

Dimension Table

Diameter	5 ϕ	7 ϕ	10 ϕ	14 ϕ	20 ϕ	unit:mm
D max.	7.5	9.0	12.5	16.5	23	
d ± 0.05	0.6	0.6	0.6/0.8	0.8/1.0	0.8/1.0	
F ± 1.0	5.0	5.0	5.0/7.5	7.5/10.0	7.5/10.0	
H max.	11.0	13	18	22	28	
H ₁ max.	3.5	3.5	5	5	5	
L ₁ min.	25.0	25.0	25.0	25.0	25.0	
L min.	24.0	24.0	24.0	24.0	24.0	

Table of T max., A & P₁ max.

Diameter	5 ϕ			7 ϕ			10 ϕ			14 ϕ			20 ϕ		
Type No.	T max.	A ± 0.8	P ₁ max.	T max.	A ± 0.8	P ₁ max.	T max.	A ± 0.8	P ₁ max.	T max.	A ± 0.8	P ₁ max.	T max.	A ± 0.8	P ₁ max.
180M	4.5	1.4	3.0	4.5	1.4	3.0	4.9	1.4	3.0	5.0	1.5	3.0	5.2	1.5	3.0
220L	4.5	1.5	3.0	4.5	1.5	3.0	4.9	1.5	3.0	5.0	1.6	3.0	5.3	1.6	3.0
270K	4.7	1.5	3.0	4.7	1.5	3.0	5.1	1.5	3.0	5.2	1.7	3.0	5.4	1.7	3.0
330K	4.7	1.6	3.0	4.7	1.6	3.0	5.1	1.6	3.0	5.2	1.8	3.0	5.4	1.8	3.0
390K	4.7	1.8	3.0	4.7	1.8	3.0	5.1	1.8	3.0	5.2	2.0	3.0	5.4	2.0	3.0
470K	5.0	1.8	3.0	5.0	1.8	3.0	5.5	1.8	3.0	5.6	2.0	3.0	5.6	2.0	3.0
560K	5.0	2.0	3.0	5.0	2.0	3.0	5.5	2.0	3.0	5.6	2.2	3.0	5.6	2.2	3.0
680K	5.5	2.3	3.0	5.5	2.3	3.0	6.0	2.3	3.0	6.1	2.5	3.0	6.1	2.5	3.0
820K	3.8	1.4	3.0	3.8	1.4	3.0	4.3	1.4	3.0	4.4	1.6	3.0	4.9	1.8	3.0
101K	3.9	1.4	3.0	3.9	1.4	3.0	4.4	1.4	3.0	4.5	1.6	3.0	5.1	1.8	3.0
121K	4.1	1.5	3.0	4.1	1.5	3.0	4.5	1.5	3.0	4.6	1.7	3.0	5.3	1.9	3.0
151K	4.5	1.8	3.0	4.5	1.8	3.0	4.9	1.8	3.0	5.1	2.0	3.0	5.6	2.2	3.0
181K	4.1	1.6	3.0	4.1	1.6	3.0	4.5	1.6	3.0	4.7	1.8	3.0	5.2	2.0	3.0
201K	4.2	1.6	3.0	4.2	1.6	3.0	4.6	1.6	3.0	4.8	1.8	3.0	5.3	2.0	3.0
221K	4.3	1.7	3.0	4.3	1.7	3.0	4.7	1.7	3.0	4.9	1.9	3.0	5.4	2.1	3.0
241K	4.4	1.7	3.0	4.4	1.9	3.0	4.8	1.9	3.0	5.0	2.1	3.0	5.5	2.3	3.0
271K	4.6	1.9	3.0	4.6	2.0	3.0	5.0	2.0	3.0	5.2	2.1	3.0	5.7	2.5	3.0
301K	4.8	1.9	3.0	4.8	2.1	3.0	5.2	2.2	3.0	5.4	2.3	3.0	5.9	2.7	3.0
331K	4.9	1.9	3.0	4.9	2.1	3.0	5.3	2.2	3.0	5.5	2.3	3.0	6.0	2.7	3.0
361K	5.1	2.4	3.0	5.1	2.5	3.0	5.5	2.5	3.0	5.7	2.7	3.0	6.2	2.9	3.0
391K	5.3	2.6	3.5	5.3	2.6	3.5	5.7	2.8	3.5	5.9	2.8	3.5	6.4	3.0	3.5
431K	6.1	2.7	3.5	6.1	2.9	3.5	6.5	3.1	3.5	6.7	3.1	3.5	7.2	3.3	3.5
471K	6.4	2.8	3.5	6.4	2.9	3.5	6.8	3.2	3.5	7.0	3.3	3.5	7.5	3.5	4.0
511K	6.6	3.1	4.0	6.6	3.1	4.0	7.0	3.7	4.0	7.2	3.7	4.0	7.7	3.9	4.0
561K	6.9	3.4	4.0	6.9	3.4	4.0	7.3	4.0	4.0	7.5	4.0	4.0	8.0	4.2	4.0
621K	7.2	3.7	4.0	7.2	3.7	4.0	7.6	4.6	4.0	7.8	4.4	4.0	8.3	4.7	4.0
681K	7.5	4.0	4.0	7.5	4.0	4.0	8.0	5.0	4.0	8.2	4.7	4.0	8.7	5.0	4.0
751K	7.9	4.3	4.0	7.9	4.3	4.0	8.4	5.0	4.0	8.6	4.9	4.0	9.1	5.1	4.0
781K				8.1	4.5	4.0	8.6	5.2	4.0	8.8	5.2	4.0	9.3	5.4	4.0
821K				8.3	4.7	4.0	8.8	5.2	4.0	9.0	5.2	4.0	9.5	5.4	4.0
911K							9.4	6.0	4.0	9.6	6.0	4.0	10.1	6.3	4.0
102K							9.9	6.0	4.0	10.1	6.2	4.0	10.7	6.4	4.0
112K							10.5	6.3	4.0	10.7	6.7	4.0	11.2	6.9	4.0
182K							12.6	9.8	6.0	12.8	10.2	6.0	13.5	10.4	6.0

