

■ R 系列压敏电阻器 R Series Varistor

氧化锌压敏电阻器是以氧化锌为主要材料制造的半导体无极性电子陶瓷元件。当施加在压敏电阻器两端的电压达到某一阈值时，压敏电阻器的电阻值迅猛变小，从而在电子（电力）线路上起降压作用，达到保护其它元器件的目的。

Zinc Oxide Varistor are non-linear resistors utilizing semiconductor ceramic element which mainly composed of zinc oxide. When the applied voltage on both termination reach the surge value, the voltage of electronic circuit would be reduced to protect the other components.



◆ 特性 FEATURES

*电压范围宽 (180V~1200V)	Widely voltage range 180 V~1200 V
*响应速度快 ($\leq 25\text{ns}$)	Fast response to the rapidly increase Voltage ($\leq 25\text{ns}$)
*非线性指数大	Excellent non-linearity coefficient
*无极性	Symmetric V-I characteristics
*通流容量大 (5000A/cm ²)	Great withstanding surge current (5000A/cm ²)
*150°C低温断扣	150 °C low temperature broken clasp
*寿命长	Long life
*符合 ROHS、REACH、无卤环保要求	Meet ROHS, REACH, HF requirements of environmental protection

◆ 应用 APPLICATIONS

家电、通讯、各类电源、新能源、电表、照明、工业设备

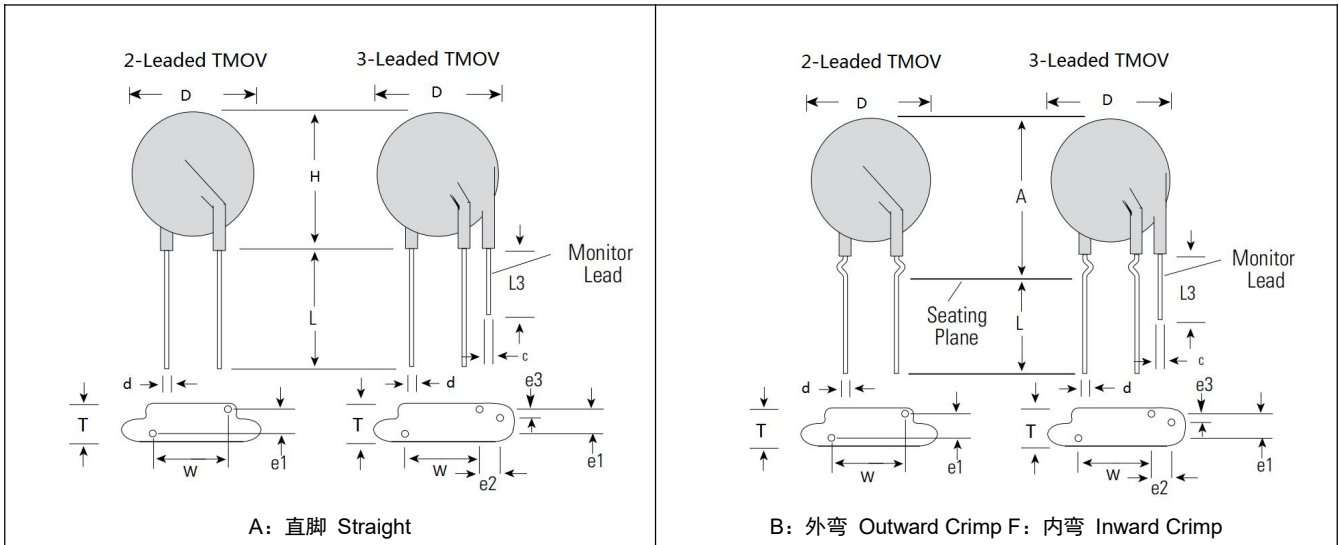
Household Appliance、Communication、All kinds of power supply、New energy、Electric meter、Lighting Power、Industrial equipment

