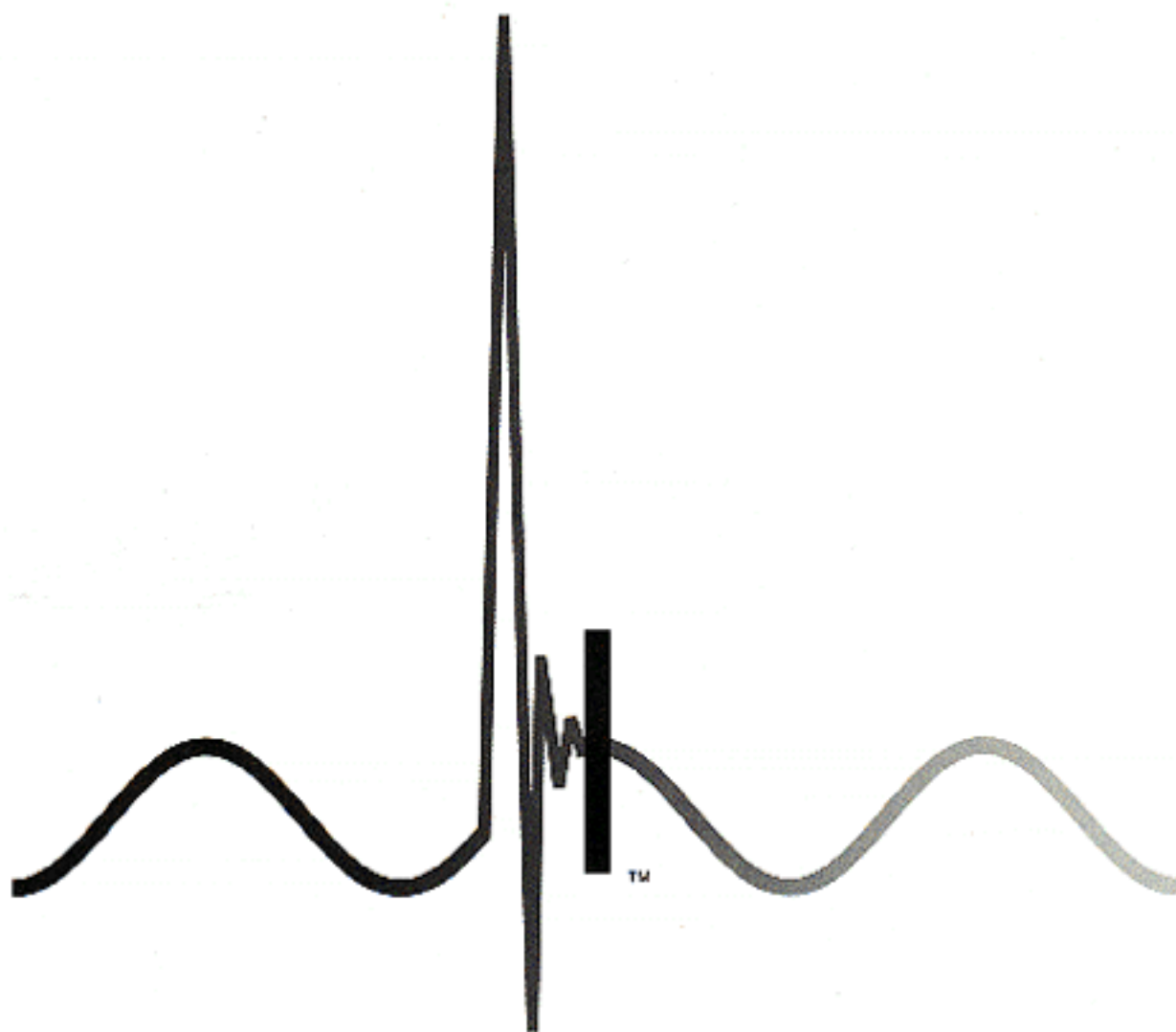


W O R L D P R O D U C T S

# THYRISTORS



WORLD PRODUCTS INC.

# Thyristors

The Protection Products Group of World Products Inc., specializing in protection components for telecommunication and AC and DC circuits, is proud to feature World Products complete line of Thyristors.

At World Products Inc. we keep our promises. It's just that simple. You will see for yourself when you buy a World Products Thyristor that you have not only purchased a fine component, but that we will also provide the finest customer service in today's marketplace.

## The main features of these Thyristors are:

- Bidirectional transient voltage protection.
- Nanosecond clamping response.
- No performance degradation under service life.
- Glass passivated junction.

