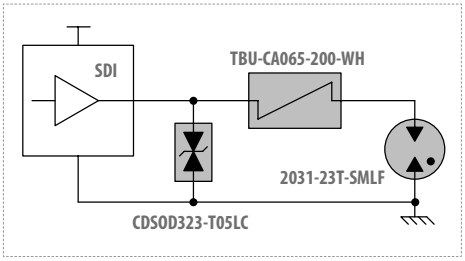

CDSOD323-T05LC

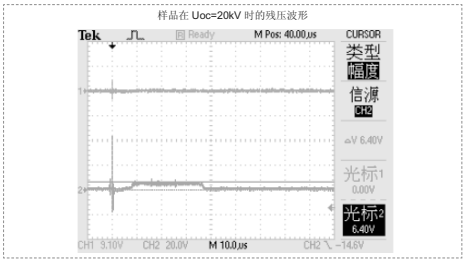
Design Kit

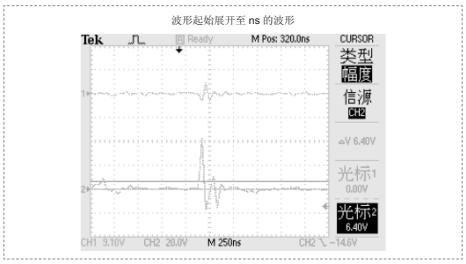

PN-DESIGNKIT-27

1 HD-SDI / SDI - Coaxial Port

- SDI接口,是“数字分量串行接口”. SDI接口是数字分量串行接口(serial digital interface)的首字母缩写。HD–SDI就是高清数字分量串行接口。传输速度达到1.485Gb/s。
- 采用BOURNS的保护方案，可通过8/20 µs4 kV&10/700 µs6 kV Surge Standard测试标准。







TBU:
TBU–CA065–200–WH

TVS:
CDSOD323–T05LC

GDT:
2031–23T–SMLF
2027–09–SM–RPLF
2035–09–SM–RPLF


CDDFN10-0524P


CDSOT236-0504LC

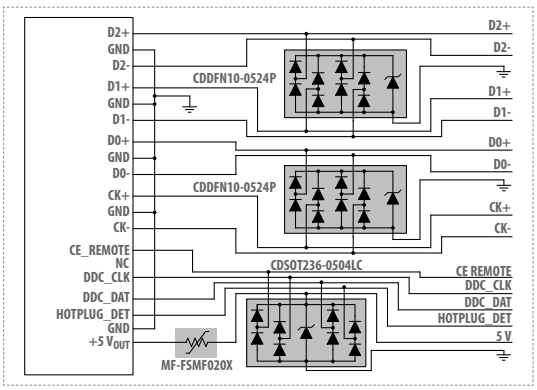

MF-FSMF020X

Design Kit


PN-DESIGNKIT 11

2 HDMI 1.3 - ESD & Overcurrent Protection

- HDMI，高清晰度多媒体接口(英文：High Definition Multimedia Interface)是一种全数位化影像和声音传送接口，可以传送无压缩的音频信号及视频信号，属于消费电子。HDMI可用于机顶盒、DVD播放机、个人电脑、电视游乐器、综合扩大机、数位音响与电视机。HDMI可以同时传送音频和影音信号，由于音频和视频信号采用同一条电缆，大大简化了系统的安装。
- 采用BOURNS的保护方案，可通过IEC 61000–4–2 Level 4 (8 kV / 15 kV)测试标准。



TVS:
CDDFN10–0524P
CDSOT236–0504LC

PPTC:
MF–FSMF020X


CG0402MLU-05x

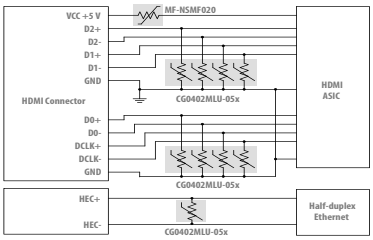

MF-NSMF020

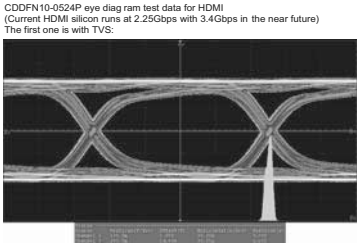
Design Kit

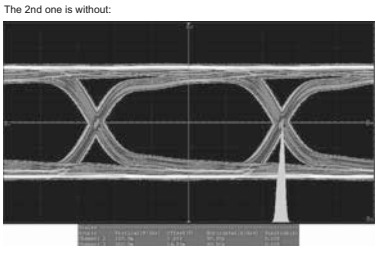

PN-DESIGNKIT 12

3 HDMI 1.4 - ESD & Overcurrent Protection

- 采用BOURNS的保护方案，可通过IEC 61000–4–2 Level 4 (8 kV / 15 kV)测试标准。







TVS:
CDDFN10–0524P
CDSOT236–0504LC

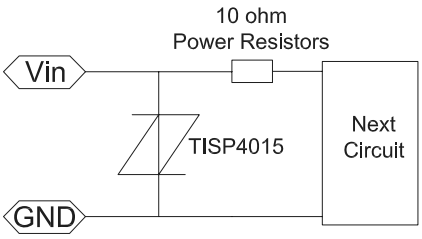
ChipGuard:
CG0402MLU–50X

PPTC:
MF–FSMF020X

4 BNC-ESD & Overcurrent


TISP4015L1B

- BNC接头，是一种用于同轴电缆的连接器，全称是Bayonet Nut Connector（刺刀螺母连接器，这个名称形象地描述了这种接头外形），。BNC接口即常说的细同轴电缆接口。BNC接口可以隔绝视频输入信号，使信号间互相干扰减少，且信号带宽要比普通15针的D型接口大，可达到更佳的信号响应效果。
- 采用BOURNS的保护方案，可通过IEC61000–4–4 EFT和IEC61000–4–5 Surge/Lightning 测试标准。



TISP:
TISP4015L1B

音频/视频
Audio/Video


CDDFN10-0524P


CDSOT236-0504LC

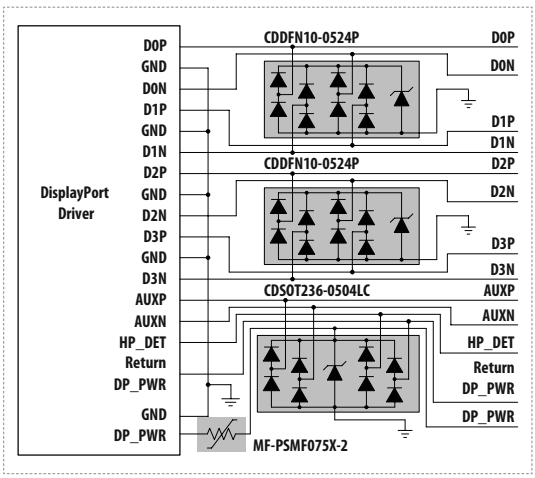

MF-PSMF075X-2

Design Kit


PN-DESIGNKIT-31

5 DisplayPort 1.2 ESD & Overcurrent Protection

- DisplayPort 是视频电子标准协会（VESA, Video Electronics Standards Association）推动的数字式视频接口标准，订定于2006年5月，目前最新版是1.2，订定于2009年11月22日。该接口订定免认证、免授权金，发展中的新型数字式音频／视频界面，主要适应于连接电脑和屏幕，或是电脑和家庭剧院系统。有意要取代旧有的VGA和DVI界面。
- 采用BOURNS的保护方案，可通过IEC 61000–4–2 Level 4 (8 kV / 15 kV) 测试标准。



TVS:
CDDFN10–0524P
CDSOT236–0504LC

PPTC:
MF–PSMF075X–2


TBU-CA085-200-WH


2031-42T-SM-RPLF

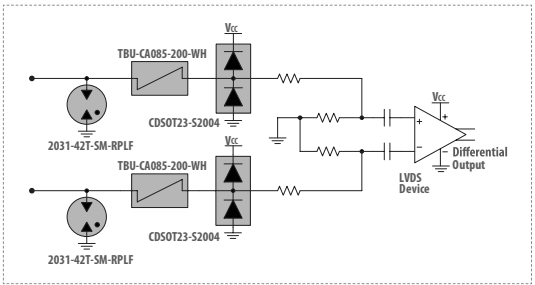

CDSOT23-S2004

Design Kit


PN-DESIGNKIT-15

6 LVDS - Input Port - Surge Protection

- LVDS即低压差分信号传输， 1994年由美国国家半导体公司提出的一种信号传输模式，是一种电平标准，广泛应用于液晶屏接口。它在提供高数据传输率的同时会有很低的功耗。一般在工业领域或行业内部使用。 LVDS目前大多用在7寸以上的显示屏上。
- 采用BOURNS的保护方案，可通过IEC 61000–4–5; Class 4 and 5; 4000 V/95 A测试标准。



TBU:
TBU–CA085–200–WH

TVS:
CDSOT23–S2004

GDT:
2031–42T–SM–RPLF


TBU-CA085-200-WH


2031-42T-SM-RPLF

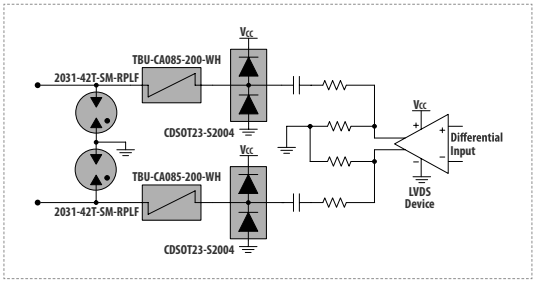

CDSOT23-S2004

Design Kit


PN-DESIGNKIT-16

7 LVDS - Output Port - Surge Protection

- 采用BOURNS的保护方案，可通过IEC 61000–4–5; Class 4 and 5; 4000 V/95 A测试标准。



TBU:
TBU–CA085–200–WH

TVS:
CDSOT23–S2004

GDT:
2031–42T–SM–RPLF


2035-09-SM

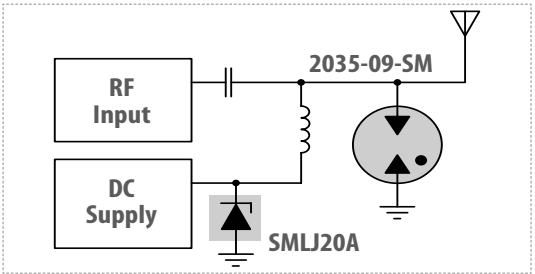

SMLJ20A

Design Kit


PN-DESIGNKIT-24

8 Satellite Receiver RF Input - Surge Protection

- 采用BOURNS的保护方案，可通过IEC 61000–4–5; 6 kV / 3 kA测试标准。



TVS:
SMLJ20A

GDT:
2035–09–SM–RPLF


CG0402MLU-12

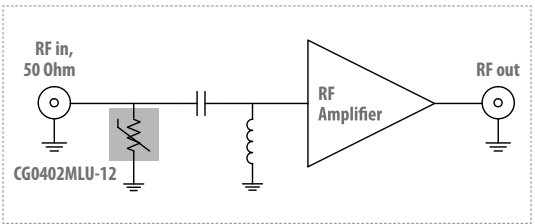

CS160808-68NK
Multilayer Chip Inductor

Design Kit


PN-DESIGNKIT 5

9 VHF/UHF - Coaxial Port - ESD Protection

- VHF意思是甚高频，UHF意思是超高频。多用于手机对相机等天线装置。
- 采用BOURNS的保护方案，可通过IEC 61000–4–2 Level 4 (8 kV/15 kV)测试标准。



TVS:
CDSOD323–T12LC

ChipGuard:
CG0402MLU–12

电信
Telecommunications

TISP4145M3BJR-S

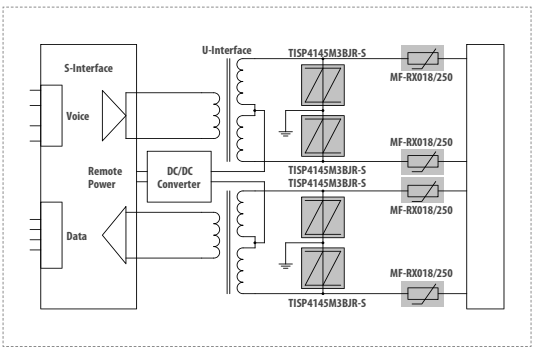
MF-RX018/250

Design Kit

PN-DESIGNKIT 10

1 ISDN

- ISDN(Integrated Service Digital Network)的中文名称是综合业务数字网，俗称“一线通”。同时以公共交换电话网 传输语音、视频及数据等的电路。
- 采用BOURNS的保护方案，可通过ITU–T K.21和GR–1089–CORE测试标准。



TISP:
TISP4145M3BJR–S
TISP4145H3

PPTC:
MF–RX018/250

Telefuse：
B1250T

TISP4350T3BJR-S

B1250T

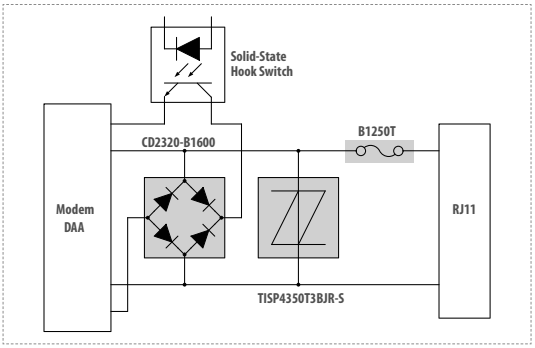
CD2320-B1600

Design Kit

PN-DESIGNKIT 8

2 RJ11 Fax/Modem (FXO)

- Fax modem(传真调制解调器)是一种以传真格式将数据编码并发送出去(也可接收)的调制解调器。它发送的数据可以由一台传真机或另一台调制解调器解码并转换成图像。
- 采用BOURNS的保护方案，可通过ITU–TK.21, IEC 60950, UL 60950和 TIA–968A 测试标准。



TISP:
TISP4350T3BJR–S
TISP4310T3

Telefuse:
B1250T

Diode Bridge:
CD2320–B1600

TISP61089BDR

TISP61089QB

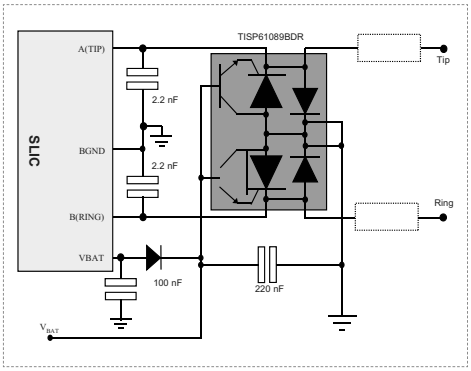
CMF-SDP50A

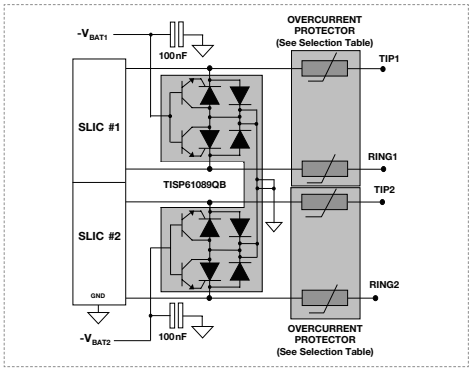
Design Kit

PN-DESIGNKIT 7

3 RJ11 SLIC Protection - GR-1089-CORE Dual Supply Voltage

- SLIC：Subscriber Line Interface Circuit，用户线接口电路。SLIC芯片提供支持话机的模拟接口，通常为RJ11，可以直接连接电话机。
- 采用BOURNS的保护方案，可通过GR–1089–CORE, Section 4, Port Types 1, 3, 5测试标准。





TISP:
TISP61089BDR
TISP61089QB

PTC:
CMF–SDP50A

TISP9110LDMR-S

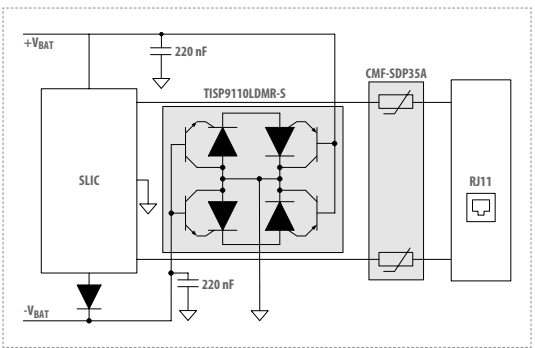
CMF-SDP35A

Design Kit

PN-DESIGNKIT 6

4 RJ11 SLIC Protection - ITU-T Dual Supply Voltage

- SLIC：Subscriber Line Interface Circuit，用户线接口电路。SLIC芯片提供支持话机的模拟接口，通常为RJ11，可以直接连接电话机。
- 采用BOURNS的保护方案，可通过ITU–T Basic and Enhanced for K.20, K.21, K.45测试标准。



TISP:
TISP9110LDMR–S

PTC:
CMF–SDP35A

电信
Telecommunications

TBU-PL060-200-WH

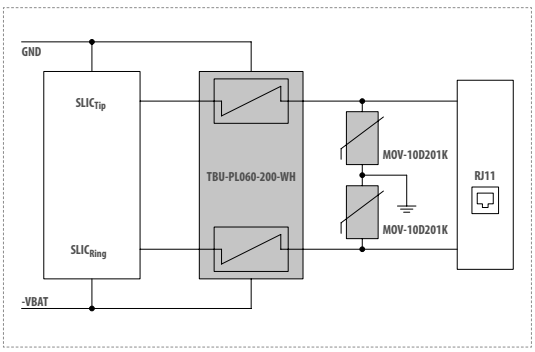
MOV-10D201K

Design Kit

PN-DESIGNKIT-20

5 RJ11 SLIC Protection - GR-1089-CORE Negative Voltage Tracking

- SLIC：Subscriber Line Interface Circuit，用户线接口电路。SLIC芯片提供支持话机的模拟接口，通常为RJ11，可以直接连接电话机。
- 采用BOURNS的保护方案，可通过GR–1089–CORE, Section 4, Port Types 2, 4 with increased surge level to 5000 V, 500 A 2/10 μs测试标准。



GDT:
2027–09–SM–RPLF
2026–09–C4LF
2036–09–SM–RPLF

MOV:
MOV–10D201K

TBU:
TBU–PL060–200–WH

TBU-PL085-200-WH

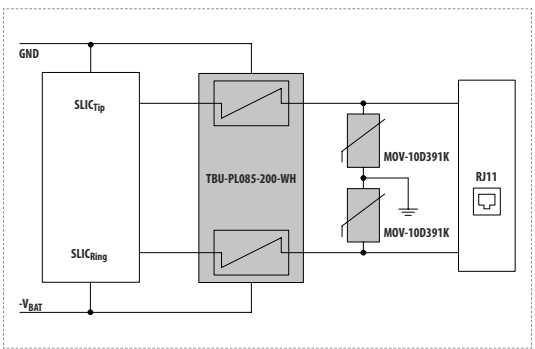
MOV-10D391K

Design Kit

PN-DESIGNKIT-21

6 RJ11 SLIC Protection - ITU-T Negative Voltage Tracking

- SLIC：Subscriber Line Interface Circuit，用户线接口电路。SLIC芯片提供支持话机的模拟接口，通常为RJ11，可以直接连接电话机。
- 采用BOURNS的保护方案，可通过ITU–T K.20, K.21, K.45. Meets enhanced requirements with primary protector breakdown voltage <330 V 测试标准。



GDT:
2027–09–SM–RPLF
2026–09–C4LF
2036–09–SM–RPLF

MOV:
MOV–10D391K

TBU:
TBU–PL085–200–WH
TBU–PL075–200–WH

电信
Telecommunications


TBU-DT085-200-WH


TISP4015L1BJR-S


2020-42T-C2FLF

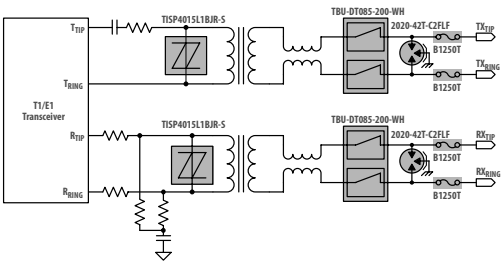

B1250T

Design Kit


PN-DESIGNKIT-40

7 T1/E1 - GR-1089-CORE

- T1和E1是物理连接技术，是数字网络，可以同轴也可以光纤，T1是美国标准，1.544M，E1是欧洲标准，2.048M，我国的专线一般都是E1，T1E1一般都是光纤入出的应用。
- 采用BOURNS的保护方案，可通过GR–1089–CORE, Section 4, Port Types 1, 3, 5测试标准。



