# WPFxxAxxK-xx Series

Self Control Fuse

## 特征/Features

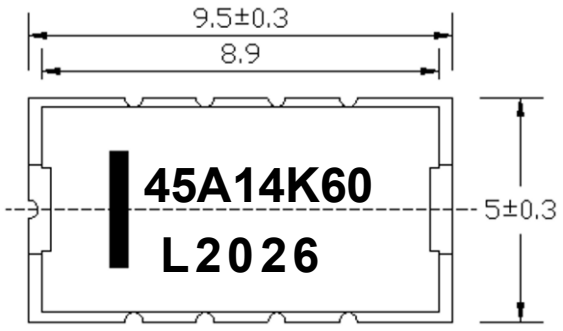
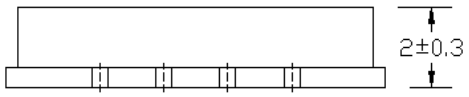
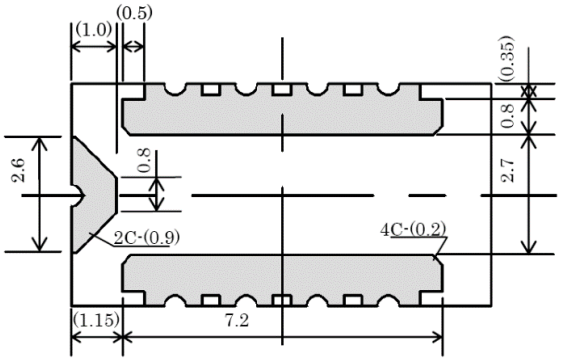
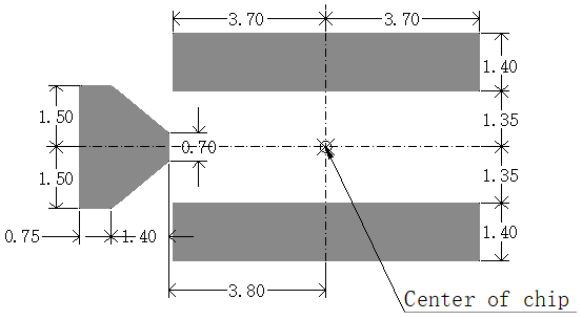



- 无卤 Halogen free
- SMD 电子器件/SMD Electronic devices
- 高结构强度/High structural intensity
- 过电流保护/Over current protection
- 过充电保护/Over charge protection
- 兼容回流焊接工艺/Compatible with reflow soldering processes
- UL: UL-248-1, UL-248-14…File Number: E311435
- TUV: EN60127-1, EN60127-4…File Number: J50552619

## 环境特性/Environmental Characteristics

| 本产品各材料中所含卤素的情况如下所示。<br>Contents of halogens used in each material for the product are as follows. | |
|---|---|
| 卤素物质<br>Halogen substance | 含量<br>Content |
| 氯<br>Chlorine（CL） | ≤ 900ppm (0.09%) |
| 溴<br>Bromine（Br） | ≤ 900ppm (0.09%) |
| 氯（Cl）+溴（Br）总浓度<br>Total concentration of chlorine (Cl) + bromine (Br) | ≤ 1500ppm (0.15%) |
| 本规格书所述产品符合 RoHS 指令的要求。BOM 表中包含高温合金、焊料及部分电子浆料（含铅），但均符合 RoHS 指令的相关规定。<br>The product described in this specification complies with the RoHS Directive. BOM table contains the high-temperature alloy, solder, some electronic slurry, including lead, but are in line with the relevant provisions of the RoHS directive. | |

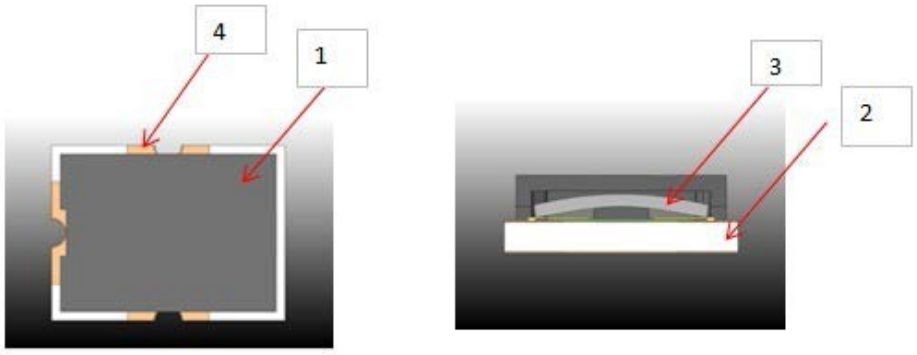
## ● 产品尺寸/Product size（mm）

| 正面/ Front | 侧面/ Side |
|---|---|
|  |  |
| **背面/ Back** | |
|  |  |



## ● 产品结构/Product Structure

结构图/Structure diagram

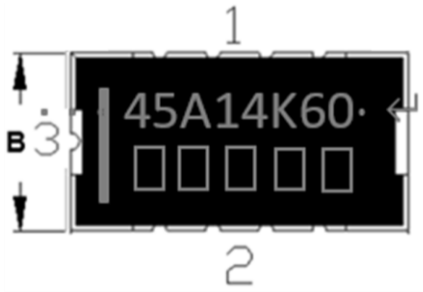


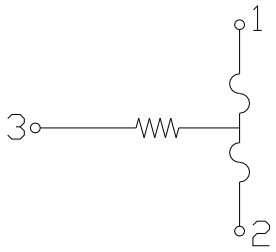

上表面/Top　　横断面/Cross section

注/Note：图中所示产品的顶盖不区分左右。/The top cover of the product shown in the figure does not distinguish between the right and the left

| No. | 名称/Name | 材料/Material |
|---|---|---|
| 1 | 上盖/Cap | LCP |
| 2 | 陶瓷基板/Ceramic | $Al_2O_3$ |
| 3 | 合金/Alloy | Sn/Pb/Ag |
| 4 | 端接电极/Termination electrode | Ag/Pd/Ni/Au |

