# WAYON

Let's Make
electronics *Safer* !

# History

- **1991--"PTC thermistor for telephone communication protection" was successful in tendering for the project of Shanghai Committee of Economy.**

- **1996--Wayon Company formally registered.**

- **1999-- Venture Company was introduced.**

- **2000-- Wayon was changed into a joint stock company.**

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# Company Profile

- Major products: Polymer & ceramic PTC　Thyristor Fuse　PCM and other protection components

- Annual sales of US　28.5 million in 2002

- More than 1200 employees in Shanghai, China.

- 1 share　control or share hold subsidiary companies.

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# Quality System Approvals

- **ISO9001 (2000) Quality Certification**

- **QS9000 Quality Certification**

# Quality Programming

- **1998   ISO9002 Quality System**

- **2001    QS9000 Quality System**

- **2002   ISO9001(2000) Quality System**

- **2003   ISO14001 Environment  Management System**

- **2004   TS16949 Quality System**

- **2005   6**

# Product certification

## Safety Approvals

- **UL \ TUV \ CSA**

# Green Product Program

- **human in manufacture & design**

- **harmless in production**

- **lead-free in jointing**

- **Innoxious in  packaging**

**ISO14001 Environment Management Certification**
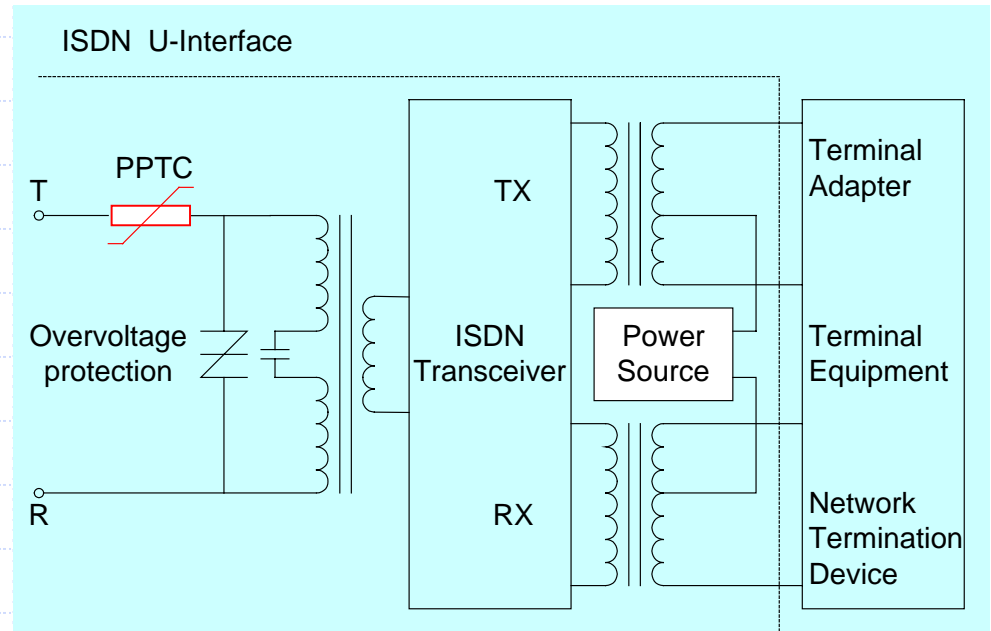
# Target Markets
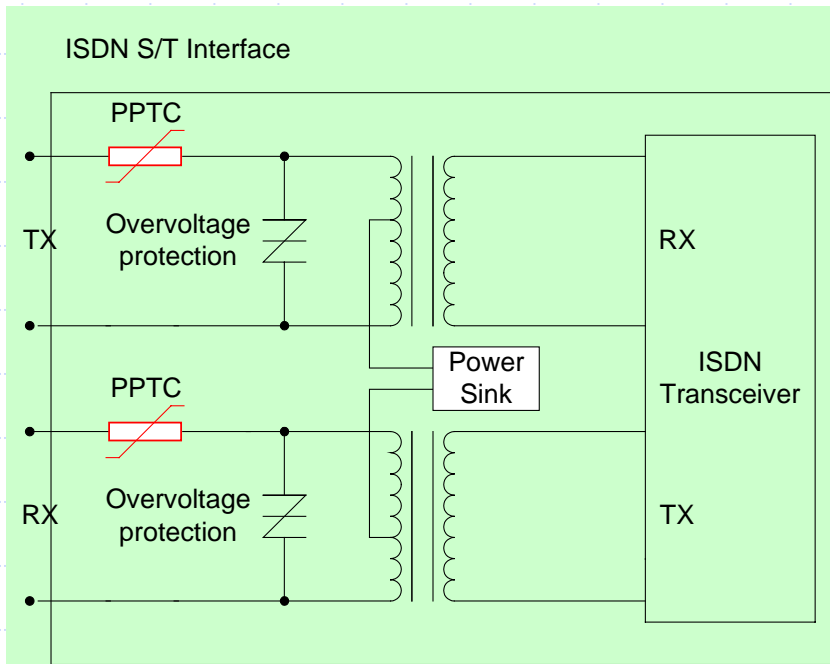
- **Telecom**