TBU:
TBU–DT085–200–WH

TISP:
TISP4015L1BJR–S

GDT:
2020–42T–C2FLF

Telefuse:
B1250T


2038-110-SM


TISP4P015L1N

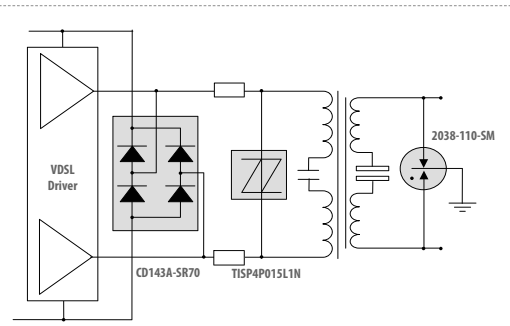

CD143A-SR70

Design Kit


PN-DESIGNKIT 9

8 VDSL - Driver Side Protection

- VDSL(very high bit–rate DSL) 是一种非对称DSL，通过一对VDSL设备，用作光纤结点到附近用户的最后引线。VDSL允许用户端利用现有铜线获得高带宽服务而不必采用光纤。VDSL和ADSL一样，也和电话共用同一条线。
- 采用BOURNS的保护方案，可通过ITU–T Basic and Enhanced和GR–1089–CORE测试标准。



GDT:
2038–110–SM

TVS;
CD143A–SR70

TISP:
TISP4P015L1N

电信
Telecommunications

TBU-CA050-500-WH

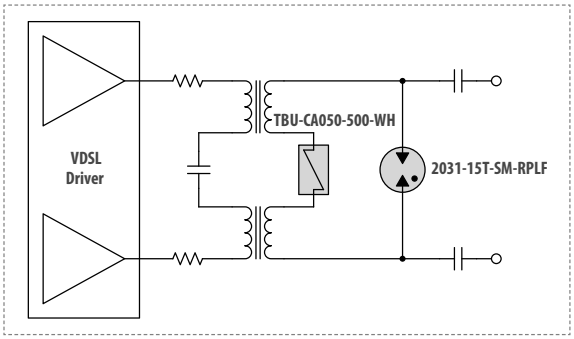
2031-15T-SM-RPLF

Design Kit

PN-DESIGNKIT-18

9 VDSL - Line Side Protection

- VDSL(very high bit–rate DSL) 是一种非对称DSL，通过一对VDSL设备，用作光纤结点到附近用户的最后引线。VDSL允许用户端利用现有铜线获得高带宽服务而不必采用光纤。VDSL和ADSL一样，也和电话共用同一条线。
- 采用BOURNS的保护方案，可通过ITU–T Basic and Enhanced和GR–1089–CORE测试标准。



TBU:
TBU–CA050–500–WH

GDT:
2031–15T–SM–RPLF

TBU-PL085-200-WH

TBU-CA085-500-WH

2020-42T-C4LF

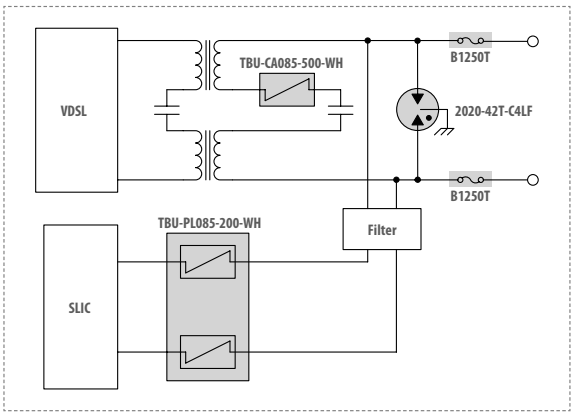
B1250T

Design Kit

PN-DESIGNKIT-19

10 VDSL - VDSL Over POTS

- VDSL(very high bit–rate DSL) 是一种非对称DSL，通过一对VDSL设备，用作光纤结点到附近用户的最后引线。VDSL允许用户端利用现有铜线获得高带宽服务而不必采用光纤。VDSL和ADSL一样，也和电话共用同一条线。
- 采用BOURNS的保护方案，可通过GR–1089–CORE测试标准。



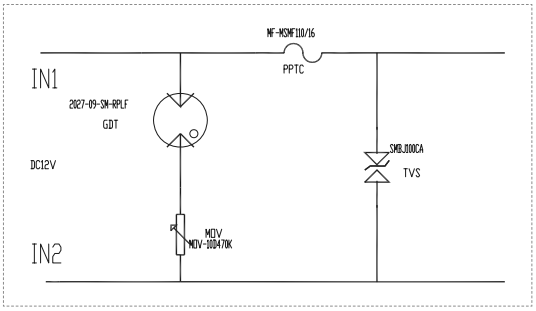
TBU:
TBU–CA085–500–WH
TBU–PL085–200–WH

GDT:
2020–42T–C4LF

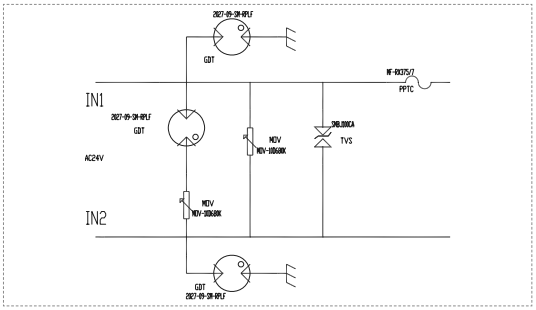
Telefuse:
B1250T

电源
Power supply

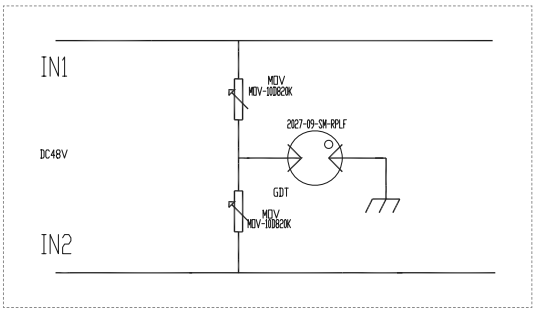
1 +12V直流电源保护



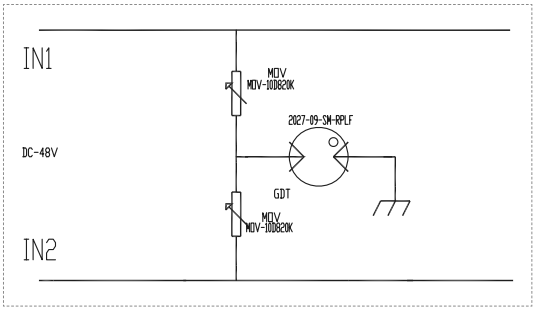
2 +24V交流电源保护



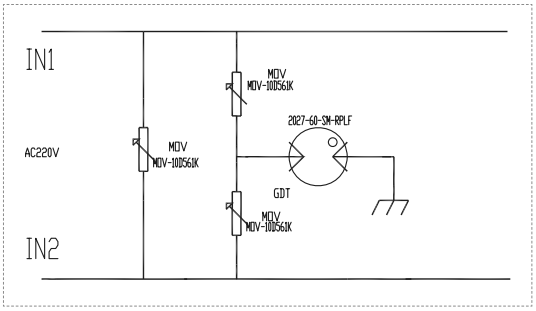
3 +48V直流电源保护



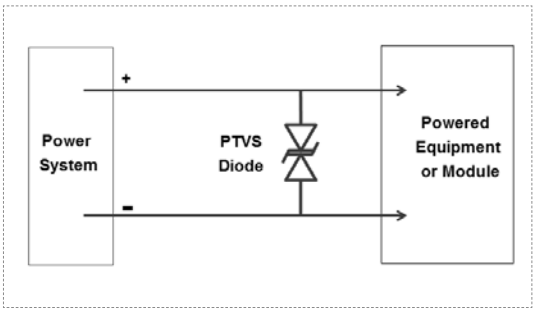
4 –48V直流电源保护



5 110V/220V交流电电源保护



6 PTVS In DC/AC Power



其他
Other

MF-MSMF110/16

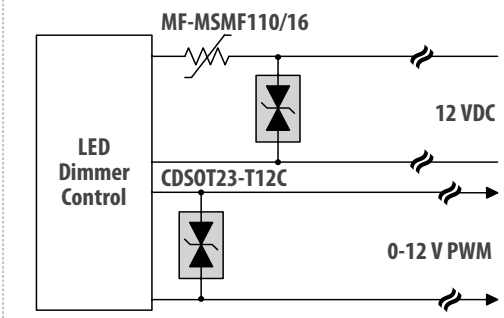
CDSOT23-T12C

Design Kit

PN-DESIGNKIT-29

1 LED PWM Dimmer - PWM / Power

- PWM Dimming (脉宽调制) 调光方式——这是一种利用简单的数字脉冲，反复开关白光 LED驱动器的调光技术。
- 采用BOURNS的保护方案，可通过IEC61000–4–2、IEC61000–4–4和IEC61000–4–5测试标准。



PPTC:
MF–MSMF110/16

TVS:
CDSOT23–T12C
CDSOD323–T12C
CDSOD323–T12LC

MF-SVS210

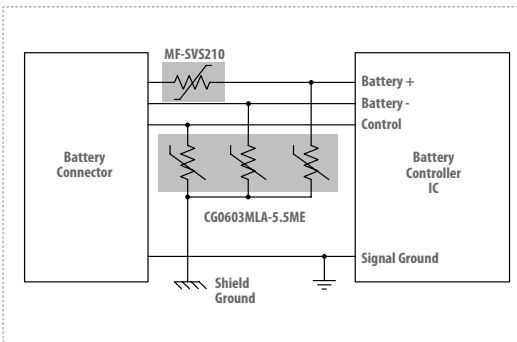
CG0603MLA-5.5ME

Design Kit

PN-DESIGNKIT-30

2 Li-ion Battery Controller Protection - Overcurrent and ESD Protection

- 此方案是为锂电池内部IC提供过流和ESD保护。
- 采用BOURNS的保护方案，可通过61000–4–2 ESD Level 4测试标准。



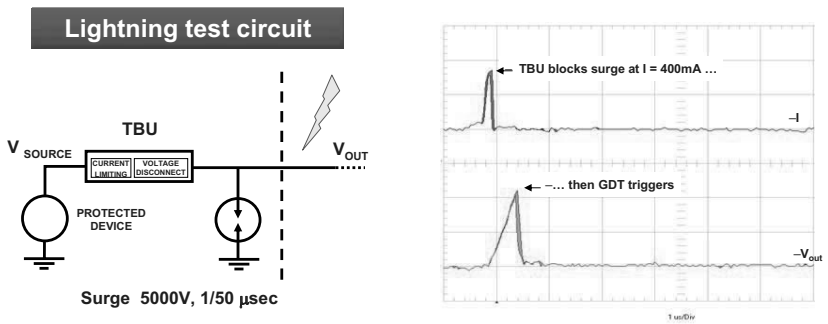
PPTC:
MF–SVS210

Chip Guard:
CGO6O3MLA–5.5ME

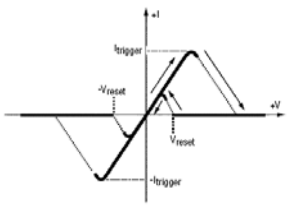
产品系列
Products Series

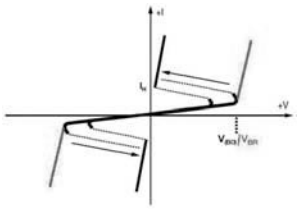
1 TBU

Example: OVP Coordination using a TBU™ device



OCP vs. OVP



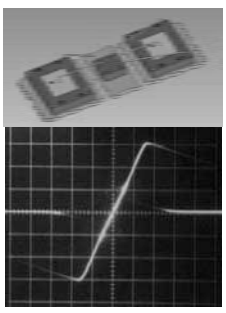


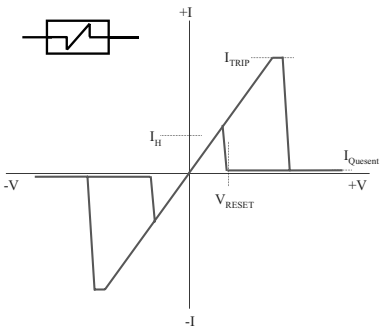
- Current Limiting Device
- Open Circuit / Current Clamp when activated
- Reset on Voltage

- Voltage Limiting Device
- Short Circuit / Voltage Clamp when activated
- Reset on Current

I-V Characteristic of a TBUTM device

- Below trigger threshold, TBU device acts like a resistor
- Above trigger threshold, TBU acts like a ~1mA current source

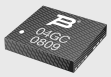
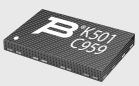




产品系列
Products Series

Bidirectional Dual TBU® Protectors

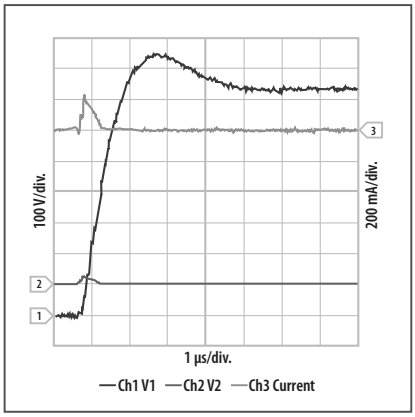
TBU-PL, TBU-PK & P40 Product Families

Part Number	Maximum Ratings		Operating Characteristics				Device Size (mm)	Form Factor
	V_{imp} (V)	V_{rms} (V)	$I_{trigger}$ Min. (mA)	$I_{trigger}$ Max. (mA)	t_{block} (µs)	R_{typ} (Ω)		
P40-G240-WH	40	28	240	480	0.2	3.6	4.00 x 4.00	
TBU-PL050-100-WH	500	300	100	200	1	50	6.50 x 4.00	
TBU-PL050-200-WH	500	300	200	400	1	50		
TBU-PL060-100-WH	600	350	100	200	1	50		
TBU-PL060-200-WH	600	350	200	400	1	50		
TBU-PL075-100-WH	750	400	100	200	1	50		
TBU-PL075-200-WH	750	400	200	400	1	50		
TBU-PL085-100-WH	850	425	100	200	1	50		
TBU-PL085-200-WH	850	425	200	400	1	50		
TBU-PK050-100-WH	500	300	100	200	1	80	6.50 x 4.00	
TBU-PK060-100-WH	600	425	100	200	1	80		
TBU-PK085-100-WH	850	425	100	200	1	80		

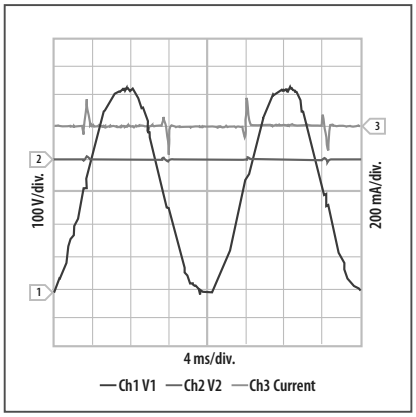
V_{imp} — Maximum peak impulse voltage withstand with duration less than 10 ms.
V_{rms} — Maximum continuous alternating current RMS voltage.
$I_{trigger}$ — Minimum and maximum current required for the device to go from operating state to protected state.
t_{block} — Maximum time for the device to go from normal operating state to protected state.
R_{typ} — Typical series resistance of the TBU® device.

Consult factory for alternate specification values. See data sheet for detailed specifications.

TBU® Lightning Surge Protection



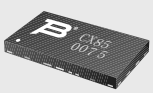
TBU® Power Fault Protection



产品系列
Products Series

Bidirectional Single TBU® Protectors

TBU-CA & TBU-CX Product Families

Part Number	Maximum Ratings		Operating Characteristics				Device Size (mm)	Form Factor
	V_{imp} (V)	V_{rms} (V)	$I_{trigger}$ Min. (mA)	$I_{trigger}$ Max. (mA)	t_{block} (µs)	R_{typ} (Ω)		
TBU-CA025-050-WH	250	100	50	100	1	13.3		
TBU-CA025-100-WH	250	100	100	200	1	7.1		
TBU-CA025-200-WH	250	100	200	400	1	4.2		
TBU-CA025-300-WH	250	100	300	600	1	3.2		
TBU-CA025-500-WH	250	100	500	1000	1	2.6		
TBU-CA040-050-WH	400	200	50	100	1	14.3		
TBU-CA040-100-WH	400	200	100	200	1	8.1		
TBU-CA040-200-WH	400	200	200	400	1	5.2		
TBU-CA040-300-WH	400	200	300	600	1	4.3		
TBU-CA040-500-WH	400	200	500	1000	1	3.6		
TBU-CA050-050-WH	500	250	50	100	1	15.7		
TBU-CA050-100-WH	500	250	100	200	1	9.5		
TBU-CA050-200-WH	500	250	200	400	1	6.6	6.50 x 4.00	
TBU-CA050-300-WH	500	250	300	600	1	5.6		
TBU-CA050-500-WH	500	250	500	1000	1	5.0		
TBU-CA065-050-WH	650	300	50	100	1	17.7		
TBU-CA065-100-WH	650	300	100	200	1	11.5		
TBU-CA065-200-WH	650	300	200	400	1	8.6		
TBU-CA065-300-WH	650	300	300	600	1	7.6		
TBU-CA065-500-WH	650	300	500	1000	1	7.0		
TBU-CA085-050-WH	850	425	50	100	1	21.4		
TBU-CA085-100-WH	850	425	100	200	1	15.2		
TBU-CA085-200-WH	850	425	200	400	1	12.3		
TBU-CA085-300-WH	850	425	300	600	1	11.3		
TBU-CA085-500-WH	850	425	500	1000	1	10.7		
TBU-CX025-VTC-WH	250	100	500	1000	1	2.6		
TBU-CX040-VTC-WH	400	200	500	1000	1	3.6		
TBU-CX050-VTC-WH	500	250	500	1000	1	5.0	8.25 x 4.00	
TBU-CX065-VTC-WH	650	300	500	1000	1	7.0		
TBU-CX085-VTC-WH	850	425	500	1000	1	10.7		