HOW TO ORDER BY PART NUMBER :

JVR

07

N

241

K

6

5

Y

AW

Joyin ZnO Varistor
久尹氧化鋅壓敏電阻

Element Size (disc dia.)
瓷片直徑別

- 05 : ϕ 5mm
- 07 : ϕ 7mm
- 10 : ϕ 10mm
- 14 : ϕ 14mm
- 20 : ϕ 20mm

Series 系列別

- N:N series N 系列
- S:S series (high surge) S 系列(高突波電流)
- U:U series (ultra surge) U 系列(超高突波電流)

Varistor Voltage

壓敏電壓值

The first two digits are the significant of voltage, the third digit signifies the multiplier, for example:

前二位數字代表電壓基數
第三位數代表指數
如：

- 080 : 8V
- 180 : 18V
- 181 : 180V
- 112 : 1100V

Varistor Voltage Tolerance

壓敏電壓容許差

- K : \pm 10%
- L : \pm 15%
- M : \pm 20%
- P : \pm 25%

Lead Diameter

線徑別

- 6 : 0.6 \pm 0.05mm
- 8 : 0.8 \pm 0.05mm
- 1 : 1.0 \pm 0.05mm

Lead Length / Packing Method

腳長 / 包裝方式

- 50 : 5 ± 0.5 mm (bulk) for shearing lead
- U4 : 24mm min. (bulk) for kink lead
- U5 : 25mm min. (bulk) for straight lead
- AW: Ammo (Ho:16mm) for kink lead
- AY : Ammo (Ho:20mm) for straight lead
- RW: Reel (Ho:16mm) for kink lead
- RY : Reel (Ho:20mm) for straight lead

* Special lead length / packing methods are available upon request

Lead Style

腳型

- Y : Y-TYPE(vertical kink)
- P : P-TYPE(straight lead)