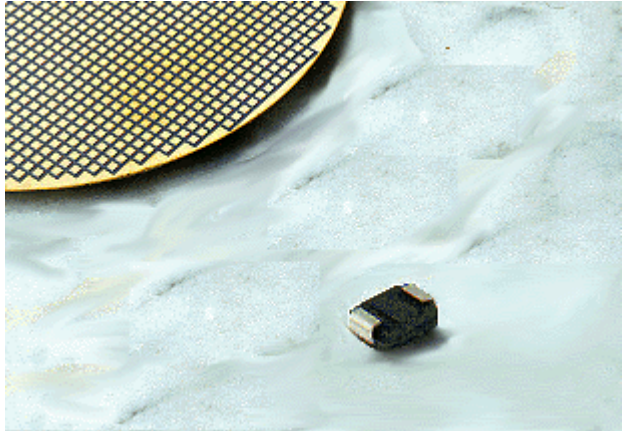
## Providing the following benefits:

- Excellent voltage protection levels.
- Primary or secondary protection levels.
- Never needs replacement (no maintenance cost).
- Highest level of quality and reliability.
- Low cost auto-assembly.

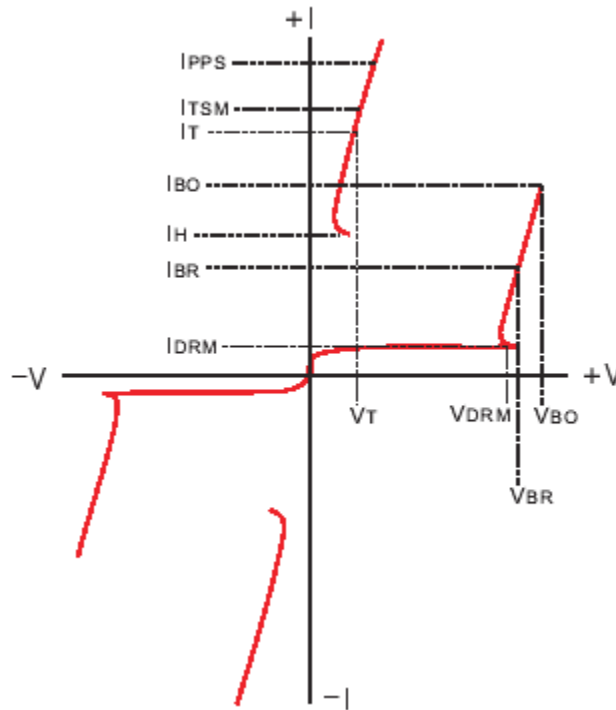
*Discover why the first choice in Thyristors is World Products.*

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# Thyristors - Definitions



SYMBOL	CHARACTERISTIC	VALUE
$V_{BO}$	Max Breakover Voltage	The maximum voltage across the device in or at breakdown measured under a specified voltage and current rate of rise.
$V_{BR}$	Min Breakover Voltage	The minimum voltage at which the device switch-on begins and significant current flows.
$I_{BO}$	Breakover Current	The instantaneous current flowing at the breakover voltage. ( $V_{BO}$ )
$I_H$	Holding Current	The minimum current required to maintain the device in the on-state.
$I_T$	On-state Current	The current through the device in the on-state condition.
$V_T$	On-state Voltage	The voltage across the device in the on-state condition at a specified current. ( $I_T$ )
$V_{DRM}$	Rated Repetitive Peak Off-state Voltage	Rated maximum (peak) continuous voltage that may be applied in the off-state condition.
$I_{DRM}$	Repetitive Peak Off-state Current	The maximum (peak) value of the current that results from the application of ( $V_{DRM}$ )
$I_{PPS}$	Non-Repetitive Peak Pulse Current	Rated maximum value of peak impulse current of specified amplitude and waveshape that may be applied without damage to the device under test.
$I_{TSM}$	Non-Repetitive Surge Peak On-state Current	Rated maximum value of AC current, at a given frequency, which may be applied for specified time or number of cycles.
$di/dt$	Critical Rate of Rise of On-state Current.	Rated value of the rate of rise of current that the device can withstand without damage.
$dv/dt$	Critical Rate of Rise of Off-state Voltage.	The maximum rate of rise of voltage (below $V_{DRM}$ ) that will not cause switching from the off-state to the on-state

# Thyristors - Application Notes

## FEATURES

- Protects by Limiting voltages and shunting surge currents away from sensitive circuits.
- Designed for telecommunications applications such as line cards, modems, PBX, FAX, LAN, VHDSL.
- Helps meet standards such as GR1089, ITU K.20, IEC950, UL1459&50, FCC part 68.
- Low capacitance, High surge (C, D, E rating available), precise voltage limiting, Long life.