产品系列
Products Series

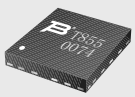
Unidirectional Single TBU® Protectors

TBU-KE Product Family

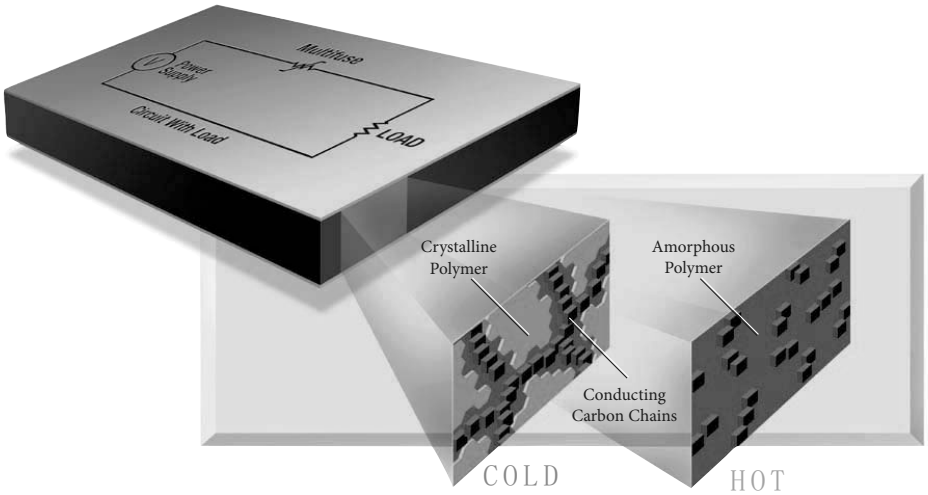
Part Number	Maximum Ratings		Operating Characteristics				Device Size (mm)	Form Factor
	V_{imp} (V)	V_{rms} (V)	$I_{trigger}$ Min. (mA)	$I_{trigger}$ Max. (mA)	t_{block} (µs)	R_{typ} (Ω)		
TBU-KE025-050-WH	250	100	50	100	1	12.5	5.00 x 2.50	
TBU-KE025-100-WH	250	100	100	200	1	6.3		
TBU-KE025-200-WH	250	100	200	400	1	3.4		
TBU-KE025-300-WH	250	100	300	600	1	2.4		
TBU-KE025-500-WH	250	100	500	1000	1	1.8		
TBU-KE040-050-WH	400	200	50	100	1	13.0		
TBU-KE040-100-WH	400	200	100	200	1	6.8		
TBU-KE040-200-WH	400	200	200	400	1	3.9		
TBU-KE040-300-WH	400	200	300	600	1	3.0		
TBU-KE040-500-WH	400	200	500	1000	1	2.3		
TBU-KE050-050-WH	500	250	50	100	1	13.7		
TBU-KE050-100-WH	500	250	100	200	1	7.5		
TBU-KE050-200-WH	500	250	200	400	1	4.6		
TBU-KE050-300-WH	500	250	300	600	1	3.6		
TBU-KE050-500-WH	500	250	500	1000	1	3.0		

Unidirectional Dual TBU® Protectors

TBU-DT Product Family

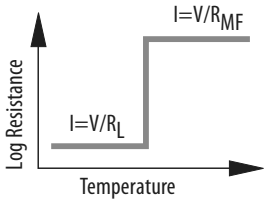
Part Number	Maximum Ratings		Operating Characteristics				Device Size (mm)	Form Factor
	V_{imp} (V)	V_{rms} (V)	$I_{trigger}$ Min. (mA)	$I_{trigger}$ Max. (mA)	t_{block} (µs)	R_{typ} (Ω)		
TBU-DT065-100-WH	650	300	100	200	1	8.5	5.00 x 5.00	
TBU-DT065-200-WH	650	300	200	400	1	5.6		
TBU-DT065-300-WH	650	300	300	600	1	4.6		
TBU-DT065-500-WH	650	300	500	1000	1	4.0		
TBU-DT085-100-WH	850	425	100	200	1	10.3		
TBU-DT085-200-WH	850	425	200	400	1	7.4		
TBU-DT085-300-WH	850	425	300	600	1	6.8		
TBU-DT085-500-WH	850	425	500	1000	1	5.8		

2 Multifuse® Products – How They Work



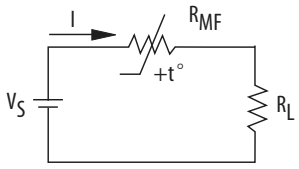
Resettable fuses are manufactured in the form of a conductive plastic, which is comprised of a non-conductive crystalline polymer with highly conductive carbon black particles impregnated throughout the crystal lattice. Because of the close proximity of the carbon black particles within the crystal lattice, under normal conditions current is allowed to flow easily through the conductive plastic. However under a fault condition, when there is an increase in current, the conductive plastic heats at the rate of I^2R. As the material continues to heat, it eventually reaches the phase transformation temperature, which changes the crystal structure into an amorphous structure. Once the material has transformed into this amorphous structure, the conductive particles become isolated and are unable to conduct current hence the drastic change in material resistance. It is only when the current is removed that the material is allowed to cool and return to its original crystal structure.

Multifuse® Products – How They Are Used



PTC Response Characteristic

It is the materials used in resettable fuses that allow them to reset after a fault condition has been removed. Resettable fuses exhibit a positive temperature coefficient effect when heated. While many materials exhibit a PTC effect when heated (an increase in resistance in response to a positive change in temperature), what makes the material used in resettable fuses unique is the fact that the increase in resistance changes exponentially rather than in a linear manner.



Typical Circuit Application

It is because of this transformation from a low resistance state to a high resistance state that allows the resettable fuse to protect loads. It is this transition from the low resistance state to high resistance state that is referred to as tripping. The time it takes for a resettable fuse to trip is relatively quick, depending on how high the fault current is and it can be as quick as a fraction of a second. Hence they are an excellent form of protection for most applications where sensitive devices need extra protection.

产品系列
Products Series

Radial Leaded Low Voltage Products

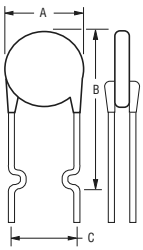
Features

- Bulk and Tape and Reel Packaging
- Industry Standard Sizes

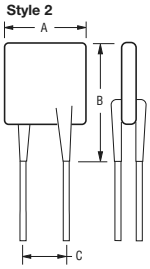
Applications

- Computers and Peripherals
- Automotive
- Electronic Toys
- General Electronics
- Consumer Appliances

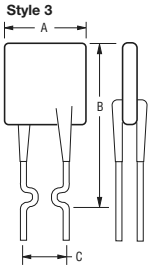
Style 1



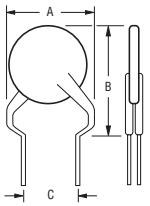
Style 2



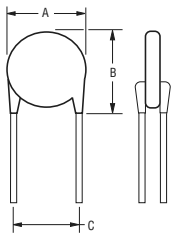
Style 3



Style 4



Style 5



MF-R Series 16-60 Volts
Radial Leaded 0.05-11 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Nom.	Style
MF-R005	0.05	60	40	7.3	22.0		8.0 (0.315)	8.3 (0.327)	5.1 (0.201)	4
MF-R010	0.10	60	40	2.50	7.50		7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R017	0.17	60	40	2.00	8.00		7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R020	0.20	60	40	1.50	4.40		7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R025	0.25	60	40	1.00	3.00		7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-R030	0.30	60	40	0.76	2.10		7.4 (0.291)	13.4 (0.528)	5.1 (0.201)	1
MF-R040	0.40	60	40	0.52	1.29		7.4 (0.291)	13.7 (0.539)	5.1 (0.201)	1
MF-R050	0.50	60	40	0.41	1.17		7.9 (0.311)	13.7 (0.539)	5.1 (0.201)	1
MF-R065	0.65	60	40	0.27	0.72		9.7 (0.382)	15.2 (0.598)	5.1 (0.201)	1
MF-R075	0.75	60	40	0.18	0.60		10.4 (0.409)	16.0 (0.630)	5.1 (0.201)	1
MF-R090	0.90	60	40	0.14	0.47		11.7 (0.461)	16.7 (0.657)	5.1 (0.201)	1
MF-R090-0-9	0.90	30	40	0.07	0.22		7.4 (0.291)	12.2 (0.480)	5.1 (0.201)	3
MF-R110	1.10	30	40	0.10	0.27		8.9 (0.350)	14.0 (0.551)	5.1 (0.201)	1
MF-R135	1.35	30	40	0.065	0.17		8.9 (0.350)	18.9 (0.744)	5.1 (0.201)	1
MF-R160	1.60	30	40	0.055	0.15		10.2 (0.402)	16.8 (0.661)	5.1 (0.201)	1
MF-R185	1.85	30	40	0.040	0.11		12.0 (0.472)	18.4 (0.724)	5.1 (0.201)	1
MF-R250	2.50	30	40	0.025	0.07		12.0 (0.472)	18.3 (0.720)	5.1 (0.201)	2
MF-R250-0-10	2.50	30	40	0.025	0.07		12.0 (0.472)	18.3 (0.720)	5.1 (0.201)	3
MF-R300	3.00	30	40	0.020	0.08		12.0 (0.472)	18.3 (0.720)	5.1 (0.201)	2
MF-R400	4.00	30	40	0.010	0.05		14.4 (0.567)	24.8 (0.976)	5.1 (0.201)	2
MF-R500	5.00	30	40	0.010	0.05		17.4 (0.685)	24.9 (0.980)	10.2 (0.402)	2
MF-R600	6.00	30	40	0.005	0.04		19.3 (0.760)	31.9 (1.256)	10.2 (0.402)	2
MF-R700	7.00	30	40	0.005	0.03		22.1 (0.870)	29.8 (1.173)	10.2 (0.402)	2
MF-R800	8.00	30	40	0.005	0.03		24.2 (0.953)	32.9 (1.295)	10.2 (0.402)	2
MF-R900	9.00	30	40	0.005	0.02		24.2 (0.953)	32.9 (1.295)	10.2 (0.402)	2
MF-R1100	11.00	16	100	0.003	0.014		24.2 (0.953)	32.9 (1.295)	10.2 (0.402)	2

MF-RG Series Operating Temperature
Radial Leaded 16 V -40 °C ~ +85 °C

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF- RG300	3.0	16	100	0.038	0.0975		7.1 (0.28)	11.0 (0.43)	5.1 ±0.7 (0.201 ±0.028)	2
MF- RG500	5.0	16	100	0.015	0.0340		10.4 (0.41)	14.3 (0.56)	5.1 ±0.7 (0.201 ±0.028)	2

MF-RX Series* 60 Volts
Radial Leaded 1.10 - 3.75 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Nom.	Style
MF-RX110	1.10	60	40	0.15	0.38		13.0 (0.512)	18.0 (0.709)	5.1 (0.201)	5
MF-RX135	1.35	60	40	0.12	0.30		14.5 (0.571)	19.6 (0.772)	5.1 (0.201)	5
MF-RX160	1.60	60	40	0.09	0.22		16.3 (0.642)	21.3 (0.839)	5.1 (0.201)	5
MF-RX185	1.85	60	40	0.08	0.19		17.8 (0.701)	22.9 (0.902)	5.1 (0.201)	5
MF-RX250	2.50	60	40	0.05	0.13		21.3 (0.839)	26.4 (1.039)	10.2 (0.402)	5
MF-RX300	3.00	60	40	0.04	0.10		24.9 (0.980)	30.0 (1.181)	10.2 (0.402)	5
MF-RX375	3.75	60	40	0.03	0.08		28.4 (1.118)	33.5 (1.319)	10.2 (0.402)	5

Not recommended for new designs, suggest using new **MF-RX/72 Series*

MF-RX/72 Series 72 Volts
Radial Leaded 0.20 – 3.75 Amps Hold Current

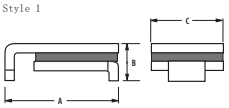
Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Nom.	Style
MF-RX020/72	0.20	72	40	1.50	4.40		7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-RX025/72	0.25	72	40	1.00	3.00		7.4 (0.291)	12.7 (0.500)	5.1 (0.201)	1
MF-RX030/72	0.30	72	40	0.76	2.10		7.4 (0.291)	13.4 (0.528)	5.1 (0.201)	1
MF-RX040/72	0.40	72	40	0.52	1.29		7.4 (0.291)	13.7 (0.539)	5.1 (0.201)	1
MF-RX050/72	0.50	72	40	0.41	1.17		7.9 (0.311)	13.7 (0.539)	5.1 (0.201)	1
MF-RX065/72	0.65	72	40	0.27	0.72		9.7 (0.382)	15.2 (0.598)	5.1 (0.201)	1
MF-RX075/72	0.75	72	40	0.18	0.60		10.4 (0.409)	16.0 (0.630)	5.1 (0.201)	1
MF-RX090/72	0.90	72	40	0.14	0.47		11.7 (0.461)	16.7 (0.657)	5.1 (0.201)	1
MF-RX110/72	1.10	72	40	0.15	0.38		10.84 (0.427)	16.84 (0.662)	5.1 (0.201)	2
MF-RX135/72	1.35	72	40	0.12	0.30		12.26 (0.483)	18.26 (0.718)	5.1 (0.201)	2
MF-RX160/72	1.60	72	40	0.09	0.22		13.94 (0.549)	19.94 (0.785)	5.1 (0.201)	2
MF-RX185/72	1.85	72	40	0.08	0.19		15.18 (0.598)	21.18 (0.833)	5.1 (0.201)	2
MF-RX250/72	2.50	72	40	0.05	0.13		17.84 (0.702)	23.84 (0.938)	10.2 (0.402)	2
MF-RX300/72	3.00	72	40	0.04	0.10		20.67 (0.814)	26.67 (1.050)	10.2 (0.402)	2
MF-RX375/72	3.75	72	40	0.03	0.08		23.51 (0.926)	29.51 (1.161)	10.2 (0.402)	2

MF-RHT Series Operating Temperature
Radial Leaded High Temperature -40 °C ~ +125 °C

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Nom.	Style
MF-RHT070	0.7	16	40	0.3	0.8		6.86 (0.27)	10.8 (0.425)	5.1 (0.201)	3
MF-RHT200	2.0	16	100	0.045	0.110		9.4 (0.37)	14.0 (0.55)	5.1 (0.201)	1
MF-RHT450	4.5	16	100	0.022	0.054		10.4 (0.41)	15.6 (0.61)	5.1 (0.201)	2
MF-RHT650	6.5	16	100	0.011	0.026		12.7 (0.5)	22.2 (0.88)	5.1 (0.201)	2
MF-RHT750	7.5	16	100	0.0094	0.022		14.0 (0.55)	23.5 (0.93)	5.1 (0.201)	2
MF-RHT1300	13.0	16	100	0.0041	0.01		23.5 (0.925)	28.7 (1.17)	10.2 (0.402)	2

产品系列
Products Series

Style 1



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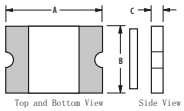

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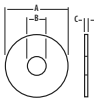


Surface Mount Low Voltage Products

Features

- Tape and Reel Packaging
- Industry Standard Sizes

Applications

- Computers and Peripherals
- General Electronics
- Automotive

MF-SM Series (2920 package) 6-60 Volts
Surface Mount (7555 mm) 0.30-3.00 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Nom.	Style
MF-SM030	0.30	60	40	0.90	4.80	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)		1
MF-SM050	0.50	60	40	0.35	1.40	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)		1
MF-SM075	0.75	30	80	0.23	1.00	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)		1
MF-SM075/60	0.75	60	10	0.23	1.00	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)		1
MF-SM100	1.10	30	80	0.12	0.48	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)		1
MF-SM100/33	1.10	33	40	0.12	0.41	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)		1
MF-SM125	1.25	15	100	0.07	0.25	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)		1
MF-SM260	2.60	6	100	0.025	0.075	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)		1
MF-SM300	3.00	6	100	0.015	0.048	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)		1

MF-SM Series (3425 package) 15-33 Volts
Surface Mount (8763 mm) 1.50-2.50 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-SM150	1.50	15	100	0.06	0.25	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)		1
MF-SM150/33	1.50	33	40	0.06	0.23	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)		1
MF-SM185/33	1.80	33	40	0.04	0.15	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)		1
MF-SM200	2.00	15	100	0.045	0.125	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)		1
MF-SM250	2.50	15	100	0.024	0.085	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)		1

MF-NSMF Series (1206 package) 6 - 30 Volts
Surface Mount (3216 mm) 0.12 - 2.00 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-NSMF012	0.12	30	10	1.35	8.50	3.4 (0.134)	1.8 (0.071)	1.1 (0.043)	2
MF-NSMF020	0.20	24	10	0.60	2.60	3.4 (0.134)	1.8 (0.071)	0.85 (0.033)	2
MF-NSMF035	0.35	6	100	0.30	1.20	3.4 (0.134)	1.8 (0.071)	0.85 (0.033)	2
MF-NSMF050	0.50	13.2	100	0.15	0.70	3.4 (0.134)	1.8 (0.071)	0.85 (0.033)	2
MF-NSMF075	0.75	6	100	0.10	0.40	3.4 (0.134)	1.8 (0.071)	0.7 (0.028)	2
MF-NSMF110	1.10	6	100	0.06	0.20	3.4 (0.134)	1.8 (0.071)	0.7 (0.028)	2
MF-NSMF150	1.50	6	100	0.03	0.13	3.4 (0.134)	1.8 (0.071)	0.7 (0.028)	2
MF-NSMF200	2.00	6	100	0.02	0.085	3.5 (0.138)	1.8 (0.071)	1.6 (0.063)	2

MF-MSMF Series (1812 package) 6-60 Volts
Surface Mount (4532 mm) 0.10-2.60 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-MSMF010	0.10	60	40	0.70	15.0	4.73 (0.186)	3.41 (0.134)	1.10 (0.043)	2
MF-MSMF014	0.14	60	40	0.40	6.50	4.73 (0.186)	3.41 (0.134)	1.10 (0.043)	2
MF-MSMF020	0.20	30	80	0.40	6.00	4.73 (0.186)	3.41 (0.134)	1.10 (0.043)	2
MF-MSMF020/60	0.20	60	40	0.40	6.00	4.73 (0.186)	3.41 (0.134)	1.10 (0.043)	2
MF-MSMF030	0.30	30	10	0.30	3.00	4.73 (0.186)	3.41 (0.134)	1.10 (0.043)	2
MF-MSMF050	0.50	15	100	0.15	1.00	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF075	0.75	13.2	100	0.11	0.45	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF075/24	0.75	24	40	0.11	0.45	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF110	1.10	6	100	0.04	0.21	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF110/16	1.10	16	100	0.04	0.21	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF110/24X	1.10	24.0	20	0.04	0.21	4.73 (0.190)	3.41 (0.134)	1.60 (0.063)	2
MF-MSMF125	1.25	6	100	0.035	0.14	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF150	1.50	6	100	0.03	0.12	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF150/24X	1.50	24.0	20	0.03	0.120	4.83 (0.190)	3.41 (0.134)	1.60 (0.063)	2
MF-MSMF160	1.60	8	100	0.035	0.099	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF200	2.00	8	40	0.020	0.08	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2
MF-MSMF250/16X	2.50	16.0	100	0.015	0.100	4.83 (0.190)	3.41 (0.134)	1.60 (0.063)	2
MF-MSMF260	2.60	6	100	0.015	0.08	4.73 (0.186)	3.41 (0.134)	0.85 (0.033)	2

Surface Mount Low Voltage Products (Continued)

MF-SMDF Series (2018 package) 10 - 60 Volts
Surface Mount (5050 mm) 0.30 - 2.00 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-SMDF050	0.55	60	10	0.20	1	5.44 (0.214)	4.93 (0.194)	1.09 (0.043)	2
MF-SMDF150	1.50	15	40	0.05	0.17	5.44 (0.214)	4.93 (0.194)	0.85 (0.033)	2
MF-SMDF200	2.00	10	40	0.03	0.1	5.44 (0.214)	4.93 (0.194)	0.85 (0.033)	2

MF-SMHT Series 16 Volts
Surface Mount/High 1.36 - 1.60 Amps Hold Current
Temperature *(Working temp: -40 ~ +125 °C)*

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-SMHT136	1.36	16	100	0.085	0.330	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	1
MF-SMHT160	1.60	16	100	0.050	0.150	9.5 (0.374)	3.0 (0.118)	6.71 (0.264)	1

MF-USMF Series (1210 package) 6 - 30 Volts
Surface Mount (3225 mm) 0.05 - 1.75 Amps Hold Current

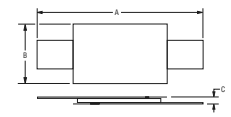
Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-USMF005	0.05	30	10	2.80	50.0	3.43 (0.135)	2.8 (0.11)	1.1 (0.043)	2
MF-USMF010	0.10	30	10	0.80	15.0	3.43 (0.135)	2.8 (0.11)	1.1 (0.043)	2
MF-USMF020	0.20	30	10	0.40	5.00	3.43 (0.135)	2.8 (0.11)	1.1 (0.043)	2
MF-USMF035	0.35	6.0	40	0.20	1.30	3.43 (0.135)	2.8 (0.11)	0.85 (0.033)	2
MF-USMF050	0.50	13.2	40	0.18	0.90	3.43 (0.135)	2.8 (0.11)	0.85 (0.033)	2
MF-USMF075	0.75	6.0	40	0.07	0.45	3.43 (0.135)	2.8 (0.11)	0.85 (0.033)	2
MF-USMF110	1.10	6.0	40	0.05	0.21	3.43 (0.135)	2.8 (0.11)	0.85 (0.033)	2
MF-USMF150	1.50	6.0	40	0.03	0.11	3.43 (0.135)	2.8 (0.11)	0.85 (0.033)	2
MF-USMF175	1.75	6.0	40	0.02	0.09	3.43 (0.135)	2.8 (0.11)	0.85 (0.033)	2