* Special lead styles are available upon request

Lead Spacing

線距別

- 5 : 5.0mm
- 7 : 7.5mm
- 1 : 10 mm

- To identify the source and route of surge.
- To decide the connection method of varistor.
- To decide varistor voltage and max. clamping voltage.
- To decide surge current waveform by calculation from surge voltage and surge impedance.
- To check whether the withstanding surge current and surge life of varistor is sufficient or not.
- To check the variation of electric power of protected device.
- To check whether the max. energy and energy life of varistor is enough or not.
- To check the relation:
Max. withstanding voltage of protected device > Max. clamping voltage of varistor > The real clamping voltage occurred > Breakdown voltage of varistor > Operating voltage of protected device.
- To check whether the loss of capacitance of varistor in operating condition.
- To check whether the problem caused by excessive current of leakage.
- To check the connection method of varistor.
- To check the condition of varistor overload.
- To check any other problems by various operating conditions.
- To test and to verify by real practice.
- To check the connection of the grounding wire.

EXAMPLES OF APPLICATION

Varistor voltage selection in line circuit

Power supply voltage	Type
100V AC	JVR□□△201K JVR□□△221K JVR□□△241K JVR□□△271K
200V AC	JVR□□△391K JVR□□△431K JVR□□△471K
12V DC	JVR□□△220L
24V DC	JVR□□△390K

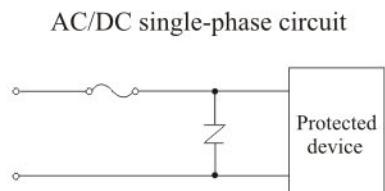
Varistor voltage selection in line to ground circuit

Power supply voltage	Type
100V AC, 200V AC	JVR□□△431K JVR□□△471K JVR□□△751K to JVR□□△112K

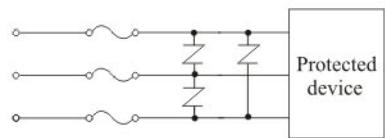
- 確定突波的來源及其通路。
- 確定壓敏電阻的連接方式。
- 確定所需要的壓敏電壓及最高抑制電壓。
- 依突波電壓和突波阻抗計算出突波電流的波形。
- 檢查壓敏電阻的突波耐量和脈衝壽命是否足夠。
- 檢查受保護電子產品所使用電源的變動(穩定)程度。
- 檢查壓敏電阻的最大能量和能量壽命是否足夠。
- 檢查下列關係是否正確：
受保護電子產品之最高耐電壓 > 壓敏電阻之最高抑制電壓 > 真正產生之抑制電壓 > 壓敏電阻之崩潰電壓 > 受保護電子產品之工作電壓
- 檢查壓敏電阻於工作狀態下是否損失其電容值。
- 若出現問題先檢查是否漏電流太大之原因。
- 檢查壓敏電阻連接方式是否適當。
- 檢查壓敏電阻負荷是否過大。
- 檢查壓敏電阻於工作狀態下是否有其他任何問題。
- 受保護電子產品以實際操作來測試及確認所使用之壓敏電阻。
- 檢查接地線之連接狀況。

應用說明

Line Circuit



AC three-phase circuit



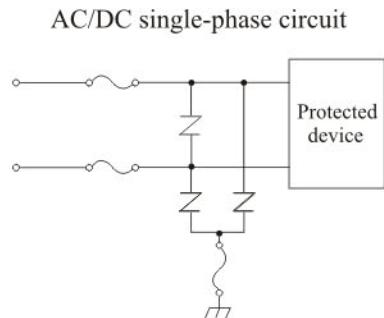
□ : Element size (disc dia.)

△ : Series (N : N series, S : S series, U : U series)

Varistor voltage selection in switching circuit protection

Power supply voltage	Type	
12V DC	JVR□□△220L	
24V DC	JVR□□△390K	
100V DC	JVR□□△151K	
100V AC	JVR□□△201K JVR□□△221K	JVR□□△241K JVR□□△271K

Line and Ground



Varistor voltage selection in telecommunication circuit protection

Power supply voltage	Type
12V DC	JVR□□△220L JVR□□△820K to JVR□□△112K
24V DC	JVR□□△390K JVR□□△820K to JVR□□△112K

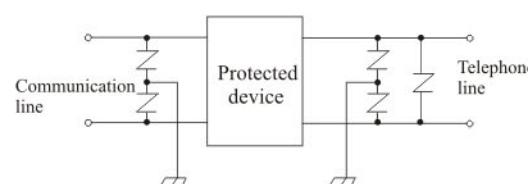
□ : Element size (disc dia.)