## SELECTION GUIDE

Follow these steps to select the proper Thyristor surge protector for your application:

1. Define the operating parameters for the circuit:

- Ambient operating temperature range
- Maximum telephone line operating current (highest battery and shortest copper loop)
- Maximum operating voltage: (Maximum DC bias + peak ringing voltage)
- Maximum surge current
- System voltage damage threshold

2. Select device with an off-state voltage rating (VDRM) above the maximum operating voltage at the minimum operating temperature

3. Select surge current ratings ( $I_{PPS}$  and  $I_{TSM}$ )  $\geq$  those which the application must withstand

4. Verify that the minimum holding current of the device at the maximum ambient temperature is above the maximum dc current of the system

5. Verify that the maximum breakover voltage of the device is below the system damage threshold.

6. Verify that the circuit's ambient operating temperatures are within the device's operating temperature range.

7. Verify that the device's dimensions fit the application's space considerations.

8. Independently evaluate and test the suitability and performance of the device in the application

## MAXIMUM THERMAL RATINGS

Rating	Symbol	Value	Unit
Storage Junction Temperature Range	T <sub>STG</sub>	-55 to 150	∞C
Operating Junction Temperature Range	T <sub>J</sub>	-40 to 150	∞C

Notes:

PCB board mounted on minimum foot print.

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance Junction to leads T <sub>L</sub> on tab adjacent to plastic. Both leads soldered to identical pad sizes.	R <sub>θJL</sub>	Max. 20	∞C / W

Notes:

The junction to lead thermal resistance represents a minimum limiting value with both leads soldered to a large near-infinite heatsink. The junction to ambient thermal resistance depends strongly on board mounting conditions and typically is 3 to 6 times higher than the junction to lead resistance. The data shown is to be used as guideline values for preliminary engineering.

# Thyristors - Application Notes - (continued)

## ELECTRICAL CHARACTERISTICS ( $T_c = 25 \text{ }^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameters	Test Conditions	Symbol	Min.	Max.	Unit
Repetitive Peak Off-State Current	$V_D = \text{rated } V_{DRM}$	$I_{DRM}$		5	$\mu\text{A}$
Breakover Current	$f = 60 \text{ Hz}$ , $I_{SC} = 1 \text{ Arms}$ , $V_{ac} = 1 \text{ KVrms}$ , $R_L = 1 \text{ Kohm}$ , 1/2 AC cycle	$I_{BO}$		800	mA
Holding Current	10/1000 $\mu\text{s}$ waveform, $I_{SC} = 10 \text{ A}$ , $V_{oc} = 62 \text{ V}$ , $R_L = 400 \text{ ohms}$	$I_H$	150		mA
On-State Voltage	$I_T = 1 \text{ A}$ , $T_w = 300 \mu\text{s}$ , 1 pulse	$V_T$		3.5	V

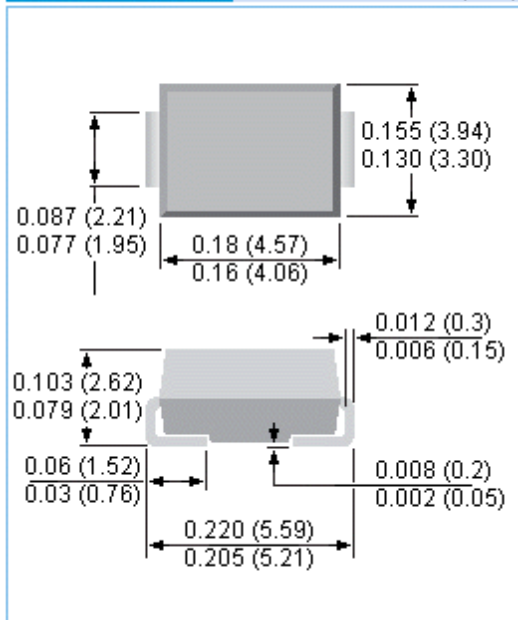
Notes:

Specific  $I_H$  values are available by request.

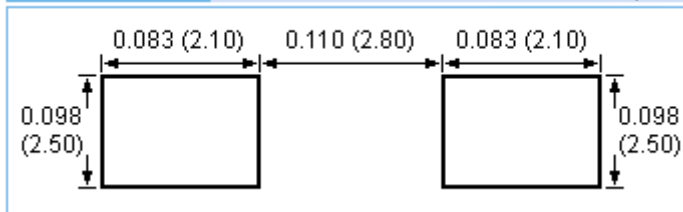
## MECHANICAL DATA

- Case: JEDEC DO-214AA molded plastic
- Terminals: Solder plated, Solderable per MIL-STD-750, Method 2026
- Polarity: Bi-directional Standard packaging: 12mm tape (EIA-481)
- Weight: 0.003 ounce, 0.093 gram