◆型号表示法 Part Number

FNR	14	R	621	K	A	2	S	20	P	E	1	B	NN
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭

代码说明 Part Number Code Description

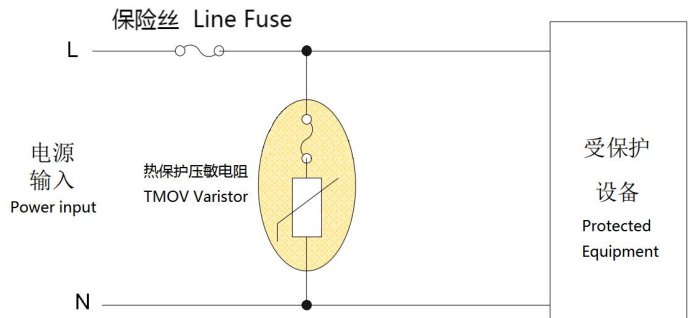
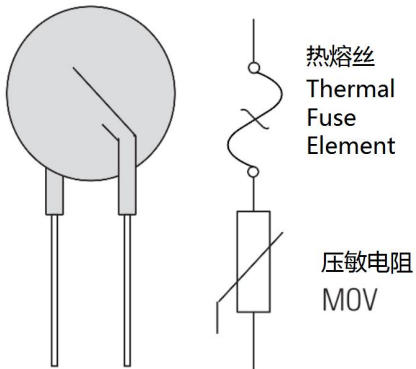
序号 NO	表示说明 Description	
①	风华压敏电阻 Fenghua Nonlinear Resistor	
②	芯片标称直径 Diameter of Element	14: 14mm 20: 20mm
③	系列型号 Series Type	R 系列: TMOV 热保护型压敏系列 R Series: Thermally Protected Varistor
④	压敏电压 Varistor Voltage	180 : $18 \times 10^0 = 18V$ 621 : $62 \times 10^1 = 620V$ 112 : $11 \times 10^2 = 1100V$
⑤	压敏电压公差 Tolerance	K: $\pm 10\%$
⑥	引脚形状 Lead Style	A: 直脚 Straight F: 内弯 Inward--Crimp B: 外弯 Outward-Crimp
⑦	引脚间距和线径 Pin spacing and Wire diameter	2: 脚距&线径: Spacing and Wire diameter: 7.5mm & $\phi 0.8mm$
⑧	包装方式-长/短脚/编带/步距 Packaging-Long lead/Short lead/Taping /pitch-row	S: 散装&长脚 Bulk& long lead C: 散装&短脚 Bulk&short lead
⑨	编带 H ₀ 值/引脚长度 Taping H ₀ /Lead length	20: 长脚 Long lead (20mm Min.) 35: 短脚 Short-Lead length 3.5mm
⑩	引脚材料 Lead wire	P: 镀锡铜包钢线 Tin plating steel wire
⑪	产品等级 Product level	E: 高能 High Energy
⑫	产品配置 Product Configuration	D: 两脚型, 涂装型 2-leaded TMOV, coating T: 三脚型, 涂装型 3-leaded TMOV, coating
⑬	本体外观颜色/封装材 Body Color / Coating Material	B: 蓝色环氧树脂 Blue Epoxy resin
⑭	内部控制码 Internal code	