电路结构图/Circuit structure diagram



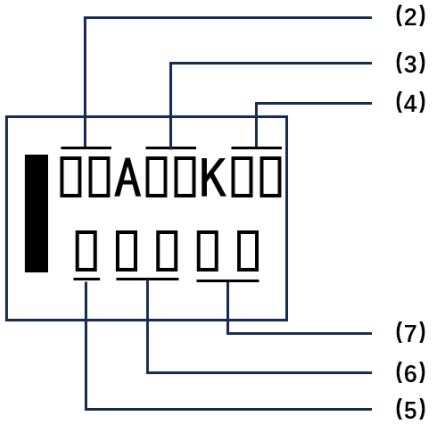




等效电路/Equivalent Circuit

## 标印说明/Marking requirements

标印说明/Marking requirements

WPF □□A□□K-□□
(1) (2) (3) (4)




（1）WPF：维安 SCF 产品系列代号/ SCF/Way-on SCF protector

（2）额定电流 Rated current;

（3）电芯串数/ Commercial Code;

（4）电压平台/ Voltage platform;

（5）年份/ Year: K: 2025；L: 2026；M: 2027；N: 2028；O: 2029……;

（6）一年中的第几周：Week of year: 01、02……52;

（7）运行编号: Running number: 01、02……;

## ● 电气特性/Specifications

| 料号 Part Number | 额定电流 Rated current | 额定电压 Rated voltage ★ | 工作电压 Operating Voltage | 控制电路最大电流 Control Circuit Rating | 保险丝内阻 Fuse DCR | 分断电流 Breaking capacity | 电池组串数 (选型参考) Cells in series (Selection Reference) | | 电压平台 Voltage Platform |
|---|---|---|---|---|---|---|---|---|---|
| | A | VDC | V | A | mΩ | A | NCM/NCA | LFP | V |
| WPF30A14K-18 | 30 | 80 | 12-27 | 7 | 1.0-2.5 | 80 | 5-6 | 6-7 | 18 |
| WPF30A14K-24 | 30 | 80 | 15-36.5 | 5 | 1.0-2.5 | 80 | 6-8 | 8-10 | 24 |
| WPF30A14K-36 | 30 | 80 | 20-54 | 4 | 1.0-2.5 | 80 | 8-12 | 10-14 | 36 |
| WPF30A14K-48 | 30 | 80 | 26-66 | 3 | 1.0-2.5 | 80 | 11-14 | 13-18 | 48 |
| WPF30A14K-60 | 30 | 80 | 34-77 | 3 | 1.0-2.5 | 80 | 14-17 | 17-21 | 60 |
| WPF30A14K-72 | 30 | 80 | 37.5-92 | 1 | 1.0-2.5 | 80 | 15-20 | 19-25 | 72 |
| WPF30A14K-84 | 30 | 80 | 50-110 | 1 | 1.0-2.5 | 80 | 20-24 | 25-30 | 84 |
| WPF30A14K-96 | 30 | 80 | 60-135 | 1 | 1.0-2.5 | 80 | 24-30 | 30-36 | 96 |
| | | | | | | | | | |
| WPF45A14K-12 | 45 | 120 | 10-18.25 | 10 | 0.5-1.5 | 120 | 4 | 5 | 12 |
| WPF45A14K-18 | 45 | 120 | 12-27 | 7 | 0.5-1.5 | 120 | 5-6 | 6-7 | 18 |
| WPF45A14K-24 | 45 | 120 | 15-33 | 5 | 0.5-1.5 | 120 | 6-7 | 8-9 | 24 |
| WPF45A14K-36 | 45 | 120 | 20-51 | 4 | 0.5-1.5 | 120 | 8-11 | 10-14 | 36 |
| WPF45A14K-48 | 45 | 120 | 30-63 | 3 | 0.5-1.5 | 120 | 12-14 | 15-17 | 48 |
| WPF45A14K-60 | 45 | 120 | 35-72 | 3 | 0.5-1.5 | 120 | 15-16 | 18-20 | 60 |
| WPF45A14K-72 | 45 | 120 | 40-90 | 2 | 0.5-1.5 | 120 | 17-20 | 21-24 | 72 |
| WPF45A14K-84 | 45 | 120 | 50-108 | 2 | 0.5-1.5 | 120 | 21-24 | 25-29 | 84 |
| WPF45A14K-96 | 45 | 120 | 60-132 | 1 | 0.5-1.5 | 120 | 24-29 | 30-36 | 96 |
| | | | | | | | | | |
| WPF60A14K-12 | 60 | 150 | 10-18.25 | 10 | 0.5-1.5 | 240 | 4 | 5 | 12 |
| WPF60A14K-18 | 60 | 150 | 12-27 | 7 | 0.5-1.5 | 240 | 5-6 | 6-7 | 18 |
| WPF60A14K-24 | 60 | 150 | 15-33 | 5 | 0.5-1.5 | 240 | 6-7 | 8-9 | 24 |
| WPF60A14K-36 | 60 | 150 | 20-51 | 4 | 0.5-1.5 | 240 | 8-11 | 10-14 | 36 |
| WPF60A14K-48 | 60 | 150 | 30-63 | 3 | 0.5-1.5 | 240 | 12-14 | 15-17 | 48 |
| WPF60A14K-60 | 60 | 150 | 35-72 | 3 | 0.5-1.5 | 240 | 15-16 | 18-20 | 60 |
| WPF60A14K-72 | 60 | 150 | 40-90 | 2 | 0.5-1.5 | 240 | 17-20 | 21-24 | 72 |
| WPF60A14K-84 | 60 | 150 | 50-108 | 2 | 0.5-1.5 | 240 | 21-24 | 25-29 | 84 |
| WPF60A14K-96 | 60 | 150 | 60-132 | 1 | 0.5-1.5 | 240 | 24-29 | 30-36 | 96 |

