

压敏电阻器规格承认书

APPROVAL SPECIFICATION FOR VARISTORS

客户 CUSTOMER	立创商城		
客户料号 CUSTOMER P/N	C2761818		
客户规格描述 CUST. DESCRIPTION			
规格描述 DESCRIPTION	10D470K/F7.5/直脚/L24/环氧(蓝)/ZNR		
产品编码 PART NUMBER	RM10D470KD1IE100		
日期 DATE	2021/3/17	文件编号 DOC. NO.	DEC-SA-WI007

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請確保我們的產品安裝到您的產品上，已根據您的需求進行了評估。

Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

請您在使用我們的產品時，不要偏離此標準。

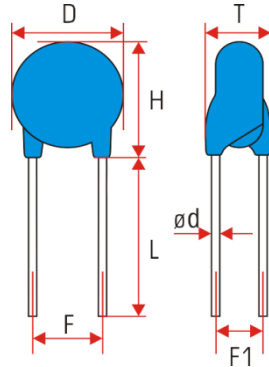
You are requested not to use our product deviating from this specification.

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1. 规格表

DATA SHEET



本体颜色: 蓝色

Body color: Blue

包封层: 环氧树脂 (UL94 V-0)

Coating: Epoxy resin (UL94 V-0)

导线: CP线

Lead wire: CP wire

印字:

Marking:

ZNR
 10D470K

 **D

产品编码 Part number	RM10D470KD1E100	
客户料号 Customer P/N	C2761818	
最大连续工作电压 Max continuous operating voltage	AC30V (max) DC38V (max)	
压敏电压, V_N Varistor voltage, V_N	47V \pm 10% @ 1mA 30ms	
标称脉冲电流, I_p Nominal pulse current, I_p	5A @ 8/20 μ s	
最大抑制电压, V_C Maximum clamping voltage, V_C	93V (max) @ I_p	
耐冲击电流 Withstanding surge current	最大脉冲电流 Maximum pulse current	500A (1 time) @ 8/20 μ s 250A (2 times) @ 8/20 μ s (5 minute interval)
	重复脉冲电流 Repetitive pulse current	125A (10 times), @ 8/20 μ s (90 sec. interval)
	冲击寿命 Impulse life	20A (10 000 times) @ 8/20 μ s (10 sec. interval)
最大耐受能量 Maximum energy	5.5J @ 10/1000 μ s	
额定功率 Rated power	0.05W	
最大漏电流 Maximum leakage current	20 μ A @ 75% V_N	
最大电容量 Maximum capacitance	2100pF @ 1kHz 1.0Vrms	
工作温度范围 Operating temperature range	-40 $^{\circ}$ C ~ +85 $^{\circ}$ C	
尺寸 Dimensions	D (Diameter)	12.5mm max
	T (Thickness)	2.9mm \pm 0.8mm
	H (Height)	16.5mm max
	F (Lead spacing)	7.5mm \pm 1.2mm
	F1 (Lead malposed spacing)	1.48mm \pm 0.5mm
	L (Lead length)	24mm \pm 4.0mm
	ϕd (Lead diameter)	0.75mm \pm 0.10mm

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2. 概述

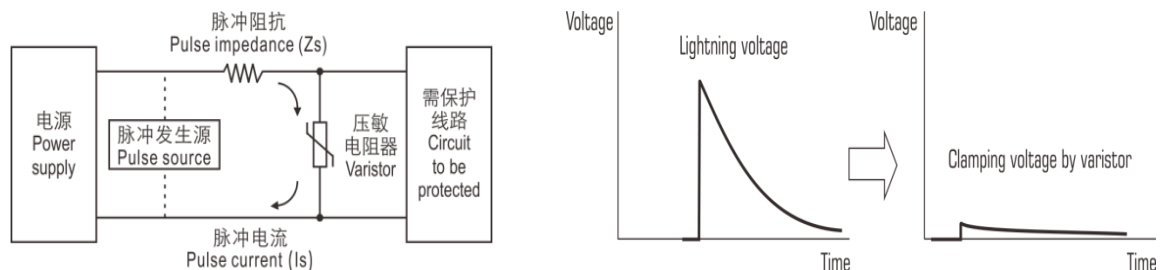
INTRODUCTION

压敏电阻是一种具有在一定的电压条件下支持电流急速流出的电压-电流特性的产品。

A varistor has the volt-ampere characteristics in which current suddenly starts to flow through the device at a certain voltage.

压敏电阻的作用：保护在电子线路中的电子元器件免受过电压的影响。如下图所示，压敏电阻并联在电路中起保护作用。当有脉冲(脉冲电流 I_s ：由脉冲电压 V_s 和阻抗 Z_s 决定)施加在电路上时，脉冲电流(I_s)限制脉冲电压在压敏电阻的限制电压 V_c 之内。

The varistors are used to protect components in electronic and electric circuits from overvoltage. As shown in following figure, a varistor is inserted in parallel with a circuit to be protected. When a pulse is applied to the circuit, pulse current I_s , which is determined by pulse voltage V_s and pulse impedance Z_s , flows to limit the pulse voltage to the varistor limit voltage V_c .



压敏电阻器对脉冲的吸收
PULSE ABSORPTION BY VARISTOR

相互的关系可以用下面的公式来解释：

The relation can be expressed by the equations as follows:

$$V_s = I_s \times Z_s + V_c$$

$$\therefore V_c = V_s - I_s \times Z_s$$

因为 V_s 远远大于 V_c ，脉冲电流 I_s 可以用以下公式求得

The pulse current I_s are easily obtained by the following equation because of V_s much larger than V_c .

$$I_s \approx V_s \div Z_s$$

所以，由于可承受电压大于最大的限定电压，电路可以长时间的免于脉冲电压的损坏。

Thus, the circuit can be protected from being damaged by pulse voltages as long as it has withstand voltage larger than the maximum limit voltage.

由于吸收异常电压和电流脉冲的特性，压敏电阻可非常高效的保护电子器件。

Owing to the characteristic, the varistors are extremely effective as protecting devices of electronic and electric equipment by absorption of abnormal voltages and lightning pulses.

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3. 应用

APPLICATION

- 消费电子产品：电视机、音频输出设备、安全插座、机顶盒等
 Consumer electronics products: television, audio output device, safety plug, STB etc.
- 工业产品：马达、半导体元件、继电器、电磁开关、电源线路、三相整流线路、自动控制线路等
 Industrial products: motor, semiconductor component, relay, electromagnetic switch, power circuit, three-phase rectifier circuit, automatic control circuit etc.
- 通信设备：电话机、传真机、交换机等
 Communication equipment: Telephone, facsimile, exchanger etc.
- 计算机：计算机、显示器、打印机、扫描仪、电源、电源适配器等
 Computer: computer, displayer, printer, scanner, power supply, adapter etc.
- 汽车电子产品
 Automotive electronics products