△ : Series (N : N series, S : S series, U : U series)

Fuse current selection if fuse being in series with varistor to protect from follow-on surge current after varistor damaged

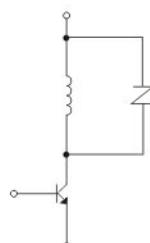
Varistor	5 φ	7 φ	10 φ	14 φ	20 φ
Nominal fuse current	≤1A	≤3A	≤5A	≤10A	≤15A

Telecommunication Circuit Protection

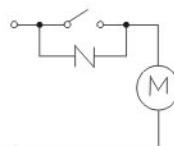


Switching Circuit Protection

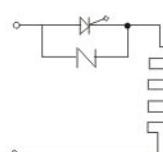
Relay protection



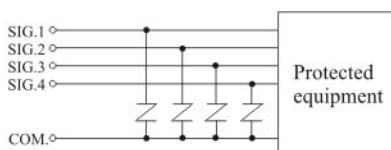
Spark elimination



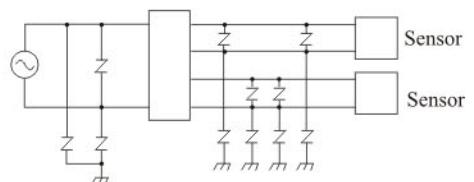
Semiconductor protection



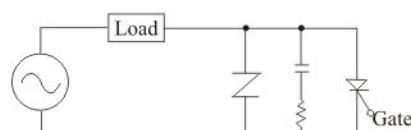
Surge protection of signal line



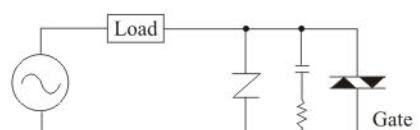
Fire alarm system



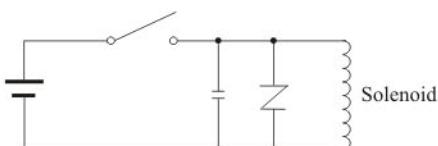
Thyristor protection



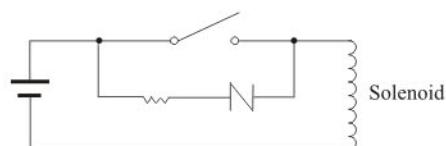
Triac protection



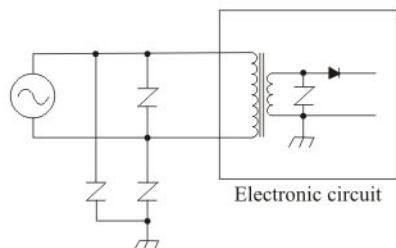
Solenoid



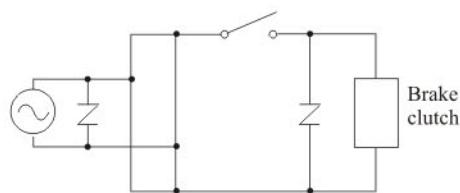
Contact protection



Stove, Boiler



Brake, Clutch



CHECK LIST IN SERIES AND PARALLEL OPERATION OF VARISTORS

Item	Series	Parallel
Objective	Higher voltage capability Higher energy capability (No Selection is required)	Higher current capability Higher energy capability (Selection is required)
Application Range	All voltages and currents.	All voltages-but for higher currents, i.e.,>100A
Models Applicable	All, must have same withstandin surge current ratings.	All models
Precautions	Withstanding surge current ratings must be equal.	Must be identical voltage rated models. Must test and select units for similar V-I characteristics.
Effect on Rating	The same current ratings with single unit. Voltage ratings additive. Energy ratings additive. Clamp voltages additive.	Current ratings function of current sharing. The same voltage ratings with single unit. Energy ratings as above in proportion to current sharing. Clamp voltages determined by composite V-I characteristic of matched units.