★额定电压是保险丝可以阻断的最大电压，而不是加热器组件的动作电压。

Rated voltage is the maximum voltage that the fuse can block, not the action voltage of the heater assembly.

## ● 熔断特性/ Clear-time characteristics

| 项目<br>Test Item | 条件<br>Condition of Test | 要求<br>Requirement at 25℃ |
|---|---|---|
| 电流承载能力<br>Carrying Capacity<br>(UL248-14) | 100%额定电流，4 小时<br>100% of rated current, 4hr | 不熔断<br>No Melting |
| 熔断特性<br>Fusing Time<br>(UL248-14) | 200%额定电流<br>200% rated Current | 1 分钟及以内保险丝熔断<br>≤1min |
| | 施加工作电压<br>In operation voltage range | |
| 脉冲能力测试<br>Pulse | P1-P2 施加 5 倍额定电流电流 5ms，断电 995ms，循环 100,000 次<br>5×In（In = rated current）A @ 25℃ @on 5ms/off 995 ms，100,000 cycles | 不熔断<br>No Melting |
| 短路耐受测试<br>Endurance Test | P1-P2 施加 1400 A 电流 500us，断电 60s，循环 50 次（如有特殊脉冲电流需求，可联系技术）<br>1400A power on 500us, power off 60s, 50 cycles<br>(For special pulse current requirements, contact Technical) | 不熔断<br>No Melting |

1. 工作温度范围：-20~85℃（1 分钟及以内保险丝熔断）。
   Operating temperature range: -20~85℃ (Fusing time≤1min).
2. 电气特性会因为基板热容量等条件的变化而发生特性变动，因此，您应该在 PCB 板上进行验证。
   Electrical Characteristics is influenced by thermal capacity of PCB, parts, pattern width, and so on. Therefore you should check it on your PCB.

## ● 测量一般条件/ Standard test condition

除特定条件外，测试环境按以下标准执行；

In the absence of additional test environmental standards, the test environmental standards are as follows;

环境温度/ Ambient temperature: 5 to 35℃;

相对湿度/ Relative humidity: 45 to 85%RH;

气压/ Air pressure: 86 to 106KPa.

若对测量结果有疑虑，按在以下条件进行测量；

If you have any questions about the test results, please follow the following environmental standards;

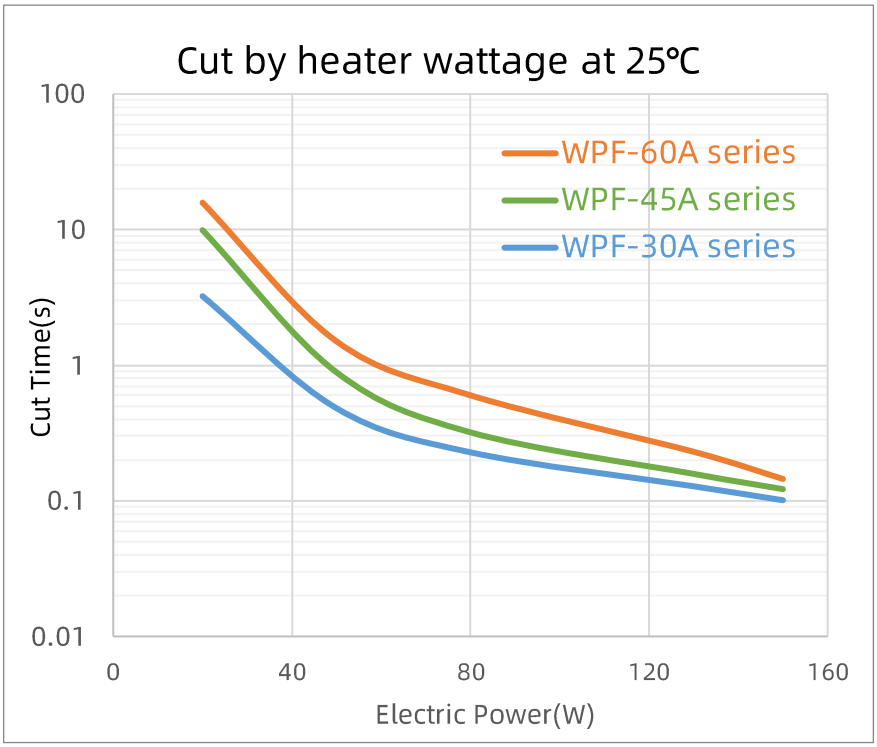
环境温度/ Ambient temperature: 20±2℃;

相对湿度/ Relative humidity: 60 to 70%RH;