***产品结构及尺寸 Structure And Dimensions**

单位 (Unit) : mm

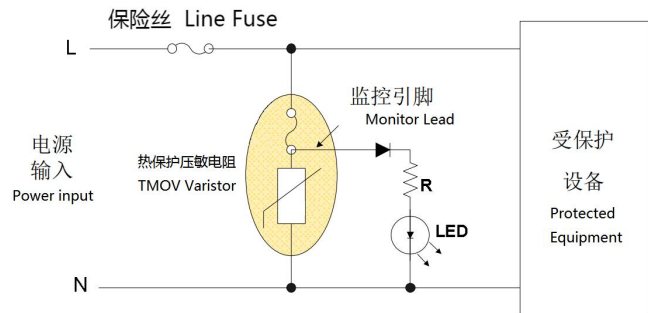
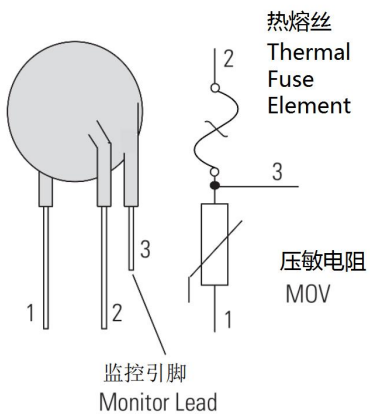
规格 Part NO.	D	Φd	W	H 直脚 Straigh t	H 弯脚 Crim p	L 短脚 Short-Lea d	L 长脚 Long-Le ad	L3	e2	e3	T	e
	max	± 0.05	± 1.0	max	max	± 1.0	min	min	± 1.0	max	max	± 1.0
FNR-14R (2-leaded TMOV)	17.0	0.8	7.5	22.0	24.0	3.5	20	n/a	n/a	n/a	请参考电性能参数表 Please refer to the Electrical Characteristics Table	
FNR-14R (3-leaded TMOV)	17.0	0.8	7.5	22.0	24.0	3.5	20	6.0	5.0	2.0		
FNR-20R (2-leaded TMOV)	23.0	0.8	7.5	28.0	31.0	3.5	20	n/a	n/a	n/a		
FNR-20R (3-leaded TMOV)	23.0	0.8	7.5	28.0	31.0	3.5	20	6.0	5.0	2.0		

*脚型结构和应用电路 Lead configurations and application examples

2-leaded TMOV



3-leaded TMOV



***14R 系列电气性能 14R Series Performance Specification**

14R 系列 14R Series	压敏电压 Varistor Voltage (@1mA DC)	最大连续工作压 Max. Allowable Voltage		最大限制电压 Max. Clamping Voltage (8/20 μ s)		最大 冲击电流 Max. Impulse Current (8/20 μ s)	能量 耐量 Energy (10/1000 μ s)	额定 功率 Rated Wattage	产品尺寸 Dimensions	
		Ac (V)	Dc (V)	Vc (V)	I _p (A)				1 Times	W _{max} (J)
FNR-14R181K	180 (162~198)	115	150	300	50	6000	56	0.6	9	4
FNR-14R201K	200 (180~220)	130	170	340	50	6000	70	0.6	9	4
FNR-14R221K	220 (198~242)	140	180	360	50	6000	78	0.6	9	4
FNR-14R241K	240 (216~264)	150	200	395	50	6000	84	0.6	9	4
FNR-14R271K	270 (243~297)	175	225	455	50	6000	99	0.6	9	4
FNR-14R301K	300 (270~330)	195	250	500	50	6000	108	0.6	9.5	4.5
FNR-14R331K	330 (297~363)	210	275	550	50	6000	115	0.6	9.5	4.5
FNR-14R361K	360 (324~396)	230	300	595	50	6000	130	0.6	9.5	4.5
FNR-14R391K	390 (351~429)	250	320	650	50	6000	140	0.6	9.5	4.5
FNR-14R431K	430 (387~473)	275	350	710	50	6000	155	0.6	9.5	4.5
FNR-14R471K	470 (423~517)	300	385	775	50	6000	175	0.6	11	5.5
FNR-14R511K	510 (459~561)	320	410	840	50	6000	180	0.6	11	5.5
FNR-14R561K	560 (504~616)	350	455	925	50	6000	185	0.6	11	5.5
FNR-14R621K	620 (558~682)	385	505	1025	50	6000	190	0.6	11	5.5
FNR-14R681K	680 (612~748)	420	560	1120	50	6000	200	0.6	11	5.5
FNR-14R751K	750 (675~825)	460	615	1240	50	6000	210	0.6	11	5.5
FNR-14R781K	780 (702~858)	485	640	1290	50	6000	220	0.6	12	8
FNR-14R821K	820 (738~902)	510	670	1355	50	6000	235	0.6	12	8
FNR-14R911K	910 (819~1001)	550	745	1500	50	6000	255	0.6	12	8
FNR-14R102K	1000 (900~1100)	625	825	1650	50	6000	280	0.6	13	10
FNR-14R112K	1100 (990~1210)	680	895	1815	50	6000	310	0.6	13	10