适用范围

APPLICATIONS SCOPE

规格 Specifications					主要用途 Recommended Applications	
05D180K	07D180K	10D180K	14D180K	20D180K	用于低压电路，如用于保护半导体器件、汽车电子产品、DC48V以下的继电器与电磁阀、静电放电设备、行动电话等 For the low voltage circuit, Such as for the protection of semiconductor devices, automotive electronics, DC48V following relays and solenoid valves, electrostatic discharge equipment, mobile phones, etc.	
05D220K	07D220K	10D220K	14D220K	20D220K		
05D270K	07D270K	10D270K	14D270K	20D270K		
05D330K	07D330K	10D330K	14D330K	20D330K		
05D390K	07D390K	10D390K	14D390K	20D390K		
05D470K	07D470K	10D470K	14D470K	20D470K		
05D560K	07D560K	10D560K	14D560K	20D560K		
05D680K	07D680K	10D680K	14D680K	20D680K		
05D820K	07D820K	10D820K	14D820K	20D820K		用于电话，DC48V通信电路电线 Telephone, communication line (DC48V)
05D101K	07D101K	10D101K	14D101K	20D101K		
05D121K	07D121K	10D121K	14D121K	20D121K		
05D151K	07D151K	10D151K	14D151K	20D151K		
05D181K	07D181K	10D181K	14D181K	20D181K	用于AC100V线与线间(如日本) AC100V line-line applications (Japan etc.)	
05D201K	07D201K	10D201K	14D201K	20D201K		
05D221K	07D221K	10D221K	14D221K	20D221K		
05D241K	07D241K	10D241K	14D241K	20D241K	用于AC100~120V线与线间(如日本、美国等) AC100V~120V, line-line applications (Japan, US etc.)	
05D271K	07D271K	10D271K	14D271K	20D271K		
05D301K	07D301K	10D301K	14D301K	20D301K		
05D331K	07D331K	10D331K	14D331K	20D331K	用于AC100~120V线与线间，用于电话(应对250V绝缘阻抗测试) AC100V~120V, line-line applications, telephone line applications (for DC250V insulation resistance test)	
05D361K	07D361K	10D361K	14D361K	20D361K		
05D391K	07D391K	10D391K	14D391K	20D391K		
05D431K	07D431K	10D431K	14D431K	20D431K	用于AC200~220V线与线间、线与大地间 AC200V~220V, line-line and line-ground applications	
05D471K	07D471K	10D471K	14D471K	20D471K		
05D511K	07D511K	10D511K	14D511K	20D511K		
05D561K	07D561K	10D561K	14D561K	20D561K	用于AC240V线与线间、线与大地间(如英国、澳洲等) AC240V, line-line and line-ground applications (UK, Australia etc.)	
05D621K	07D621K	10D621K	14D621K	20D621K		
05D681K	07D681K	10D681K	14D681K	20D681K		
05D751K	07D751K	10D751K	14D751K	20D751K	用于AC380V线与线间、线与大地间 AC380V, line-line and line-ground applications	
	07D781K	10D781K	14D781K	20D781K		
	07D821K	10D821K	14D821K	20D821K		
		10D911K□	14D911K□	20D911K□	用于AC415V线与线间、线与大地间 AC415V, line-line and line-ground applications	
		10D102K 10D112K	14D102K 14D112K 14D122K 14D142K	20D102K 20D112K 20D122K 20D142K	用于AC480V线与线间、线与大地间 AC480V, line-line and line-ground applications	
			14D162K 14D182K	20D162K 20D182K	用于线与大地间(应对AC1200V耐压测试) line-ground applications (for AC1200V withstanding test)	

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4. 基本特性

GENERAL CHARACTERISTIC

■ 特性表

Characteristic sheet

压敏电压 Varistor voltage	压敏电压范围 Varistor voltage range (@ 1mA)	最大工作电压 Max operating voltage		抑制电压 Clamping voltage (V _c) @ I _p 8/20μs
		AC	DC	
		V	V	V
180K	15.8~20.7	11	14	36
220K	19.4~25.3	14	18	43
270K	23.7~31.1	17	22	53
330K	29.0~36.3	20	26	65
390K	35.1~42.9	25	31	77
470K	42.3~51.7	30	38	93
560K	50.4~61.6	35	45	110
680K	61.2~74.8	40	56	135
820K	73.8~90.2	50	65	135
101K	90~110	60	85	165
121K	108~132	75	115	200
151K	135~165	95	125	250
181K	162~198	115	150	300
201K	180~220	130	170	340
221K	198~242	140	180	360
241K	216~264	150	200	395
271K	243~297	175	225	455
301K	270~330	195	250	505
331K	297~363	210	275	545
361K	324~396	230	300	595
391K	351~429	250	320	650
431K	387~473	275	350	710
471K	423~517	300	385	775
511K	459~561	320	415	845
531K	477~583	330	435	875
561K	504~616	350	460	915
621K	558~682	385	505	1025
681K	612~748	420	560	1120
721K	648~792	440	585	1180
751K	675~825	460	615	1240
781K	702~858	485	640	1290
821K	738~902	510	670	1355
911K	819~1001	550	745	1500
951K	855~1045	575	765	1570
102K	900~1100	625	825	1650
112K	990~1210	680	895	1815
122K	1080~1320	750	1060	2000
142K	1260~1540	880	1140	2310
162K	1440~1760	940	1280	2640
182K	1620~1980	1000	1465	2970

尺寸规格 Nominal diameter	等级电流 Class current (I _p) @ 8/20μs	耐冲击电流 Withstanding impulse current			额定功率 Rated power
		8/20μs			
		A	1 time	2 times	10 ⁴ times
Varistor voltage: 180K ~ 680K (D, T type)					
05D	1	125	50	4	0.01
07D	2.5	250	125	10	0.02
10D	5	500	250	20	0.05
14D	10	1000	500	40	0.1
20D	20	2000	1000	80	0.2
Varistor voltage: 180K ~ 680K (V type)					
05D	1	250	100	10	0.01
07D	2.5	500	250	20	0.02
10D	5	1000	500	40	0.05
14D	10	2000	1000	80	0.1
20D	20	3000	2000	120	0.2
Varistor voltage: 820K ~ 182K (D, T, K type)					
05D	5	600	200	17	0.1
07D	10	1250	600	75	0.25
10D	25	2500	1250	120	0.4
14D	50	4500	2500	150	0.6
20D	100	6500	4500	190	1
Varistor voltage: 820K ~ 182K (V type)					
05D	5	800	400	22	0.1
07D	10	1750	1200	100	0.25
10D	25	3500	2500	150	0.4
14D	50	6000	4500	200	0.6
20D	100	10000	6500	250	1
Varistor voltage: 391K ~ 112K (J type)					
07D	10	1800	1250	120	0.25
10D	25	4000	3000	175	0.4
14D	50	8000	6000	220	0.6
20D	100	13000	8000	260	1
Varistor voltage: 391K ~ 182K (Q type)					
10D	25	4000	3000	175	0.4
14D	50	8000	6000	220	0.6
20D	100	13000	8000	260	1

Note:

K type: General type (Voltage gradient: 260 V/mm)

D type: Standard type (Voltage gradient: 240 V/mm)

T type: Hi-temperature (125°C) type, based on D type

V type: Hi-energy type

J type: Withstanding surge type

Q type: Appendix Q (IEC 60950-1, 6KV/3KA)

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4. 基本特性

GENERAL CHARACTERISTIC

- 符合RoHS 2.0、REACH及无卤
Comply with rohs 2.0, reach, halogen-free available.
- 安规认证
Safety certification