MF-PSMF Series (0805 package) 6 - 9 Volts
Surface Mount (2010 mm) 0.20 - 1.10 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-PSMF020X	0.20	9	40	0.65	3.5	2.3 (0.091)	1.5 (0.059)	0.85 (0.033)	2
MF-PSMF035X	0.35	6	40	0.25	1.2	2.3 (0.091)	1.5 (0.059)	0.85 (0.033)	2
MF-PSMF050X	0.50	6	40	0.15	0.9	2.3 (0.091)	1.5 (0.059)	0.85 (0.033)	2
MF-PSMF075X	0.75	6	40	0.09	0.35	2.3 (0.091)	1.5 (0.059)	1.25 (0.049)	2
MF-PSMF110X	1.10	6	40	0.06	0.21	2.3 (0.091)	1.5 (0.059)	1.25 (0.049)	2

产品系列
Products Series

Standard Style



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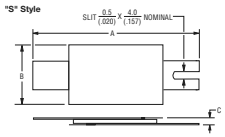

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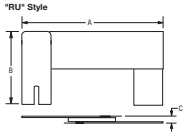


Strap Products

Features

- Axial/Radial Leaded
- Very Low Internal Resistance
- Weldable Nickel Terminal

Applications

- Rechargeable Battery Packs forCellular Phones & Laptop Computers

MF-SVS Series (Lowest Available Resistance) 10 Volts
Axial Leaded Strap 1.7-2.3 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-SVS170	1.7	10	100	0.018	0.064	18.0 (0.709)	5.5 (0.216)	0.9 (0.035)	Std.
MF-SVS170N	1.7	10	100	0.018	0.064	24.0 (0.945)	3.9 (0.153)	0.9 (0.035)	Std.
MF-SVS175	1.75	10	100	0.017	0.063	18.0 (0.709)	5.5 (0.216)	0.9 (0.035)	Std.
MF-SVS175N	1.75	10	100	0.017	0.063	24.0 (0.945)	3.9 (0.153)	0.9 (0.035)	Std.
MF-SVS175NL	1.75	10	100	0.017	0.063	28.0 (1.102)	3.9 (0.153)	0.9 (0.035)	Std.
MF-SVS210	2.1	10	100	0.010	0.040	23.1 (0.909)	5.5 (0.216)	0.9 (0.035)	Std.
MF-SVS210N	2.1	10	100	0.010	0.040	32.0 (1.260)	3.9 (0.153)	0.9 (0.035)	Std.
MF-SVS230	2.3	10	100	0.010	0.036	23.1 (0.909)	5.5 (0.216)	0.9 (0.035)	Std.
MF-SVS230N	2.3	10	100	0.010	0.036	32.0 (1.260)	3.9 (0.153)	0.9 (0.035)	Std.

MF-VS Series (Low Resistance & Low Temp.) 16 Volts
Axial Leaded Strap 1.7-2.4 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-VS170	1.7	16	100	0.030	0.105	18.0 (0.709)	5.5 (0.217)	0.9 (0.035)	Std.
MF-VS170S	1.7	16	100	0.030	0.105	18.0 (0.709)	5.5 (0.217)	0.9 (0.035)	S
MF-VS210	2.1	16	100	0.018	0.060	23.1 (0.909)	5.5 (0.217)	0.9 (0.035)	Std.
MF-VS210L	2.1	16	100	0.018	0.060	26 (1.023)	5.5 (0.217)	0.9 (0.035)	Std.
MF-VS210S	2.1	16	100	0.018	0.060	23.1 (0.909)	5.5 (0.217)	0.9 (0.035)	S

MF-VS Narrow Body Series (Low Resistance Narrow) 12 Volts
Axial Leaded Strap 1.7-2.1 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-VS170N	1.7	12	100	0.030	0.105	24.0 (0.945)	3.9 (0.154)	0.9 (0.035)	Std.
MF-VS175NL	1.75	12	100	0.029	0.102	28.0 (1.102)	3.9 (0.154)	0.9 (0.035)	Std.
MF-VS210N	2.1	12	100	0.018	0.060	32.0 (1.260)	3.9 (0.154)	0.9 (0.035)	Std.

MF-LR Series (Low Resistance) 10-20 Volts
Axial Leaded Strap 1.90-9.00 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-LR190	1.90	15	100	0.039	0.102	22.1 (0.870)	5.2 (0.205)	1.0 (0.039)	Std.
MF-LR190S	1.90	15	100	0.039	0.102	22.1 (0.870)	5.2 (0.205)	1.0 (0.039)	S
MF-LR260	2.60	15	100	0.020	0.083	23.1 (0.909)	5.2 (0.205)	1.0 (0.039)	Std.
MF-LR260S	2.60	15	100	0.020	0.083	23.1 (0.909)	5.2 (0.205)	1.0 (0.039)	S
MF-LR380	3.80	15	100	0.013	0.037	26.0 (1.024)	7.5 (0.295)	1.0 (0.039)	Std.
MF-LR450	4.50	16	100	0.011	0.028	26.0 (1.024)	10.5 (0.414)	1.0 (0.039)	Std.
MF-LR550	5.50	10	100	0.009	0.022	37.0 (1.457)	7.5 (0.295)	1.0 (0.039)	Std.
MF-LR600	6.00	10	100	0.007	0.019	26.0 (1.024)	15.9 (0.626)	1.0 (0.039)	Std.
MF-LR730	7.30	10	100	0.006	0.015	30 (1.18)	15 (0.590)	1.0 (0.039)	Std.
MF-LR730/20	7.30	20	100	0.006	0.015	29.1 (1.146)	14.5 (0.571)	1.0 (0.039)	Std.
MF-LR900/20	9.00	20	100	0.006	0.014	47.6 (1.874)	8.5 (0.335)	1.3 (0.051)	Std.

MF-LL Series (Low Resistance) 6 Volts
Axial Leaded Strap 1.90 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	B Max.	C Max.	Style
MF-LL190	1.90	6	50	0.005	0.024	16.8 (0.66)	3.26 (0.13)	1.1 (0.04)	Std.
MF-LL270	2.70	6	50	0.005	0.018	10.8 (0.425)	3.26 (0.128)	1.1 (0.043)	S
MF-LL300	3	6	50	0.004	0.017	16.8 (0.661)	3.26 (0.128)	1.1 (0.043)	Std.

产品系列
Products Series

Strap Products (Continued)

MF-LS Series (Lower Trip Temperature) 15-24 Volts
Axial Leaded Strap 1.0-3.4 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-LS100S	1.0	24	100	0.070	0.260		23.1 (0.909)	5.2 (0.205)	1.0 (0.039)	S
MF-LS180	1.8	24	100	0.040	0.120		26.0 (1.024)	5.2 (0.205)	1.0 (0.039)	Std.
MF-LS180L	1.8	24	100	0.040	0.120		37.5 (1.48)	5.6 (0.22)	1.0 (0.039)	Std.
MF-LS180S	1.8	24	100	0.040	0.120		26.0 (1.024)	5.2 (0.205)	1.0 (0.039)	S
MF-LS190	1.9	24	100	0.030	0.100		23.4 (0.921)	11.0 (0.433)	1.1 (0.043)	Std.
MF-LS190RU	1.9	15	100	0.030	0.100		20.8 (0.819)	14.3 (0.563)	0.76 (0.030)	RU
MF-LS260	2.6	24	100	0.025	0.076		26.0 (1.024)	11.9 (0.469)	1.0 (0.039)	Std.
MF-LS300	3.0	24	100	0.015	0.055		31.8 (1.252)	13.5 (0.531)	1.1 (0.043)	Std.
MF-LS340	3.4	24	100	0.016	0.050		26.0 (1.024)	15.9 (0.626)	1.0 (0.039)	Std.

MF-S Series (Standard) 15-30 Volts
Axial Leaded Strap 1.20-4.20 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-S120	1.20	15	100	0.085	0.220		22.1 (0.870)	5.2 (0.205)	1.0 (0.039)	Std.
MF-S120S	1.20	15	100	0.085	0.220		22.1 (0.870)	5.2 (0.205)	1.0 (0.039)	S
MF-S150	1.50	15	100	0.050	0.113		23.4 (0.921)	11.0 (0.433)	1.1 (0.043)	Std.
MF-S175	1.75	15	100	0.050	0.120		23.1 (0.909)	5.2 (0.205)	1.0 (0.039)	Std.
MF-S175S	1.75	15	100	0.050	0.120		23.1 (0.909)	5.2 (0.205)	1.0 (0.039)	S
MF-S200	2.00	30	100	0.030	0.080		23.4 (0.921)	11.0 (0.433)	1.1 (0.043)	Std.
MF-S350	3.50	30	100	0.017	0.040		31.8 (1.252)	13.5 (0.531)	1.1 (0.043)	Std.
MF-S420	4.20	30	100	0.012	0.040		32.4 (1.276)	13.6 (0.535)	1.1 (0.043)	Std.

Disk & Chip Type PTC Products

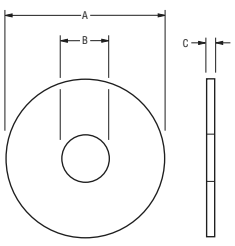
Features

- Custom designs to meet appropriate applications
- Overcurrent and overtemperature protection
- Patents pending
- Compatible with current industry standards
- Standard and low–temperature material

Applications

- Lithium cells
- Powered toys
- Battery cells
- Motors

Style 1



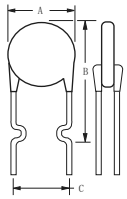
MF-D Series* 15 Volts
Disk Configuration 2.5 - 12.2 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-D	2.5	15	10	0.015	0.032	14.4 (0.567)	6.3 (0.248)	0.36 (0.014)	1
MF-D	3.5	15	20	0.015	0.032	16.4 (0.646)	10.0 (0.394)	0.36 (0.014)	1
MF-D	5.5	15	40	0.014	0.30	16.08 (0.633)	9.0 (0.354)	0.36 (0.014)	1
MF-D	12.2	15	50	0.007	0.017	2.4 (0.945)	–	0.36 (0.014)	1

**For ordering information, contact your Bourns representative.*

产品系列
Products Series

Style 1



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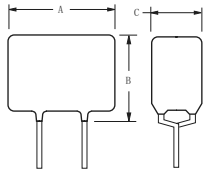

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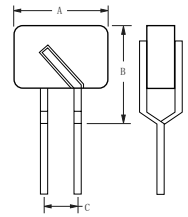

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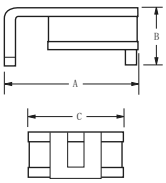

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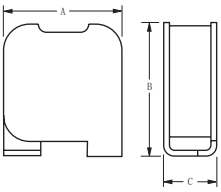


Telecom Products

Features

- Designed to Withstand Lightning Surge
- Available in Matched Resistance "Bins"
- Designed to Withstand AC Power Cross

Applications

- CPE and Central Office
- Hybrid–Fiber Coax
- Access Equipment

MF-R/90 Series 90 Volts
Radial Leaded 0.55-0.75 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Nom.	Style
MF-R055/90	0.55	90	10	0.45	2.0	10.9 (0.43)	16.7 (0.65)	5.1 (0.201)		1
MF-R055/90U	0.55	90	10	0.45	2.0	10.3 (0.4)	16.7 (0.65)	5.1 (0.201)		1
MF-R075/90	0.75	90	10	0.37	1.65	11.9 (0.47)	15.5 (0.61)	5.1 (0.201)		1

MF-RX/250 Series 60 Volts
(Fast Trip, Small Package) 250 Vrms short duration interrupt
Radial Leaded 0.12-0.18 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	Initial Resistance Ohms at 23 °C Max.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-RX012/250	0.12	60	3.0	4.0	16.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250-A	0.12	60	3.0	7.0	16.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250-C	0.12	60	3.0	5.5	14.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250-F	0.12	60	3.0	6.0	16.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250-1	0.12	60	3.0	6.0	16.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250-2	0.12	60	3.0	8.0	16.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250-T	0.12	60	3.0	7.0	16.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX012/250U	0.12	60	3.0	6.0	16.0	6.0 (0.236)	10.0 (0.394)	5.1 (0.201)		3
MF-RX014/250	0.145	60	3.0	3.0	14.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX014/250-A	0.145	60	3.0	3.0	12.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX014/250-B	0.145	60	3.0	4.5	14.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX014/250-T	0.145	60	3.0	5.4	14.0	6.5 (0.256)	11.0 (0.433)	5.1 (0.201)		2
MF-RX014/250U	0.145	60	3.0	3.5	12.0	6.0 (0.236)	10.0 (0.394)	5.1 (0.201)		3
MF-RX018/250	0.18	60	10.0	0.8	4.0	11.0 (0.433)	13.6 (0.535)	5.1 (0.201)		2
MF-RX018/250U	0.18	60	10.0	0.8	4.0	10.4 (0.409)	12.6 (0.496)	5.1 (0.201)		3

60 Volts
MF-R/600 Series 600 Vrms short duration interrupt
Radial Leaded 0.15-0.16 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-R015/600	0.15	60	3.0	6.0	22.0	13.5 (0.531)	12.6 (0.496)	6.0 (0.236)	2
MF-R015/600-A	0.15	60	3.0	7.0	20.0	13.5 (0.531)	12.6 (0.496)	6.0 (0.236)	2
MF-R015/600-B	0.15	60	3.0	9.0	22.0	13.5 (0.531)	12.6 (0.496)	6.0 (0.236)	2
MF-R015/600-F	0.15	60	3.0	7.0	22.0	13.5 (0.531)	12.6 (0.496)	6.0 (0.236)	2
MF-R016/600	0.16	60	3.0	4.0	18.0	16.0 (0.629)	12.6 (0.496)	6.0 (0.236)	2
MF-R016/600-A	0.16	60	3.0	4.0	16.0	16.0 (0.629)	12.6 (0.496)	6.0 (0.236)	2
MF-R016/600-1	0.16	60	3.0	4.0	17.0	16.0 (0.629)	12.6 (0.496)	6.0 (0.236)	2

60 Volts
MF-SM013/250 Series 250 Vrms short duration interrupt
Surface Mount 0.13 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-SM013/250-2	0.13	60	3.0	6.5	20.0	9.4 (0.370)	3.7 (0.146)	7.4 (0.291)	4
MF-SM013/250-A-2	0.13	60	3.0	6.5	20.0	9.4 (0.370)	3.7 (0.146)	7.4 (0.291)	4
MF-SM013/250-B-2	0.13	60	3.0	9.0	20.0	9.4 (0.370)	3.7 (0.146)	7.4 (0.291)	4
MF-SM013/250-C-2	0.13	60	3.0	7.0	20.0	9.4 (0.370)	3.7 (0.146)	7.4 (0.291)	4

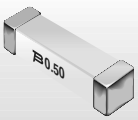
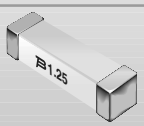
60 Volts
MF-SM013/250V Series 250 Vrms short duration interrupt
Surface Mount 0.13 Amps Hold Current

Model	I_{hold} Amperes at 23 °C	V max. Volts	I max. Amps	Initial Resistance Ohms at 23 °C Min.	1 Hour (R_1) Post-Trip Resistance Ohms at 23 °C Max.	Dimensions mm/(in) A Max.	Dimensions mm/(in) B Max.	Dimensions mm/(in) C Max.	Style
MF-SM013/250V	0.13	250	3.0	6.5	20.0	6.6 (0.260)	7.4 (0.291)	3.2 (0.126)	5

3 Bourns® Telefuse™ Telecom Fuses

Features

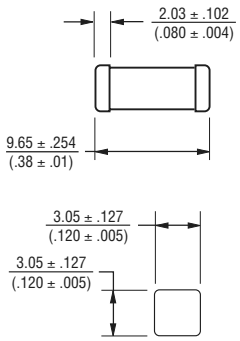
- For Use in Telecommunication Circuit Applications Requiring Low Current Protection with High Surge Tolerance
- Overcurrent Protection to Telcordia GR–1089–CORE & UL 1950/60950
- Ideal for Protecting Central Office and Customer Premises Equipment, including POTS, T1/E1, ISDN and xDSL circuits
- Model B1250T Allows Overcurrent Compliance with Telecom Specifications including Telcordia GR–1089–CORE, UL 60950 and ITU K.20, K.21 and K.44
- Model B0500T is a Lower Current Version for Use in Applications where a Faster Opening Time May be Required
- Bourns® TISP® Thyristor Surge Protector Products are Recommended for the Overvoltage Section of the Circuit
- Agency Recognition: File: E198545

	Model Number	Ampere Rating (A)	Voltage Rating (Vrms)	Typical Cold Resistance (ohms)	Peak Surge Current* (Amps)	Power Fault 2.2 A, 600 V Clearing Time Max. (minutes)	Maximum Power Dissipation (W)
	B0500T	0.500	600	0.350	25	2	0.25
	B1250T	1.25	600	0.090	100	15	0.40

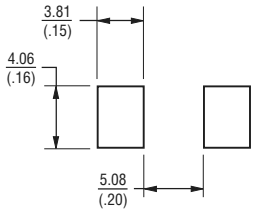
*50 pulses @ 1 kV 10/1000 µs

Body Material: Ceramic with tin plated brass caps
Solder: Lead free
Packaging: 2,000 pcs. per 13 ″ reel

Product Dimensions



Recommended Pad Layout



DIMENSIONS = MILLIMETERS / (INCHES)

产品系列
Products Series

4 GDT

2027-xx-XX 2-Electrode GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
8 x 6 mm	20 kA	>1000 operations	75 - 600 V	<1 pF	Bulk, Tape & Reel	Core, axial leaded, lead formed	• High surge current rating • ±15 % DCBD tolerance on 150 - 600 V devices • Stable breakdown throughout life • Custom configurations available • Low and stable capacitance • RoHS and non-RoHS versions available • Multiple leadforms available

2027-xx-SM 2-Electrode Surface Mount GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
8 x 6 mm	20 kA	>1000 operations	75 - 600 V	<1 pF	Bulk, Tape & Reel		• Surface mountable for economical assembly • ±15 % DCBD tolerance on 150 - 600 V devices • High surge current rating • Low capacitance and insertion loss • Stable breakdown throughout life

2035-xx-XX 2-Electrode Miniature GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 4 mm	10 kA	>300 operations	90 - 600 V	<1 pF	Bulk, Tape & Reel	Core, axial leaded, lead formed	• Small size • ±15 % DCBD tolerance on 150 - 600 V devices • High surge current rating • Stable breakdown throughout life • Low capacitance and insertion loss • Multiple leadforms available

2035-xx-SM 2-Electrode Precision Surface Mount GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 5 mm	10 kA	>300 operations	90 - 600 V	<1 pF	Bulk, Tape and Reel		• Surface mountable for economical assembly • ±15 % DCBD tolerance on 150 - 600 V devices • Compact mini-size • Low capacitance and insertion loss • Stable breakdown throughout life

2037-xx-XX 2-Electrode Miniature GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 5 mm	10 kA	>300 operations	90 - 600 V	<1 pF	Bulk, Tape & Reel	Core, axial leaded, lead formed	• Small size • ±15 % DCBD tolerance on 150 - 600 V devices • High surge current rating • Stable breakdown throughout life • Low capacitance and insertion loss • Multiple leadforms available

产品系列
Products Series

GDT

2039-xxx-XX 2-Electrode High Voltage GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 4 mm	5 kA	>100 operations	800V , 1100 V up to 1500 V	<1 pF	Bulk, Tape and Reel	Core, axial leaded, lead formed	• High voltage DCBD • Low capacitance and insertion loss • Fast reponse to transients • Compact mini size • Ideal for dense board applications • Leadless SMT pkg. supports auto assembly