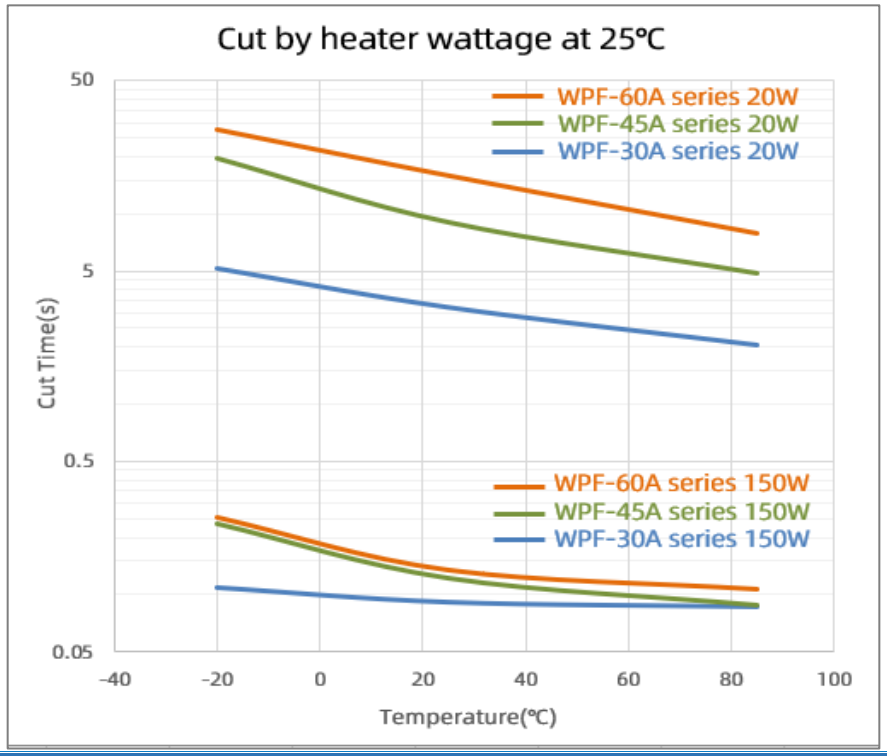
气压/ Air pressure: 86 to 106KPa.