***20R 系列电气性能 20R Series Performance Specification**

20R 系列 20R Series	压敏电压 Varistor Voltage (@1mA DC)	最大连续工作压 Max. Allowable Voltage		最大限制电压 Max. Clamping Voltage (8/20 μ s)		最大 冲击电流 Max. Impul se Current (8/20 μ s)	能量 耐量 Energy (10/1000 μ s)	额定 功率 Rated Wattage	产品尺寸 Dimensions	
		Ac (V)	Dc (V)	Vc (V)	I _p (A)				1 Times	W _{max} (J)
FNR-20R181K	180 (162~198)	115	150	300	100	10000	110	1.0	9	4
FNR-20R201K	200 (180~220)	130	170	340	100	10000	140	1.0	9	4
FNR-20R221K	220 (198~242)	140	180	360	100	10000	155	1.0	9	4
FNR-20R241K	240 (216~264)	150	200	395	100	10000	170	1.0	9	4
FNR-20R271K	270 (243~297)	175	225	455	100	10000	190	1.0	9	4
FNR-20R301K	300 (270~330)	195	250	500	100	10000	205	1.0	9.5	4.5
FNR-20R331K	330 (297~363)	210	275	550	100	10000	215	1.0	9.5	4.5
FNR-20R361K	360 (324~396)	230	300	595	100	10000	225	1.0	9.5	4.5
FNR-20R391K	390 (351~429)	250	320	650	100	10000	240	1.0	9.5	4.5
FNR-20R431K	430 (387~473)	275	350	710	100	10000	270	1.0	9.5	5.5
FNR-20R471K	470 (423~517)	300	385	775	100	10000	350	1.0	11	5.5
FNR-20R511K	510 (459~561)	320	410	840	100	10000	380	1.0	11	5.5
FNR-20R561K	560 (504~616)	350	455	925	100	10000	400	1.0	11	5.5
FNR-20R621K	620 (558~682)	385	505	1025	100	10000	425	1.0	11	6
FNR-20R681K	680 (612~748)	420	560	1120	100	10000	435	1.0	11	6
FNR-20R751K	750 (675~825)	460	615	1240	100	10000	455	1.0	11	7
FNR-20R781K	780 (702~858)	485	640	1290	100	10000	461	1.0	12	7
FNR-20R821K	820 (738~902)	510	670	1355	100	10000	475	1.0	12	7
FNR-20R911K	910 (819~1001)	550	745	1500	100	10000	500	1.0	12	8
FNR-20R102K	1000 (900~1100)	625	825	1650	100	10000	560	1.0	13	8
FNR-20R112K	1100 (990~1210)	680	895	1815	100	10000	610	1.0	13	9