- **Power supply**
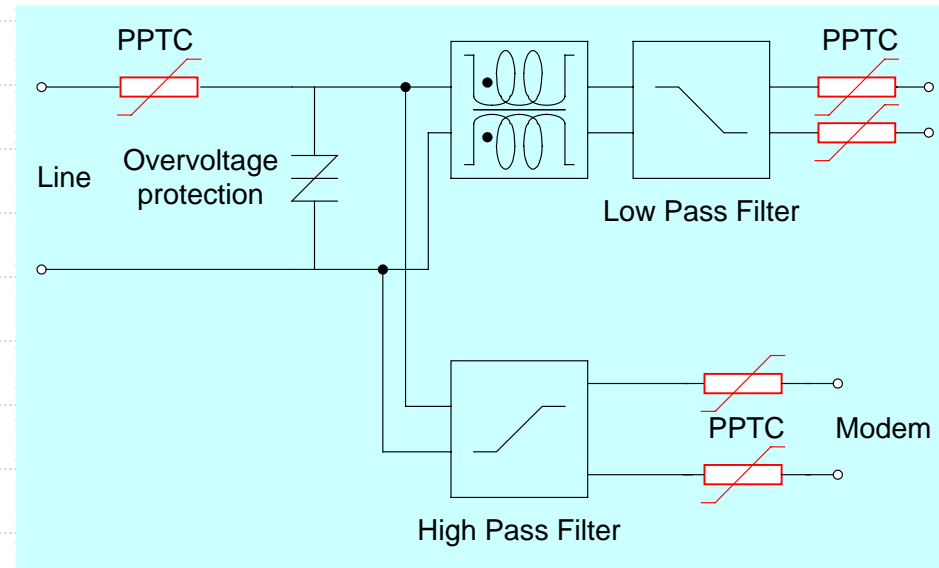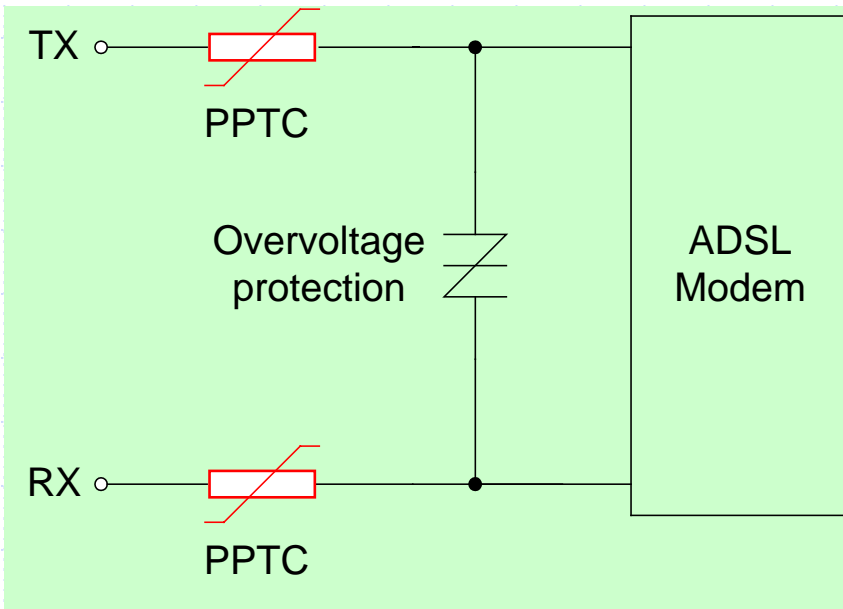
- **Automobile electronics**
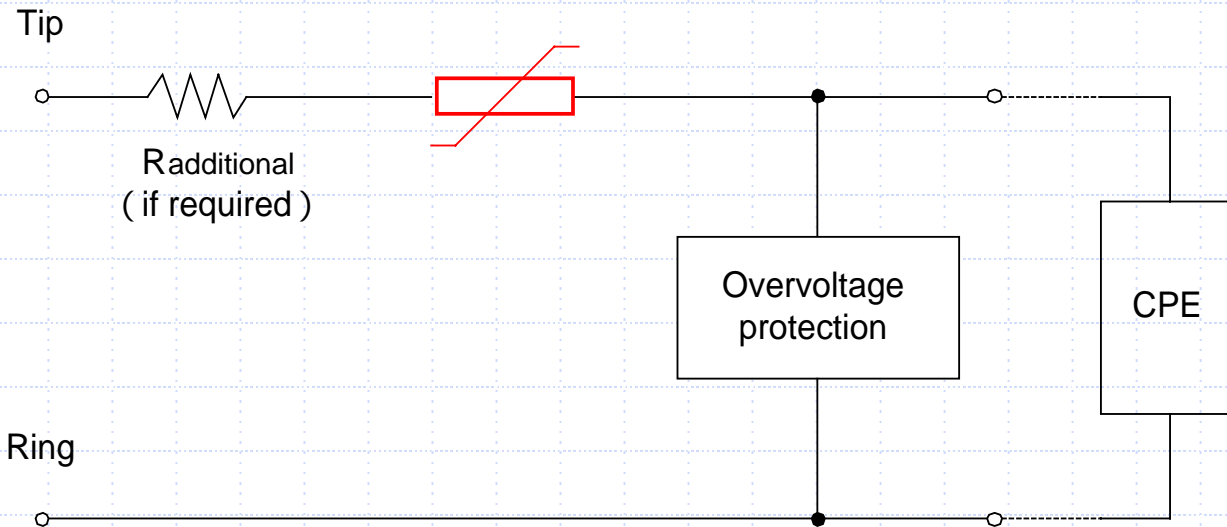
- **Home appliance & IT equipments**

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# Customer Premise Equipment



A○———[PPTC]————●————[Line feed resistor]----

PPTC

Overvoltage
protection

B○———[PPTC]————●————[Line feed resistor]----

PPTC

Line feed resistor

SLIC chip
or
transformer

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# ISDN

# ADSL

# HDSL

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# Customer Premise Equipment

Tip

$R_{additional}$
if required

Overvoltage
protection

CPE

Ring

# Customer Premise Equipment



Tip

$R_{additional}$
if required

Overcurrent
protection

Overvoltage
protection

Overvoltage
protection
optional

CPE

Overvoltage
protection

Ring

$R_{additional}$
if required

Overcurrent
protection

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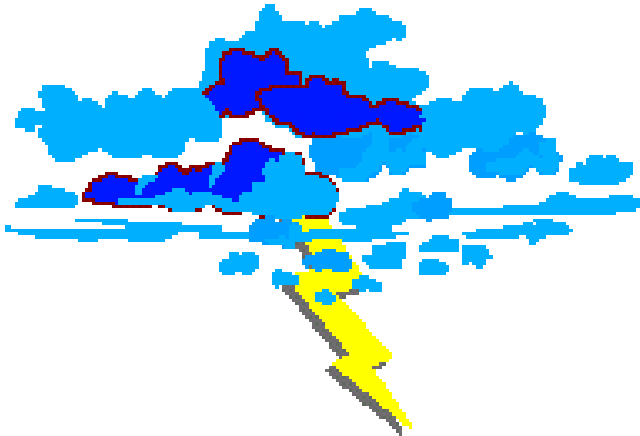
# Protection for telecom equipment

*A Protection ... against what ?*

Lightning surges

ESD surges

Power Contact

AC lines

TELEPHONE lines
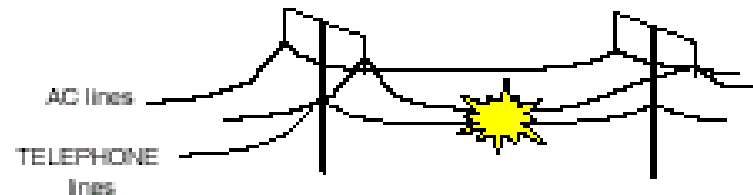
*Let's make electronics safer !*