## ● 典型性能数据/ Typical Performance Data

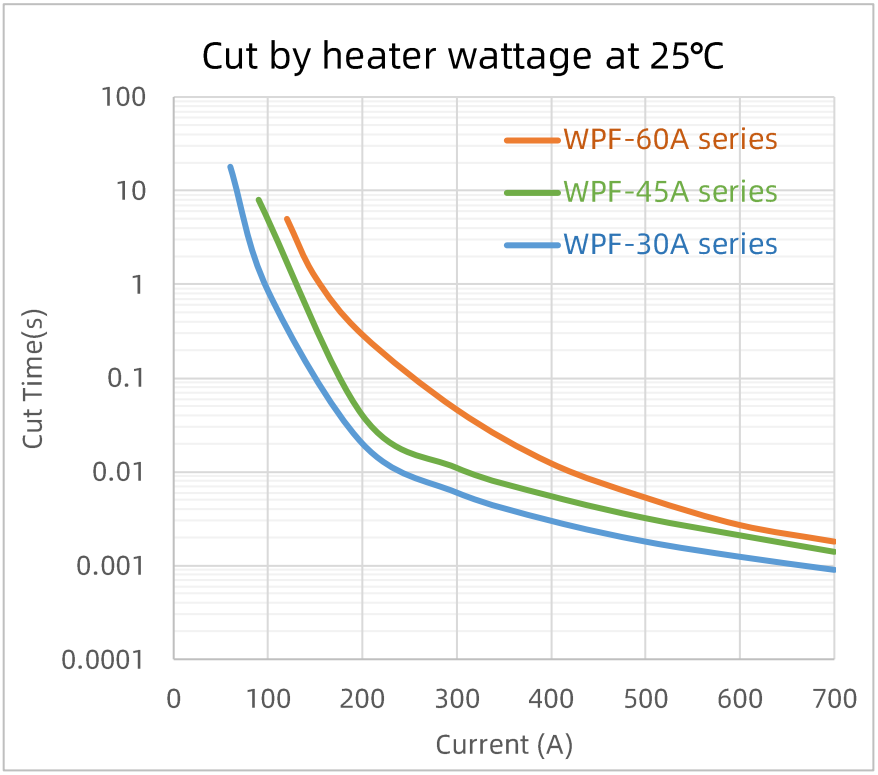
P-t curve



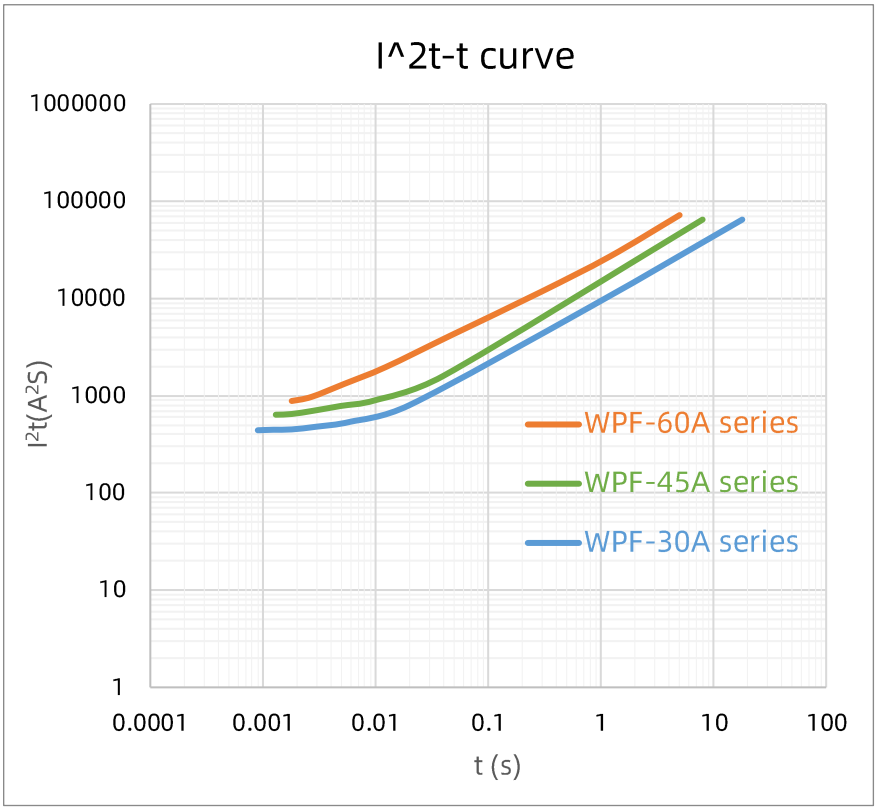
## T-t curve



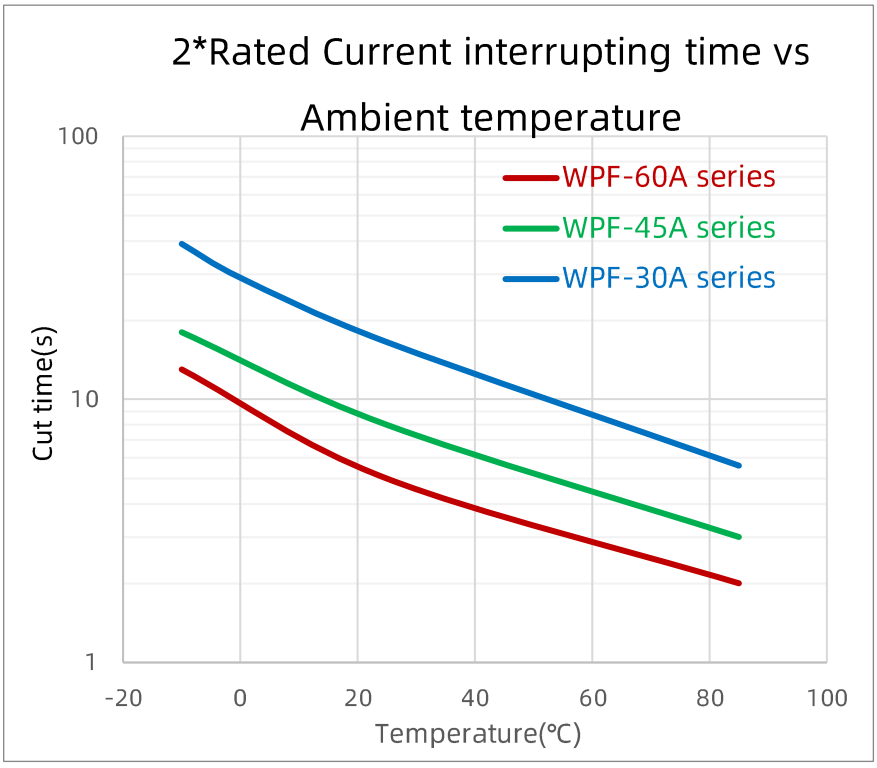

## I-t curve



## I²t-t curve




## I-T curve at different temperature



## ● 可靠性/ Reliability

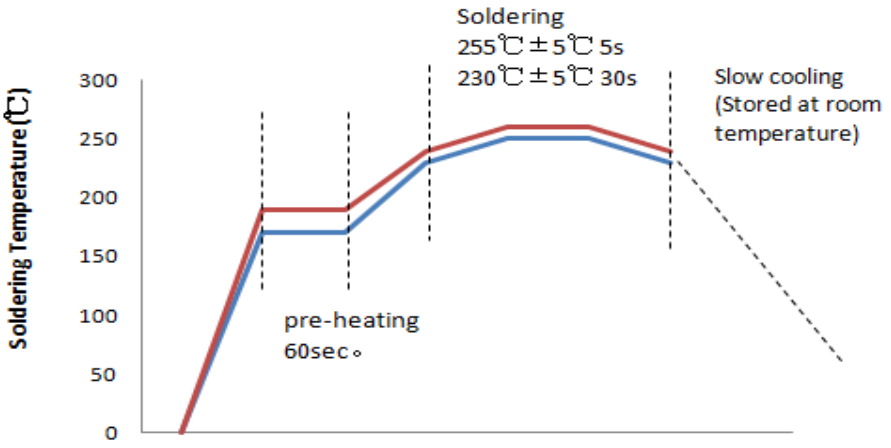
| 类型<br>Test Item | 项目<br>Project | 条件<br>Condition | 要求<br>Requirements |
|---|---|---|---|
| 电性能<br>Electrical performance | 过电压<br>Over voltage | 加电压后对发热体施加工作电压<br>Operating voltage shall be applied to heater | 熔断时间不超过 1 分钟<br>Fusing Time≤1min |
| | 绝缘<br>Insulation | @100VDC，在过电压工作电压测试后<br>@100VDC after OV operating voltage test | >0.2MΩ |
| | 耐电压<br>Withstand voltage | @100VAC，50-60Hz，60 秒，过电压工作电压测试后<br>@100VAC @50-60Hz@60s after OV operating voltage test | 无击穿<br>No breakdown |
| | 过电流<br>Over current | 额定电流的 200%<br>200% of Rated current | 熔断时间不超过 1 分钟<br>Fusing Time≤1min |
| | 承载能力<br>Carrying Capacity | 100% 额定电流，4 小时<br>100% of rated current, 4hr | 不溶断<br>No Melting |
| 耐久性能<br>Reliability performance | 高温存储<br>High temperature | 温度 100±5℃的环境中存储 250 小时。常温常湿条件 下放置 24 小时后再测试。<br>100℃±5℃@250hr | 元器件外观无变形或损坏，电气性能可满足要求。<br>Without deformation of case or excessive looseness of caps.<br>Electrical characteristics shall be satisfied. |
| | 高温高湿存储<br>High humidity | 温度为 60±2℃，湿度为 90~95%RH 的环境中存储 250 小时。常温常湿条件下放置 24 小时后再测试。<br>60℃±2℃@90%~95%@250hr | |
| | 低温存储<br>Keeping cold | 温度-20±3℃的环境中存储 50 小时。常温常湿条件下放置 24 小时后再测试。<br>-20℃±3℃@500hr | |
| | 脉冲能力测试<br>Pulse | 5 倍额定电流通电 5ms，995ms 切断，重复循环 10,000 次。<br>5×In（In = rated current）A @ 25℃ @ on 5ms/off 995 ms，100,000 cycles | No operating; |