◆电气性能 Electrical Performance Test

序号 NO	项目 Item	测试标准 Standard	测试方法 Test method	特性 Performance
1	压敏电压 Varistor Voltage	规格标准 Specification Standard	在规定电流条件下 (DC _{1mA}) 的两端电压值。 The voltage between two terminals with the specified measuring current (DC _{1mA}).	参见电气性能 To meet Performance Specification
2	漏电流 Leakage current	规格标准 Specification Standard	在标准测试条件下, 施加 83%压敏电压时流过压敏电阻器的电流值。 The direct current flowing from the Varistor at 0.83V _v . V _v :压敏电压 (DC _{1mA}) V _v :Varistor Voltage(DC _{1mA}).	在 25℃时: ≥82V IR≤20μA <82V IR≤40μA (V _v of 83%)
3	限制电压 Clamping Voltage	规格标准 Specification Standard	在 8/20us 波形下, 施加规定电流后压敏电阻器两端的电压峰值。 The maximum voltage between two terminals with the specified standard impulse current(8/20us) applied.	参见电气性能 To meet Performance Specification
4	最大通流容量 Maximum peak current (withstanding surge current)	规格标准 Specification Standard	在环境温度 25℃下, 施加 1 次 8/20us 的标准冲击电流后, 压敏电阻电压变化率在±10%内。 The maximum current within the varistor voltage change of ±10% with the standard impulse applied by the specified condition.	参见电气性 To meet Performance Specification ΔV/V ≤10%
5	能量耐量 Maximum energy	规格标准 Specification Standard	在环境温度 25℃下, 施加 1 次 2ms 或 10/1000uS 的标准冲击电流后, 压敏电阻电压变化率在±10%内。 The maximum energy (2ms or 10/1000uS wave) within the Varistor Voltage change of ±10% when the specified impulse is applied.	参见电气性能 To meet Performance Specification ΔV/V ≤10%
6	电压温度系数 Temperature coefficient of varistor Voltage	规格标准 Specification Standard	在规定温度下显示压敏电压的变化值。 Coefficient indicating dependency of Varistor Voltage on Specified temperature. $\frac{V_{1mA@85^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{60} \times 100\% (\%/^{\circ}C)$ $\frac{V_{1mA@-40^{\circ}C} - V_{1mA@25^{\circ}C}}{V_{1mA@25^{\circ}C}} \times \frac{1}{65} \times 100\% (\%/^{\circ}C)$	-0.05≤Tc≤0.05(%/°C)
7	静态电容量 Capacitance	规格标准 Specification Standard	在环境温度为 25±2℃, 测试频率为 1KHz±10%, 1Vrms (max) 下所测得的介电损失。 Dielectric loss tangent shall be measured at 1KHz±10%, 1Vrms max bias and 25±2℃.	参见电气性能 To meet Performance Specification

◆可靠性试验项目 Reliability Testing Item

序号 NO	项目 Item	测试标准 Standard	测试方法 Test method	特性 Performance								
1	端子抗拉强度 Tensile Strength of Terminals	IEC 60068-2-21	<p>逐渐施加规定的力, 并保持装置固定 10±1 秒。 Gradually applying the force specified and keeping the unit fixed for 10±1 sec.</p> <table border="1"> <thead> <tr> <th>引线直径 Terminal diameter(mm)</th> <th>拉力 Force(N)</th> </tr> </thead> <tbody> <tr> <td>0.5<d≤0.8</td> <td>10</td> </tr> <tr> <td>0.8<d≤1.25</td> <td>20</td> </tr> <tr> <td>1.25<d</td> <td>40</td> </tr> </tbody> </table>	引线直径 Terminal diameter(mm)	拉力 Force(N)	0.5<d≤0.8	10	0.8<d≤1.25	20	1.25<d	40	<p>无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%.</p>
引线直径 Terminal diameter(mm)	拉力 Force(N)											
0.5<d≤0.8	10											
0.8<d≤1.25	20											
1.25<d	40											
2	引线弯折试验 Bending Strength of Terminals	IEC 60068-2-21	<p>固定试样, 并将以下规定的力施加到每个引脚上。将样品弯曲至 90°, 然后回到原样位置。在相反的方向上重复此步骤。 Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction.</p> <table border="1"> <thead> <tr> <th>引线直径 Terminal diameter(mm)</th> <th>拉力 Force(Kg)</th> </tr> </thead> <tbody> <tr> <td>0.5<d≤0.8</td> <td>5</td> </tr> <tr> <td>0.8<d≤1.25</td> <td>10</td> </tr> <tr> <td>1.25<d</td> <td>20</td> </tr> </tbody> </table>	引线直径 Terminal diameter(mm)	拉力 Force(Kg)	0.5<d≤0.8	5	0.8<d≤1.25	10	1.25<d	20	<p>无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%.</p>
引线直径 Terminal diameter(mm)	拉力 Force(Kg)											
0.5<d≤0.8	5											
0.8<d≤1.25	10											
1.25<d	20											
3	振动试验 Resistance Vibration	IEC 60068-2-6	<p>振动频率: 10 ~ 55 Hz 振幅: 0.75mm 或 98 m/s² 3 方向, 持续时间: 6 小时(3 x 2 小时) Frequency range:10Hz-55Hz, Amplitude: 0.75mm or 98m/s²,three direction,Total duration: 6h.</p>	<p>无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%.</p>								
4	碰撞 Bump	IEC 60068-2-29	<p>400m/S², 6ms, 三个方向, 共 4000 次。 Acceleration: 400m/S², 6ms, three direction, umber of bumps: 4000.</p>	<p>无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%.</p>								
5	耐溶剂性 Permanency of marking	IEC 60068-2-45	<p>溶剂: 丙酮溶液 温度: 23±5°C 浸入时间: 1 分钟。 Class of reagent :acetone solution Test temperature:23±5°C Immersing time:1min</p>	<p>无损伤、标志清楚, 容易辨认。 No visible damage and legibly marking. ΔV/V ≤5%.</p>								
6	可焊性 Solderability	IEC 60068-2-20	<p>槽焊法 245±3°C, 3±0.3 秒 Solder bath method 245±5°C,3±0.3ses.</p>	<p>着锡面积 ≥95% At least 95% of terminal electrode is covered by new solder.</p>								