敏壓電阻器以串聯及並聯方式使用應確認的項目

項目	串聯	並聯
目的	較高電壓。 較高能量。 (不須挑選)	較大電流。 較高能量。 (需要挑選)
應用範圍	所有電壓及電流	所有電壓，但較大電流(>100A)
型號適用性	須有相同的額定突波耐量。	所有型號。
注意事項	額定突波耐量必須相同。	必須是單一額定電壓。 必須挑選類似的V-I特性。
對額定值的影響	須與單一元件額定電流相同。 額定電壓增加。 額定能量增加。 殘壓增加。	額定電流決定於電流分配方式。 須與單一元件額定電壓相同。 額定能量與電流分配成正比。 殘壓決定於合成之V-I曲線。



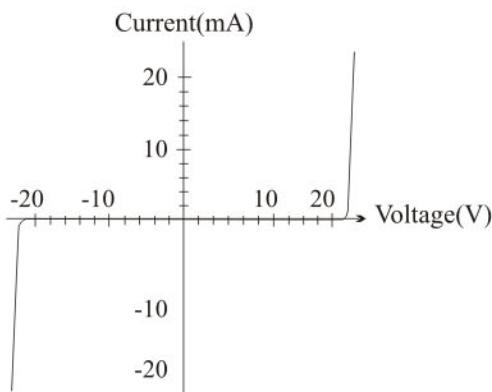
JVR ZINC OXIDE VARISTORS

Zinc oxide varistor is a voltage dependent resistor with symmetrical voltage-current characteristics that is designed to protect all kinds of electronic devices or elements from switching and induced lightning surges. Its non linear exponent characteristic with broad using range and mass production is gradually being used by various level of electric engineering.

FEATURES

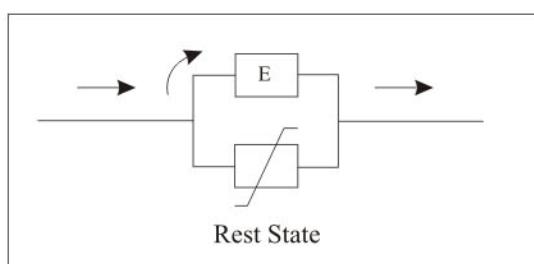
- Fast response time.
- Low leakage current.
- Excellent voltage ratio.
- Wide voltage & energy ratio.
- Low standby power and no follow on current.
- High performance in surge current handling capability.
- High performance in clamping voltage characteristics.

V-I Characteristics of varistor



(如左圖)

The varistor's rest state has a high impedance (several megaohms) in relation to the component to be protected and does not change the characteristics of the electric circuit. In the presence of transient voltage (over the breakdown voltage of varistor), the varistor then has a low impedance (a few ohms) and short circuits, i.e. the assembly E to be protected.



JVR 氧化鋅壓敏電阻

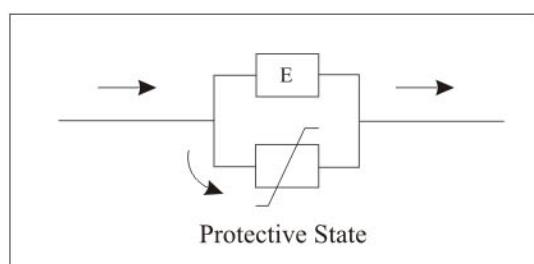
氧化鋅壓敏電阻又稱「突波吸收器」，係一種具有電壓-電流對稱特性之電壓屬性電阻器。它主要的設計是用來保護所有的電子產品或元件免於受開關或雷擊誘發所產生之突波的影響，而其非線性指數的特性與廣泛的應用範圍以及可以量產等優點，已逐漸地被應用在各種不同領域的電子工程方面。

特性介紹

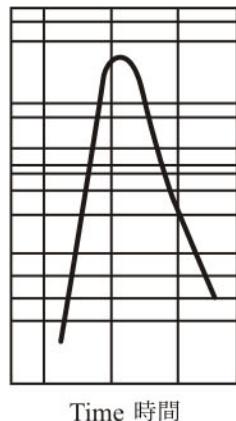
- 反應時間快速。
- 低漏電流。
- 優越之電壓比。
- 寬廣之電壓及能量比。
- 低備用電力且無後續電流。
- 高效能之突波電流處理能力。
- 抑制電壓特性之穩定執行能力。