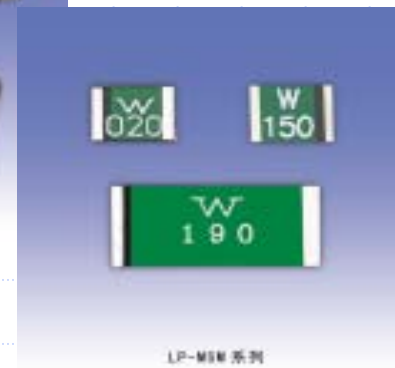# WAYON Products for telecom

## Over-current Protection
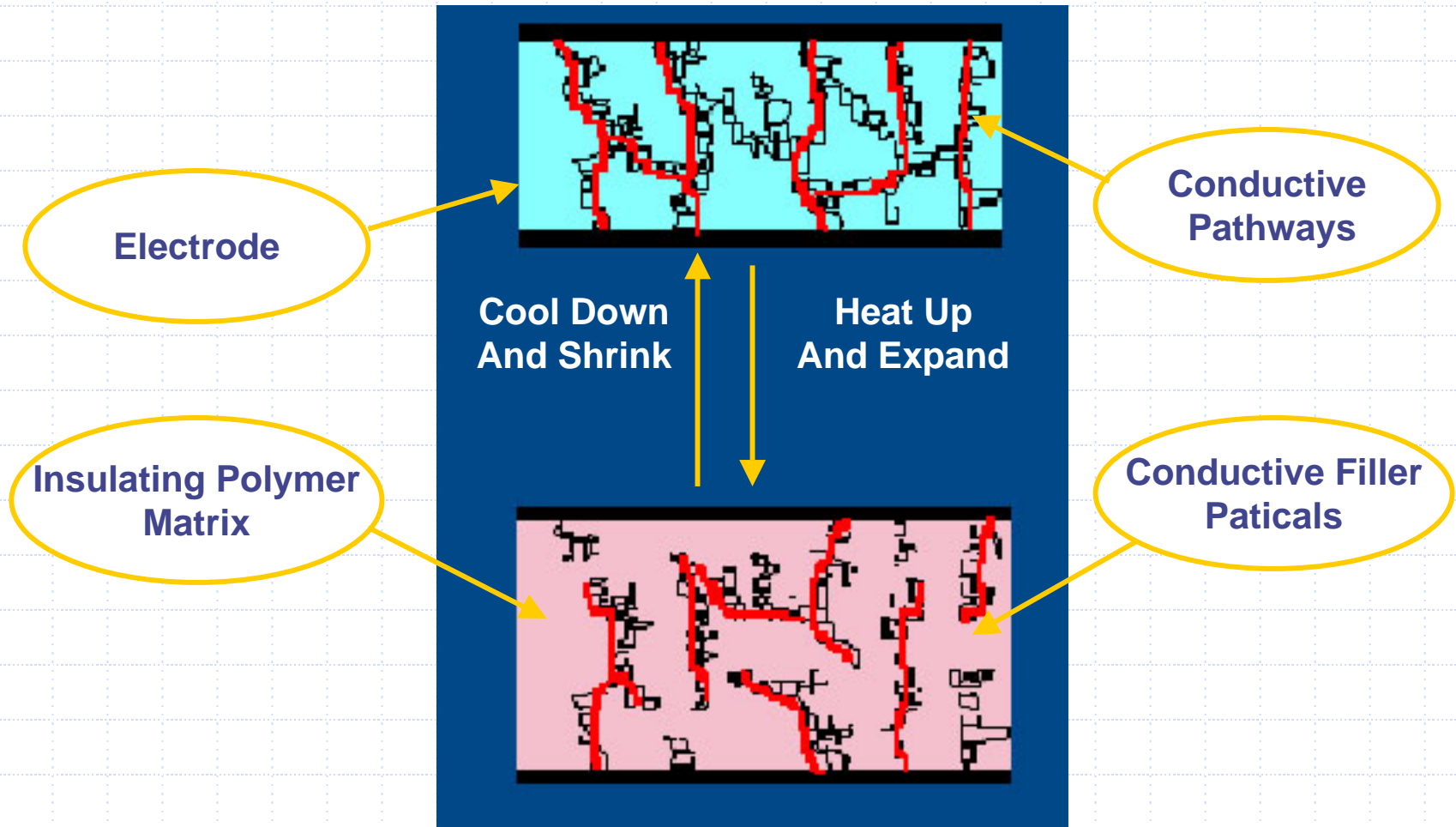
- PPTC
- CPTC

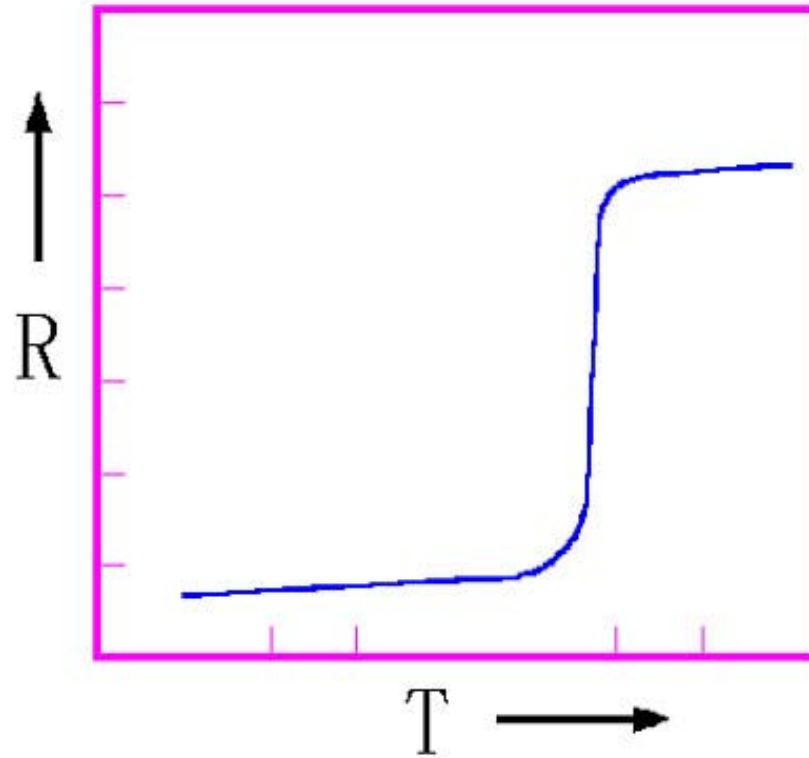## Over-voltage Protection

- Thyristor

# Overcurrent Protection--

- **PPTC**

# PPTC



Electrode

Conductive Pathways

Cool Down And Shrink

Heat Up And Expand

Insulating Polymer Matrix

Conductive Filler Paticals

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# PPTC

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# PPTC

**PPTC Resettable Fuse**
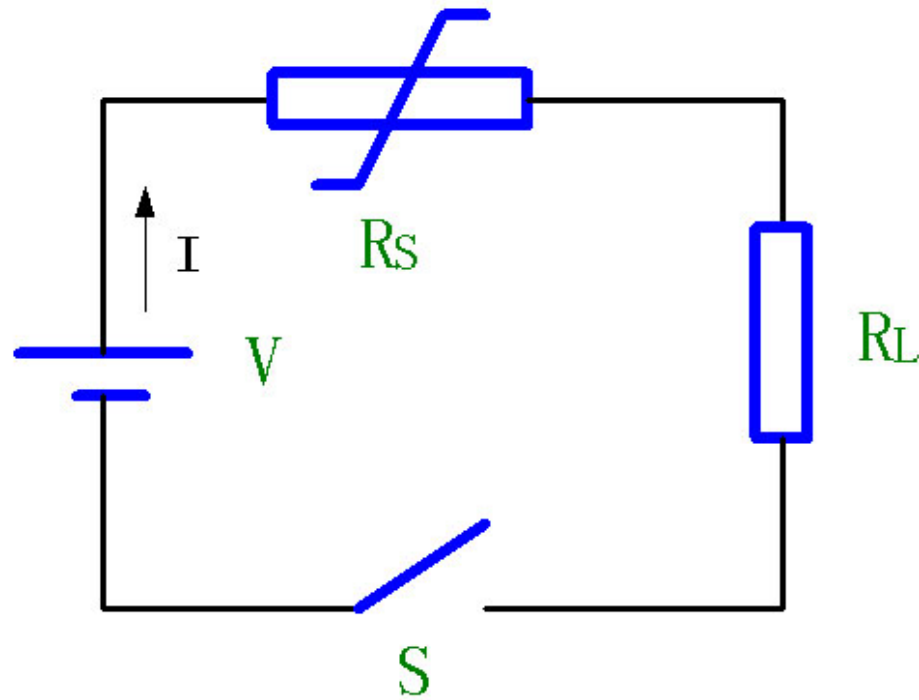
# PPTC

$$C_P(\Delta T/\Delta t)=I^2R(T)-U(T-T_a)$$

**Heat Accumulated = Heat Generated -**

**Cp = thermal mass of the device**
**I = current through device**
**R(T) = resistance of device**
**U = thermal conductance of device**
**T = device temperature**
**Ta = ambient temperature**

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# PPTC