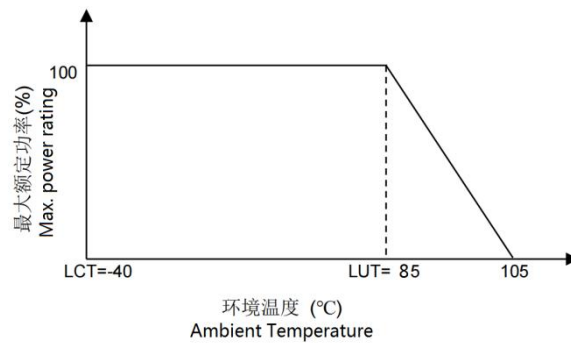
7	耐焊接热 Resistance to soldering heat	IEC 60068-2-20	槽焊法 260±5℃, 10±1 秒, 深度: 至引线根部 2.0~2.5mm 浸入速度: 25±2.5mm/sec Solder bath method 260±5℃, 10±1ses. Depth of immersion: up to 2.0~2.5mm from the root of the lead wire covered with thermal screen. Speed of immersion: 25±2.5mm/sec.	无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%.															
8	稳态湿热 Resistance to damp heat (steady state)	IEC 60068-2-78	试验分 a、b 两组: a. 40±2℃, 90~95% RH, 1344 小时 b. 40±2℃, 90~95% RH, 10% VDC, 1344 小时 Group: a、b a. 40±2℃, 90~95% RH, 1344 hrs b. 40±2℃, 90~95% RH, 10% VDC, 1344 hrs	无可见损伤。 压敏电压变化率在±10%内。 绝缘电阻≥100MΩ。 No visible damage. ΔV/V ≤10% Insulation resistance ≥100MΩ															
9	上限类别温度耐久性 High temperature load	MIL-STD-202 Method 108	施加电压: 最大连续交流电压。 试验温度: 85±2℃ 试验时间: 1000h At V _{AC} (Max. Operating Voltage) 85 ± 2 °C, 1000 ± 24 hrs.	外观无可见损伤。 压敏电压变化率在±10%内。 No visible damage. ΔV/V ≤10%															
10	高温贮存试验 Shelf life test	IEC 60068-2-2	在 125±2℃ 环境下无负荷贮存 1000h。 The Zinc oxide varistor are then stored with no voltage applied at a temperature of 125±2℃ for 1000h.	外观无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%															
11	温度快速变化 Temperature cycling	IEC60068-2-14	温度循环应重复 5 次, 并在室温和湿度下保存 1 至 2 小时。 The conditions shown below shall be repeated 5 cycles. <table border="1" data-bbox="638 1361 1182 1671"> <thead> <tr> <th>步骤 Step</th> <th>温度 Temperature</th> <th>时间 Period</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±3℃</td> <td>30min</td> </tr> <tr> <td>2</td> <td>室温 Room temperature</td> <td>15min</td> </tr> <tr> <td>3</td> <td>+85±2℃</td> <td>30min</td> </tr> <tr> <td>4</td> <td>室温 Room temperature</td> <td>15min</td> </tr> </tbody> </table>	步骤 Step	温度 Temperature	时间 Period	1	-40±3℃	30min	2	室温 Room temperature	15min	3	+85±2℃	30min	4	室温 Room temperature	15min	外观无可见损伤。 压敏电压变化率在±5%内。 No visible damage. ΔV/V ≤5%
步骤 Step	温度 Temperature	时间 Period																	
1	-40±3℃	30min																	
2	室温 Room temperature	15min																	
3	+85±2℃	30min																	
4	室温 Room temperature	15min																	
12	脉冲寿命 Impulse life	IEC 61051-1	固定冲击电流用 8/20μS 标准波冲击 10000 次, 时间间隔 10S, 恢复时间室温 1~2 小时。 @8/20μS, 10000 times, the interval 10 seconds. The specimen shall be stored at room temperature and humidity for 1 to 2 hours.	外观无可见损伤。 压敏电压变化率在±10%内。 No visible damage. ΔV/V ≤10%															