2039-xx-SM 2-Electrode Surface Mount High Voltage GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 4 mm	5 kA	>100 operations	800 V, 1100 V	<1 pF	Bulk, Tape and Reel		• Low capacitance and insertion loss • Fast reponse to transients • Compact mini size • Ideal for dense board applications • Leadless SMT pkg. supports auto assembly

2047-xx-A 2-Electrode Heavy Duty GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	1000 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
12.7 x 12.7 mm	40 kA+	>1000 operations	90 - 350 V	<5 pF	Bulk	Core	• Very high surge current rating • Breakdown stability thoughout life • Long life

2051 2-Electrode Surface Mount µGDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
2.7 x 3.2 x 4.5 mm	2 kA	>300 operations	90 - 600 V	.6 pF (typical)	Tape and Reel		• Compact low profile size • Low capacitance and insertion loss • High insulation resistance • Stability over life

2055-xx-SM 2-Electrode Surface Mount Mini GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
6.2 x 4.2 mm	5 kA	>300 operations	230 - 600 V	.6 pF (typical)	Bulk, Tape and Reel		• Compact mini-size • Low capacitance and insertion loss • Surface mount package for economical assembly • Economical

产品系列
Products Series

GDT

2026-xx-XX 3-Electrode Balanced TRIGARD® GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	1000 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
8 x 11 mm	40 kA	>400 operations	75 - 600 V	<2 pF	Bulk	Core, Radial, Custom	• Switch-Grade Fail-Short available • Balanced GDT design • High surge current ratings • Stable performance over long life • Custom configurations available

2026-xx-XX-MSP 3-Electrode Multi-Stage Protector MSP® GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	500 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
8 x 14 mm	40 kA	>1000 operations	184 - 276 V, 200 - 300 V, 300 - 400 V	10 pF line to line/ 20 pF line to Gnd (typical)	Bulk	Radial, Custom	• Switch-Grade Fail-Short • Hybrid solid-state GDT design • Solid-state reponse combined with robust GDT • Drop-in primary protection solution for all paired copper communication lines

2036-xx-XX 3-Electrode Mini TRIGARD™ GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.2 mm	20 kA	>300 operations	75 - 600 V	<2 pF	Bulk	Radial, Custom	• Switch-Grade Fail-Short available • Balanced mini-GDT design • Compact size • High surge current rating • Low capacitance and insertion loss

2036-xx-SM 3-Electrode Surface Mount Mini TRIGARD™ GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.3 mm	20 kA	>300 operations	75 - 600 V	<2 pF	Bulk, Tape & Reel		• Balanced mini-GDT design • Surface mount • Compact size, ideal for board level protection • Stable breakdown throughout life • Low capacitance and insertion loss

2038-xx-SM 3-Electrode Surface Mount Symmetric Mini TRIGARD™ GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.3 mm	10 kA	>300 operations	150 - 1100 V	<1 pF	Bulk, Tape & Reel		• Balanced mini-GDT design • Symmetrical breakdown voltage (L-L, L-G) • High surge current rating • Low capacitance and insertion loss • Leadless SMT design for economical assembly

2054-xx-SM 3-Electrode Surface Mount GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	200 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Advantages
5 x 7.2 mm	5 kA	>100 operations	230 - 470 V	<2 pF	Tape & Reel		• Compact mini-size • Surface mount • Low capacitance and insertion loss • Economical

产品系列
Products Series

GDT

2020-xxT 3-Electrode T-Series Fast Acting GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Optional Fail-Short
8 x 11.2 mm	5 kA	>100 operations	60 V, 185 V, 360 V	< 1 pF	Bulk	Radial leaded, Custom	Yes

2031-xxT-SM 2-Electrode Surface Mount T-Series Fast Acting GDT

Size (ø x L)	Max. 8/20 µs Impulse Discharge Current	100 A, 10/1000 µs Impulse Life Rating	DC Breakdown Range	Capacitance @ 1 MHz	Packaging	Leadforms Available	Optional Fail-Short
5 x 4.4 mm	2 kA	>25 operations	60 V, 185 V, 360 V	<1 pF	Bulk, Tape & Reel		

5 Discrete Low Capacitance Transient Voltage Suppressor (TVS) Diodes

Part Number	Pkg. Size	Electrical Characterization (Ta = 25 °C)								
		V_{rwm} (V)	V_{rsm} (V)	I_{rsm} (A)	P_{pk} (W)	V_{br} min. (V)	@ I_f (mA)	C_t Typ (pF)	@ V_r (V)	@ F (MHz)
CDSOD323-T03	SOD-323	3.3	19	20	350	4	1	3	0	1
CDSOD323-T05	SOD-323	5	18.3	17	350	6	1	3	0	1
CDSOD323-T08	SOD-323	8	18.5	17	350	8.5	1	3	0	1
CDSOD323-T12	SOD-323	12	28.3	11	350	13.3	1	3	0	1
CDSOD323-T15	SOD-323	15	31.8	10	350	16.7	1	3	0	1
CDSOD323-T18	SOD-323	18	45	8	350	20	1	3	0	1
CDSOD323-T24	SOD-323	24	56	6	350	26.7	1	3	0	1
CDSOD323-T03C	SOD-323	3.3	19	20	350	4	1	3	0	1
CDSOD323-T05C	SOD-323	5	18.3	17	350	6	1	3	0	1
CDSOD323-T08C	SOD-323	8	18.5	17	350	8.5	1	3	0	1
CDSOD323-T12C	SOD-323	12	28.3	11	350	13.3	1	3	0	1
CDSOD323-T15C	SOD-323	15	31.8	10	350	16.7	1	3	0	1
CDSOD323-T18C	SOD-323	18	45	8	350	20	1	3	0	1
CDSOD323-T24C	SOD-323	24	56	6	350	26.7	1	3	0	1

SMBJ Transient Voltage Suppressor Diode Series

Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Unidirectional Device		Bidirectional Device		Breakdown Voltage V_{BR} (Volts)			Working Peak Reverse Voltage	Maximum Reverse Leakage @ V_{RWM}	Maximum Reverse Voltage @ I_{RSM}	Maximum Reverse Surge Current
Part Number	Part Marking	Part Number	Part Marking	Min.	Max.	@ I_T (mA)	V_{RWM} (Volts)	I_R (μA)	V_{RSM} (Volts)	I_{RSM} (Amps)
SMBJ5.0A	KE	SMBJ5.0CA	AE	6.40	7.25	10	5.0	800	9.2	65.2
SMBJ6.0A	KG	SMBJ6.0CA	AG	6.67	7.67	10	6.0	800	10.3	58.3
SMBJ6.5A	KK	SMBJ6.5CA	AK	7.22	8.30	10	6.5	500	11.2	53.6
SMBJ7.0A	KM	SMBJ7.0CA	AM	7.78	8.95	10	7.0	200	12.0	50.0
SMBJ7.5A	KP	SMBJ7.5CA	AP	8.33	9.58	1.0	7.5	100	12.9	46.5
SMBJ8.0A	KR	SMBJ8.0CA	AR	8.89	10.2	1.0	8.0	50	13.6	44.1
SMBJ8.5A	KT	SMBJ8.5CA	AT	9.44	10.8	1.0	8.5	20	14.4	41.7
SMBJ9.0A	KV	SMBJ9.0CA	AV	10.0	11.5	1.0	9.0	10	15.4	39.0
SMBJ10A	KX	SMBJ10CA	AX	11.1	12.8	1.0	10	5.0	17.0	35.3
SMBJ11A	KZ	SMBJ11CA	AZ	12.2	14.4	1.0	11	5.0	18.2	33.0
SMBJ12A	LE	SMBJ12CA	BE	13.3	15.3	1.0	12	5.0	19.9	30.2
SMBJ13A	LG	SMBJ13CA	BG	14.4	16.5	1.0	13	5.0	21.5	27.9
SMBJ14A	LK	SMBJ14CA	BK	15.6	17.9	1.0	14	5.0	23.2	25.8
SMBJ15A	LM	SMBJ15CA	BM	16.7	19.2	1.0	15	5.0	24.4	24.0
SMBJ16A	LP	SMBJ16CA	BP	17.8	20.5	1.0	16	5.0	26.0	23.1
SMBJ17A	LR	SMBJ17CA	BR	18.9	21.7	1.0	17	5.0	27.6	21.7
SMBJ18A	LT	SMBJ18CA	BT	20.0	23.3	1.0	18	5.0	29.2	20.5
SMBJ20A	LV	SMBJ20CA	BV	22.2	25.5	1.0	20	5.0	32.4	18.5
SMBJ22A	LX	SMBJ22CA	BX	24.4	28.0	1.0	22	5.0	35.5	16.9
SMBJ24A	LZ	SMBJ24CA	BZ	26.7	30.7	1.0	24	5.0	38.9	15.4
SMBJ26A	ME	SMBJ26CA	CE	28.9	32.2	1.0	26	5.0	42.1	14.2
SMBJ28A	MG	SMBJ28CA	CG	31.1	35.8	1.0	28	5.0	45.4	13.2
SMBJ30A	MK	SMBJ30CA	CK	33.3	38.3	1.0	30	5.0	48.4	12.4
SMBJ33A	MM	SMBJ33CA	CM	36.7	42.2	1.0	33	5.0	53.3	11.3
SMBJ36A	MP	SMBJ36CA	CP	40	46.0	1.0	36	5.0	58.1	10.3
SMBJ40A	MR	SMBJ40CA	CR	44.4	51.1	1.0	40	5.0	64.5	9.3
SMBJ43A	MT	SMBJ43CA	CT	47.8	54.9	1.0	43	5.0	69.4	8.6
SMBJ45A	MV	SMBJ45CA	CV	50	57.5	1.0	45	5.0	72.7	8.3
SMBJ48A	MX	SMBJ48CA	CX	53.3	61.3	1.0	48	5.0	77.4	7.7
SMBJ51A	MZ	SMBJ51CA	CZ	56.7	65.2	1.0	51	5.0	82.4	7.3
SMBJ54A	NE	SMBJ54CA	DE	60	69	1.0	54	5.0	87.1	6.9
SMBJ58A	NG	SMBJ58CA	DG	64.4	74.6	1.0	58	5.0	93.6	6.4
SMBJ60A	NK	SMBJ60CA	DK	66.7	76.7	1.0	60	5.0	96.8	6.2
SMBJ64A	NM	SMBJ64CA	DM	71.1	81.8	1.0	64	5.0	103	5.8
SMBJ70A	NP	SMBJ70CA	DP	77.8	89.5	1.0	70	5.0	113	5.3
SMBJ75A	NR	SMBJ75CA	DR	83.3	95.8	1.0	75	5.0	121	4.9
SMBJ78A	NT	SMBJ78CA	DT	86.7	99.7	1.0	78	5.0	126	4.7
SMBJ85A	NV	SMBJ85CA	DV	94.4	109	1.0	85	5.0	137	4.4
SMBJ90A	NX	SMBJ90CA	DX	100	116	1.0	90	5.0	146	4.1
SMBJ100A	NZ	SMBJ100CA	DZ	111	128	1.0	100	5.0	162	3.7
SMBJ110A	PE	SMBJ110CA	EE	122	140	1.0	110	5.0	177	3.4
SMBJ120A	PG	SMBJ120CA	EG	133	153	1.0	120	5.0	193	3.1
SMBJ130A	PK	SMBJ130CA	EK	144	165	1.0	130	5.0	209	2.9
SMBJ150A	PM	SMBJ150CA	EM	167	192	1.0	150	5.0	243	2.5
SMBJ160A	PP	SMBJ160CA	EP	178	205	1.0	160	5.0	259	2.3
SMBJ170A	PR	SMBJ170CA	ER	189	218	1.0	170	5.0	275	2.2

Notes:
1. Suffix 'A' denotes a 5 % tolerance unidirectional device.
2. Suffix 'CA' denotes a 5 % tolerance bidirectional device.
3. For bidirectional devices with a V_R of 10 volts or less, the I_R limit is double.
4. For unidirectional devices with a V_F max. of 3.5 V at an I_F of 35 A, 0.5 Sine Wave of 8.3 ms Pulse Width.

产品系列
Products Series

SMCJ Transient Voltage Suppressor Diode Series

Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Unidirectional Device		Bidirectional Device		Breakdown Voltage V_{BR} (Volts)			Working Peak Reverse Voltage	Maximum Reverse Leakage @ V_{RWM}	Maximum Reverse Voltage @ I_{RSM}	Maximum Reverse Surge Current
Part Number	Part Marking	Part Number	Part Marking	Min.	Max.	@ I_T (mA)	V_{RWM} (Volts)	I_R (μA)	V_{RSM} (Volts)	I_{RSM} (Amps)
SMCJ5.0A	GDE	SMCJ5.0CA	BDE	6.4	7.23	10	5	1000	9.2	163
SMCJ6.0A	GDG	SMCJ6.0CA	BDG	6.67	7.67	10	6	1000	10.3	145.6
SMCJ6.5A	GDK	SMCJ6.5CA	BDK	7.22	8.3	10	6.5	500	11.2	133.9
SMCJ7.0A	GDM	SMCJ7.0CA	BDM	7.78	8.95	10	7	200	12	125
SMCJ7.5A	GDP	SMCJ7.5CA	BDP	8.33	9.58	1	7.5	100	12.9	116.3
SMCJ8.0A	GDR	SMCJ8.0CA	BDR	8.89	10.2	1	8	50	13.6	110.3
SMCJ8.5A	GDT	SMCJ8.5CA	BDT	9.44	10.8	1	8.5	20	14.4	104.2
SMCJ9.0A	GDV	SMCJ9.0CA	BDV	10	11.5	1	9	10	15.4	97.4
SMCJ10A	GDX	SMCJ10CA	BDX	11.1	12.8	1	10	5	17	88.2
SMCJ11A	GDZ	SMCJ11CA	BDZ	12.2	14.4	1	11	5	18.2	82.4
SMCJ12A	GEE	SMCJ12CA	BEE	13.3	15.3	1	12	5	19.9	75.3
SMCJ13A	GEG	SMCJ13CA	BEG	14.4	16.5	1	13	5	21.5	69.7
SMCJ14A	GEK	SMCJ14CA	BEK	15.6	17.9	1	14	5	23.2	64.7
SMCJ15A	GEM	SMCJ15CA	BEM	16.7	19.2	1	15	5	24.4	61.5
SMCJ16A	GEP	SMCJ16CA	BEP	17.8	20.5	1	16	5	26	57.7
SMCJ17A	GER	SMCJ17CA	BER	18.9	21.7	1	17	5	27.6	53.3
SMCJ18A	GET	SMCJ18CA	BET	20	23.3	1	18	5	29.2	51.4
SMCJ20A	GEV	SMCJ20CA	BEV	22.2	25.5	1	20	5	32.4	46.3
SMCJ22A	GEX	SMCJ22CA	BEX	24.4	28	1	22	5	35.5	42.2
SMCJ24A	GEZ	SMCJ24CA	BEZ	26.7	30.7	1	24	5	38.9	38.6
SMCJ26A	GFE	SMCJ26CA	BFE	28.9	32.2	1	26	5	42.1	35.6
SMCJ28A	GFG	SMCJ28CA	BFG	31.1	35.8	1	28	5	45.4	33
SMCJ30A	GFK	SMCJ30CA	BFK	33.3	38.3	1	30	5	48.4	31
SMCJ33A	GFM	SMCJ33CA	BFM	36.7	42.2	1	33	5	53.3	28.1
SMCJ36A	GFP	SMCJ36CA	BFP	40	46	1	36	5	58.1	25.8
SMCJ40A	GFR	SMCJ40CA	BFR	44.4	51.1	1	40	5	64.5	23.3
SMCJ43A	GFT	SMCJ43CA	BFT	47.8	54.9	1	43	5	69.4	21.6
SMCJ45A	GFV	SMCJ45CA	BFV	50	57.5	1	45	5	72.7	20.6
SMCJ48A	GFX	SMCJ48CA	BFX	53.3	61.3	1	48	5	77.4	19.4
SMCJ51A	GFZ	SMCJ51CA	BFZ	56.7	65.2	1	51	5	82.4	18.2
SMCJ54A	GGE	SMCJ54CA	BGE	60	69	1	54	5	87.1	17.2
SMCJ58A	GGG	SMCJ58CA	BGG	64.4	74.6	1	58	5	93.6	16
SMCJ60A	GGK	SMCJ60CA	BGK	66.7	76.7	1	60	5	96.8	15.5
SMCJ64A	GGM	SMCJ64CA	BGM	71.1	81.8	1	64	5	103	14.6
SMCJ70A	GGP	SMCJ70CA	BGP	77.8	89.5	1	70	5	113	13.3
SMCJ75A	GGR	SMCJ75CA	BGR	83.3	95.8	1	75	5	121	12.4
SMCJ78A	GGT	SMCJ78CA	BGT	86.7	99.7	1	78	5	126	11.4
SMCJ85A	GGV	SMCJ85CA	BGV	94.4	108.2	1	85	5	137	10.4
SMCJ90A	GGX	SMCJ90CA	BGX	100	115.5	1	90	5	146	10.3
SMCJ100A	GGZ	SMCJ100CA	BGZ	111	128	1	100	5	162	9.3
SMCJ110A	GHE	SMCJ110CA	BHE	122	140	1	110	5	177	8.4
SMCJ120A	GHG	SMCJ120CA	BHG	133	153	1	120	5	193	7.9
SMCJ130A	GHK	SMCJ130CA	BHK	144	165	1	130	5	209	7.2
SMCJ150A	GHM	SMCJ150CA	BHM	167	192	1	150	5	243	6.2
SMCJ160A	GHP	SMCJ160CA	BHP	178	205	1	160	5	259	5.8
SMCJ170A	GHR	SMCJ170CA	BHR	189	217.5	1	170	5	275	5.5

Notes:
1. Suffix 'A' denotes a 5 % tolerance unidirectional device.
2. Suffix 'CA' denotes a 5 % tolerance bidirectional device.
3. For bidirectional devices with a V_R of 10 volts or less, the I_R limit is double.
4. For unidirectional devices with a V_F max. of 3.5 V at an I_F of 35 A, 0.5 Sine Wave of 8.3 ms Pulse Width.