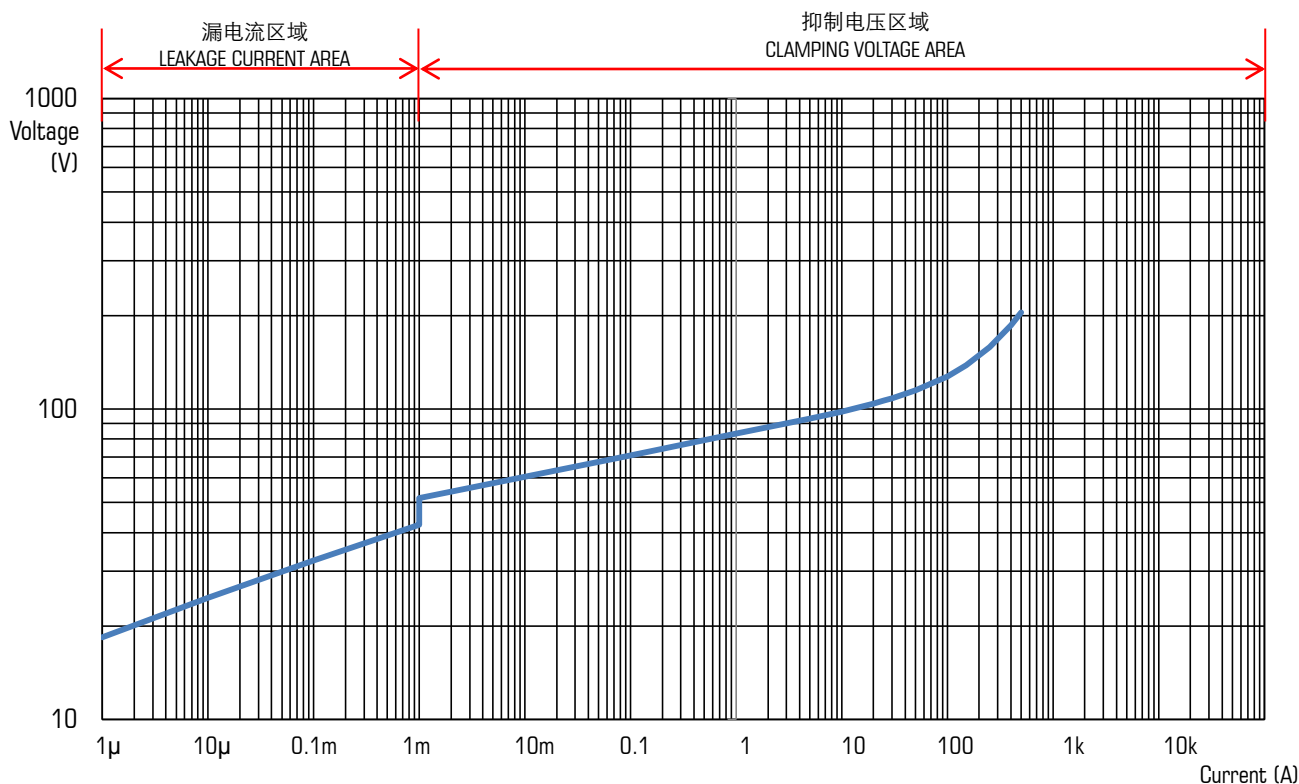
认证机构 CERTIFICATE AUTHORITY	认证标准 APPROVAL STANDARD	证书编号 CERTIFICATE NO.	认证范围 CERTIFICATION RANGE		
			规格 SPECS	压敏电压 VARISTOR VOLTAGE	最大连续交流电压 MAXIMUM CONTINUOUS OPERATING VOLTAGE A.C.
CQC	GB/T 10193-1997 GB/T 10194-1997	CQC14001104814	07D	18V-820V	11VAC-510VAC
	GB 4943.1-2011 GB 8898-2011 GB/T 10193-1997 GB/T 10194-1997	CQC16001149384	10D	18V-1100V*	11VAC-680VAC
		CQC16001149385	14D	18V-1800V*	11VAC-1000VAC
		CQC16001149386	20D	18V-1800V*	11VAC-1000VAC
TÜV SÜD	IEC 61051-1:2018 IEC 61051-2:1991/A1:2009 IEC 61051-2-2:1991	B 096835 0001**	07D	18V-820V	10VAC-510VAC
			10D	18V-1100V	10VAC-680VAC
			14D	18V-1800V	10VAC-1000VAC
			20D	18V-1800V	10VAC-1000VAC
UL (cUL)	UL 1449 (4th edition)	E485399	07D	18V-820V	11VAC-510VAC
			10D	18V-1100V	11VAC-680VAC
			14D	18V-1800V	11VAC-1000VAC
			20D	18V-1800V	11VAC-1000VAC

*: 18V~360V is only applicable to GB/T 10193-1997, GB/T 10194-1997

** : Additional test for 10D, 14D, 20D series: Annex Q of IEC 60950-1:2005/A2:2013, clause 14.13 of IEC 60065:2014 and clause G.8.1 of IEC 62368-1:2018.

- 典型的10D470K抑制电压特性曲线(供参考)

Typical 10D470K clamping voltage characteristic curve (for reference)



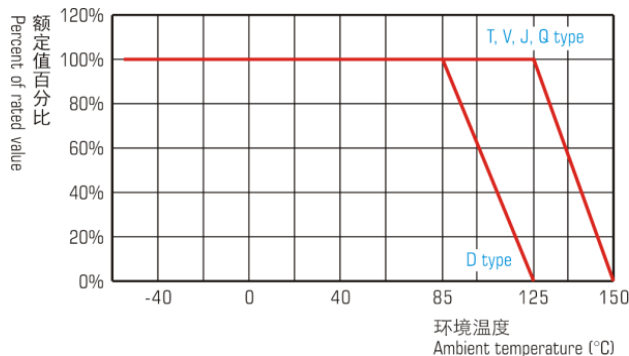
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■ 工作温度降额曲线(见下图)

Operating temperature derating curve (see fig below)



标准型85°C到125°C降额系数为2.5%/°C
D type: 85°C to 125°C derating factor: 2.5% per °C

- D type: 标准型
Standard type
- T type: 高温型
High temperature type
- V type: 高能型
High energy type
- J type: 耐浪涌冲击型
Withstanding surge type
- Q type: 附录Q型
Annex Q (IEC 60950-1, withstanding 6kV/3kA combination wave testing) type



请注意: 额定特性包括最大连续工作电压、耐冲击电流、能量耐量及额定功率, 降幅2.5%/°C
Please note: rated characteristic includes maximum continuous operating voltage, withstanding surge current, maximum energy and rated dissipation power, 2.5%/°C reduction.