13	耐压试验 Voltage Proof	IEC 61051-1	金属球法, 2500 V _{AC} 1 分钟 Metal balls method, 2500 V _{AC} 1 min	外观无可见损伤。 No visible damage.
14	阻燃性试验 Fire hazard	IEC 60695-11-5	针焰测试 施加火焰时间: 10 秒 needle flame test Severity: vertical 10 s	不燃烧或残焰不超过 30s; 滴落物不引燃垫纸。 Flames or glowing of the specimen and the layer below extinguish in 30s, there has been no ignition of the specified layer.

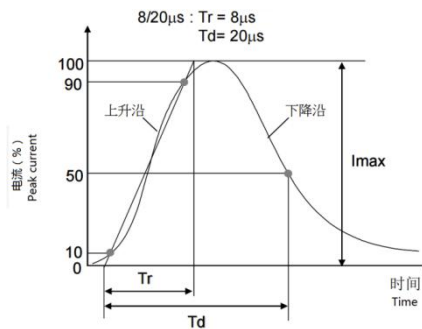
◆功率降额曲线 Power Derating Curve

在室温下操作超过 85°C 功率会按下图降级。

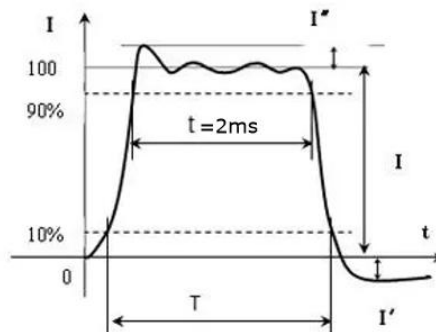
For operation at ambient temperature in excess of 85°C, the power should be derated in accordance with below figure.



