# Description

The CR range of protectors are based on the proven technology of the T10 thyristor product. Designed for transient voltage protection of telecommunications equipment, it provides higher power handling than a conventional avalanche diode (TVS) and when compared to a GDT offers lower voltage clamping levels and infinite surge life.
Packaged in a transfer moulded DO-214AA surface mount outline designed for high speed pick & place machines used in today's surface mount assembly lines.

## Electrical Characteristics

The electrical characteristics of an CRXXXX device is similar to that of a self gated Triac, but the CR is a two terminal device with no gate. The gate function is achieved by an internal current controlled mechanism.

Like the T.V.S. diodes, the CRXXXX has a standoff voltage (Vrm) which should be equal to or greater than the operating voltage of the system to be protected. At this voltage (Vrm) the current consumption of the CRXXXX is negligible and will not effect the protected system.

When a transient occurs, the voltage across the CRXXXX will increase until the breakdown voltage (Vbr) is reached. At this point the device will operate in a similar way to a T.V.S. device and is in an avalanche mode.

The voltage of the transient will now be limited and will only increase by a few volts as the device diverts more current. As this transient current rises, a level of current through the device is reached (Ibo) which causes the device to switch to a fully conductive state such that the voltage across the device is now only a few volts (Vt). The voltage at which the device switches from the avalanche mode to the fully conductive state (Vt) is known as the Breakover Voltage (Vbo). When the device is in the Vt state, high currents can be diverted without damage to the CRXXXX due to the low voltage across the device, since the limiting factor in such devices is dissipated power (V x I).

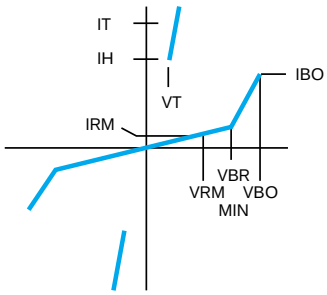
Resetting of the device to the non conducting state is controlled by the current flowing through the device. When the current falls below a certain value, known as the Holding Current (Ih), the device resets automatically.

As with the avalanche T.V.S. device, if the CRXXXX is subjected to a surge current which is beyond its maximum rating, then the device will fail in short circuit mode, this ensures that the equipment is ultimately protected.

## Selecting A CRXXXX

1. When selecting an CRXXXX device, it is important that the Vrm of the device is equal to or greater than the operating voltage of the system.

2. The minimum Holding Current (Ih) must be greater than the current the system is capable of delivering otherwise the device will remain conducting following a transient condition.




V-I Graph illustrating symbols and terms for the CR surge protection device

## The CRXXXX Range Can Be Used To Protect Against Surges As Defined In The Following International Standards.

| | | | SA | SB | SC |
|---|---|---|---|---|---|
| FCC Rules Part 68/D | Metallic | 10/560µs | 50A | 100A | 100A |
| | Longitudinal | 10/160µs | 100A | 150A | 200A |
| Bellcore Specification | TR-NWT-001089 | 10/1000µs | 37A | 75A | 100A |
| | | 2/10µs | – | – | 500A |
| | | 100v/µs | 1KV | 1KV | 1KV |
| ITU K-17 (Formerly CCITT) | Voltage Wave Form | 10/700µs | – | 1.5KV | 1.5KV |
| | Current Wave Form | 5/310µs | – | 38A | 38A |
| VDE 0433 | Voltage Wave Form | 10/700µs | – | 2KV | 4.0KV |
| | Current Wave Form | 5/310µs | – | 50A | 100A |
| C-NET 131-24 | Voltage Wave Form | 0.5/700µs | 1.0KV | 1.0KV | 4.0KV |
| | Current Wave Form | 0.8/310µs | 25A | 25A | 100A |
| IEC 1000 -4-5 (Discharge through 2Ω impedance) I | | 8/20µs | – | 100A | 250A |
| | Voltage Wave Form | 1-2/50µs | – | 300V | 500V |
| ITU K-20 | Voltage Wave Form | 10/700µs | 1000V | 1000V | 4000V |
| (Formerly CCITT) | Current Wave Form | 5/310µs | 25A | 25A | 100A |

# Specifications

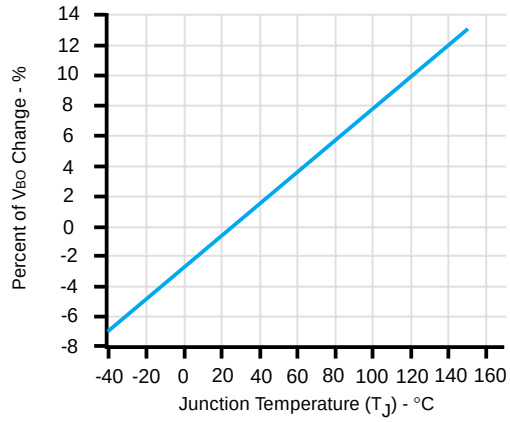
## Electrical Characteristics (Tj = 25°C)

| SYMBOL | PARAMETER | | |
|---|---|---|---|
| $V_{RM}$ | Stand-off Voltage | $I_{RM}$ | Stand-off Current |
| $V_{BR}$ | Breakdown Voltage | $I_{BO}$ | Breakover Current |
| $V_{BO}$ | Breakover Voltage | $I_H$ | Holding Current |
| $V_T$ | On-State Voltage | | |