- 压敏电压温度系数
Temperature coefficient of varistor voltage: 0 to -0.05 %/°C max.
- 储存温度范围
Storage temperature range: -55°C ~ +125°C
- 绝缘电压
Insulation voltage: 2500V 60s (body Insulation)

5. 名词解释

DEFINITIONS

- 1) 最大连续工作电压: 在环境温度25°C下, 允许连续施加在压敏电阻器上的最大工频正弦电压有效值 Uac(总谐波失真小于5%)或直流电压值 Udc。
Maximum continuous operating voltage: maximum ac RMS voltage uac or maximum dc voltage udc which can be applied continuously at a temperature of 25°C. Uac shall be a substantially sinusoidal voltage (less than 5% total harmonic distortion).
- 2) 压敏电压: 直流参考电流流过压敏电阻器时, 压敏电阻器两端的直流电压值。
Varistor voltage: dc voltage across the varistor when the dc reference current flows through the varistor.
- 3) 标称脉冲电流: 是一个电流峰值, 它是以每分钟2次的方式用8/20μs脉冲电流冲击100次, 压敏电阻器可以通过的电大峰值电流的1/10。
Nominal pulse current: it is a current peak value. It is pulsed 100 times with 8/20μs pulse current in 2 times per minute, and the varistor can pass 1/10 of the peak current.
- 4) 抑制电压: 是指在标准大气条件下, 压敏电阻器中通过标称脉冲电流时, 其两端呈现的电压峰值。
Clamping voltage: refers to the voltage peak appearing between the two terminals of a varistor when passing a nominal pulse current under standard atmospheric conditions.
- 5) 耐冲击电流: 压敏电阻器允许通过的规定波形的每个脉冲的最大电流值。
Withstanding surge current: the maximum current value of each pulse of the specified waveform that the varistor is allowed to pass.
- 6) 能量耐量: 能被压敏电阻器吸收的指定波形的最大单个脉冲能量, 除非另有规定, 否则应使用2ms脉冲或10/1000μs脉冲。
Maximum energy: the maximum single pulse energy of the specified waveform that can be absorbed by the varistor. Unless otherwise specified, 2ms pulses or 10/1000μs pulses should be used.
- 7) 额定功耗: 在25°C的环境温度下的最大允许功耗。
Rated power: the maximum allowable power dissipation of varistors at an ambient temperature of 25°C.
- 8) 漏电流: 在25°C或规定的其他温度下, 施加最大直流电压时, 通过压敏电阻器中的电流。
Leakage current: the current through the varistor at the maximum dc voltage applied at 25°C or other specified

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6. 产品编码

PART NUMBER

RM	10	D	470	K	D	1	I	E	100
系列 Series	标称直径 Nominal diameter	形状及等级 Shape and grade	压敏电压 Varistor voltage	误差 Tolerance	脚距 Lead spacing	脚型 Lead style	编带包装或散装脚长 Taping packing or Lead length (bulk)	包封材质 Coating material	类别和标志 Type and marking

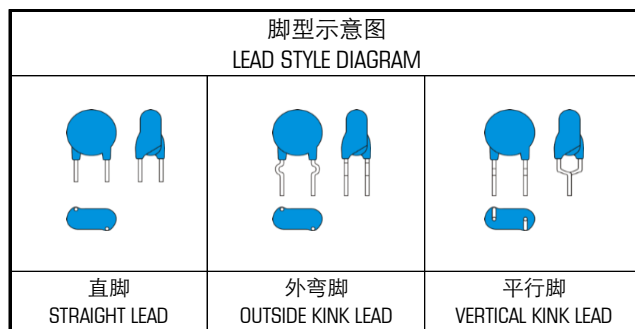
序号 No.	名称 Field name	表达内容 Expression
1	系列 Series	RM: 压敏电阻器 ZnO (Zinc oxide) Varistors
2	标称直径 Nominal diameter	10: 10mm
3	形状 Shape	D: 圆形 Disc
4	压敏电压 Varistor voltage	470: 47V
5	误差 Tolerance	K: $\pm 10\%$
6	脚距 Lead spacing	D: F=7.5mm
7	脚型 Lead style	1: 直脚 Straight Leads
8	编带包装或散装脚长 Taping packing or Lead length (bulk)	I: 散件包装, 脚长(L)=24mm Bluk packing, Lead length (L)=24mm
9	包封材质 Coating material	E: 环氧(蓝) Epoxy (Blue)
10	类别和标志 Type and marking	100: 标准型, 打印ZNR商标 Standard type, printed ZNR trademark

常用标称直径有:

Common nominal diameters are: 5mm, 7mm, 10mm, 14mm, 20mm

常用压敏电压有:

Common varistor voltage are: 18V, 22V, 27V, 33V, 39V, 47V, 56V, 68V, 82V, 100V, 120V, 150V, 180V, 200V, 220V, 240V, 270V, 300V, 330V, 360V, 390V, 430V, 470V, 510V, 560V, 620V, 680V, 750V, 780V, 820V, 910V, 1000V, 1100V, 1200V, 1800V.



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7. 测量与试验

MEASUREMENT AND TESTING

如无特殊需要，压敏电阻器应在下列环境条件下进行试验：

If there is no special need, varistor measurement and testing should be conducted under the following environmental conditions:

温度 Temperature	相对湿度 Relative humidity	大气压力: Atmospheric pressure:
25°C±5°C	30%~70%	86kpa~106kpa

序号 No.	检验项目 Item	要求 Specification	试验方法 Testing method
1	外观与尺寸 Appearance And dimension	外观形状没有明显的缺点，尺寸在标准范围内。 No marked defect on appearance form and dimensions are within specified range.	压敏电阻器必须用目视检查其明显的缺点。 The varistors should be visually inspected for evidence of defect. 尺寸用游标卡尺测量。 Dimensions should be measured with slide calipers.
2	标志 Marking	清晰易于识别。 To be easily legible.	目视检查。 The capacitor should be visually inspected.
3	抑制电压 Clamping voltage	满足额定值 To meet the specified value.	使用波形为8/20μs的标称脉冲电流施加在压敏电阻器引出端上，同时测试抑制电压的峰值。 A nominal pulse current of 8/20μs waveform was applied to the varistor terminals and the clamping voltage peak was tested.
4	压敏电压 Varistor voltage	在误差范围内。 Within specified tolerance.	将压敏电阻器固定在不锈蚀的夹具上，按“规格表”规定的条件进行测试压敏电阻器引出端的电压。 The varistor is fixed on the fixture without rust, and the voltage of the varistor terminal is tested according to the conditions specified in the "Data sheet".
5	电容量 Capacitance	满足额定值 To meet the specified value.	在标准大气条件下，使用1kHz、1V的条件进行测量。 Measurement at 1kHz, 1V under standard atmospheric conditions
6	漏电流 Leakage current	满足额定值 To meet the specified value.	在25°C时施加75%的最大连续直流电压，测量其漏电流。 Apply a maximum continuous dc voltage of 75% to the varistor at 25°C and measure its leakage current.
7	电流冲击 稳定性 Impulse testing stability	重复脉冲 电流 Repetitive pulse current	试验过程中压敏电阻器应无击穿、闪络，外观不应有任何机械损伤 The varistor should have no breakdown or flashover during the test, and the appearance should not have any mechanical damage
		方波电流 Square wave current	冲击后，应在常温下恢复2h，测量压敏电压，其值相对于初始值的变化率应小于10% After the impulse, it should be stored at room temperature for 2 hours. Measure the varistor voltage. The rate of change should be less than 10% of the initial value.
8	最大脉冲电流 Max pulse current	在8/20μs波形下，对压敏电阻器施加10次重复脉冲电流，每个方向冲击各5次，相邻两次冲击的间隔为90s。 Under 8/20μs waveform, the varistor was subjected to 10 times of repetitive pulse current, and the impulses was 5 times in each direction. The interval between two adjacent impulses was 90 s.	对压敏电阻器施加1次方波电流冲击(2ms或者10/1000μs)的冲击，方向任意。 The varistor is subjected to a square wave current impulse (2ms or 10/1000μs), in any direction.
9	耐电压 Withstand voltage	在8/20μs波形下，对压敏电阻器施加1次最大脉冲电流冲击，方向任意。 Under 8/20μs waveform, the varistor is subjected to a max pulse current impulse, in any direction.	首先，将压敏电阻器的端子拧在一起，然后将金属箔包住压敏电阻器离端子3-4mm的本体，接着将压敏电阻器插入盛着直径为1mm的金属球的容器中，最后施加2500V的电压60秒种。 First, the terminals of the varistor should be connected together. Then, a metal foil should be closely wrapped around the body of the varistor to the distance of about 3 to 4mm from each terminal. Then, the varistor should be inserted into a container filled with metal balls of about 1mm diameter. Finally, 2500v voltage is applied for 60 sec. Between the varistor lead wires and metal balls.
10	最大能量 Maximum energy	试验过程中压敏电阻器无击穿、电弧、闪络等现象，外观不应有任何机械损伤 The varistor should have no breakdown, arcing or flashover during the test, and the appearance should not have any mechanical damage.	在10/1000μs电流波下，压敏电阻器能承受的最大能量。 The maximum energy that the varistor can absorb under the 10/1000μs current wave.