壓敏電阻之V-I特性

壓敏電阻在休息狀態時，相對於受保護的電子元件而言，具有很高的阻抗(數兆歐姆)而且不會改變原設計之電路特性。但當瞬間突波電壓出現(超過壓敏電阻之前潰電壓時)，該壓敏電阻之阻抗會變低(僅有幾個歐姆而已)並造成原線路短路；換言之：電子產品或元件E因此而受到保護(如下圖)。



Surge suppression of varistor



PARAMETERS DEFINITION

Varistor Voltage (breakdown voltage):

The varistor voltage is the voltage across the varistor measured at a specified current I_c (0.1mA or 1mA) of specified duration.

Maximum allowable voltage:

The Maximum allowable voltage corresponds to the rest state of the varistor. The rest state voltage offers a low leakage current in order to limit the power consumption of the protected device and not to disturb the circuit to be protected.

Non linear exponent (α):

The varistor voltage-current characteristic is defined by the equation:
 $I = KV^\alpha$ where K is a constant dependent on geometry, and α is the non linear exponent. We usually take two points $(V_1, I_1), (V_2, I_2)$ to estimate the value of α .

$$\alpha = \frac{\log I_1/I_2}{\log V_1/V_2} \quad \text{In which } I_1 \text{ and } I_2 \text{ are the current value corresponding to the voltage value } V_1 \text{ and } V_2.$$

Maximum clamping voltage:

Maximum clamping voltage is the maximum voltage V_p between two terminals with the specified standard impulse current I_p ($8 \times 20 \mu\text{sec}$). The voltage value is an indication on the protective function of the varistor.

Energy(Joule):

Maximum energy from one or a burst of pulses. It is the value within the varistor change of $\pm 10\%$ when one impulse of $10 \times 1000 \mu\text{sec}$ is applied.

$$E = K \times V_m \times I_m \times T$$

E : Energy(Joule)

K : Constant = 1.4

V_m : Max. clamping voltage at I_m .

I_m : Max. allowable single surge current of $10 \times 1000 \mu\text{sec}$.

T : Duration of surge current ($1000 \mu\text{sec}$)

壓敏電阻之突波抑制功能



參數名詞解釋

壓敏電壓(即崩潰電壓):

壓敏電壓係以一定的電流 I_c (0.1mA或1mA)於一定的時間內通過壓敏電阻所量取之電壓。

最高工作電壓:

最高工作電壓表示壓敏電阻在該電壓之下仍為休息狀態。休息狀態之壓敏電阻僅有很小的漏電流,以限制受保護電子產品之電力消耗,同時不致干擾到受保護的線路。

非線性指數(即 α 值):

壓敏電阻之電壓-電流(V-I)特性係由公式 $I = KV^\alpha$ 所定義的, K 是一幾何常數,而 α 則是非線性指數。吾人通常截取二點 (V_1, I_1) 及 (V_2, I_2) 來計算其 α 值,

$$\alpha = \frac{\log I_1/I_2}{\log V_1/V_2}$$

I_1 及 I_2 係電壓等於 V_1 及 V_2 時相對應之電流值。

最高抑制電壓:

最高抑制電壓係以一定之標準衝擊電流 I_p ($8 \times 20 \mu\text{sec}$) 於壓敏電阻二條引線端點之間所量得的最高電壓 V_p 。該電壓值同時也是壓敏電阻發揮其保護功能的一項指標。

能量(即焦耳值):

表示一次脈衝之最大能量,亦即以 $10 \times 1000 \mu\text{sec}$ 衝擊一次而壓敏電壓之變化仍在 10% 以內之焦耳值。其公式:

$$E = K \times V_m \times I_m \times T$$

E : 能量(焦耳)