SMB / DO-214AA Unit: inch (mm)



Solder Pads Unit: inch (mm)



# Thyristors - Maximum Surge Ratings

( $T_J = 25 \text{ }^\circ\text{C}$  UNLESS OTHERWISE NOTED)

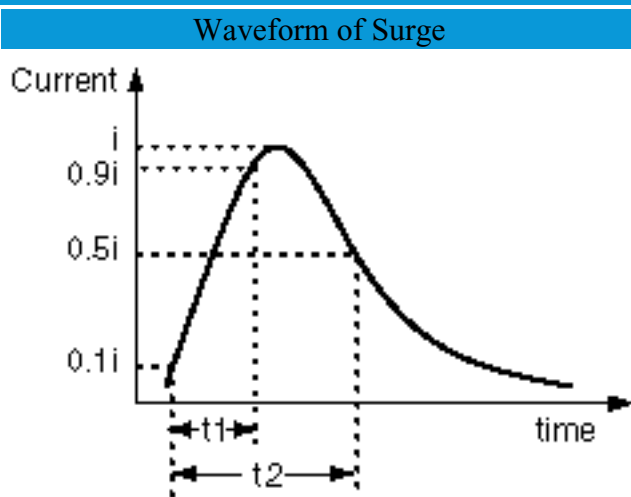
Rating	Non-Repetitive Peak Pulse Current				
Symbol	$I_{PPS}$				
Short-Circuit Current Wave	2/10 $\mu\text{s}$	8/20 $\mu\text{s}$	10/160 $\mu\text{s}$	10/560 $\mu\text{s}$	10/1000 $\mu\text{s}$
Open-Circuit Voltage Wave	2/10 $\mu\text{s}$	1.2/50 $\mu\text{s}$	10/160 $\mu\text{s}$	10/560 $\mu\text{s}$	10/1000 $\mu\text{s}$
<b>C</b>	<b>200 A</b>	<b>150 A</b>	<b>100 A</b>	<b>60 A</b>	<b>30 A</b>
<b>D</b>	<b>300 A</b>	<b>250 A</b>	<b>150 A</b>	<b>100 A</b>	<b>50 A</b>
<b>E</b>	<b>500 A</b>	<b>400 A</b>	<b>250 A</b>	<b>200 A</b>	<b>100 A</b>
Notes	(1,2,4,5,6)				

## Notes:

1. Thermal accumulation between successive surge tests is not allowed.
2. The device under test initially must be in thermal equilibrium with  $T_J = 25 \text{ }^\circ\text{C}$ .
3. Test at 1 cycle, 60 Hz.
4. Surge ratings are non-repetitive because instantaneous junction temperatures may exceed the maximum rated  $T_J$ . Nevertheless, devices will survive many surge applications without degradation. Surge capability will not degrade over a device's typical operating life.
5. Adjust the surge generator for optimum current-wave accuracy when both voltage and current wave specifications cannot be exactly met. The current wave is more important than the voltage wave for accurate surge evaluation.
6. The waveform is defined as A/B ms where:  
 A: (Virtual front time) =  $1.25 \times \text{Rise time} = 1.25 \times (T_b - T_a)$   
 B: (Duration time to 50% level of  $I_{PPS}$ ) =  $T_1 - T_0$

## Maximum Rated Surge Waveform

Waveform	Standard	$I_{pp}(A)$		
		C type	D type	E type
2 / 10 $\mu\text{s}$	GR-1089-CORE	200	300	500
8 / 20 $\mu\text{s}$	IEC61000-4-5	150	250	400
10 / 160 $\mu\text{s}$	FCC Part 68	100	150	250
10 / 700 $\mu\text{s}$	ITU-T K20/21	50	75	160
10 / 560 $\mu\text{s}$	FCC Part 68	60	100	200
10 / 1000 $\mu\text{s}$	GR-1089-CORE	30	50	100