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APPROVAL SPECIFICATION FOR VARISTORS

续上表

Continued on the table

序号 No.	检验项目 Item	要求 Specification	试验方法 Testing method
11	冲击寿命 Impulse life	试验后压敏电阻器外观不应有任何机械损伤, 压敏电压变化率不应超过10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10%	常温下, 将指定的脉冲电流间隔10秒接通10000次, 在1小时至2小时时间段内测定其特性。 The change of varistor voltage shall be measured after the specified impulse current is applied 10000 times continuously with the interval of 10 seconds at room temperature.
12	额定功率 Rated power	满足额定值 To meet the specified value.	在环境温度25°C下施加连续脉冲电流时, 压敏电阻器可以耗散的最大平均功率。 Maximum allowable average power dissipation when subjected to the stress of successive impulses and at the temperature of 25°C.
13	压敏电压温度系数 Temperature coefficient of varistor voltage	满足额定值 To meet the specified value.	$\frac{V_{N2}-V_{N1}}{V_{N1}} \times 1/60 \times 100(\%/^{\circ}\text{C})$ 式中, V_{N1} 是25°C下的压敏电压值, V_{N2} 是85°C下的压敏电压值 Where V_{N1} is varistor voltage at 25°C and V_{N2} is varistor voltage at 85°C
14	导线抗张强度 Terminal tensile strength	导线无折断, 压敏电阻器无破损。 Lead wire should not be cut off. Varistor should not be broken.	固定压敏电阻器的本体, 使压敏电阻器每支导线均承受10N(1.0mm导线直径为20N)垂直力, 保持10±1秒钟。 Fix the body of the varistor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N (1.0mm lead wire diameter is 20N) and keep it for 10±1 s.
15	导线抗折强度 Terminal bending strength	导线无折断, 压敏电阻器无破损。 Lead wire should not be cut off. Varistor should not be broken.	压敏电阻器导线应承受5N(1.0mm导线直径为10N)重量, 然后向外弯折成90°, 然后回复到原来位置; 接着往反方向弯折90°, 再复原; 弯折一次2-3秒钟。 Each lead wire should be subjected to 5N (1.0mm lead wire diameter is 10N) weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then apply a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.
16	可焊性 Solderability of leads	导线必须有3/4以上的面积均匀附着焊锡。 Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.	将压敏电阻器的导线浸入焊料中2±0.5秒钟, 浸入深度离导线根部1.5-2.0mm。 The lead wire of a varistor should be dipped into molten solder for 2±0.5 s. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires. 焊锡温度: 无铅焊锡 (Sn-3Ag-0.5Cu) 245±5°C Temp. of solder: lead free solder (Sn-3Ag-0.5Cu) 245±5°C 易溶解的H63号锡 (Pb37/Sn63) 235±5°C H63 eutectic solder (Pb37/Sn63) 235±5°C
17	耐焊接热 Soldering effect	试验后压敏电阻器外观不应有任何机械损伤, 压敏电压变化率不应超过5% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 5%.	导线浸入离导线根部1.5-2.0mm处, 锡温为260±5°C锡槽中10±1秒。试验后, 压敏电阻器应在室温中恢复2小时。 The lead wires should be immersed in solder of 260±5°C up to 1.5 to 2.0mm from the root of terminal for 10±1.0 s. After the test, the varistor should recover at room temperature for 2h.
18	振动 Vibration resistance	试验后压敏电阻器外观不应有任何机械损伤, 压敏电压变化率不应超过5% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 5%.	将压敏电阻器导线焊稳和调整振动频率范围为10-55Hz、总振幅为1.5mm, 振动从10Hz到55Hz, 然后再回到10Hz, 大约一分钟。总时间六个小时, 每两小时在相互垂直方向来回三次。 The varistor should be firmly soldered to the supporting lead wire and vibrated at a frequency range of 10 to 55Hz, 1.5mm in total amplitude, with about a 1 minute rate of vibration change from 10Hz to 55Hz and back to 10Hz. Apply for a total of 6h., 2h each in 3 mutually perpendicular directions.

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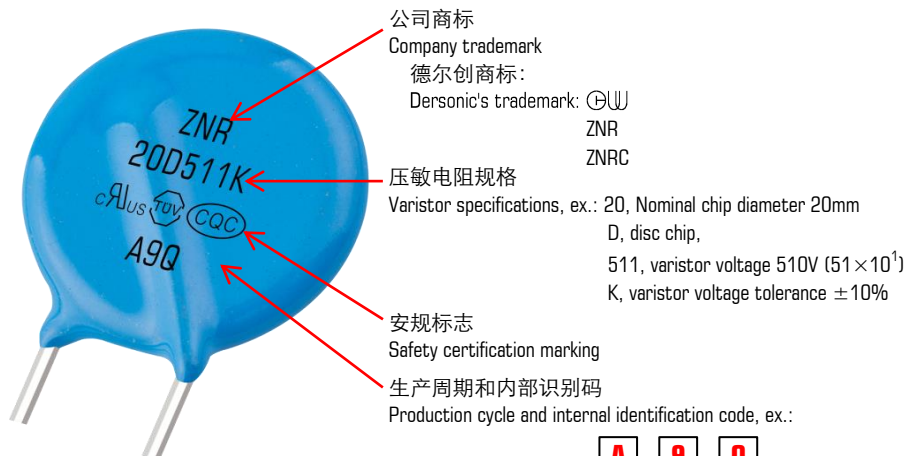
APPROVAL SPECIFICATION FOR VARISTORS