SMLJ Transient Voltage Suppressor Diode Series

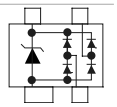
Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Unidirectional Device		Bidirectional Device		Breakdown Voltage V_{BR} (Volts)			Working Peak Reverse Voltage	Maximum Reverse Leakage @ V_{RWM}	Maximum Reverse Voltage @ I_{RSM}	Maximum Reverse Surge Current
Part Number	Part Marking	Part Number	Part Marking	Min.	Max.	@ I_T (mA)	V_{RWM} (Volts)	I_R (μA)	V_{RSM} (Volts)	I_{RSM} (Amps)
SMLJ5.0A	HDE	SMLJ5.0CA	IDE	6.40	7.82	10	5	1000	9.2	326.00
SMLJ6.0A	HDG	SMLJ6.0CA	IDG	6.67	8.15	10	6	1000	10.3	291.30
SMLJ6.5A	HDK	SMLJ6.5CA	IDK	7.22	7.98	10	6.5	500	11.2	267.90
SMLJ7.0A	HDM	SMLJ7.0CA	IDM	7.78	8.60	10	7	200	12	250.00
SMLJ7.5A	HDP	SMLJ7.5CA	IDP	8.33	9.21	1	7.5	100	12.9	232.60
SMLJ8.0A	HDR	SMLJ8.0CA	IDR	8.89	9.83	1	8	50	13.6	220.60
SMLJ8.5A	HDT	SMLJ8.5CA	IDT	9.44	10.43	1	8.5	25	14.4	208.40
SMLJ9.0A	HDV	SMLJ9.0CA	IDV	10.00	11.05	1	9	10	15.4	194.80
SMLJ10A	HDX	SMLJ10CA	IDX	11.10	12.27	1	10	5	17	176.40
SMLJ11A	HDZ	SMLJ11CA	IDZ	12.20	13.50	1	11	5	18.2	164.80
SMLJ12A	HEE	SMLJ12CA	IEE	13.30	14.70	1	12	5	19.9	150.60
SMLJ13A	HEG	SMLJ13CA	IEG	14.40	15.90	1	13	5	21.5	139.40
SMLJ14A	HEK	SMLJ14CA	IEK	15.60	17.20	1	14	5	23.2	129.40
SMLJ15A	HEM	SMLJ15CA	IEM	16.70	18.50	1	15	5	24.4	123.00
SMLJ16A	HEP	SMLJ16CA	IEP	17.80	19.70	1	16	5	26	115.40
SMLJ17A	HER	SMLJ17CA	IER	18.90	20.90	1	17	5	27.6	106.60
SMLJ18A	HET	SMLJ18CA	IET	20.00	22.10	1	18	5	29.2	102.80
SMLJ20A	HEV	SMLJ20CA	IEV	22.20	24.50	1	20	5	32.4	92.60
SMLJ22A	HEX	SMLJ22CA	IEX	24.40	27.00	1	22	5	35.5	84.40
SMLJ24A	HEZ	SMLJ24CA	IEZ	26.70	29.50	1	24	5	38.9	77.20
SMLJ26A	HFE	SMLJ26CA	IFE	28.90	31.90	1	26	5	42.1	71.20
SMLJ28A	HFG	SMLJ28CA	IFG	31.10	34.40	1	28	5	45.4	66.00
SMLJ30A	HFK	SMLJ30CA	IFK	33.30	36.80	1	30	5	48.4	62.00
SMLJ33A	HFM	SMLJ33CA	IFM	36.70	40.60	1	33	5	53.3	56.20
SMLJ36A	HFP	SMLJ36CA	IFP	40.00	44.20	1	36	5	58.1	51.60
SMLJ40A	HFR	SMLJ40CA	IFR	44.40	49.10	1	40	5	64.5	46.40
SMLJ43A	HFT	SMLJ43CA	IFT	47.80	52.80	1	43	5	69.4	43.20
SMLJ45A	HFV	SMLJ45CA	IFV	50.00	55.30	1	45	5	72.7	41.20
SMLJ48A	HFX	SMLJ48CA	IFX	53.30	58.90	1	48	5	77.4	38.80
SMLJ51A	HFZ	SMLJ51CA	IFZ	56.70	62.70	1	51	5	82.4	36.40
SMLJ54A	HGE	SMLJ54CA	IGE	60.00	66.30	1	54	5	87.1	34.40
SMLJ58A	HGG	SMLJ58CA	IGG	64.40	71.20	1	58	5	93.6	32.00
SMLJ60A	HGK	SMLJ60CA	IGK	66.70	73.70	1	60	5	96.8	31.00
SMLJ64A	HGM	SMLJ64CA	IGM	71.10	78.60	1	64	5	103	29.20
SMLJ70A	HGP	SMLJ70CA	IGP	77.80	86.00	1	70	5	113	26.60
SMLJ75A	HGR	SMLJ75CA	IGR	83.30	92.10	1	75	5	121	24.80
SMLJ78A	HGT	SMLJ78CA	IGT	86.70	95.80	1	78	5	126	22.80
SMLJ85A	HGV	SMLJ85CA	IGV	94.40	104.30	1	85	5	137	20.80
SMLJ90A	HGX	SMLJ90CA	IGX	100.00	110.50	1	90	5	146	20.60
SMLJ100A	HGZ	SMLJ100CA	IGZ	111.00	122.70	1	100	5	162	18.60
SMLJ110A	HHE	SMLJ110CA	IHE	122.00	134.80	1	110	5	177	16.80
SMLJ120A	HHG	SMLJ120CA	IHG	133.00	147.00	1	120	5	193	15.60
SMLJ130A	HHH	SMLJ130CA	IHH	144.00	159.20	1	130	5	209	14.40
SMLJ150A	HHM	SMLJ150CA	IHM	167.00	184.60	1	150	5	243	12.40
SMLJ160A	HHP	SMLJ160CA	IHP	178.00	196.70	1	160	5	259	11.60
SMLJ170A	HHR	SMLJ170CA	IHR	189.00	208.90	1	170	5	275	11.00

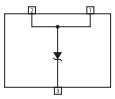
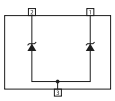
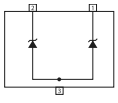
Notes:
1. Suffix 'A' denotes a 5 % tolerance unidirectional device.
2. Suffix 'CA' denotes a 5 % tolerance bidirectional device.
3. For bidirectional devices with a V_R of 10 volts or less, the I_R limit is double.
4. For unidirectional devices with a V_F max. of 3.5 V at an I_F of 35 A, 0.5 Sine Wave of 8.3 ms Pulse Width.

产品系列
Products Series

Transient Voltage Suppressor (TVS) & Steering Diode Arrays

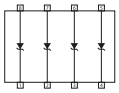
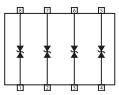
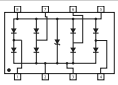
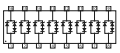
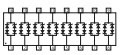
Part Number	Pkg. Size	Absolute Max. Rating (Ta = 25 ˚C)			Electrical Characterization (Ta = 25 ˚C)							Schematic
		V_{wm} (V)	V_{br} (V)	I_o (A)	V_f max. (V)	@ I_f (mA)	I_r max. (uA)	@ V_r (mA)	C_{typ} (pF)	@ V_r (V)	@ F (MHz)	
CDSOT23-SR208	SOT23-6	20		0.7	1.2	5	1	5	3	0	1	
CDSOT23-SR724	SOT23-6	20		0.7	1.2	5	1	5	3	0	1	
CD143A-SR2.8	SOT-143A	2.8	3.0	30	1.0	10	1	2.8	4.5	0	1	
CD143A-SR3.3	SOT-143A	3.3	3.5	30	1.0	10	1	3.3	4.5	0	1	
CD143A-SR05	SOT-143A	5.0	6.0	30	1.5	10	5	5	10	0	1	
CD143A-SR12	SOT-143A	12.0	13.3	30	1.5	10	1	12	10	0	1	
CD143A-SR70	SOT-143A	70	70	24	1.5	1000	1	70	8	0	1	
CDNBS16-SR720	NSOIC 16L	30		12	2	1000	0.02	20	3	0	1	
CDNBS08-SR720	NSOIC 8L	30		12	2	1000	0.02	20	3	0	1	
2DEA-2-Q24RLF	QSOP 24L	12		0.015	1.5	12	10	12	3	0	1	
2DTA-5-Q24RLF	QSOP 24L	7		0.050	0.75	50	5	7	3	0	1	
2DTA-10-Q24RLF	QSOP 24L	7		0.050	0.85	50	5	7	3	0	1	

Transient Voltage Suppressor (TVS) Diode Arrays

Part Number	Pkg. Size	Absolute Max. Rating (Ta = 25 ˚C)			Electrical Characterization (Ta = 25 ˚C)					Schematic
		V_{rwm} (V)	V_{rsm} (V)	I_{rsm} (A)	V_{br} min. (V)	@ I_f (mA)	C_t typ (pF)	@ V_r (V)	@ F (MHz)	
CDDFN4-T05	DFN-4	5.0	12	2	6.0	1	10.5	0	1	
CDSC706-T05C	SC70-6	5.0	12	9	6	1	60	0	1	
CDSC706-T12C	SC70-6	12	23.8	4.2	13.3	1	35	0	1	
CDSC706-T15C	SC70-6	15	33.3	3.0	16.7	1	25	0	1	
CDSC706-T24C	SC70-6	24	55.5	1.8	26.7	1	20	0	1	
CDSC706-0504F	SC70-6	5.0	25.0	5.0	6.0	1	1.9	0	1	
CDSOT23-T03	SOT23	3.3	10.9	43	4.0	1	500	0	1	
CDSOT23-T05	SOT23	5.0	13.5	42	6.0	1	350	0	1	
CDSOT23-T08	SOT23	8.0	16.9	34	8.5	1	250	0	1	
CDSOT23-T12	SOT23	12	25.9	27	13.3	1	150	0	1	
CDSOT23-T15	SOT23	15	30.0	17	16.7	1	100	0	1	
CDSOT23-T24	SOT23	24	49.0	12	26.7	1	88	0	1	
CDSOT23-T36	SOT23	36	76.8	9	40.0	1	80	0	1	
CDSOT23-T03C	SOT23	3.3	10.9	43	4.0	1	300	0	1	
CDSOT23-T05C	SOT23	5.0	13.5	42	6.0	1	210	0	1	
CDSOT23-T08C	SOT23	8.0	16.9	34	8.5	1	150	0	1	
CDSOT23-T12C	SOT23	12	25.9	27	13.3	1	90	0	1	
CDSOT23-T15C	SOT23	15	30.0	17	16.7	1	60	0	1	
CDSOT23-T24C	SOT23	24	49.0	12	26.7	1	63	0	1	
CDSOT23-T36C	SOT23	36	76.8	9	40.0	1	60	0	1	
CDSOT23-T03LC	SOT23	3.3	10.9	43	4.0	1	5	0	1	
CDSOT23-T05LC	SOT23	5.0	13.5	42	6.0	1	5	0	1	
CDSOT23-T08LC	SOT23	8.0	16.9	34	8.5	1	5	0	1	
CDSOT23-T12LC	SOT23	12	25.9	27	13.3	1	5	0	1	
CDSOT23-T15LC	SOT23	15	30.0	17	16.7	1	5	0	1	
CDSOT23-T24LC	SOT23	24	49.0	12	26.7	1	5	0	1	
CDSOT23-T36LC	SOT23	36	76.8	9	40.0	1	5	0	1	
CDSOT23-SLVU2.8	SOT23	2.8	21	30	3.0	1	2.5	0	1	
CDSOT23-SM712	SOT23	7 / 12	30	30	7.5 / 13.3	1	75	0	1	

产品系列
Products Series

Transient Voltage Suppressor (TVS) Diode Arrays

Part Number	Pkg. Size	Absolute Max. Rating (Ta = 25 ˚C)			Electrical Characterization (Ta = 25 ˚C)					Schematic
		V_{rwm} (V)	V_{rsm} (V)	I_{rsm} (A)	V_{br} min. (V)	I_f (mA)	C_t typ (pF)	V_r (V)	F (MHz)	
CDSOT236-T05	SOT23-6	5.0	13.5	42	6.0	1	70	0	1	
CDSOT236-T12	SOT23	12	25.9	27	13.3	1	50	0	1	
CDSOT236-T15	SOT23	15	30.0	17	16.7	1	30	0	1	
CDSOT236-T24	SOT23	24	49.0	12	26.7	1	25	0	1	
CDSOT236-T05C	SOT23	5.0	13.5	42	6.0	1	70	0	1	
CDSOT236-T12C	SOT23	12	25.9	27	13.3	1	50	0	1	
CDSOT236-T15C	SOT23	15	30.0	17	16.7	1	30	0	1	
CDSOT236-T24C	SOT23	24	49.0	12	26.7	1	25	0	1	
CDSOT23-SRV05-4	SOT23	5.0	15	30	6	1	3.5	0	1	
CDNBS08-T03	8L NSOIC	3.0	10.9	43	3.3	1	800	0	1	
CDNBS08-T05	8L NSOIC	5.0	13.5	42	6.0	1	550	0	1	
CDNBS08-T08	8L NSOIC	8.0	16.9	34	8.5	1	500	0	1	
CDNBS08-T12	8L NSOIC	12	25.9	27	13.3	1	185	0	1	
CDNBS08-T15	8L NSOIC	15	30.0	17	16.7	1	140	0	1	
CDNBS08-T24	8L NSOIC	24	49.0	12	26.7	1	88	0	1	
CDNBS08-T36	8L NSOIC	36	76.8	9	40.0	1	80	0	1	
CDNBS08-T03C	8L NSOIC	3.0	10.9	43	3.3	1	450	0	1	
CDNBS08-T05C	8L NSOIC	5.0	13.5	42	6.0	1	308	0	1	
CDNBS08-T08C	8L NSOIC	8.0	16.9	34	8.5	1	300	0	1	
CDNBS08-T12C	8L NSOIC	12	25.9	27	13.3	1	105	0	1	
CDNBS08-T15C	8L NSOIC	15	30.0	17	16.7	1	80	0	1	
CDNBS08-T24C	8L NSOIC	24	49.0	12	26.7	1	50	0	1	
CDNBS08-T36C	8L NSOIC	36	76.8	9	40.0	1	45	0	1	
CDNBS08-PLC03-3.3	8L NSOIC	3.0	11	50	3.3	1	8	0	1	
CDNBS08-PLC03-6	8L NSOIC	6.0	20	100	6.8	1	8	0	1	
CDNBS08-SLVU2.8-4	8L NSOIC	2.8	21	30	3.0	1	6	0	1	
CDNBS08-SLVU2.8-8	8L NSOIC	2.8	17	30	3.0	1	6	0	1	
CDNBS08-SRDA3.3-4	8L NSOIC	3.0	10.9	43	4.0	1	15	0	1	
CDNBS08-SRDA05-4	8L NSOIC	5.0	13.5	42	6.0	1	15	0	1	
CDNBS08-SRDA12-4	8L NSOIC	12	25.9	27	13.3	1	15	0	1	
CDNBS08-SRDA15-4	8L NSOIC	15	30.0	17	16.7	1	15	0	1	
CDNBS08-SRDA3.3-6	8L NSOIC	3.0	10.9	43	4.0	1	15	0	1	
CDNBS08-SRDA05-6	8L NSOIC	5.0	13.5	42	6.0	1	15	0	1	
CDNBS08-USB3B	8L NSOIC	3.3	12.9	37	4.0	1	15	0	1	
CDNBS08-USB6B	8L NSOIC	5.25	13.2	35	6.0	1	15	0	1	
CDNBS16-T03	16L NSOIC	3.0	23	43	4.5	1	15	0	1	
CDNBS16-T05	16L NSOIC	5.0	24	42	6.0	1	15	0	1	
CDNBS16-T08	16L NSOIC	8.0	26	30	8.5	1	15	0	1	
CDNBS16-T12	16L NSOIC	12	33	21	13.3	1	15	0	1	
CDNBS16-T15	16L NSOIC	15	39	15	16.7	1	15	0	1	
CDNBS16-T24	16L NSOIC	24	57	10	26.7	1	15	0	1	
CDNBS16-T36	16L NSOIC	36	72	7	40.0	1	15	0	1	
CDNBS16-T03C	16L NSOIC	3.0	23	43	4.5	1	15	0	1	
CDNBS16-T05C	16L NSOIC	5.0	24	42	6.0	1	15	0	1	
CDNBS16-T08C	16L NSOIC	8.0	26	30	8.5	1	15	0	1	
CDNBS16-T12C	16L NSOIC	12	33	21	13.3	1	15	0	1	
CDNBS16-T15C	16L NSOIC	15	39	15	16.7	1	15	0	1	
CDNBS16-T24C	16L NSOIC	24	57	10	26.7	1	15	0	1	
CDNBS16-T36C	16L NSOIC	36	72	7	40.0	1	15	0	1	
CDNBS16-PLC05-6	16L NSOIC	5.0	9.6	5	6.0	1	15	0	1	
CDWBS16-PLC01-6	16L WSOIC	6	16	200	8	1	50	0	1	

6 MOV-10DxxxK Series - Metal Oxide Varistor

Features

- High voltage rating
- High current rating
- Bidirectional
- Surge protection
- Fast response time
- RoHS compliant*
- Agency recognition:

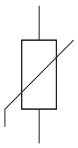
Applications

- Power supplies
- Power systems
- Line voltage
- Telecom systems
- White goods / appliances

General Information

The MOV-10DxxxK Series of 10 mm radial leaded varistor devices protects against overvoltage transients such as lightning, power contact and power induction. The metal oxide varistors offer a choice of varistor voltages from 18 V to 820 V and V_{rms} voltages from 11 V to 510 V.

The devices have a high current handling, high energy absorption capability and fast response times to protect against transient faults up to rated limits.



Industry Standard Compliance

Standard	UL 1449
File Number	E313168

Standard	ITU-T K.20, K.21, K.45
MOV-10D201K	Will pass 600 V rms, 600 ohm, 1 A, 0.2 s, 5 cycles, every 1 minute condition.
MOV-10D361K	
MOV-10D391K	
MOV-10D431K	

Absolute Maximum Ratings (@ T_A = 25 °C Unless Otherwise Noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature	T_{OPR}	-40	25	+85	˚C
Storage Temperature	T_{STG}	-40	25	+125	˚C
Rated Wattage	P_w			0.40	Watt
Varistor Voltage Temperature Coefficient	V_{TC}	0		0.05	% / ˚C
Response Time	T_r		10	25	ns
Varistor Voltage Tolerance	V_{tol}	-10		10	%

Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Bourns Part No.	Max. Continuous Voltage (V)		Voltage @ 1 mA DC (V)			Voltage @ Class Current (8/20 μs)		Max. Peak Current (8/20 μs)	Max. Energy (J)	Max. Cap. (pF)
	r.m.s.	d.c.	Min.	Nom.	Max.	Class Current (A)	Max. Clamping Voltage (V)	One Time	8/20 μs	1 kHz
MOV-10D180K	11	14	16	18	20	5	36	500	2.1	5600
MOV-10D220K	14	18	20	22	24	5	43	500	2.5	4250
MOV-10D270K	17	18	24	27	30	5	53	500	3.0	3700
MOV-10D330K	20	26	30	33	36	5	65	500	4.0	3000
MOV-10D390K	25	31	35	39	43	5	77	500	4.6	2400
MOV-10D470K	30	38	42	47	52	5	93	500	5.5	2100
MOV-10D560K	35	45	50	56	62	5	110	500	7.0	1800
MOV-10D680K	40	56	61	68	75	5	135	500	8.2	1500
MOV-10D820K	50	65	74	82	90	25	135	2500	12	1200
MOV-10D101K	60	85	90	100	110	25	165	2500	15	1000
MOV-10D121K	75	100	108	120	132	25	200	2500	18	830
MOV-10D151K	95	125	135	150	165	25	250	2500	22	670
MOV-10D181K	115	150	162	180	198	25	300	2500	27	560
MOV-10D201K	130	170	185	200	225	25	340	2500	30	500
MOV-10D221K	140	180	198	220	242	25	360	2500	32	450
MOV-10D241K	150	200	216	240	264	25	395	2500	35	420
MOV-10D271K	175	225	243	270	297	25	455	2500	40	370
MOV-10D301K	190	250	270	300	330	25	500	2500	40	330
MOV-10D331K	210	275	297	330	363	25	550	2500	43	300
MOV-10D361K	230	300	324	360	396	25	595	2500	47	280
MOV-10D391K	250	320	351	390	429	25	650	2500	60	260
MOV-10D431K	275	350	387	430	473	25	710	2500	65	230
MOV-10D471K	300	385	423	470	517	25	775	2500	70	210
MOV-10D511K	320	415	459	510	561	25	845	2500	70	200
MOV-10D561K	350	460	504	560	616	25	925	2500	70	180
MOV-10D621K	385	505	558	620	682	25	1025	2500	70	160
MOV-10D681K	420	560	612	680	748	25	1120	2500	70	150
MOV-10D751K	460	620	675	750	825	25	1240	2500	75	130
MOV-10D781K	480	640	702	780	858	25	1290	2500	80	130
MOV-10D821K	510	675	738	820	902	25	1355	2500	85	110

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

MOV-14DxxxK Series - Metal Oxide Varistor

Features

- High voltage rating
- High current rating
- Bidirectional
- Surge protection
- Fast response time
- RoHS compliant*
- Agency recognition:

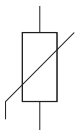
Applications

- Power supplies
- Power systems
- Line voltage
- Telecom systems
- White goods / appliances

General Information

The MOV-14DxxxK Series of 14 mm radial leaded varistor devices protects against overvoltage transients such as lightning, power contact and power induction. The metal oxide varistors offer a choice of varistor voltages from 18 V to 1800 V and V_{rms} voltages from 11 V to 1100 V.

The devices have a high current handling, high energy absorption capability and fast response times to protect against transient faults up to rated limits.