| 安装特性<br>Mounting Characteristics | 可焊性<br>Solder ability | 焊锡：Sn96.5/Ag3/Cu0.5[%]<br>助焊剂：25wt%松香酒精溶液<br>浸渍深度：2～2.5mm<br>温度：245±5℃<br>浸渍时间：3±0.5sec<br>浸渍及拉高速度：25±2.5mm/sec<br>Solder: Pb-free (Sn96.5/Ag3/Cu0.5[%])<br>Flux: 25wt%Rosin Ethanol solution<br>Dipping depth: 2～2.5mm<br>Temperature: 245±5℃<br>Dipping time: 3±0.5s<br>Dipping and drawing speed: 25±2.5mm/s | 新的锡涂层将覆盖浸渍面积 95%以上。<br>A new uniform coating of solder shall cover a minimum of 95% of the surface being immersed. |
| | 耐焊接热<br>Resistance to soldering heat | ① 回流焊曲线<br>最高温度：255℃±5℃ 5sec 230℃±5℃ 30sec<br>温度为样品电极温度（焊接温度）。<br>样品将通过上述条件回流焊炉两次。<br>样品将存储于常温常湿条件下 24 小时后再进行测量。<br>Reflow soldering method | 外观无变形，电气性能可满足要求。<br>Without deformation of case or excessive looseness of caps. Electrical |

| | | | |
|---|---|---|---|
| | | Peak temp: 255℃±5℃ 5s 230℃±5℃ 30s<br>At electrode temperature of the specimen. (Solder temperature)<br>The specimen shall be passed through the reflow furnace with the condition shown in the above profile for 2 times.<br>The specimen shall be stored at standard atmospheric conditions for 24h after which the measurement shall be made.<br>② 烙铁焊接<br>开始温度：300±5℃<br>烙铁条件：3±1 sec<br>适用于焊电极<br>样品将存储于常温常湿条件下 24 小时后再进行测量。<br>Soldiering iron method<br>Bit temperature: 300±5℃<br>Application of soldering iron: 3±1s<br>Apply the soldering iron to the electrode.<br>The specimen shall be stored at standard atmospheric condition for 24h, after which the measurements shall be made. | characteristics shall be satisfied. |

电气特性会因为基板热容量等条件的变化而发生特性变动，因此，您应该在 PCB 板上进行验证。

Electrical Characteristics is influenced by thermal capacity of PCB, parts, pattern width, and so on. Therefore you should check it on your PCB.

## ● 推荐回流焊曲线/ Solder Reflow Recommendations



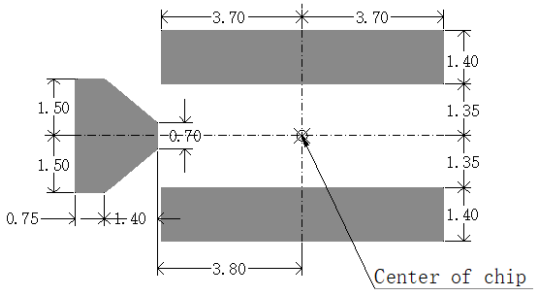

回流焊要求：

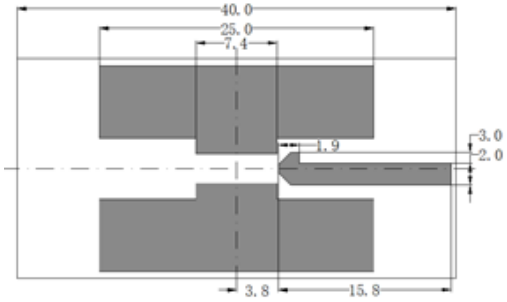
峰值温度：255℃±5℃ 5s，230℃±5 摄氏度 30s。试样最多可以通过 2 次回流焊。

Reflow soldering method:

Peak temp: 255℃±5℃ 5s, 230℃±5℃ 30s.The specimen shall be passed through the reflow furnace for 2 times.