续上表
 Continued on the table

序号 No.	检验项目 Item	要求 Specification	试验方法 Testing method									
19	耐湿负荷 Humidity loading	试验后压敏电阻器外观不应有任何机械损伤, 压敏电压变化率不应超过10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10%.	压敏电阻器保持在温度为 $40\pm 2^{\circ}\text{C}$ 、相对湿度为90%-95%条件下施加最大连续交流电压 500 ± 12 小时。 Apply the max continuous operating ac voltage for 500 ± 12 h. At $40\pm 2^{\circ}\text{C}$ in 90% to 95% relative humidity. 试验结束后, 压敏电阻器应在室温下恢复2小时。 After the test, the varistor should recover at room temperature for 2h.									
20	高温负荷 High temperature loading	试验后压敏电阻器外观不应有任何机械损伤, 压敏电压变化率不应超过10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10%.	应给压敏电阻器施加最大连续交流电压, 储存最高工作温度下 1000 ± 12 小时。 The maximum continuous ac voltage should be applied to the varistor and stored at a maximum operating temperature of 1000 ± 12 h 试验结束后, 压敏电阻器应在室温下恢复2小时。 After the test, the varistor should recover at room temperature for 2 h.									
21	温度循环 Temperature cycle	试验后压敏电阻器外观不应有任何机械损伤, 压敏电压变化率不应超过10% After the test, the appearance of the varistor should not have any mechanical damage, and the varistor voltage change rate should not exceed 10%	温度循环试验按以下条件进行试验和测量 Temperature cycling shall be measured in the following test. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>$-40\pm 2^{\circ}\text{C}$</td> <td>30min</td> </tr> <tr> <td>2</td> <td>$+125\pm 2^{\circ}\text{C}$</td> <td>30min</td> </tr> </tbody> </table> 循环次数: 5次 Cycle numbers: 5 cycles 试验结束后, 压敏电阻器应在室温下恢复2小时。 After the test, the varistor should recover at room temperature for 2 h.	Step	Temperature	Time	1	$-40\pm 2^{\circ}\text{C}$	30min	2	$+125\pm 2^{\circ}\text{C}$	30min
Step	Temperature	Time										
1	$-40\pm 2^{\circ}\text{C}$	30min										
2	$+125\pm 2^{\circ}\text{C}$	30min										
22	阻燃性 Passive flammability	火焰撤去后30秒内, 燃烧应能自熄 The burning of the sample shall be self-extinguishing within 30 s after removing the needle flame.	按[IEC 60695-11-5]对MOV进行针状火焰试验。火焰施加部位为电阻体样品的侧面, 施加时间为5秒。 The MOV shall be subjected to the needle-flame test of [IEC 60695-11-5]. The needle-flame application shall be on the side surface of the samples for 5 s.									

8. 标志说明

MARKING DESCRIPTION



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9. 安全注意事项

SAFETY PRECAUTIONS

使用压敏电阻器时，压敏电阻器周围条件（设备设计中的材料、环境、电源条件、电路条件等）发生异常时，则可能引发火灾、触电、烧伤、以及产品故障。

In case that a varistor is used, if an abnormality takes place because of peripheral conditions of the varistor(material, environments, power source conditions, circuit conditions, etc. In equipment design), fire, electric shock, burn, or product failure may occur.

下列内容为使用时的相关注意事项，请认真确认后再行使用。如对未及事项有疑议，请速与我公司担当部门联系。

The precautions for this product are described below; understand the content thoroughly before usage. For more questions, contact us.

9.1. 严格遵守事项

Precautions to be strictly observed

9.1.1. 额定性能确认

Confirmation of performance ratings

请遵守压敏电阻器的最大连续工作电压，耐冲击电流、最大能量耐量、浪涌寿命、额定功率和操作温度范围等额定性能的规定，在规定范围内使用。

Use the varistor within its rated range of performance such as the maximum continuous operating voltage, withstanding surge current, maximum energy, impulse life, rated power and operating temperature range.

超出规定范围使用，则会造成压敏电阻器性能劣化，破坏元件，严重可引起压敏电阻器冒烟或起火。

If used outside the range, the varistor can be degrade and have element fracture, which may result in smoking and ignition.

9.1.2. 为避免意外现象发生，请采用如下对策

To avoid accidents due to unexpected phenomena, take the following measures

1) 压敏电阻器受损时，可能出现破碎飞散，因此要对集成产品加保护盖或外盒。

In the event of fracture of the varistor, its pieces may scatter; hence, put the case or cover of the set product in place.

2) 请勿安装在可燃物品（塑料电线、树脂合成物等）附近。若无法避免，请使用不燃性保护外壳。

Do not install the varistor near combustible substances (polyvinyl chloride wires, resin moldings, etc.). If it's difficult to do, install a nonflammable cover.

3) 线间使用

Across-the-line use

在线间使用时，将保险丝与压敏电阻器串联。

When the varistor is used across a line, put a current fuse in series with the varistor.

4) 线-地间使用

Use between line to ground

a) 在线-地间使用时，压敏电阻器短路时会产生接地电阻，电流保险丝不会熔断，可能引起压敏电阻器外涂层树脂冒烟或起火。
If the case that the varistor is used between a line to the ground, the short circuit of the varistor may not blow the current fuse because of grounding resistance, which may cause smoking and ignition of the varistors exterior resin.

为避免上述情况，请在电源端安装漏电断路器。如无漏电断路器，则需将电流保险丝与温度保险丝串联使用。

As the measure against it, install an earth leakage breaker on the power supply side of the varistor position. If no earth leakage breaker is installed, use a thermal fuse together with a current fuse in series.

b) 在带电部件与金属部件之间使用压敏电阻器时，压敏电阻器短路时有触电危险，故请将金属部件接地或勿与人体接触。

If the case that the varistor is used between a live parts to metal case, an electric shock may develop at a shortcircuit of the varistor; hence, ground the metal case to the ground or keep it from the human body.

9.2. 使用注意事项

Application notes

9.2.1. 注意下列事项，可能导致压敏电阻器寿命缩短或引发故障

Pay attention to the following items to avoid the shortened life and failure of the varistor.

1) 电路条件

Circuit conditions

a) 选定的压敏电阻器的电压最大值在最大连续工作电压值之上。

Select a varistor of which the maximum voltage including fluctuations in source voltage allows for the maximum permissible circuit voltage.

b) 短间隔性地施加浪涌时（施加抗干扰模拟试验电压时），不可超过压敏电阻器的额定功率。

In cases that surges are intermittently applied at short intervals (for example, in case that the voltage of the noise simulator test is implemented etc.),

c) 选定压敏电阻器时，须按照表1的标准产品型号

Select a varistor recommended in table 1.

① 线间使用

Across-the-line use

单相三线式连线时单独配线负荷导致负荷不平衡、电压线和中性线短路、中性线欠损、容量性负荷情况下开闭时的共振等，将导致电源电压的上升，可能使用表1中标有*的产品型号。

If possible, use a part no. Marked with * in case of voltage temporarily rises load unbalance of separately-wired loads, short between hot and neutral-line, open of neutral line in single-phase-three-wired system, and due to resonance at switching for a capacitive, inductive load.

② 线-地间使用

Used between line to ground

出现故障时，对地电压将上升，因此，请使用附表1中推荐的产品型号。

Use a different part no. From "across-the-line use" as table 1, because of raising voltage in case of "line to ground fault".