◆8/20 μ S 标准脉冲波形 8/20 μ S Peak Pulse Current Test Waveform

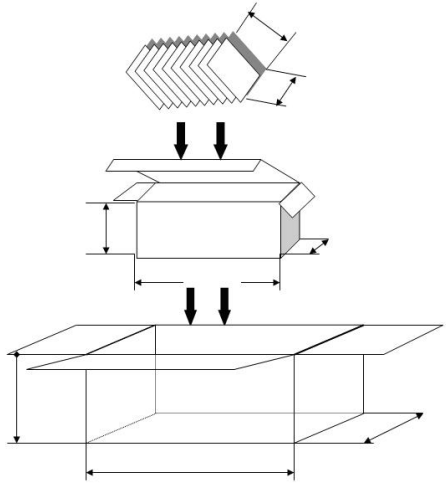


◆2ms 标准脉冲波形 2ms Peak Pulse Current Test Waveform



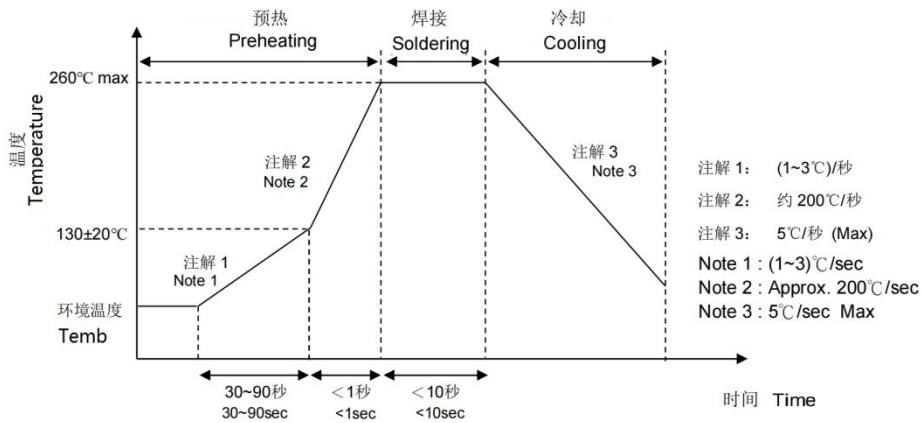
◆包装 Packaging
1. 散装 Bulk

规格 Series	适用 电压范围 Varistor Voltage Range	包装 数量 (支 / 袋) Quantity PCS/bag
14R	181-561	300
14R	681-112	200
20R	180-361	200
20R	391-112	150


◆环保情况说明 Environmental Protection Statement

我司提供的所有压敏电阻物料均符合最新欧盟 ROHS 指令及 Reach 法规要求，请贵司放心使用。

We provide all varistor materials conform to the requirements of the latest EU ROHS directive and the Reach regulation, please rest assured to use.

◆推荐焊接条件 Soldering Recommendation
***波峰焊曲线 Wave soldering profile**

***手工焊接 Iron soldering**

项目 Item	条件 Conditions
烙铁头温度 Temperature of soldering Iron-tip	360°C (max.)
焊接时间 Soldering Time	3s (max.)
焊接位置与涂装层距离 Distance from Varistor	2mm (min.)

◆ 贮存方法 Storage Methods

元器件必须储存在清洁、通风、无腐蚀性气体的仓库内；除另有规定外，仓库的温度和相对湿度必须满足如下要求：a.温度：5~30℃；
b 相对湿度：20%~75%；存储期限：1 年。

Components must be stored in a clean, ventilated, non-corrosive gases warehouse; Unless otherwise specified, the warehouse temperature and relative humidity must meet the following requirements: a. Temperature: 5 ~ 30 °C; b. Relative humidity: 20% ~ 75%; Period of Storage: 1 year.

◆ 使用注意事项 Precautions For Use

1、工作环境温度应该在技术条件规定的范围以内。

Working environment temperature should be within the prescribed scope of technical conditions.

2、不应该靠近发热或可燃元器件安装，最好有大于 3 毫米的间隔，以免损坏元器件。

Near a fever or flammable components should not be installed, it is better to have more than 3 mm intervals, so as not to damage the components.

3、接触引脚时请先佩戴手套。 Please wear gloves when the contact pin.

修改履历表

序号	位置-页码等	内容-前	内容-后	日期
1				
2				
3				
4				
5				
6				
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8				
9				
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11				