## ● 推荐设计焊盘尺寸和测试板布局/ Recommended Solder Pad Dimensio




单位：毫米

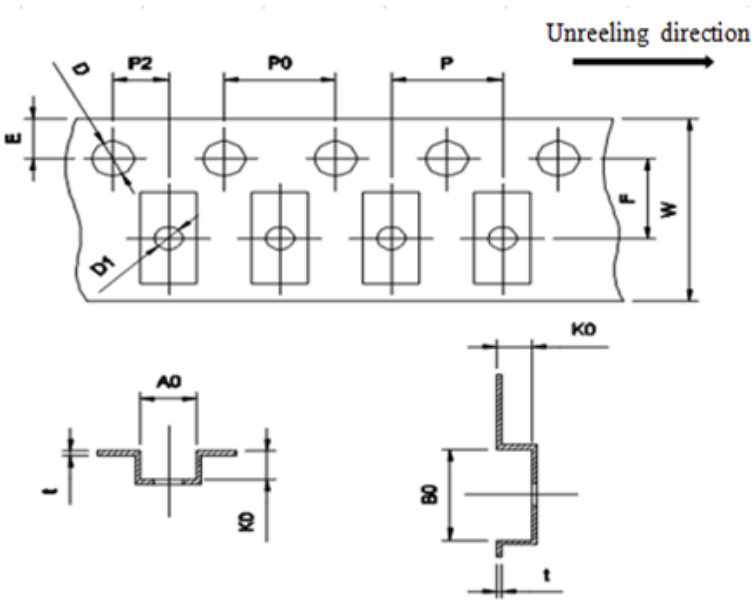
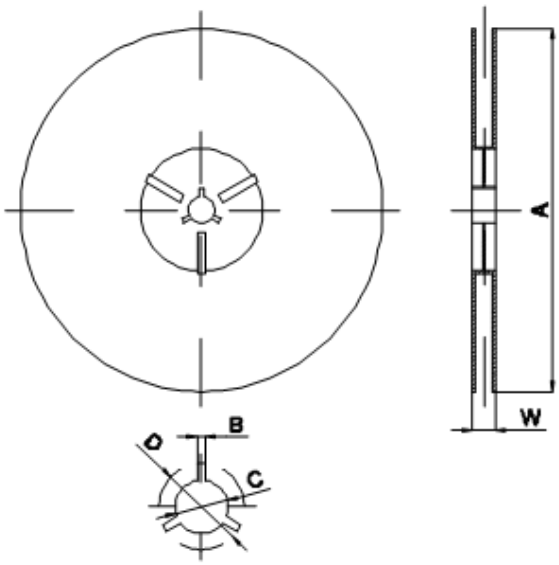
Unit: mm

| 类型<br>Type | 材料<br>Materials | 铜宽<br>Copper width A | 板厚<br>Base thickness | 覆铜厚度<br>Copper | 包线<br>Covered wires |
|---|---|---|---|---|---|
| 30A | FR-4 | 6mm | 0.6mm | 2.0OZ | AWG10 |
| 45A | FR-4 | 25mm | 0.6mm | 3.0OZ | AWG8 |
| 60A | FR-4 | 25mm | 0.6mm | 3.0OZ | AWG8 |

推荐锡膏钢网厚度：0.08~0.12mm。

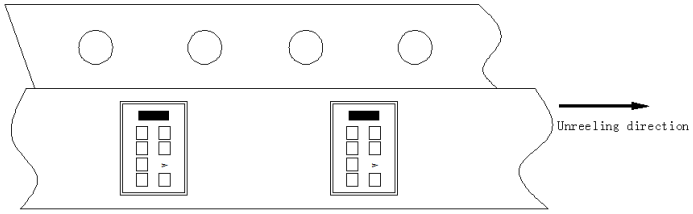
Recommended thickness of solder paste steel mesh: 0.08~0.12mm.

## ● 包装形式/Packaging Data

| 包装形式/Package | | |
|---|---|---|
| 卷带包装/ tape packing | | |
| 载带和卷盘尺寸/Dimension of Tape and Reels | | |
| 符号<br>Code | 单位<br>mm | |
| E | 1.75±0.10 |  |
| F | 7.50±0.10 | |
| P2 | 2.00±0.1 | |
| D | 1.50+0.1/-0 | |
| D1 | 1.50+0.1/-0 | |
| P0 | 4.00±0.10 | |
| 10P0 | 40.0±0.20 | |
| W | 16.00±0.30 | |
| P | 8.00±0.10 | |
| A0 | 5.30±0.10 | |
| B0 | 9.8±0.10 | |
| K0 | 2.3±0.10 | |
| t | 0.30±0.05 | |
| A | 330±1.0 |  |
| B | 2+0.5/-0 | |
| C | 13±0.2 | |
| D | 21±0.2 | |
| W | 22.7±0.5 | |
| 包装数量/Packing Quantity | | |
| 3000个/卷。 3000 pcs /reel. | | |

## 卷带方向/Direction of Taping

方向应该从卷带上盖侧面看/ The direction shall be seen from the top cover tape side.




## 标签/Label (example)

标签包含以下内容/ The label contains the following content:

（1）商标制造商和工厂地址/ manufacturer of trademark and factory address,

（2）产品类型/ product type,

（3）产品批号/ product batch number,

（4）数量/ quantity,

（5）装运检验人员质量代码/ shipment inspection personnel quality code,

（6）装运日期/ date of shipment,

（7）认证标志/ the certification mark.