**For Short Circuit Faults**

$$I^2R(T) \qquad U(T-T_a)$$

therefore

**The Device Temperature** ↑

**The Device Resistance** ↑

**to reduce the current**

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# PPTC

## nickel coil

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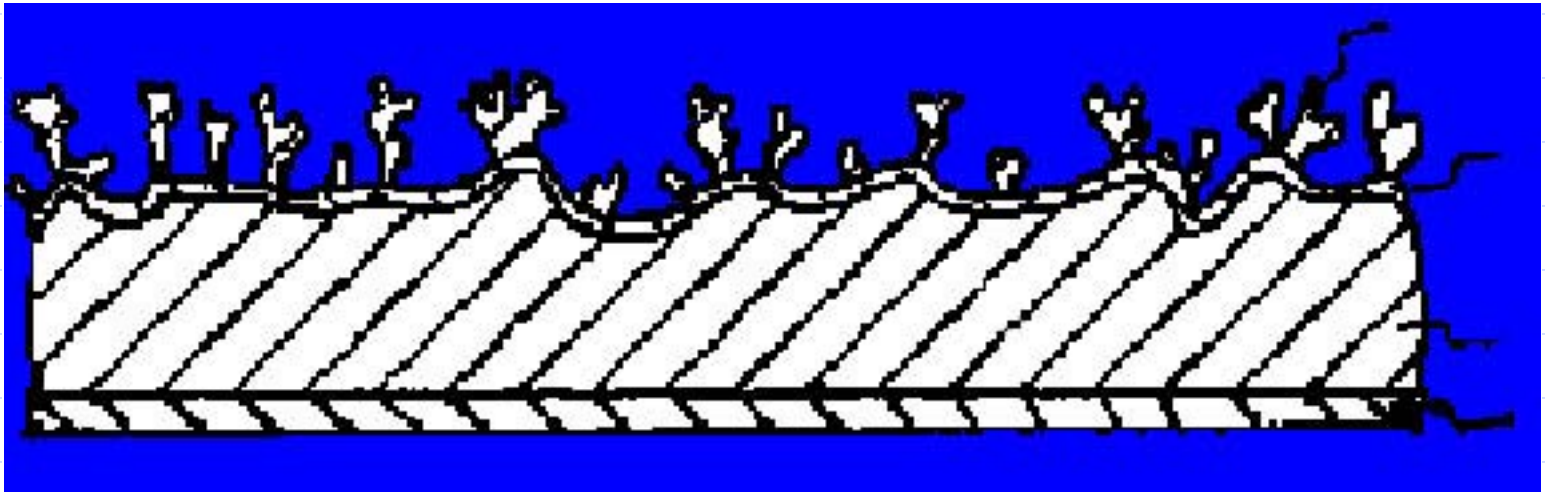
# Electrical Main Parameters

$I_H$ = Hold current: maximum current at which the device will not trip at 25  still air.

$I_T$ = Trip current: minimum current at which the device will always trip at 25  still air.

$T_{trip}$ = Maximum time to trip at assigned current.

$V_{max}$ = Maximum voltage device can withstand without damage at rated current.

$I_{max}$ = Maximum fault current device can withstand without damage at rated voltage.

$P_{typ}$ = Typical power dissipation: typical amount of power dissipated by the device when in state air environment.

$R_{min}$ = Minimum device resistance at 25  prior to tripping.