# Thyristors - Electrical Characteristics

Part Number	Rated Repetitive Peak Off-State Voltage	Breakover Voltage	On-state Voltage	Repetitive Peak Off-State Current	Breakover Current	Holding Current	Off-State Capacitance ( $f = 1\text{MHz}, 1.0V_{\text{rms}}$ )		
	Max.	Max.	Max.	Max.	Max.	Min.	Typ.		
	$V_{\text{DRM}}$	$V_{\text{BO}}@I_{\text{BO}}$	$V_{\text{T}}@1\text{A}$	$I_{\text{DRM}}$	$I_{\text{BO}}$	$I_{\text{H}}$	$C_{\text{O}}@2\text{Vdc}$		
	V	V	V	$\mu\text{A}$	mA	mA	pF		
Series	C, D or E						C	D	E
WPSCDS-058§	58	77	3.5	5.0	800	150	100	140	200
WPSCDS-065§	65	88	3.5	5.0	800	150	100	140	200
WPSCDS-075§	75	98	3.5	5.0	800	150	100	140	200
WPSCDS-090§	90	130	3.5	5.0	800	150	60	90	120
WPSCDS-120§	120	160	3.5	5.0	800	150	60	90	120
WPSCDS-140§	140	180	3.5	5.0	800	150	60	90	120
WPSCDS-160§	160	220	3.5	5.0	800	150	60	90	120
WPSCDS-190§	190	265	3.5	5.0	800	150	40	60	80
WPSCDS-220§	220	300	3.5	5.0	800	150	40	60	80
WPSCDS-275§	275	350	3.5	5.0	800	150	40	60	80
WPSCDS-320§	320	400	3.5	5.0	800	150	40	60	80
Notes	(1,3)	(3,5,6)	(3)	(3)	(3)	(2,3)	(3)	(3)	(3)

## § Part Number Suffix:

Suffix - C, D, E\*  
Surface Mount Type




SMB/DO-214AA

- Notes:**
1. Specific  $V_{\text{DRM}}$  values are available by request.
  2. Specific  $I_{\text{H}}$  values are available by request.
  3. All ratings and characteristics are at  $25^{\circ}\text{C}$  unless otherwise specified.
3.  $V_{\text{DRM}}$  applies for the life of the device.  $I_{\text{DRM}}$  will be in spec during and following operation of the device.  
\* E Series is UL Recognized File # 135015. C & D Series UL recognition is pending.

# Thyristors - Device Part Marking and Packing

## Device Marking Codes

			Surface Mount Type
<b>Part Number</b>	<b>Marking Code</b>	<b>*</b>	<b>1st Line</b> <b>WPI Logo</b>
WPSCDS-058□	058*	C	Y - Last digit of calendar year.
WPSCDS-065□	065*	D	M - Month, Jan-Sept (1-9) O=October, N=November,
WPSCDS-075□	075*	E	D=December
WPSCDS-090□	090*		
WPSCDS-120□	120*		
WPSCDS-140□	140*		
WPSCDS-160□	160*		
WPSCDS-190□	190*		
WPSCDS-220□	220*		
WPSCDS-275□	275*		
WPSCDS-320□	320*		

**2nd Line**  
Marking Code

### □ - Part Number Suffix:

Suffix - C, D, E



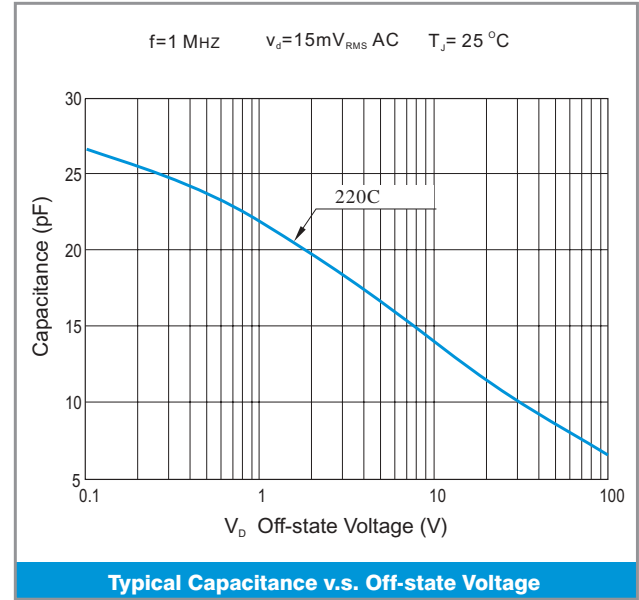
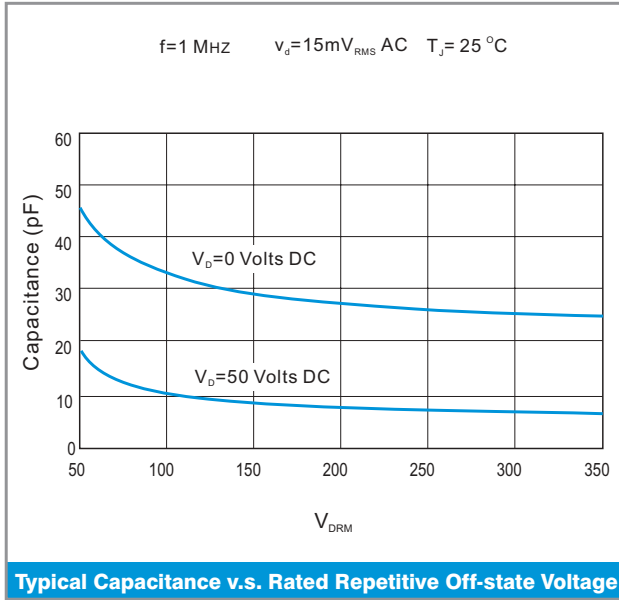
SMB/DO-214AA