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编号DOC NO.: DEC-SA-WI007

版本REV.: B/0

日期DATE: 2021/3/17

页码PAGE: 13 / 15

表1 - 压敏电阻器的适用范例
Table 1 - example of varistor application

类别 Type	线间使用 Across-the-line use	线-地使用 Use between line to ground																																		
DC / AC单相 DC/AC single-phase 连线范例 Connections example AC三相 AC 3-phase																																				
压敏电阻 选型举例 Example of varistor	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>MOV</th> <th>电源电压 Source voltage</th> <th>压敏电阻 Varistor</th> </tr> </thead> <tbody> <tr> <td rowspan="2">MOV 1</td> <td>AC100V</td> <td>201 ~ 361 *</td> </tr> <tr> <td>AC120V</td> <td>241 ~ 431 *</td> </tr> <tr> <td rowspan="3">MOV 3</td> <td>AC200V</td> <td>431 ~ 561 *</td> </tr> <tr> <td>AC220V</td> <td>471 ~ 621 *</td> </tr> <tr> <td>AC240V</td> <td>511 ~ 621 *</td> </tr> <tr> <td></td> <td>AC380V</td> <td>821</td> </tr> </tbody> </table>	MOV	电源电压 Source voltage	压敏电阻 Varistor	MOV 1	AC100V	201 ~ 361 *	AC120V	241 ~ 431 *	MOV 3	AC200V	431 ~ 561 *	AC220V	471 ~ 621 *	AC240V	511 ~ 621 *		AC380V	821	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>MOV</th> <th>电源电压 Source voltage</th> <th>压敏电阻 Varistor</th> </tr> </thead> <tbody> <tr> <td rowspan="2">MOV 2</td> <td>AC100V</td> <td>471, 511, 621 *,</td> </tr> <tr> <td>AC220V</td> <td>821 **, 182 ***</td> </tr> <tr> <td rowspan="2">MOV 4</td> <td>AC230V</td> <td>511, 621 *,</td> </tr> <tr> <td>AC240V</td> <td>821 **, 182 ***</td> </tr> <tr> <td></td> <td>AC380V</td> <td>112 **, 182 ***</td> </tr> </tbody> </table>	MOV	电源电压 Source voltage	压敏电阻 Varistor	MOV 2	AC100V	471, 511, 621 *,	AC220V	821 **, 182 ***	MOV 4	AC230V	511, 621 *,	AC240V	821 **, 182 ***		AC380V	112 **, 182 ***
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MOV	电源电压 Source voltage	压敏电阻 Varistor																																		
MOV 2	AC100V	471, 511, 621 *,																																		
	AC220V	821 **, 182 ***																																		
MOV 4	AC230V	511, 621 *,																																		
	AC240V	821 **, 182 ***																																		
	AC380V	112 **, 182 ***																																		

进行设备的绝缘电阻试验 (DC500V) 时, 请使用表1中推荐的标有**的产品型号。使用不可清除绝缘性能试验的压敏电阻电压时, 在一定的电路条件下, 试验时可将压敏电阻器从电路上取下。

Use a varistor marked with ** in table 1, in case of the insulation resistance test (500Vdc) for equipment. When using a part of the varistor voltage that the insulation efficiency examination can not be cleared, there is a case where the varistor can be done by removing it from the circuit depending on the circuit condition.

进行设备的耐电压试验 (AC1000V或AC1200V) 时, 请使用表1中推荐的标有***的产品型号。

Use a varistor marked with *** in table 1, in case of the withstanding voltage test (1000Vac or 1200Vac) for equipment.

d) 关于电流保险丝

Concerning current fuse

① 所用压敏电阻器与电流保险丝的额定电流, 一般推荐按下表进行选定。此外, 在用户端, 当压敏电阻器损坏时, 确认其设备是否会发生2次伤害。

We recommend selecting a varistor and the rated current of a current fuse as follows. Finally, please be sure that there is no danger if the varistor mounted on the equipment breaks.

规格specs	05D	07D	10D	14D	20D
保险丝额定电压 Fuse rated current	≤2A	≤5A	≤5A	≤10A	≤10A

② 保险丝的插入部位建议按表1操作。

The recommended fuse position is shown in table 1.

e) 温度保险丝

Concerning thermal fuse

将压敏电阻器与温度保险丝连接时, 用户端请尽量选用热结合较好的保险丝。

Set a thermal fuse to get high thermal conductivity with varistor.

9.2.2. 使用环境

Operating environments

1) 压敏电阻器不可在室外使用。

The varistor is designed to be used indoors. Do not use it exposed outdoors.

2) 不可在阳光直射场所、发热源附近或温度超过使用温度范围的场所使用。

Do not use the varistor in places exposed to temperatures beyond the operating temperature range, such as places exposed to sunlight and vicinities of heating equipment.

压敏电阻器规格承认书

APPROVAL SPECIFICATION FOR VARISTORS

- 3) 不可在淋雨、蒸汽、高湿度的场所使用。
Do not use the varistor in places exposed to high temperatures and high humidity, such as places exposed directly to rain, wind, dew condensation, and
- 4) 不可在粉尘或盐分较多的场所以及被腐蚀性气体污染的环境中使用。
Do not use the varistor in dusty and salty places and atmospheres polluted by corrosive gases.

9.2.3. 加工条件

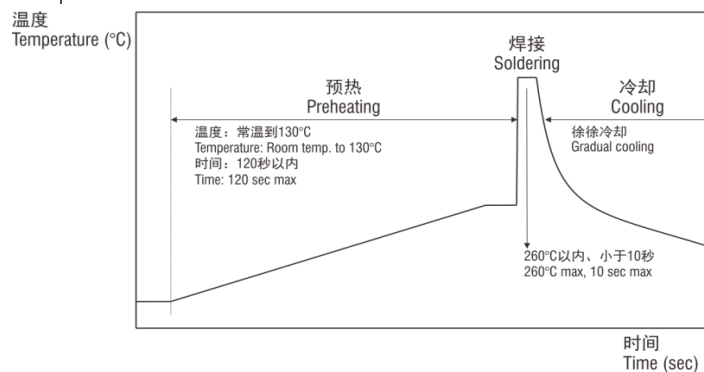
Processing conditions

- 1) 不可采用可能导致外涂层树脂劣化的溶剂（稀释剂、丙酮等）进行清洗。
Do not wash the varistor by such solvents (thinner, acetone, etc) as its exterior resin deteriorates.
- 2) 不可施加可能导致外涂层树脂或元件出现破损的冲击或撞击、压力。
Do not apply a strong vibration or shock (by falling, etc) to the varistor, cracking to its exterior resin and element may occur.
- 3) 将压敏电阻器进行树脂镀膜（含护膜塑模）时，不可使用可能导致压敏电阻器劣化的树脂。
When coating the varistor with resin (including molding), do not use such resin.
- 4) 压敏电阻器外涂层树脂附近的引线部位不可进行强烈折弯或施加外力。
Do not bend the varistor lead wires at the position close to its varistor exterior resin, or apply external force to the position.
- 5) 焊接时，请在如下条件下进行。且不可将构成压敏电阻器的焊接部位或绝缘材料熔化。
When soldering the varistor lead wires, follow the recommended conditions and do not melt the solder and insulating materials constituting the varistor.

焊接方式 Soldering method	推荐条件 Recommended condition	注意事项 Attention item
波峰焊 Flow soldering	260°C, 10秒以内 260°C, within 10 sec	引线型不是回流焊对象产品 Lead wires type is not reflow soldering object part.
上述以外的条件下使用时，请用户端自行确认。 For use other than the above conditions, please the client to confirm. 仅限进行1次返工，烙铁温度350°C以下，时间控制在5秒以内。 Only 1 times rework, soldering iron temperature should not exceed 350°C and should not be applied for more than 5 sec.		