$R_{max}$ = Maximum device resistance at 25  prior to tripping.
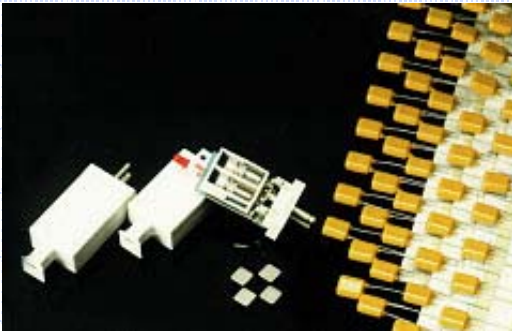
*Let's make electronics safer !*
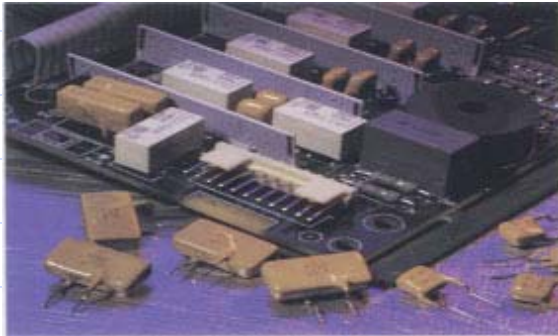
# LC series PPTC



## Features:

Radial leaded or disc chip; Resettable;

Small profile; Quick time to trip;

Resistance is sorted and matched devices available;

High voltage endurance

## Application:

Customer premise equipment; MDF modules
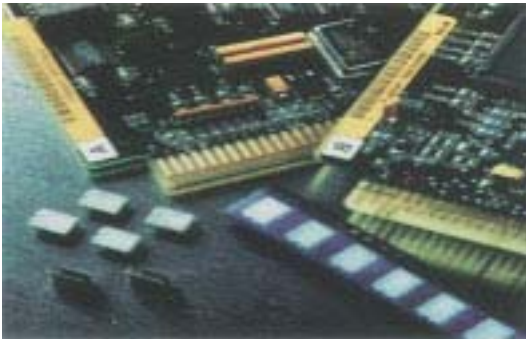
# LB/LBV series PPTC



## Features:

Radial leaded; Quick time to trip;
High voltage endurance; Resettable;
High resistance; Low parasitic capacitance/
flat impedance with frequency

## Application:

Analog/POTS linecards; xDSL modem;
Network Interface Devices (NID);
Wireless LAN base station;

Microcellular base station
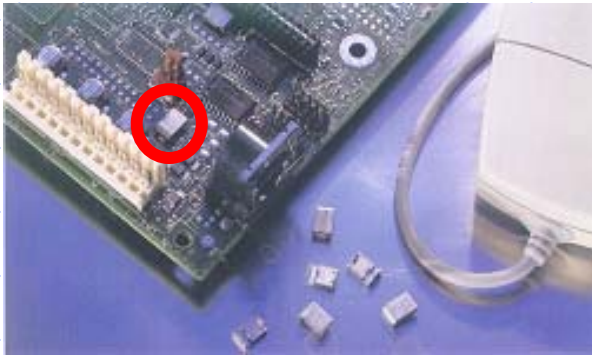
# LM/LMV series PPTC

## Features:
SMD devices; Small profile; Quick time to trip;
High voltage endurance; Resettable;
High resistance; Low parasitic capacitance/
flat impedance with frequency

## Application:
Analog/POTS linecards; xDSL modems;
Network Interface Devices (NID);
Wireless LAN base station;
Micro cellular base station

# LP-SM series PPTC

LP-SM series PPTC

## Features:
Surface Mount Devices;fast trip time;
Smaller size saves board space

## Application:
IEEE1394 Ports; Mouse;
Data communication; Keyboard;
Ethernet/LAN; LNB

# LP-MSM series PPTC

LP-MSM series PPTC



## Features:

Surface Mount Devices;fast trip time;
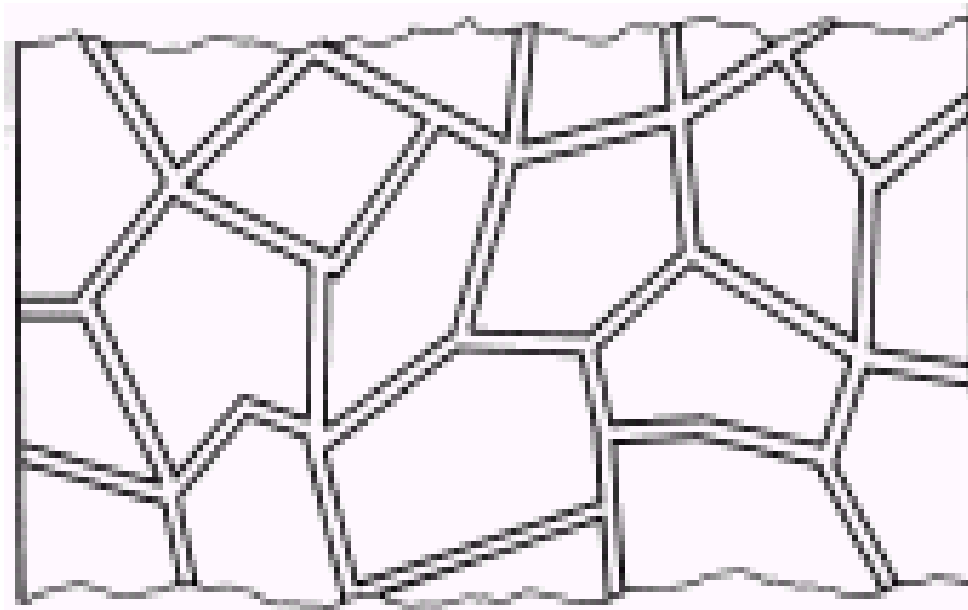Smaller size saves board space;
Reduced resistance

## Application:

PC motherboards; USB Ports;
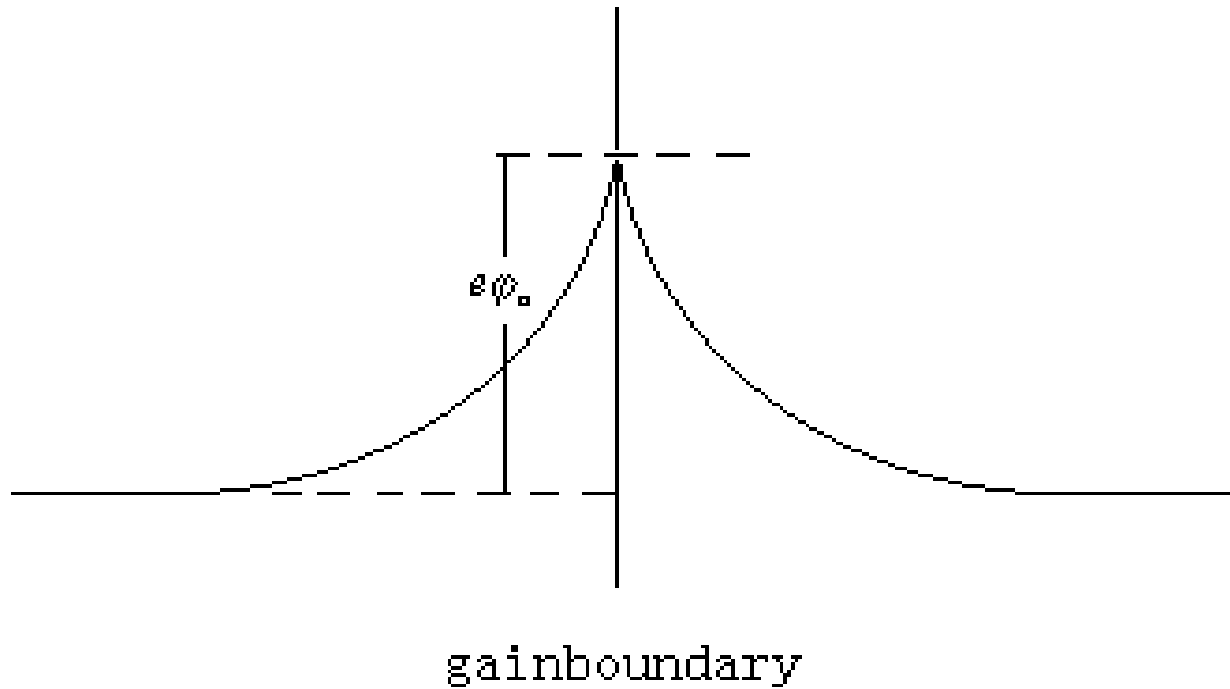Digital cameras; Disk drives; Modems;
Battery packs; PDAs;