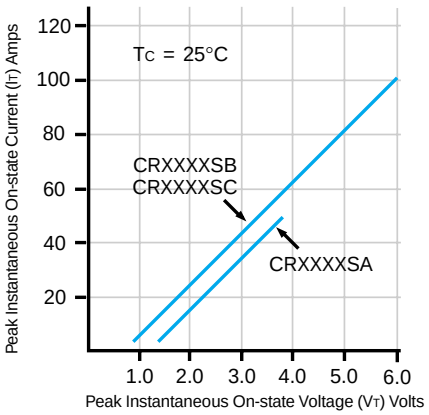
| THERMAL DATA | | VALUE | UNIT |
|---|---|---|---|
| T stg | Storage and Operating Junction Temperature Range | -40 to +150 | °C |
| Tj | | 150 | °C |
| TL | Maximum Temperature For Soldering (For period of 10 seconds max) | 230 | °C |

| | Stock Number | Device Code | Reverse Stand-off Voltage | Maximum Reverse Leakage µA | Maximum Breakover Voltage @Ibo | Maximum Breakover Current mA | Maximum Holding Current mA | Maximum On-State Voltage @1A | Typical Capacitance @1MHz 2v bias pF |
|---|---|---|---|---|---|---|---|---|---|
| MAXIMUM RATINGS SUFFIX SA | CR 0300 SA | 030A | 25 | 5 | 40 | 800 | 150 | 5 | 100 |
| Ipp 10x160µs Amps 100 | CR 0640 SA | 064A | 58 | 5 | 77 | 800 | 150 | 5 | 60 |
| Ipp 10x560µs Amps 50 | CR 0720 SA | 072A | 65 | 5 | 88 | 800 | 150 | 5 | 60 |
| $I_{TSM}$ 60Hz Amps 20 | CR 0800 SA | 080A | 75 | 5 | 98 | 800 | 150 | 5 | 60 |
| dI/dt Amps/µs 500 | CR 1100 SA | 110A | 90 | 5 | 130 | 800 | 150 | 5 | 60 |
| | CR 1300 SA | 130A | 120 | 5 | 160 | 800 | 150 | 5 | 40 |
| | CR 1500 SA | 150A | 140 | 5 | 180 | 800 | 150 | 5 | 40 |
| | CR 1800 SA | 180A | 160 | 5 | 220 | 800 | 150 | 5 | 40 |
| MAXIMUM RATINGS SUFFIX SB | CR 2300 SA | 230A | 190 | 5 | 260 | 800 | 150 | 5 | 30 |
| Ipp 10x160µs Amps 150 | CR 2600 SA | 260A | 220 | 5 | 300 | 800 | 150 | 5 | 30 |
| Ipp 10x560µs Amps 100 | CR 3100 SA | 310A | 275 | 5 | 350 | 800 | 150 | 5 | 30 |
| $I_{TSM}$ 60Hz Amps 30 | CR 3500 SA | 350A | 320 | 5 | 400 | 800 | 150 | 5 | 30 |
| dI/dt Amps/µs 500 | CR 0300 SB | 030B | 25 | 5 | 40 | 800 | 150 | 5 | 100 |
| | CR 0640 SB | 064B | 58 | 5 | 77 | 800 | 150 | 5 | 60 |
| | CR 0720 SB | 072B | 65 | 5 | 88 | 800 | 150 | 5 | 60 |
| | CR 0800 SB | 080B | 75 | 5 | 98 | 800 | 150 | 5 | 60 |
| | CR 1100 SB | 110B | 90 | 5 | 130 | 800 | 150 | 5 | 60 |
| | CR 1300 SB | 130B | 120 | 5 | 160 | 800 | 150 | 5 | 40 |
| | CR 1500 SB | 150B | 140 | 5 | 180 | 800 | 150 | 5 | 40 |
| | CR 1800 SB | 180B | 160 | 5 | 220 | 800 | 150 | 5 | 40 |
| | CR 2300 SB | 230B | 190 | 5 | 260 | 800 | 150 | 5 | 30 |
| | CR 2600 SB | 260B | 220 | 5 | 300 | 800 | 150 | 5 | 30 |
| | CR 3100 SB | 310B | 275 | 5 | 350 | 800 | 150 | 5 | 30 |
| | CR 3500 SB | 350B | 320 | 5 | 400 | 800 | 150 | 5 | 30 |
| MAXIMUM RATINGS SUFFIX SC | CR 0300 SC | 030C | 25 | 5 | 40 | 800 | 150 | 5 | 200 |
| Ipp 2x10µs Amps 500 | CR 0640 SC | 064C | 58 | 5 | 77 | 800 | 150 | 5 | 120 |
| Ipp 10x160µs Amps 200 | CR 0720 SC | 072C | 65 | 5 | 88 | 800 | 150 | 5 | 120 |
| Ipp 10x560µs Amps 100 | CR 0800 SC | 080C | 75 | 5 | 98 | 800 | 150 | 5 | 120 |
| $I_{TSM}$ 60Hz Amps 60 | CR 1100 SC | 110C | 90 | 5 | 130 | 800 | 150 | 5 | 120 |
| dI/dt Amps/µs 500 | CR 1300 SC | 130C | 120 | 5 | 160 | 800 | 150 | 5 | 80 |
| | CR 1500 SC | 150C | 140 | 5 | 180 | 800 | 150 | 5 | 80 |
| | CR 1800 SC | 180C | 160 | 5 | 220 | 800 | 150 | 5 | 80 |
| | CR 2300 SC | 230C | 190 | 5 | 260 | 800 | 150 | 5 | 60 |
| | CR 2600 SC | 260C | 220 | 5 | 300 | 800 | 150 | 5 | 60 |
| | CR 3100 SC | 310C | 275 | 5 | 350 | 800 | 150 | 5 | 60 |
| | CR 3500 SC | 350C | 320 | 5 | 400 | 800 | 150 | 5 | 60 |