■ 推荐焊接条件

Soldering temperature-time profile to recommend



9.2.4. 长期保管

Long-term storage

- 1) 压敏电阻器不可保存在高温、高湿场所。保存场所室温40°C以下，湿度75%RH以下，保存期限为1年。
Do not store the varistor under high temperature and high humidity. Store it at a temperature up to 40°C and at humidity below 75% RH, and use it within 1 year.
长期间保管（1年以上）时，使用时请确认产品的可焊性。
Before using the varistor that has been stored for a long period (1 years or longer), confirm the solderability.
- 2) 不可保存在腐蚀性气体（硫化氢、亚硫酸、氯气、氨气等）环境中。
Avoid atmospheres full of corrosive gases (hydrogen sulfide, sulfurous acid, chlorine, ammonia, etc).
- 3) 保存场所避免阳光直射、结露等。
Avoid direct sunlight and dew condensation.

9.3. 说明

Notices

用于可靠性要求极高的设备（航空航天设备、医疗设备等）时，请事先至本公司咨询使用型号和保护措施等相关事宜。

In cases that the varistor is used in equipment (aerospace equipment, medical equipment, etc) requiring extremely high reliability, ask us for a selection of part no., and protection coordination, etc in advance.

若未按照产品规格书记载事项进行操作，并由此导致出现异常时，本公司不负任何责任。

Note that we do not take any responsibility for faults and abnormalities resulting from the use not in conformity with the contents of entries in the delivery specification.

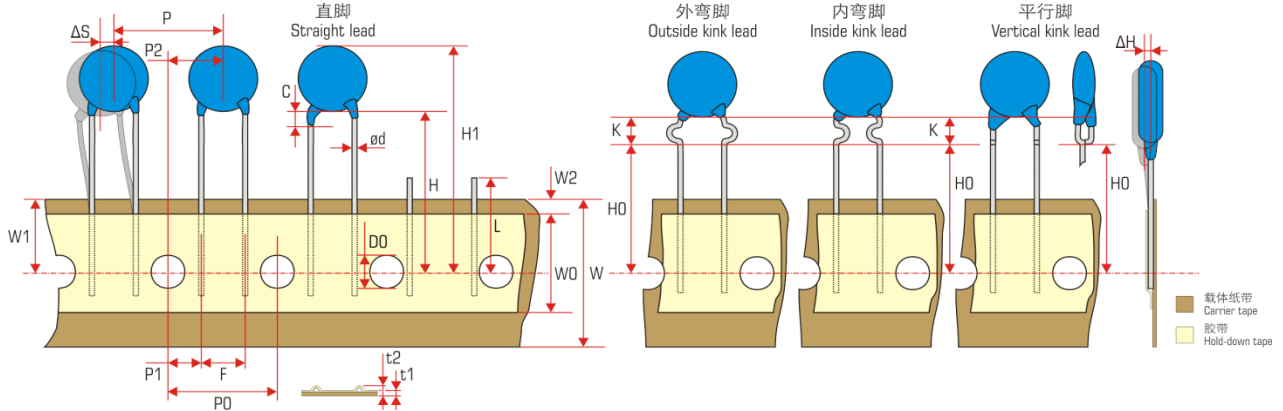
出现使用电路电压的异常上升、超高浪涌的侵入等不可预期因素时，可能导致压敏电阻器起火。为防止延烧到使用设备上，外部结构材料需使用阻燃材料进行多重保护。

There is a possibility that the varistor will unexpectedly cause smoke or ignite because of an abnormal rise of the circuit voltage and invasion of excessive surge. To prevent that accident from spreading over the equipment and not to expand the damage, use multiplex protection such as the adoption of flame-retardant materials for housing parts and structural parts.

10. 编带标准
TAPING SPECIFICATIONS

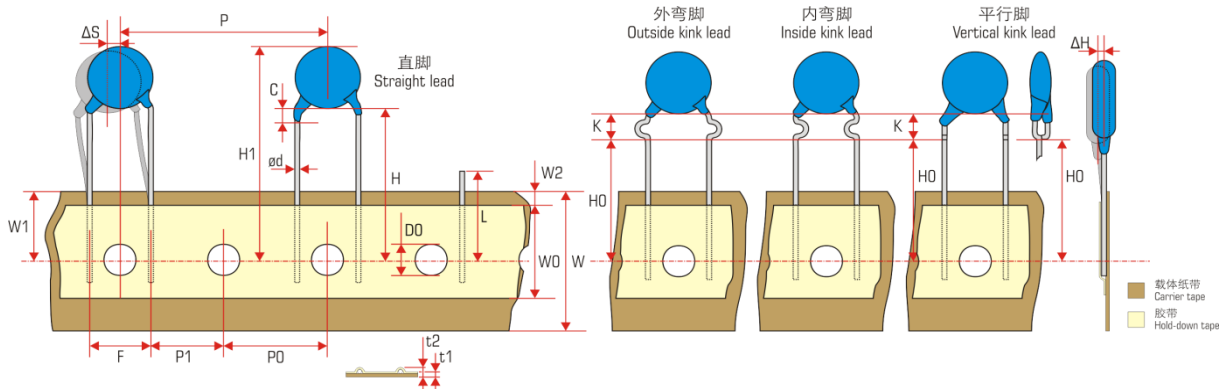
■ 方式一 Method 1

孔距(P0)与元件间距离(P)均为12.7mm
或者, 孔距(P0)与元件间距离(P)均为15.0mm
12.7mm by feed hole pitch (P0) and components pitch (P)
or, 15.0mm by feed hole pitch (P0) and components pitch (P)



■ 方式二 Method 2

孔距(P0)为12.7mm, 元件间距离(P)为25.4mm
Feed hole pitch (P0) with 12.7mm and components pitch (P) with 25.4mm



项目 Item	代码 Symbol	标准 Specifications		公差 Tolerance
		方式一 Method 1	方式二 Method 2	
弯脚架高 Height of kink	K	5.0	5.0	max
涂浆脚长度 Coating rundown on leads	C	3.0	3.0	max
剪切长度 Snipped length	L	11.0	11.0	max
编带总厚度 (含导线) Total tape, tape and lead wire	t2	1.7	1.7	max
编带厚度 Tape thickness	t1	0.9	0.9	max
进料孔直径 Feed hole diameter	D0	4.0	4.0	± 0.3
元件总高度 Component height	H1	40.0	40.0	max
元件到纸带中心的高度 Height of component from tape center	H0	16.0	16.0	± 0.5
弯脚类 Kink lead type	H	18.0	18.0	± 2.0
直脚类 Straight lead type	H	18.0	18.0	-0
胶带位置 Hold-down tape position	W2	3.0	3.0	max
孔位 Hole position	W1	9.0	9.0	$+0.75$ -0.5
胶带宽 Hold-down tape width	W0	7.0	7.0	min
纸带宽 Tape width	W	18.0	18.0	$+1.0$ -0.5
导线直径 Lead wire diameter	ϕd	0.7	0.7	± 0.1
进料孔与元件间距离 Lead wire to component center	P2	6.35	7.5	± 1.3
进料孔与导线间距离 Feed center to lead	P1	3.85	3.75	± 0.7
孔距 Feed hole pitch	P0	12.7	15.0	± 0.3
元件间距离 Component pitch	P	12.7	25.4	± 1.0
脚距 Lead to lead distance	F	5.0	7.5	± 0.8

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