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# Overcurrent Protection--

- **CPTC**

# CPTC



$$R_{PTC} = R_{grain} + R_{grain\,boundary}$$
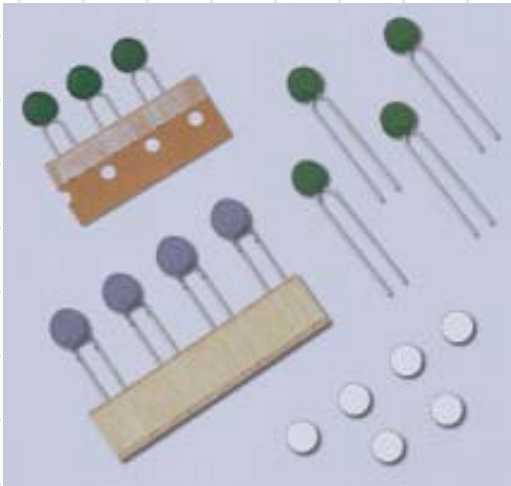
# CPTC



gainboundary
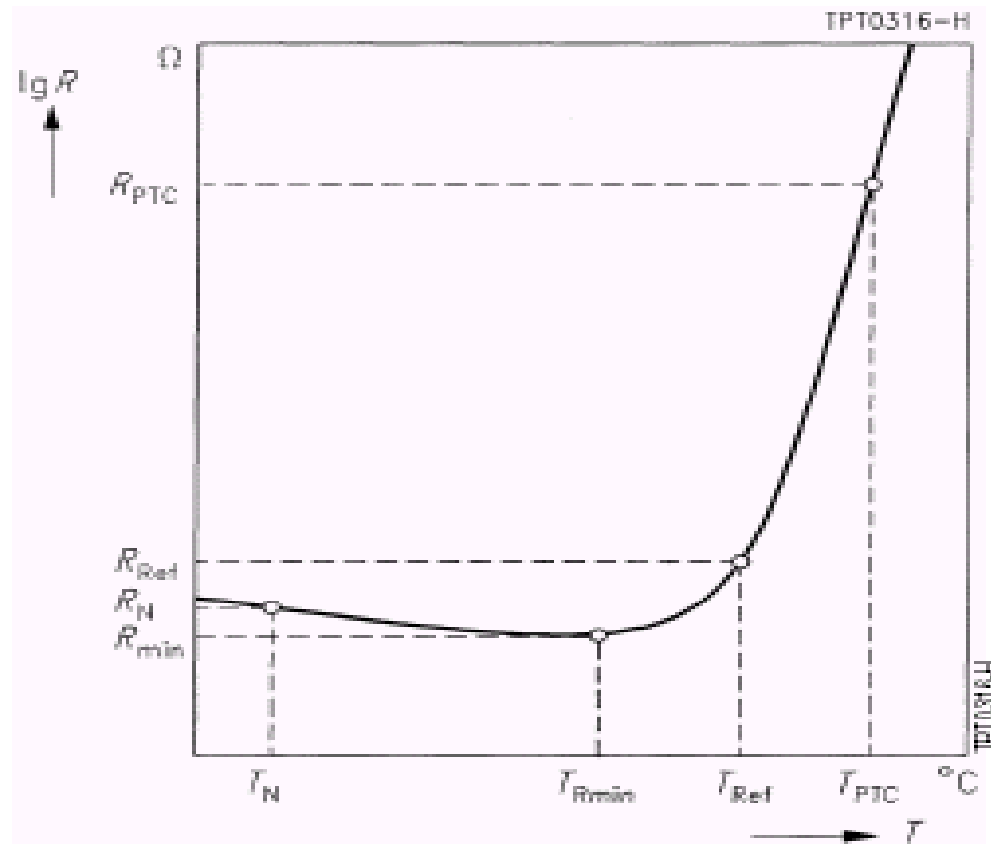
# CPTC

# SCA Series  CPTC

SCA Series



## Features:

Rapid switch; High voltage endurance;
High current endurance;
Leed-free weld
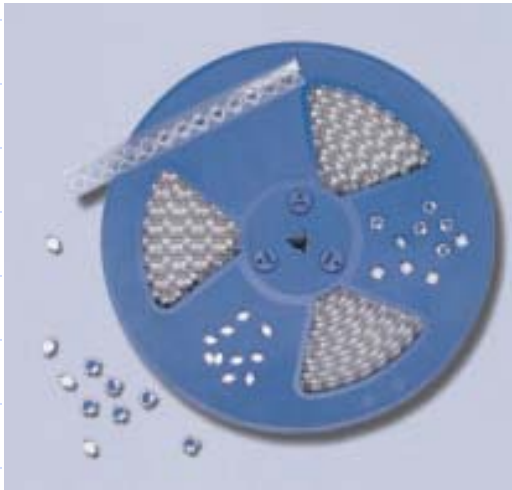
## Application:

Exchanger; Main distribution frame;
Local internet;ADSL

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# SCP Series  CPTC

SCP Series

## Features:
Quick time to trip; Resistance is sorted and matched devices available;
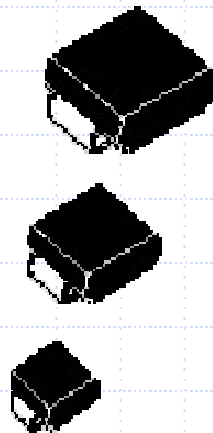High voltage endurance;
High current endurance; Small volume