## ● 存储条件/Storage

- 产品必须储存在纸箱或塑料袋中，环境温度为-10℃至 40℃，相对湿度小于 60%，无剧烈温度变化，无阳光直射，无过度 振动和冲击。
  The product must be stored in carton or plastic bag, in the conditions of ambient temperature of -10℃ to 40℃, RH of less than 60%, no radical temperature change, no direct sunshine, excessive vibration and shock.
- 上述条件下的最长储存期为交货日期后 3 个月。
  The preservation period when it is kept on the above condition is 3 months.
- 应避免储存在可能产生腐蚀性气体的地方，如盐雾、氯、硫化氢、铵、硫化物氧化、氯化氢等。
  Should avoid to store at where there is possibility of generating corrosive gas, such as salt mist, chlorine, hydrogen sulfide, ammonium, sulfide-oxidation, hydrogen chloride, etc.

## ● 使用注意事项/Cautions

(1) 发热体的载流能力会受到测试板的热容量及相关特性的影响。因此，在使用前应当在所用的测试板上进行确认。一般来说，测试板的热容量越大，动作时间就越长。
Can predict, the heat capacity of the test board current carrying capacity of a heater to work with the use of the relevant characteristics, therefore, before use to check the test board PCB you use, generally PCB plate heat capacity is bigger, the longer the action.

(2) 此规格书中的数据测试于 UL 标准 PCB 测量（0.6t 玻纤环氧铜箔基材）。产品特性会受到 PCB 热容量的影响，建议在贵司实际 PCB 上进行检验。
The data referred to in this specification are tested under the PCB standard of UL (0.6t Glass Epoxy single-sided copper laminated), The characteristics influenced thermal capacity of PCB, it is recommended checking it on actual PCB.

(3) 本产品实装前后，如果进行清洁（超声波或者清洁剂），保险丝表面的助焊剂会流失，从而出现无法满足规格的情况。如果本产品接触到清洁剂，也有可能发生同样的情况。因此，请避免对本产品进行清洗。也请注意如果对本产品进行了清洗，我们将不提供品质保证。
Ultrasonic-cleaning or immersion-cleaning and so on must not be done to Self Control Fuse before and after mounted. When cleaning is done, flux on element would flow, and it would not be satisfied its specification. Moreover, a similar influence happens when the product comes in contact with cleaning-solution. These products after cleaning will not be guaranteed.

(4) 本产品不能胶水或树脂内包覆，胶水或树脂可能会流入产品内部，导致不满足规格。请勿胶水覆盖使用。也请注意，进行了树脂封装的产品，我们将不提供品质保证。
This product can not be used in resin packaging, packaging process of resin into the product, resulting in poor product performance. These products after resin-mold will not be guaranteed.

| |
|---|
| (5) 已贴装使用取下来后的产品，请勿二次焊接使用。<br>Please do not re-use of the product removed by the solder correction. |
| (6) 请务必确认与三端保险丝电路板的连接方式：其中引脚 1-3 和 2-3 作为具有高阻抗的发热端使用。<br>Please confirm the connection with the three terminal circuit board, where in 1-3, 2-3 is used as a heating end with high resistance. |
| (7) 本产品是在常规电子设备中设计和使用的，因此我们不建议在军事、医疗等领域使用可能对其他人员和财产造成直接损害的产品。<br>This product is designed and used in conventional electronic devices, so we do not recommend the use of military, medical and other areas of other people and property may cause direct damage. |
| (8) 如果本书内容有任何疑问或更改，请提前通知我们，以便双方达成一致。<br>If there is any doubt or change in the contents of this book, please inform us in advance so that both parties can reach an agreement. |

## Contact Information

No.1001, Shiwan (7) Road, Pudong District, Shanghai, P.R.China.201207
Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com
WAYON website: http://www.way-on.com
For additional information, please contact your local Sales Representative.
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## Product Specification Statement

1.The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.

2.The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. WAYON shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and WAYON assumes no responsibility for the application of the product.

3.WAYON strives to provide accurate and up-to-date information to the best of our ability. However, due to technical, human, or other reasons, WAYON cannot guarantee that the information provided in the product specification is entirely accurate and error-free. WAYON shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications. WAYON reserves the right to revise or update the product specification and the products at any time without prior notice, and the user's continued use of the product specification is considered an acceptance of these revisions and updates. Prior to purchasing and using the product, users should verify the above information with WAYON to ensure that the product specification is the most current, effective, and complete. If users are particularly concerned about product parameters, please consult WAYON in detail or request relevant product test reports. Any data not explicitly mentioned in the product specification shall be subject to separate agreement.

4.Users are advised to pay attention to the parameter limit values specified in the product specification and maintain a certain margin in design or application to ensure that the product does not exceed the parameter limit values defined in the product specification. This precaution should be taken to avoid exceeding one or more of the limit values, which may result in permanent irreversible damage to the product, ultimately affecting the quality and reliability of the system or equipment.

5.The design of the product is intended to meet civilian needs and is not guaranteed for use in harsh environments or precision equipment. It is not recommended for use in systems or equipment such as medical devices, aircraft, nuclear power, and similar systems, where failures in these systems or equipment could reasonably be expected to result in personal injury. WAYON shall assume no responsibility for any consequences resulting from such usage.

6.Users should also comply with relevant laws, regulations, policies, and standards when using the product specification. Users are responsible for the risks and liabilities arising from the use of the product specification and must ensure that it is not used for illegal purposes. Additionally, users should respect the intellectual property rights related to the product specification and refrain from infringing upon any third-party legal rights. WAYON shall assume no responsibility for any disputes or controversies arising from the above-mentioned issues in any form.