K : 常數,約等於 1.4。

V_m : 電流在 I_m 時之最高抑制電壓。

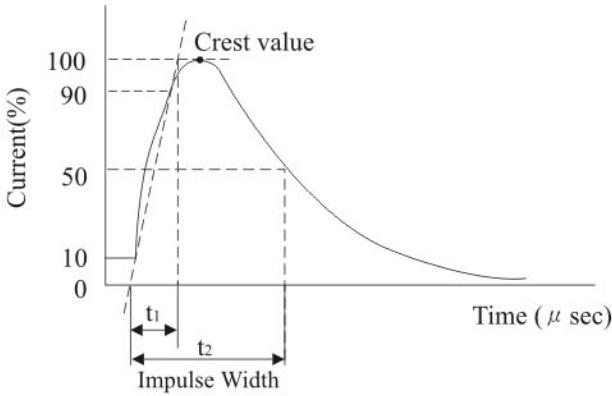
I_m : 最大允許之 $10 \times 1000 \mu\text{sec}$ 單一突波電流。

T : 突波電流延續時間 ($1000 \mu\text{sec}$)



Withstanding surge current:

Withstanding surge current is the maximum peak current for the varistor with the specified standard impulse current ($8 \times 20 \mu\text{sec}$) applied one time or two times and corresponding to a permissible variation of 10% in the varistor voltage change.



$$\begin{aligned} t_1 &= 8 \quad t_2 = 20 \quad \text{for } 8 \times 20 \mu\text{sec} \\ t_1 &= 10 \quad t_2 = 1000 \quad \text{for } 10 \times 1000 \mu\text{sec} \end{aligned}$$

耐突波電流(即突波耐量):

突波耐量乃壓敏電阻以一定之標準衝擊電流($8 \times 20 \mu\text{sec}$)衝擊1次或2次時，壓敏電壓之變化在10%以內的最大脈衝電流。

(如左圖)

Rated wattage

The maximum power that can be applied within the specified ambient temperature.

Capacitance

The capacitance of varistor is the reference value measured between the varistor terminals at specified frequency.

Pulse lifetime rating

This is expressed as the maximum allowable number of impulse currents applied. $8 \times 20 \mu\text{sec}$ impulse current (or $10 \times 1000 \mu\text{sec}$) is applied at prescribed interval. This curve also provides for derating current as required with repetitive pulsing.

額定功率(即瓦特數):

表示在一定的環境溫度下所能消耗的最大功率。

電容值:

壓敏電阻之電容值係以一定的頻率於引線端點之間所量得的參考值。

額定脈衝壽命:

表示壓敏電阻以 $8 \times 20 \mu\text{sec}$. (或 $10 \times 1000 \mu\text{sec}$.) 的衝擊電流，依規定的間隔時間連續給予衝擊時所能承受之最高衝擊次數。其受衝擊時所呈現的曲線同時也提供了連續衝擊每次所需求的遞減電流。

GENERAL CHARACTERISTICS

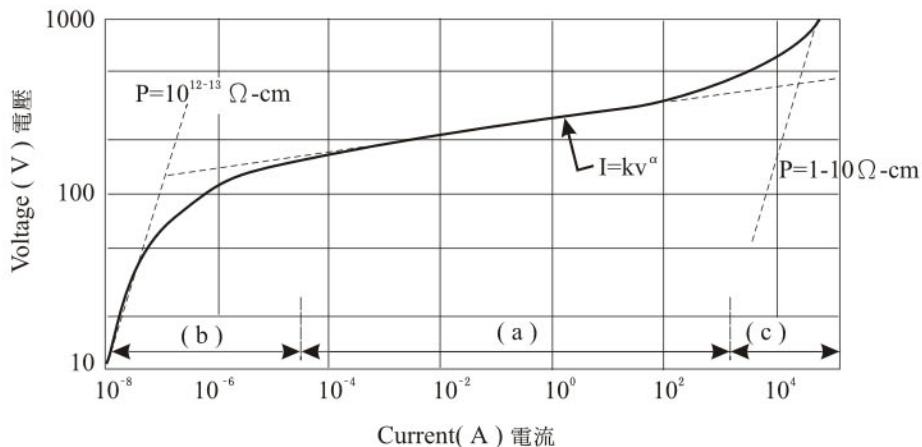
- Storage temperature : $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Max. response time : 25 n sec.
- Max. operating temperature : $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- Temp. coefficient of voltage : $0 \sim 0.05\% / ^{\circ}\text{C}$ max.
- Max. working surface temperature. : $+115^{\circ}\text{C}$
- Insulation resistance(at DC 500V) : Over $1000\text{M}\Omega$