## Application:
Telecommunication equipment and circuit

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# Overvoltage Protection

- **WP series**

- **LT  series**

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# Electrical Main Parameters

$V_{RM}$   Stand-off voltage

$I_{RM}$   Leakage current at $V_{RM}$

$V_R$   Continuous reverse voltage

$V_{BR}$   Breakdown voltage
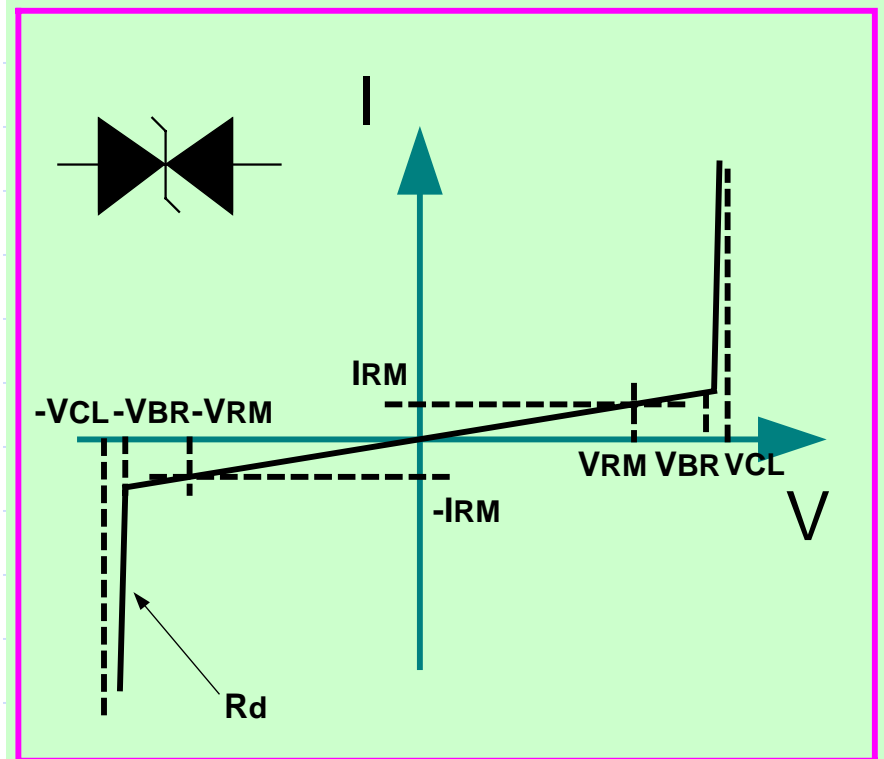
$V_{BO}$   Breakover voltage

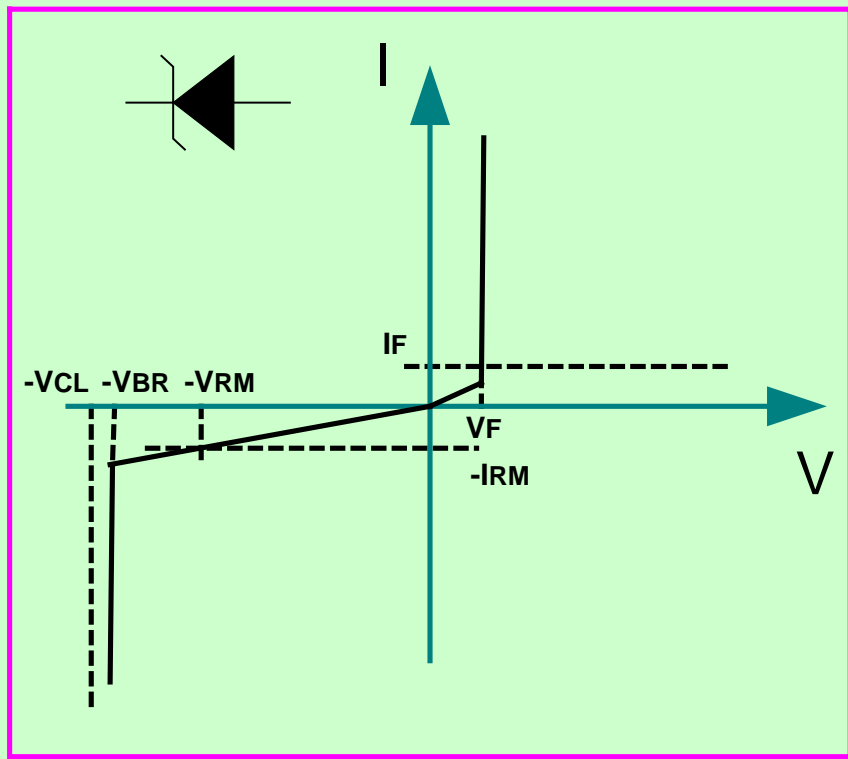$I_H$   Holding current

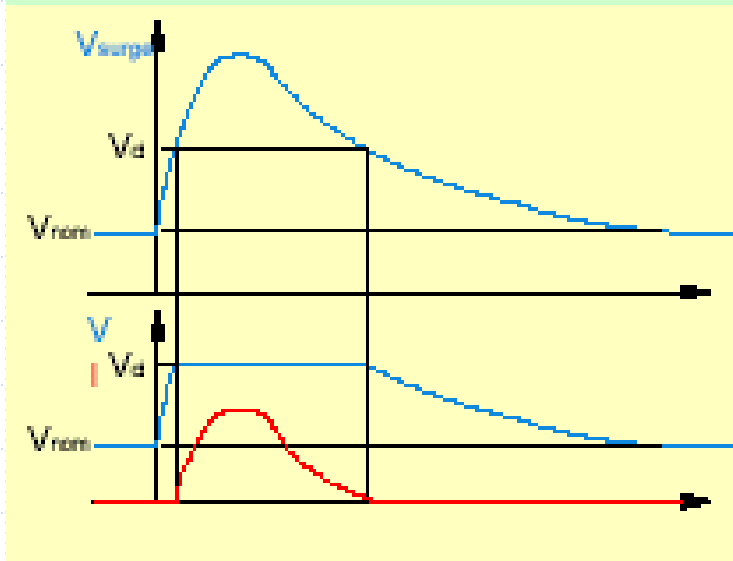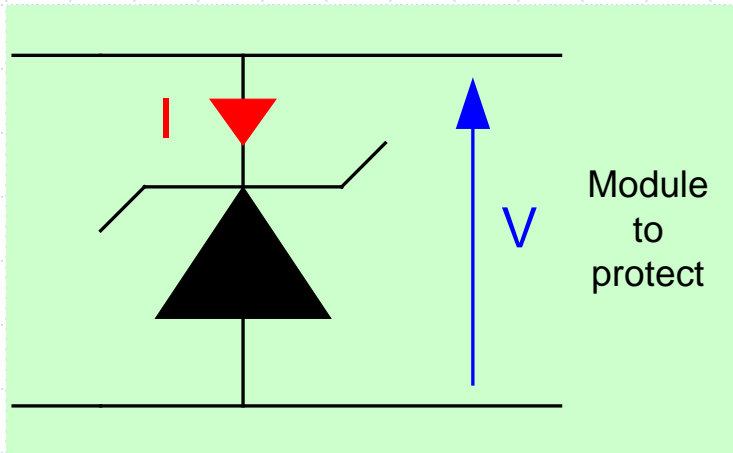$I_{BO}$   Breakover current