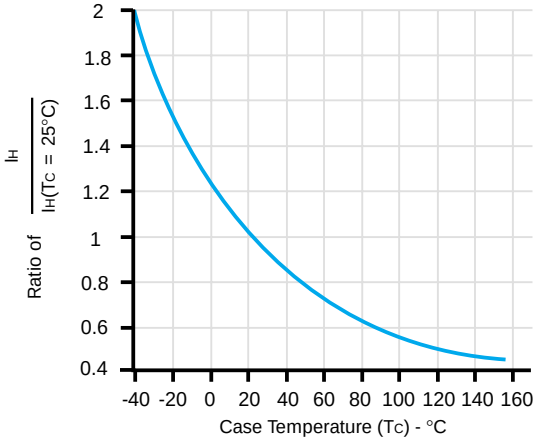
## TYPICAL $V_{BO}$ CHANGE VS JUNCTION TEMPERATURE



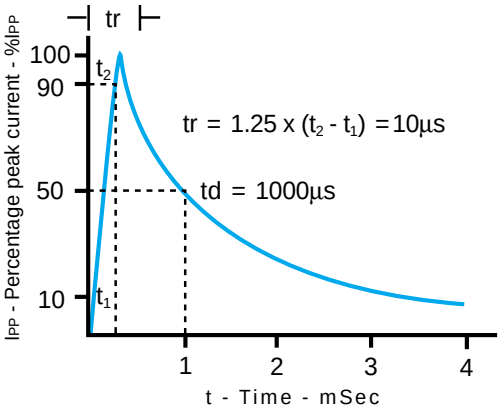

## ON-STATE VOLTAGE ($V_T$) VS ON-STATE CURRENT ($I_T$)



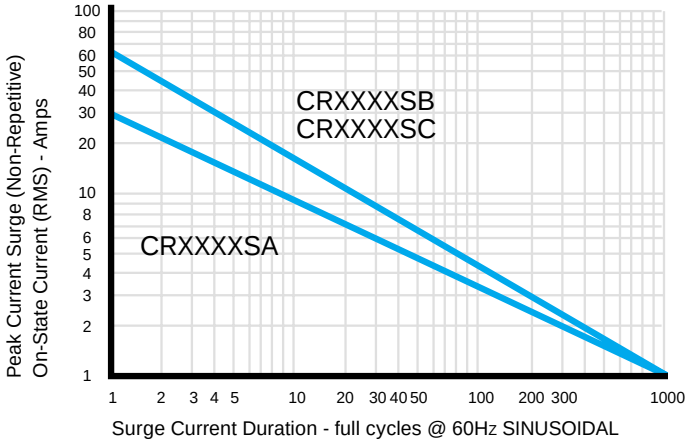

## TYPICAL DC HOLDING CURRENT VS CASE TEMPERATURE



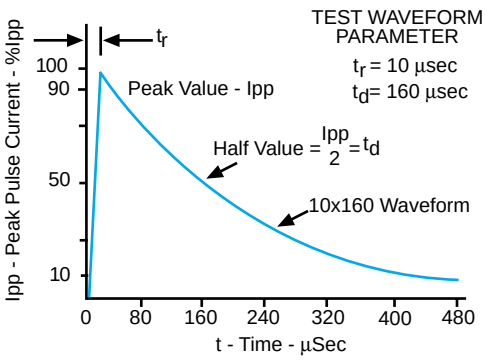

## PULSE WAVE FORM (10/1000µS)




## PEAK SURGE ON-STATE CURRENT VS SURGE CURRENT DURATION




## 10x160µs PULSE WAVE FORM




## 10x560µs PULSE WAVE FORM