Industry Standard Compliance

Standard	UL 1449
File Number	E313168

Absolute Maximum Ratings (@ T_A = 25 °C Unless Otherwise Noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature	T_{OPR}	-40	25	+85	˚C
Storage Temperature	T_{STG}	-40	25	+125	˚C
Rated Wattage	P_w			0.60	Watt
Varistor Voltage Temperature Coefficient	V_{TC}	0	0.1	0.05	% / ˚C
Response Time	T_r		10	25	ns
Varistor Voltage Tolerance	V_{tol}	-10	0	10	%

Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Bourns Part No.	Max. Continuous Voltage (V)		Voltage @ 1 mA DC (V)			Voltage @ Class Current (8/20 µs)		Max. Peak Current (8/20 µs)	Max. Energy (J)	Max. Cap. (pF)
	r.m.s.	d.c.	Min.	Nom.	Max.	Class Current (A)	Max. Clamping Voltage (V)	One Time	8/20 µs	1 kHz
MOV-14D180K	11	14	16	18	20	10	36	1000	4.0	11100
MOV-14D220K	14	18	20	22	24	10	43	1000	5.0	9100
MOV-14D270K	17	22	24	27	30	10	53	1000	6.0	7400
MOV-14D330K	20	26	30	33	36	10	65	1000	7.5	6100
MOV-14D390K	25	31	35	39	43	10	77	1000	8.6	5100
MOV-14D470K	30	38	42	47	52	10	93	1000	10.0	4300
MOV-14D560K	35	45	50	56	62	10	110	1000	11.0	3600
MOV-14D680K	40	56	61	68	75	10	135	1000	14.0	2900
MOV-14D820K	50	65	74	82	90	50	135	4500	22.0	2400
MOV-14D101K	60	85	90	100	110	50	165	4500	28.0	2000
MOV-14D121K	75	100	108	120	132	50	200	4500	32.0	1700
MOV-14D151K	95	125	135	150	165	50	250	4500	40.0	1300
MOV-14D181K	115	150	162	180	198	50	300	4500	50.0	1100
MOV-14D201K	130	170	185	200	225	50	340	4500	57.0	1000
MOV-14D221K	140	180	198	220	242	50	360	4500	60.0	900
MOV-14D241K	150	200	216	240	264	50	395	4500	63.0	830
MOV-14D271K	175	225	243	270	297	50	455	4500	70.0	740
MOV-14D301K	190	250	270	300	330	50	500	4500	77.0	670
MOV-14D331K	210	275	297	330	363	50	550	4500	85.0	610
MOV-14D361K	230	300	324	360	396	50	595	4500	93.0	560
MOV-14D391K	250	320	351	390	429	50	650	4500	100.0	510
MOV-14D431K	275	350	387	430	473	50	710	4500	115.0	460
MOV-14D471K	300	385	423	470	517	50	775	4500	125.0	430
MOV-14D511K	320	415	459	510	561	50	845	4500	125.0	390
MOV-14D561K	350	460	504	560	616	50	925	4500	125.0	360
MOV-14D621K	385	505	558	620	682	50	1025	4500	125.0	320
MOV-14D681K	420	560	612	680	748	50	1120	4500	130.0	290
MOV-14D751K	460	615	675	750	825	50	1240	4500	143.0	270
MOV-14D781K	485	640	702	780	858	50	1290	4500	148.0	260
MOV-14D821K	510	670	738	820	902	50	1355	4500	157.0	240
MOV-14D911K	550	745	819	910	1001	50	1500	4500	175.0	220
MOV-14D102K	625	825	900	1000	1100	50	1650	4500	190.0	200
MOV-14D112K	680	895	990	1100	1210	50	1815	4500	213.0	180
MOV-14D152K	750	990	1080	1500	1320	50	1980	4500	337.0	150
MOV-14D182K	1100	1465	1620	1800	1980	50	2970	4500	337.0	100

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

MOV-20DxxxK Series - Metal Oxide Varistor

Features

- High voltage rating
- High current rating
- Bidirectional
- Surge protection
- Fast response time
- RoHS compliant*
- Agency recognition:

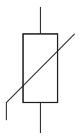
Applications

- Power supplies
- Power systems
- Line voltage
- Telecom systems
- White goods / appliances

General Information

The MOV-20DxxxK Series of 20 mm radial leaded varistor devices protects against overvoltage transients such as lightning, power contact and power induction. The metal oxide varistors offer a choice of varistor voltages from 18 V to 1800 V and V_{rms} voltages from 11 V to 1100 V.

The devices have a high current handling, high energy absorption capability and fast response times to protect against transient faults up to rated limits.



Industry Standard Compliance

Standard	UL 1449
File Number	E313168

Absolute Maximum Ratings (@ T_A = 25 °C Unless Otherwise Noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature	T_{OPR}	-40	25	+85	˚C
Storage Temperature	T_{STG}	-40	25	+125	˚C
Rated Wattage	P_w			1.00	Watt
Varistor Voltage Temperature Coefficient	V_{TC}	0	0.1	0.05	% / ˚C
Response Time	T_r		10	25	ns
Varistor Voltage Tolerance	V_{tol}	-10	0	10	%

Electrical Characteristics (@ T_A = 25 °C Unless Otherwise Noted)

Bourns Part No.	Max. Continuous Voltage (V)		Voltage @ 1 mA DC (V)			Voltage @ Class Current (8/20 µs)		Max. Peak Current (8/20 µs)	Max. Energy (J)	Max. Cap. (pF)
	r.m.s.	d.c.	Min.	Nom.	Max.	Class Current (A)	Max. Clamping Voltage (V)	One Time	8/20 µs	1 kHz
MOV-20D180K	11	14	16	18	20	20	36	2000	11.0	28500
MOV-20D220K	14	18	20	22	24	20	43	2000	14.0	18500
MOV-20D270K	17	22	24	27	30	20	53	2000	18.0	13000
MOV-20D330K	20	26	30	33	36	20	65	2000	23.0	11500
MOV-20D390K	25	31	35	39	43	20	77	2000	26.0	8500
MOV-20D470K	30	38	42	47	52	20	93	2000	33.0	7400
MOV-20D560K	35	45	50	56	62	20	110	2000	41.0	6500
MOV-20D680K	40	56	61	68	75	20	135	2000	46.0	5800
MOV-20D820K	50	65	74	82	90	100	135	6500	38.0	4900
MOV-20D101K	60	85	90	100	110	100	165	6500	45.0	4000
MOV-20D121K	75	100	108	120	132	100	200	6500	55.0	3300
MOV-20D151K	95	125	135	150	165	100	250	6500	70.0	2700
MOV-20D181K	115	150	162	180	198	100	300	6500	85.0	2200
MOV-20D201K	130	170	185	200	225	100	340	6500	95.0	2000
MOV-20D221K	140	180	198	220	242	100	360	6500	100.0	1800
MOV-20D241K	150	200	216	240	264	100	395	6500	108.0	1650
MOV-20D271K	175	225	243	270	297	100	455	6500	127.0	1500
MOV-20D301K	190	250	270	300	330	100	500	6500	136.0	1300
MOV-20D331K	210	275	297	330	363	100	550	6500	150.0	1200
MOV-20D361K	230	300	324	360	396	100	595	6500	163.0	1100
MOV-20D391K	250	320	351	390	429	100	650	6500	180.0	1000
MOV-20D431K	275	350	387	430	473	100	710	6500	190.0	930
MOV-20D471K	300	385	423	470	517	100	775	6500	220.0	850
MOV-20D511K	320	415	459	510	561	100	845	6500	220.0	780
MOV-20D561K	350	460	504	560	616	100	925	6500	220.0	710
MOV-20D621K	385	505	558	620	682	100	1025	6500	220.0	650
MOV-20D681K	420	560	612	680	748	100	1120	6500	220.0	600
MOV-20D751K	460	615	675	750	825	100	1240	6500	230.0	530
MOV-20D781K	485	640	702	780	858	100	1290	6500	255.0	510
MOV-20D821K	510	670	738	820	902	100	1355	6500	265.0	500
MOV-20D911K	550	745	819	910	1001	100	1500	6500	282.0	440
MOV-20D102K	625	825	900	1000	1100	100	1650	6500	310.0	400
MOV-20D112K	680	895	990	1100	1210	100	1815	6500	342.0	360
MOV-20D152K	750	990	1080	1500	1320	100	1980	6500	383.0	320
MOV-20D182K	1100	1465	1620	1800	1980	100	2970	6500	625.0	220

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

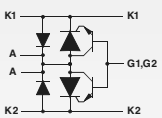
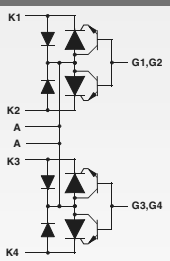
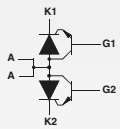
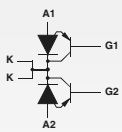
7 Bourns® TISP® Telecom Overvoltage Protectors

Product Selection Guide

FIXED VOLTAGE

Series				
TISP1xxx Dual Unidirectional	TISP3xxx Dual Bidirectional	TISP4xxx Single Bidirectional	TISP5xxx Single Unidirectional	TISP7xxx Triple Element Bidirectional
Device Symbol				
				
Applications				
• SLIC Linecard	• 3-Wire Ground Backed Ringer • Solid State Relay • Surge Bars	• 2-Wire System • ISDN Subset • Modems • Telephones • Fax Machines • xDSL • Set Top Boxes • Surge Bars	• SLIC Linecard • ISDN	• 3-Wire Battery Backed Ringer • ISDN / Interwire

GATED (PROGRAMMABLE)

Series			
TISP6xxxx TISPPBL3 Dual Programmable	TISP6NTP2x Quad Programmable	TISP8200M (Typically used as a complimentary pair) Dual Programmable Unidirectional for Negative Polarity	TISP8201M (Typically used as a complimentary pair) Dual Programmable Unidirectional for Positive Polarity
Device Symbol			
			
Applications			
• SLIC Linecard • Ericsson PBL 3xx SLIC	• Dual SLIC Lines • Cable Modems • ISDN Power Feeds • Smart NT • Set Top Boxes	• POTS Linecard • Dual Supply Ringing SLIC	

DECEMBER 2000 - REVISED OCTOBER 2001

Bourns® TISP® Telecom Overvoltage Protectors

Bourns® TISP® Telecom Overvoltage Protectors

How To Order

TISP 4 290 H 3 BJR

Device Configuration

Fixed Voltage:

1 = Dual Unidirectional
3 = Dual Bidirectional
4 = Single Bidirectional
5 = Single Unidirectional
7 = Triple Element Bidirectional

Programmable Voltage:

6, PBLx = Dual Programmable
6NTPx = Quad Programmable
8 = Dual Programmable Unidirectional

Protection Voltage $V_{(BO)}$

(Not applicable for programmable devices)

Surge Guarantee 10/1000

L ≅ 30 A
F ≅ 35 A
M = 50 A
H = 100 A

Holding Current (I_H)

1 = 50 mA
3 = 150 mA
4 = 225 mA

Delivery Option

BJR* = SMBJ (DO-214AA)
AJR* = SMAJ (DO-214AC)

DR* = SOIC

SL = Single In Line

* Supplied on tape and reel.

BOURNS®
Leading by Design®

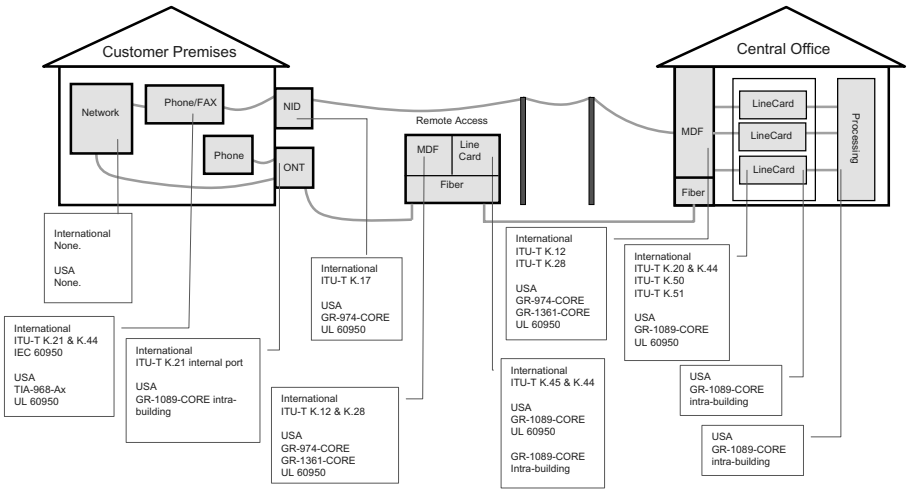
The Americas:
TEL +1-909 781-5500
FAX +1-909 781-5700

bourns.com

DECEMBER 2000 - REVISED OCTOBER 2001

附录
Appendix

1 Worldwide Telecom Standards



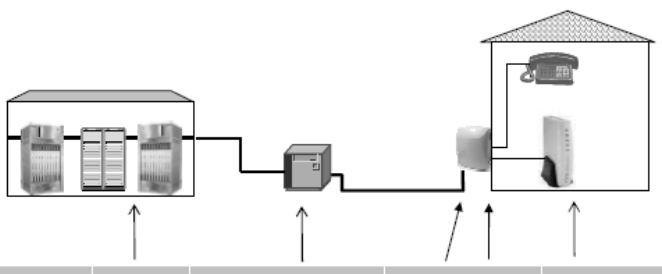
Bourns products help telecom equipment comply with all these standards

Telcordia

ITU

IEC

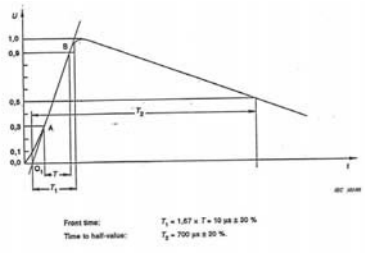
2 Bourns® Circuit Protection Products International Standards



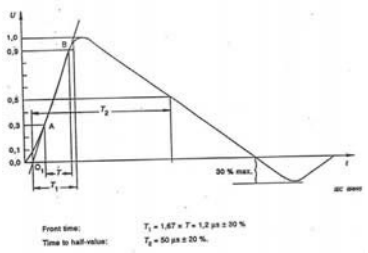
Standard	CO	OSP	CPE	CPE
GR 1089 "Port Type"	1	5	3 & 4	4
ITU-T "K Series"	K.20	K.45	K.21	K.21
YD/T " 2009 Series"	950	950	993	993

附录
Appendix

3 International Standards Surge



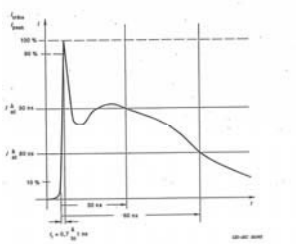
IEC61000-4-5 (10/700 μs)



IEC61000-4-5 (8/20 μs)

–测试设备电源线和内部连接线在经受来自开关切换及自然界雷击后是否会影响到其各项功能的一种测试。

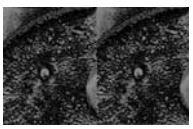
4 International Standards Electrostatic Discharge (ESD)



–模拟设备在遭受到静电放电时性能是否会下降或失效,放电分为直接放电和间接放电两类。对导电表面采用直接接触放电的方式；对绝缘表面采用空气放电方式。接触放电为首选形式，只有在不能用接触放电的地方才改用空气放电。

IEC61000-4-2

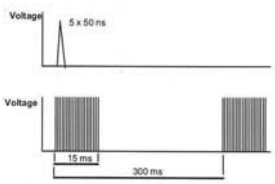
Level	Contact Discharge (kV)	Air Discharge (kV)	Current @30ns (A)	Current @60ns (A)
1	2	2	4	2
2	4	4	8	4
3	6	8	12	6
4	8	15	16	8



Damaged Device,
The trace is almost severed, causing intermittent operation

Destroyed Device,
The discharge bored through the layers of the device

5 International Standards Electrical Fast Transients (EFT)



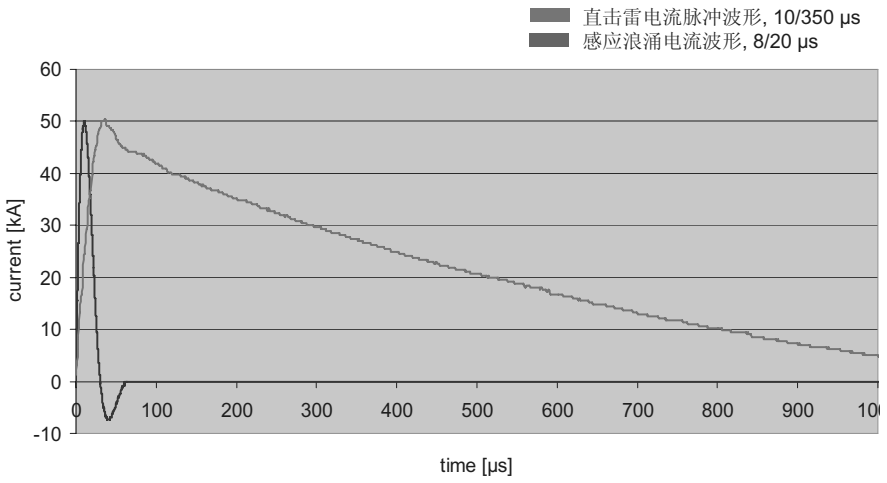
IEC61000-4-4

Level	Installation Environment	Power Supplies		Interconnection Lines	
		Voc (kV)	Isc (A)	Voc (kV)	Isc (A)
1	Well Protected	0.5	10	0.25	5
2	Protected	1	20	0.5	10
3	Industrial	2	40	1	20
4	Severe Indusrial	4	80	2	40

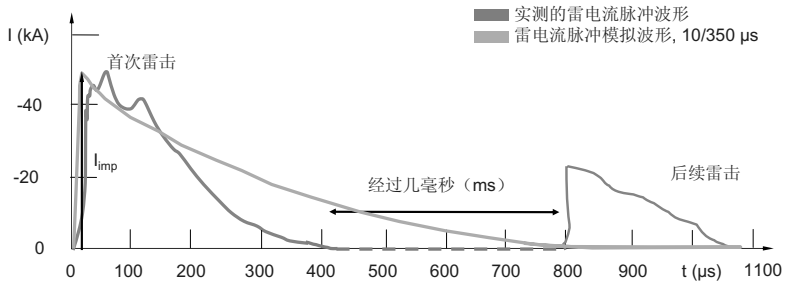
–这是一种耦合到电子设备的电源线、控制线和信号线上的，且由许多快速瞬变脉冲组成的脉冲群试验。试验的要素是瞬变的上升时间、重复率和能量。

附录
Appendix

6 直击雷波形与感应雷波形的区别



7 雷电模拟波形



在一个放电通道内的主放电和后续放电的能量效应与模拟雷电波形10/350 µs相似，在 IEC 61024·筑物防雷保护”，以及IEC 61312-1“雷电电磁脉冲防护”中提出和确认。

附录
Appendix

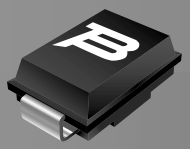
8 TOP 10 通用型TVS系列

Item	Bourns P/N	Application	Feature
1	CDSOT236–0504LC	USB/ HDMI/ DVI/ Ethernet	6V/4.7A, 6 pins, Protects 4 I/O & 1 Vdd line, Cp<0.55 pF
	CDSOT236–0504C	USB/ Ethernet	6V/5.5A, Protects 4 I/O & 1 Vdd line, Cp<1.2 pF
2	CDDFN10–0524P	USB/ HDMI/ DVI/ IEEE 1394	6V/3.8A, 10 pins, Cp<0.5 pF
3	CDDFN10–3304N	Ethernet, T1/E1, DVI	3.3V/25A, 10 pins, Cp<4 pF, 450W
4	CDSOD323–TxxLC	XDSL/ RS485&232	350W, SOD323,Cp ~ 1pF
	CDSOD323–TxxC		350W, SOD323,Cp ~ 3pF
	CDSOD323–TxxC–DSL		350W，SOD323，Cp~3pF，ID @ VWM=1nA
	CDSOD323–TxxSC		500W, SOD323,Cp ~ 500–50pF
5	CD143A–SR05LC	USB/ Ethernet/1394	250W, 5V, SOT–143, Cp<3 pF
	CD143A–SR05		500W, 5V, SOT–143, Cp<10 pF
6	CDNBS08–SLVU2.8–4	Ethernet	600W/30A,Cp<6pF, SO8, Protects 4 I/Os, 2.8V
7	CDDFN10–0506N	USB 3.0	5V, 10 pins, Protects 6 I/Os, Cp<0.3 pF
8	CDSOT23–SM712	RS485	400W,Working peak reverse voltage 7V/12V, Cp<75pF,
9	CDSOT23–SRV05–4	USB/ Ethernet/DVI	500W, 5V, SOT–23–6, Cp<3.5 pF
10	CG0402MLC–05LG	USB/ HDMI/ Ethernet Antenna Port Protection	ChipGuard ESD, Cp only 0.5 pF
	CG0603MLC–05LE		ChipGuard ESD, Cp only 0.05pF
	CG0603MLU–05E		