## Order and Packing Information

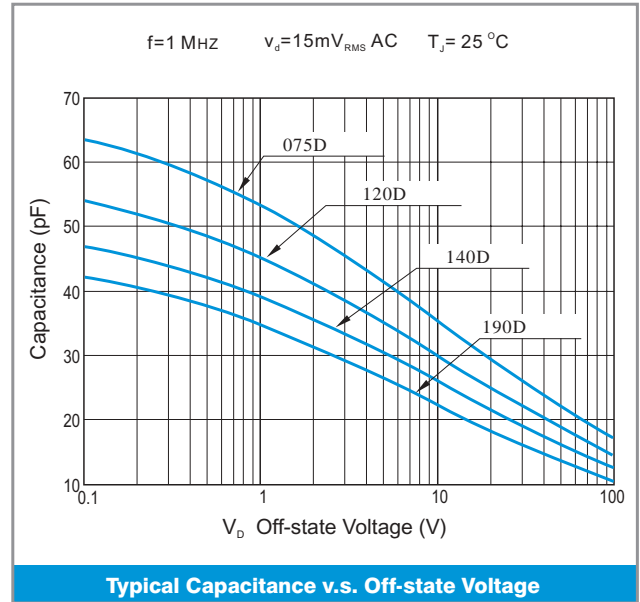
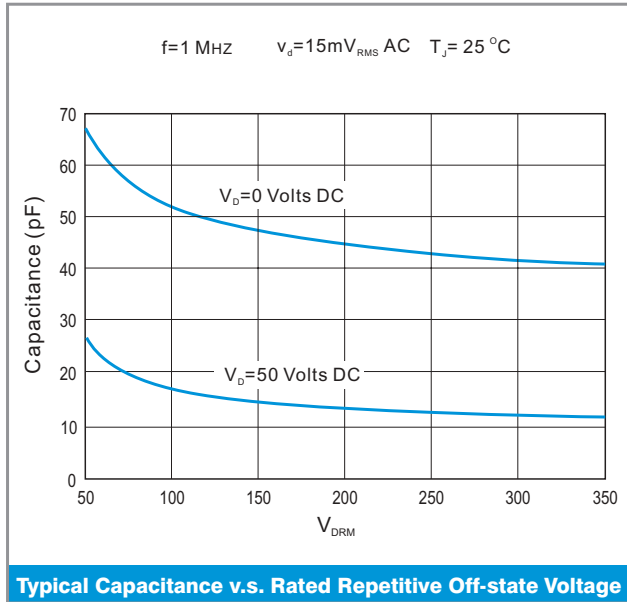
Device	Packing	Min. Order Qty.	Order As	Remark
WPSCDS-xxx□	13" Tape & Reel	3,000 pcs	WPSCDS-xxxT	Standard Packing
	Bulk		WPSCDS-xxxB	

# Thyristors - Rating and Characteristic Curves

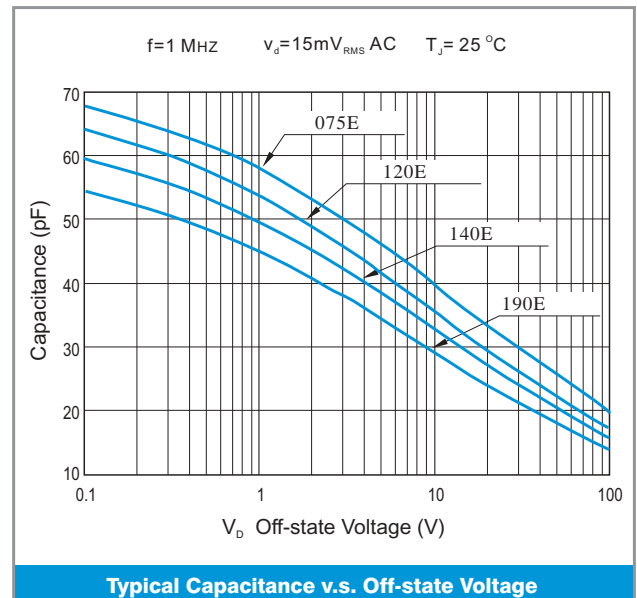
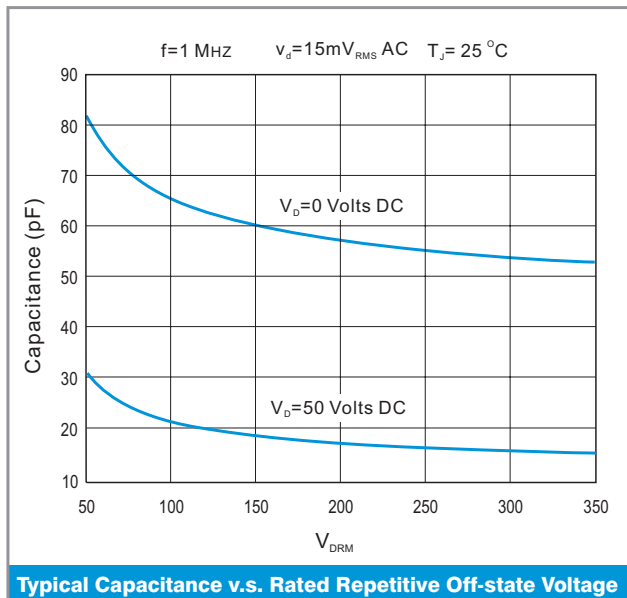
## C Series