JVR壓敏電阻之一般特性

- 儲存溫度: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- 最大反應時間: 25n sec.
- 最高工作溫度: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- 電壓溫度係數: $0 \sim 0.05\% / ^{\circ}\text{C}$ max.
- 最高表面溫度: $+115^{\circ}\text{C}$
- 絶緣電阻(DC 500V): $1000\text{M}\Omega$ 以上

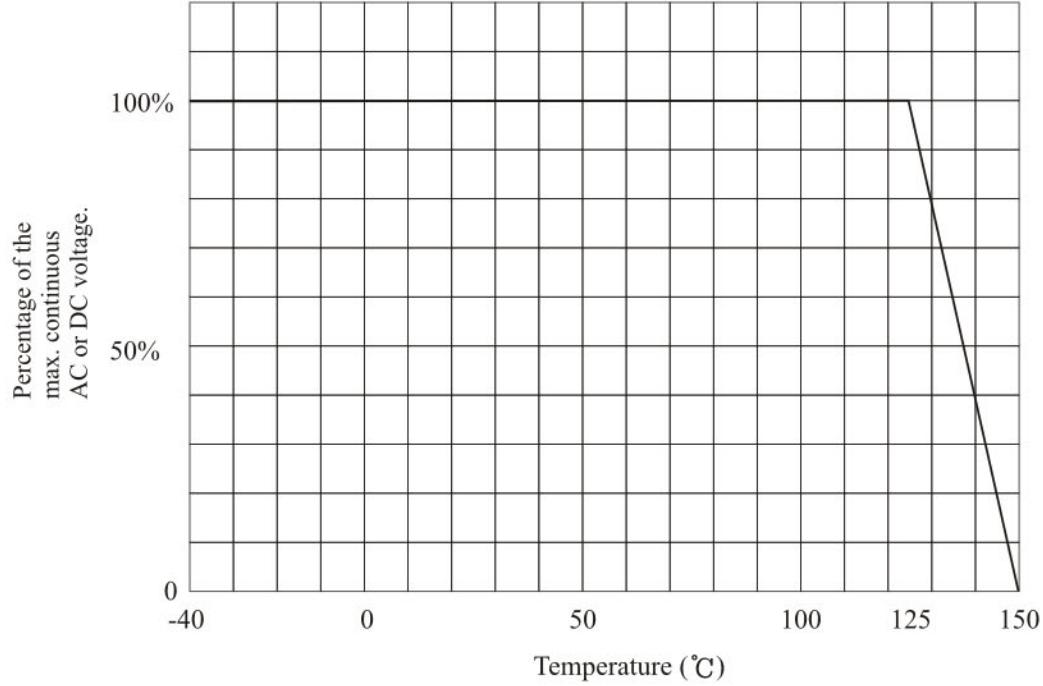
CURRENT-VOLTAGE CHARACTERISTICS

電流-電壓特性曲線



- (a) Varistor action region
壓敏電阻工作區
- (b) Prebreakdown region
預先崩潰區
- (c) Upturn region
電壓上揚區

MAX. CONTINUOUS AC or DC VOLTAGE WITH TEMPERATURE



SOURCE OF SURGE VOLTAGE

突波電壓之來源

- Direct lightning surges.
- Surge voltage by grounding fault.
- From magnetic induction.
- Induced lightning surges.
- Surge voltage by switching operation.
- From electrostatic induction.
- 直接雷擊所產生的突波。
- 接地不良所產生的突波。
- 各種磁性所誘發的突波。
- 因雷擊間接誘發的突波。
- 開關電源所產生的突波。
- 靜電特性所誘發的突波。