9 SMD Polymer PTC Resettable Fuses(贴片自恢复保险丝)

Bourns P/N	规 格	Ihold电流范围	Vmax电压范围
MF–FSMF***X	0603	0.1A–0.5A	15V–6V
MF–PSMF***X	0805	0.1A–1.1A	15V–6V
MF–NSMF	1206	0.12A–2A	30V–6V
MF–USMF	1210	0.05A–1.75A	30V–6V
MF–MSMF	1812	0.1A–2.6A	60V–6V
MF–LSMF***X	2920	1.85A–3.0A	33V–6V
MF–SMDF	2018	0.55A–2.0A	60V–10V
MF–SMHT	2920	1.36A–1.6A	16V
MF–SM	3425	0.3A–3A	60V–6V

附录
Appendix



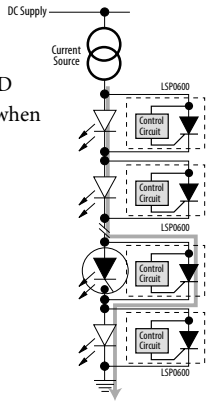
LSP Series

SALES GUIDE
LED Shunt Protectors

Solutions

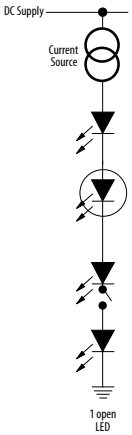
LSP Solution

- With 1 LSP0600 protecting each LED
- 3 LEDs still active when one goes open
- Small size
- Simple design

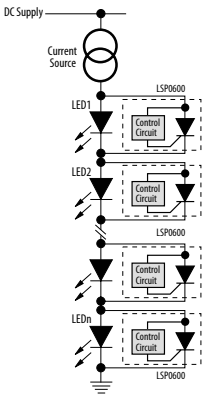


No Shunt Protection Solution

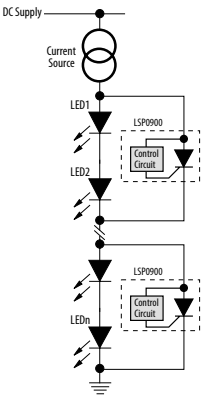
- TVS diodes or no protection
- Entire string goes dark when an LED goes open
- Even LEDs with integrated Zener cannot handle the full current of the LED string



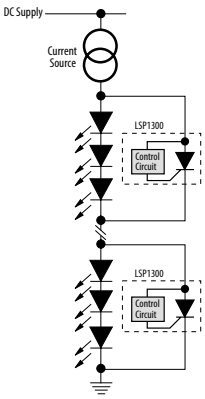
LSP0600



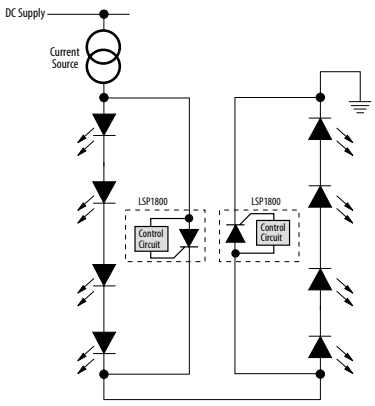
LSP0900



LSP1300



LSP1800



Application Segments

High performance lighting applications

- Most customers have an end customer specification driving high reliability
- This is a straightforward concept to sell improved reliability
- High reliability applications can have more price elasticity

Performance Level	Application Example	Conventional Solution	LSP Solution	Comment
High	Transport lighting trains, subway carriages	TVS diode fitted across each LED	LSPxx00 across 1, 2, 3 or 4 LEDs	Cost drives level of bypass per substring allowing balance of protection and cost
	Lighting in mining		LSP0600 per LED	Maximum protection and maximum light output is maintained
	LCD panel backlighting	Each LED must be driven individually or multiples in parallel	LSP0600	Bypass each LED for maximum performance

附录
Appendix

RS-485端口防雷/防交流电搭接保护

介绍

Bourns 在 RS-485 串行设备端口上有着非常优越的电路保护方案。使用两个 BOURNS TBU 高速保护（HSP），两个快速动作 GDT 和两个 TVS 二极管，来满足规定的 RS - 485 接口的行业标准。建议使用 BOURNS TBU 的解决方案，配备低容值的 GDT，以增强在高速信号上的性能。它可以帮助工程师增加 RS - 485 端口的防雷浪涌保护水平和 220V 交流电搭接的异常情况，还可减小 PCB 板的大小设计。

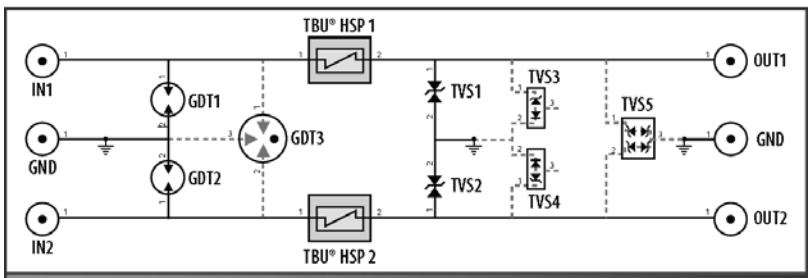


Figure 1 | *RS-485 Evaluation Board Schematic*

怎样连接

- IN1 和 IN2 连接外界线缆。
- OUT1 和 OUT2 连接 RS-485 芯片端。

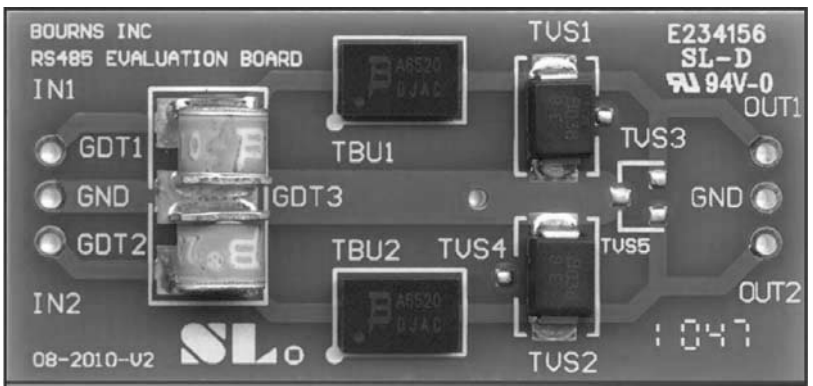


Figure 2 | *RS-485 Evaluation Board Top Side Layout*

此评估板允许有多种方案配置方式

- **TBU**：2 个 TBU-CA065-200-WH 可用一个 TBU - DT 085 - 200 – WH 代替。
- **GDT**：2 个双端 2031 GDT（GDT1 和 GDT2）可用 1 个三端 2030 GDT（GDT3）代替。
- **TVS**：2 个 SMB TVS 二极管（TVS1 和 TVS2）可用 2 个 SOT23 TVS 二极管（TVS3 和 TVS4）或者 1 个 TVS 二极管（TVS5）代替。

Table 1 | *RS-485 Evaluation Board Bill of Materials*

No.	Part Number	Qty.	Description	Reference
1	TBU-CA065-200-WH	2	TBU® Single Bidirectional Line 650 V 200 mA	TBU® HSP 1, TBU® HSP 2
2	2031-23T-SM-RPLF	2	Single Line Fast-acting GDT 650 V	GDT1, GDT2
3	SMBJ12CA	2	Single Bidirectional Line TVS 12 V SMB	TVS1, TVS2

附录
Appendix

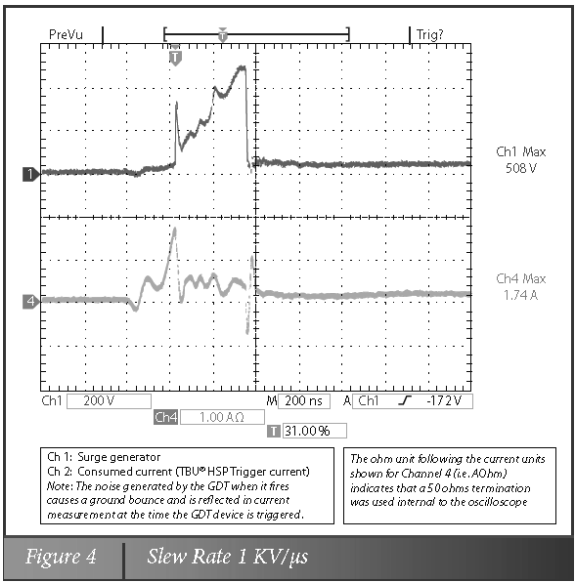


Figure 4 *Slew Rate 1 KV/μs*

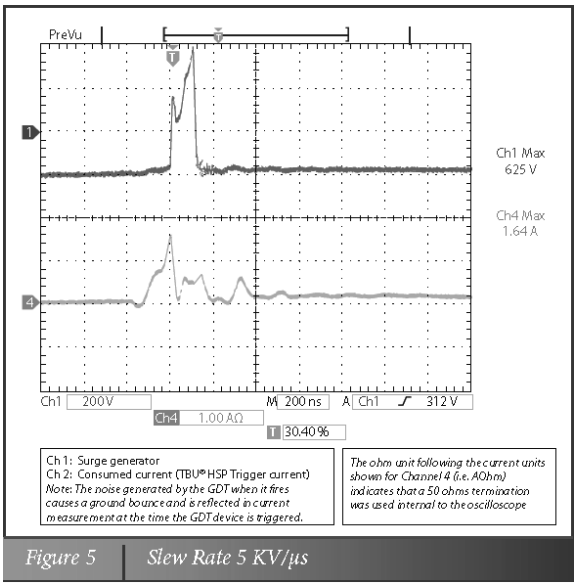
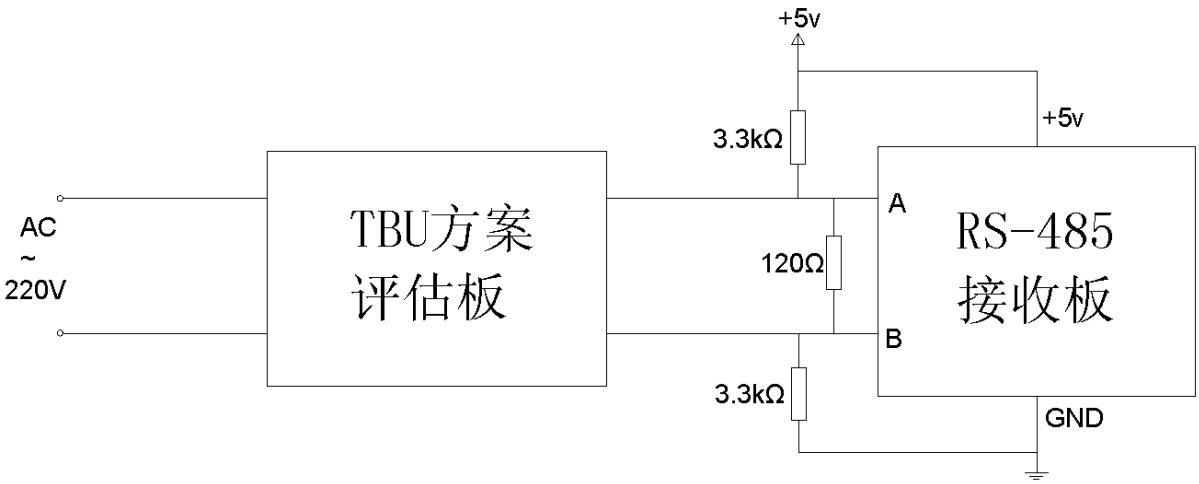


Figure 5 *Slew Rate 5 KV/μs*

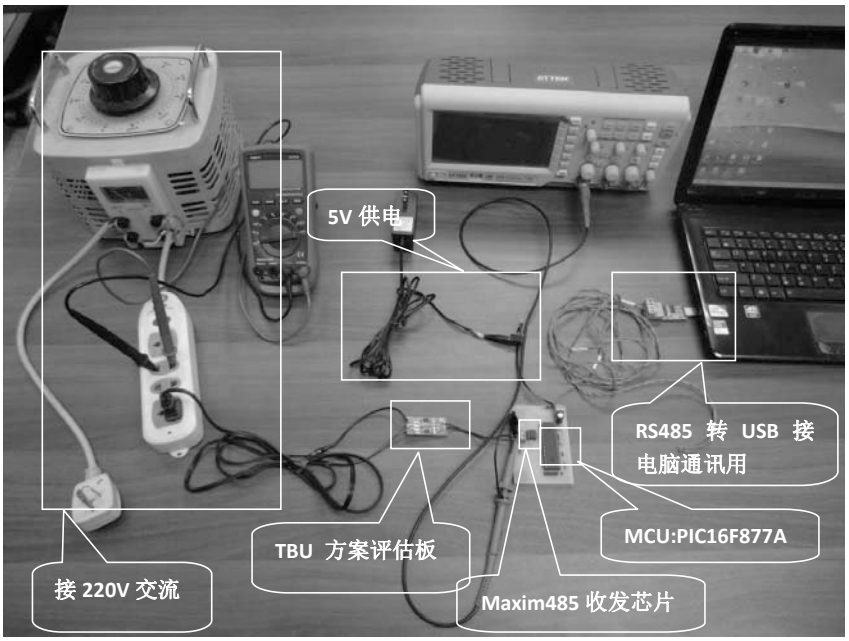
220V 交流电搭接实验

实验连接框图



附录
Appendix

实验实物图

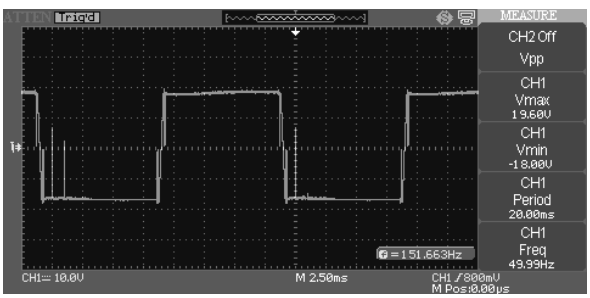


实验步骤

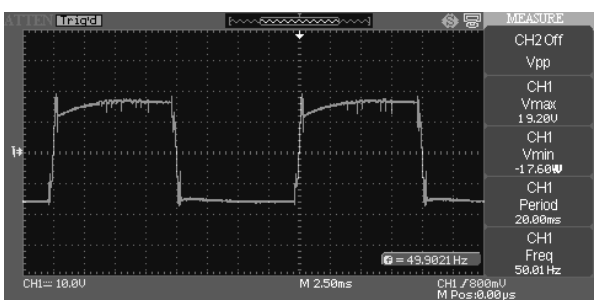
- 第一步：接好线路，如上图，示波器测试 RS485　A、B 两端，接通 5V 电源，使 RS485 芯片工作。
- 第二步：接通外接交流电源，通过调节调压器，使 RS485 输入电压逐步上升到 220V。
- 第三步：等电压上升到 220V，观看 A、B 两端波形，再去掉 5V 电源，使 RS485 芯片停止工作，RS485 输入电压仍为 220V，再观看 A、B 两端波形。
- 第四步：断开 220V 电源，接上 5V 电源，使 RS485 芯片工作，接上电脑，看 RS485 芯片能否收发正常。
- 第五步：分别对 RS-485 几种通俗外围电路进行以上测试。（通俗外围电路情况有：一，A、B 端不接任何电阻；二，A 端接 3.3K 上拉电阻，B 端接 3.3K 下拉电阻；三，A 端接 3.3K 上拉电阻，B 端接 3.3K 下拉电阻，并且 A、B 端之间接 120Ω匹配电阻。）

具体实验步骤和波形可观看视频：http://v.youku.com/v_show/id_XMzAzMTg0NDY4.html

实验波形

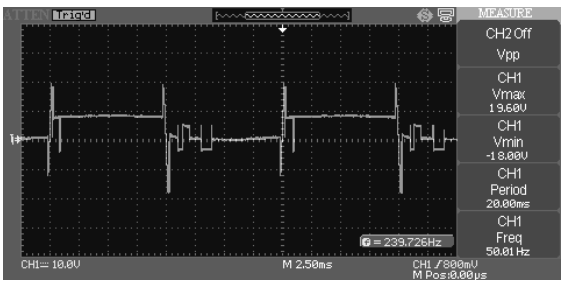


RS485 A、B 端口不接任何电阻
RS485 芯片工作时，A、B 两端电压波形

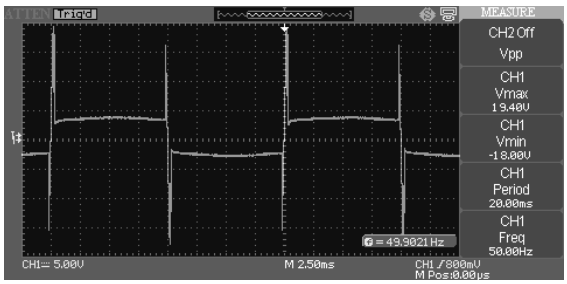


RS485 A、B 端口不接任何电阻
RS485 芯片不工作时，A、B 两端电压波形

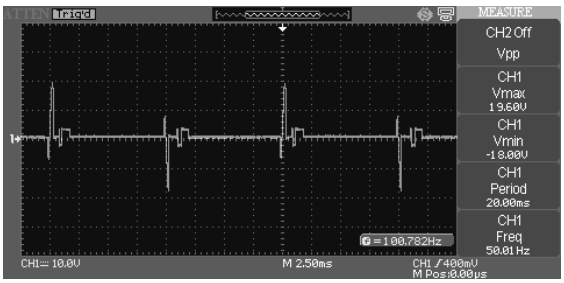
附录
Appendix



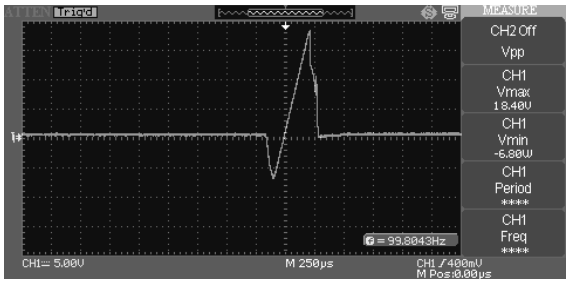
RS485 A 端接 3.3K 上拉电阻、B 端接 3.3K 下拉电阻
RS485 芯片工作时，A、B 两端电压波形



RS485 A 端接 3.3K 上拉电阻、B 端接 3.3K 下拉电阻
RS485 芯片不工作时，A、B 两端电压波形



RS485 A 端接 3.3K 上拉电阻、B 端接 3.3K 下拉电阻
A、B 之间接 120Ω匹配电阻
RS485 芯片工作时，A、B 两端电压波形



RS485 A 端接 3.3K 上拉电阻、B 端接 3.3K 下拉电阻
A、B 之间接 120Ω匹配电阻
RS485 芯片不工作时，A、B 两端电压波形

实验结果

无论何种情况，RS-485 芯片收发正常，无损坏。Bourns 的 RS-485 的 TBU 保护方案可以防止 220V 交流电搭接。