## D Series

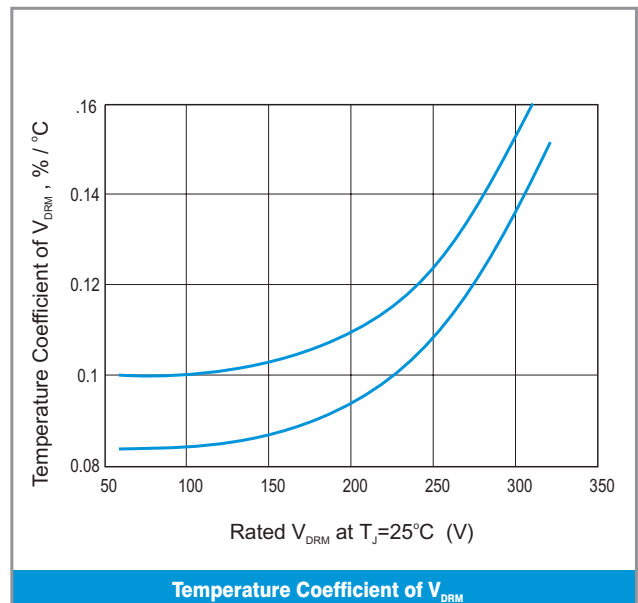
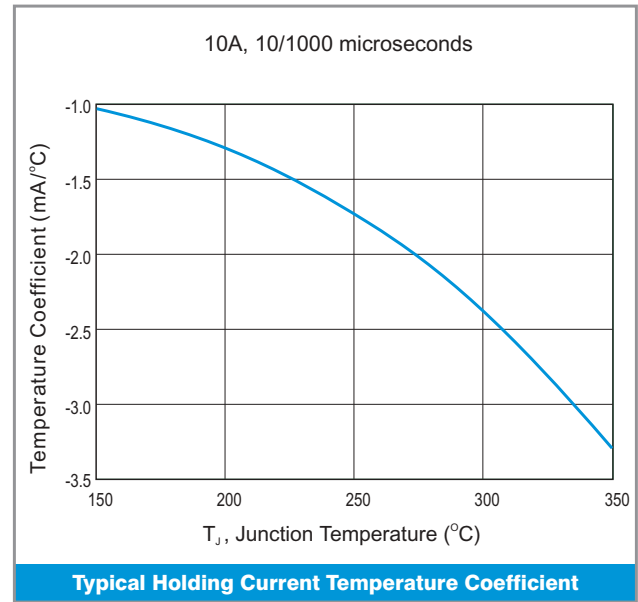
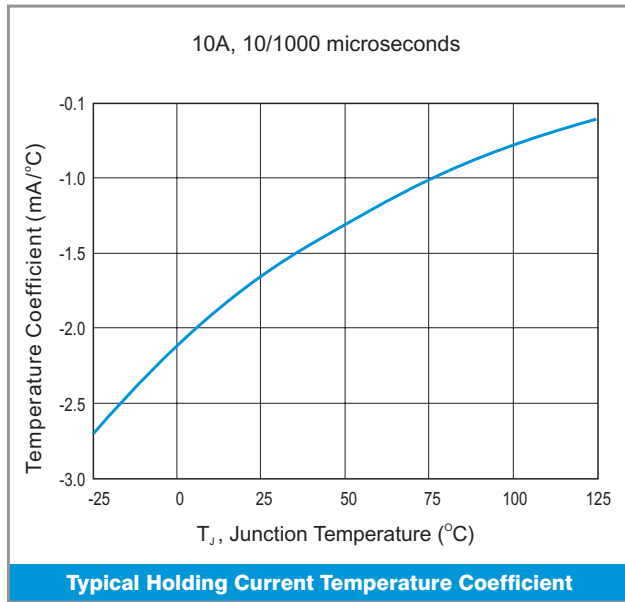
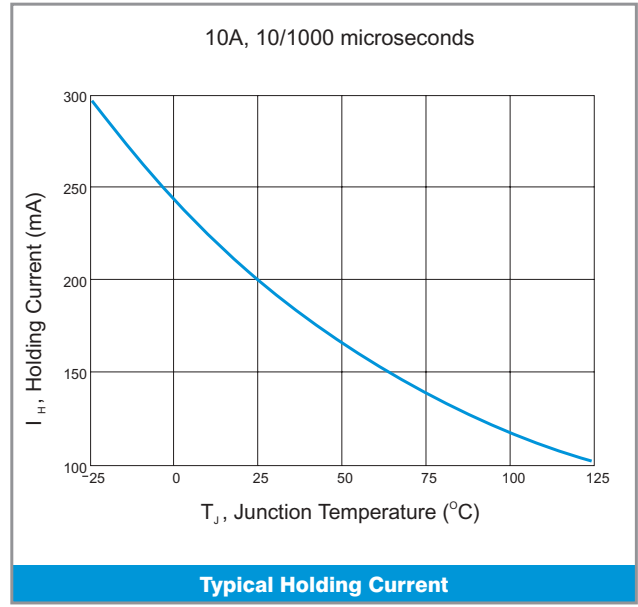
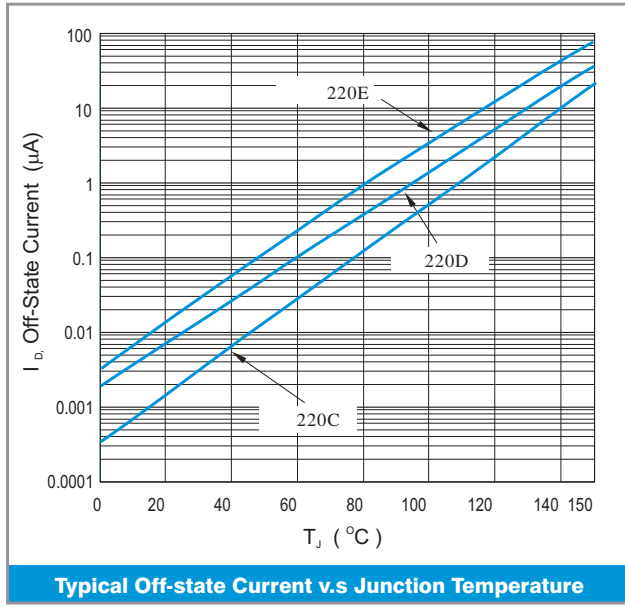