$I_{PP}$   Peak pulse current

C   Capacitance

# THYRISTOR

# THYRISTOR



Module
to
protect

**Features:**

**Fast response time**

**Wide triggering range**

**Low capacitance**

**Reliability of silicon**

**protection**



%IPP

PULSE WAVEFORM
10/1000µS

10µS

100

50

0

1000µS                    TIME

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# THYRISTOR

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# THYRISTOR



Module to protect
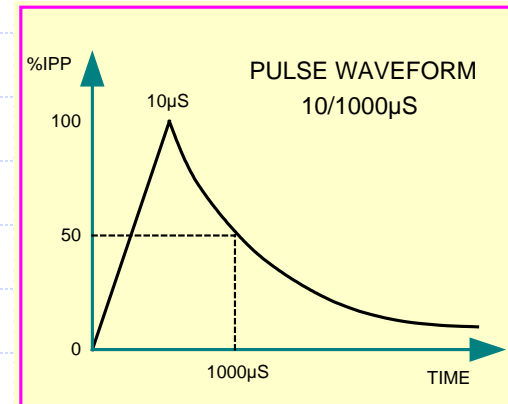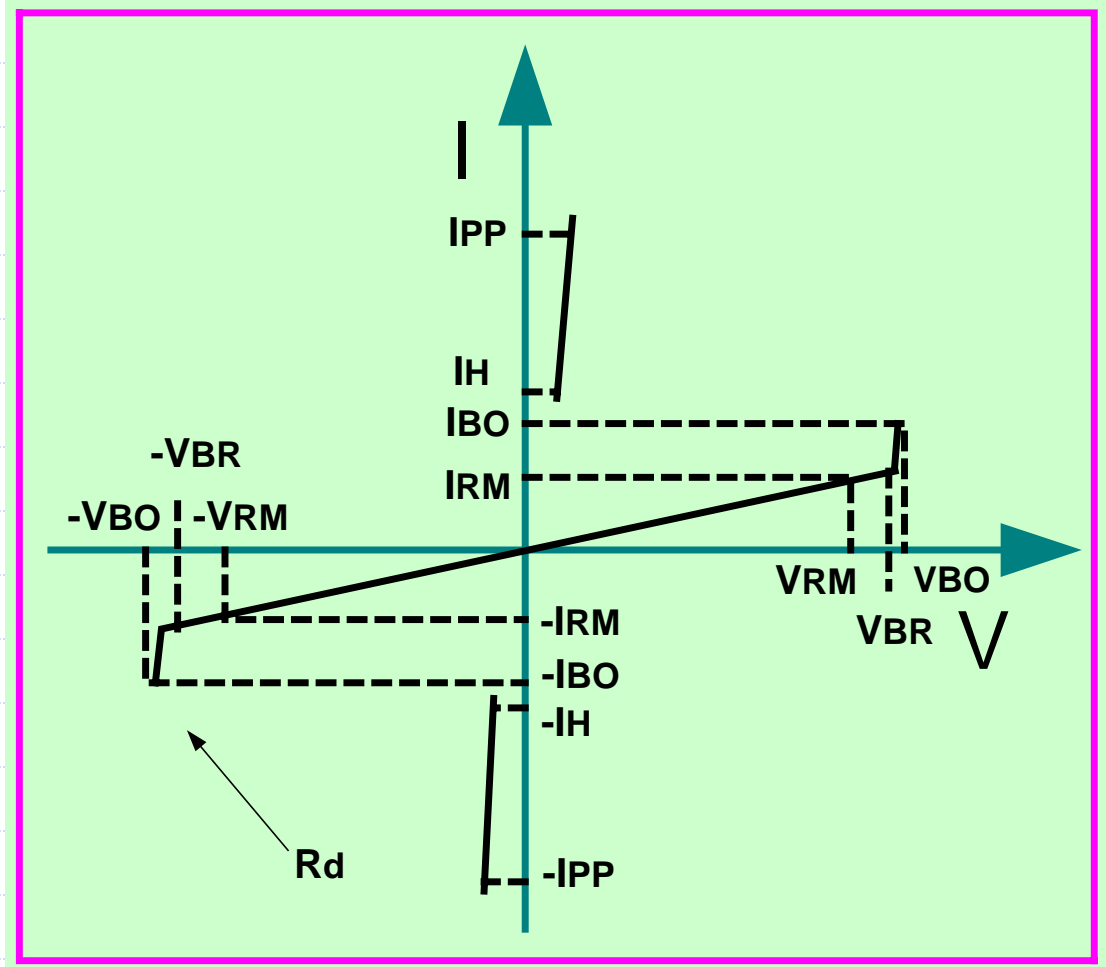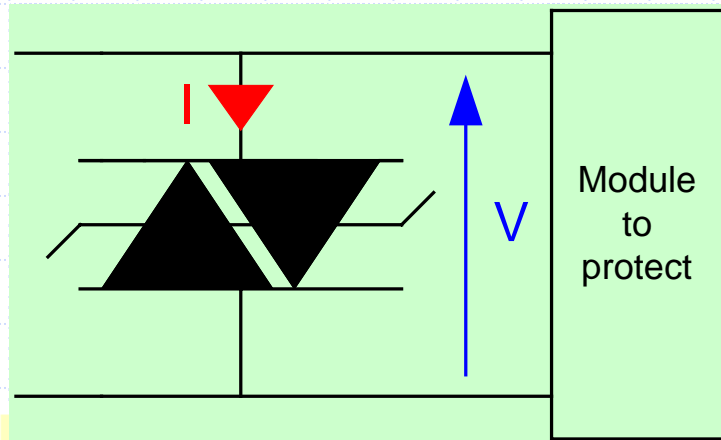
## Features:

**Stable Breakover Voltage**

**No Ageing**

**Reproducible Operation**

**No Noise**



%IPP

PULSE WAVEFORM
10/1000µS

10µS

100

50

0

1000µS

TIME

WAY-ON

# *Thanks*