## E Series



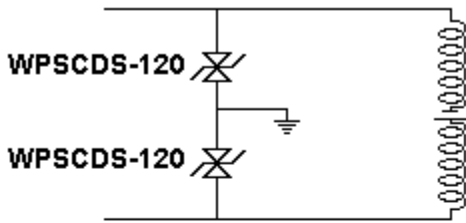
# Thyristors - Rating and Characteristic Curves

## C, D, E Series

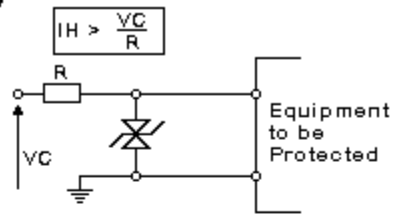


# Thyristors - Circuit Examples

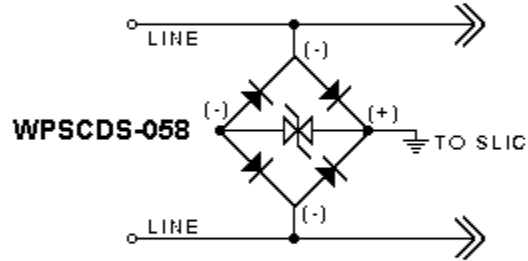
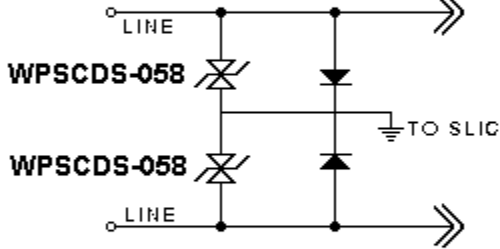
## PABX Protection



## DC Supply



## SLIC Protection



## Complete PC Board Operation Protection

