



承 认 书

APPROVAL SHEET

客户名称: _____

CUSTOMER _____

品 名: _____ 片式型钽电解电容器

PARTNAME _____

规 格: _____

SPECIFICATION _____

版 本 号: _____ HUA2002—02

VERSION _____

日 期: _____

DATE _____

| | | | | | |
|----------|----|----|----------|----|----|
| 制 造 | | | 客 户 | | |
| APPROVAL | | | APPROVAL | | |
| 拟制 | 审核 | 确认 | 检验 | 审核 | 批准 |
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1.0 概述

本产品是烧结阳极、树脂包封固体电解质钽电容器。它具有体积小，容量大、漏电流小、损耗角正切值小、可靠性高、外形多样的特点。

- 1.1 电容器通常由用作导电的两片金属极板组成，两片极板中间隔着一层绝缘材料或电介质。在所有的钽电解电容器中，都用五氧化二钽作为电介质，五氧化二钽膜具有很高的绝缘强度和介电常数。由于五氧化二钽膜介电常数大，再加上它的厚度极小，使得钽电容器单位体积内所具有的电容量特别大，适宜于小型化。
- 1.2 固体钽电容器具有极性，如果两极接反，会造成永久失效。在片式钽电容器上，正极用深颜色的长条来标识。
- 1.3 如果正向直流电压、反向直流电压、浪涌电压、功率耗散或温度超过额定条件，会造成电容器失效。

■ Summary

Economy and high performance are combined in the Series CA42 resin-coated, radial-lead, solid electrolyte tantalum capacitor. Solid electrolyte tantalum capacitors have excellent performance. They are small volumes, large capacitance, low leakage current, low dissipation factor and various kind of shape.

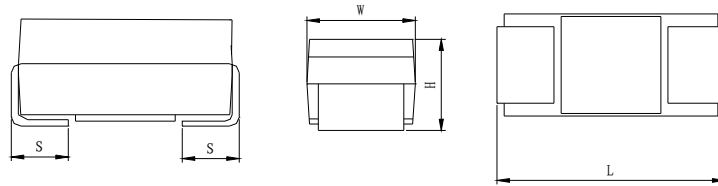
- 1.1 Capacitor consist of two conducting surfaces, usually metal plate, whose function is to conduct electricity. An insulating material or dielectric separates them. The dielectric used in all tantalum electrolytic capacitors is tantalum oxide. Tantalum oxide compound possesses high dielectric strength and a high dielectric constant. The film is applied in various thick and at various voltages. Because tantalum oxide have a high dielectric constant, in addition to the fact that extremely thin films can be deposited during the electrolytic process mentioned earlier, makes the tantalum capacitor extremely efficient with respect to the number of microfarads available per unit volume.
- 1.2 The solid tantalum capacitors are polarized devices and may be permanently damaged or destroyed if connected with the wrong polarity. The positive terminal is identified on the capacitor body by a stripe and a beveled edge. The capacitors should not be operated



continuously in reverse mode. If two of these polar capacitors are connected “back-to-back”, the pair may be used in AC applications.

1.3 Capacitor failure may be induced by exceeding the rated conditions of forward DC voltage, reverse DC voltage, surge current, power dissipation, or temperature.

2.0 结构及尺寸 Structure And Dimensions

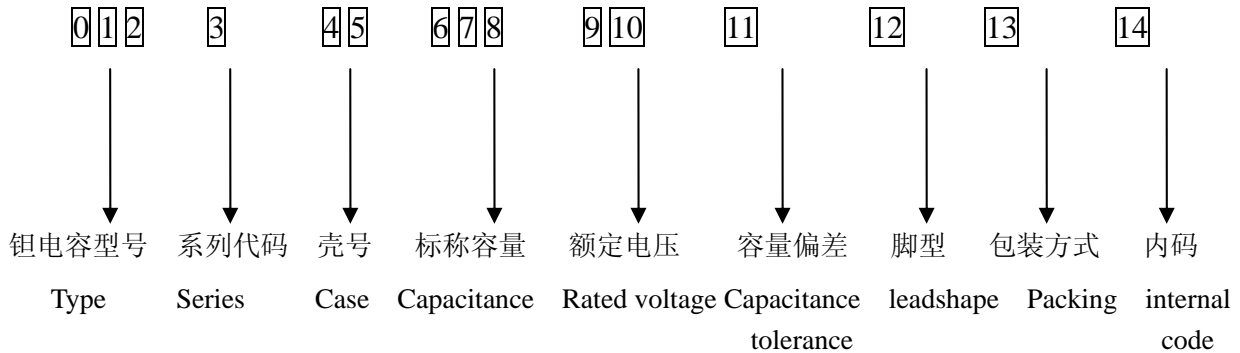


单位: mm

| 壳号 Case size | $L \pm 0.3$ | $W \pm 0.3$ | $H \pm 0.3$ | $S \pm 0.3$ |
|-----------------|-------------|-------------|-------------|-------------|
| P | 3.2 | 1.6 | 1.2 | 0.8 |
| A | 3.2 | 1.6 | 1.6 | 0.8 |
| B | 3.5 | 2.8 | 1.9 | 0.8 |
| C | 6.0 | 3.2 | 2.5 | 1.3 |
| D | 7.3 | 4.3 | 2.8 | 1.3 |
| E | 7.3 | 4.3 | 4.0 | 1.3 |



3.0 型号规格表示方法 How To Order



3.1 **012** : 表示钽电容型号 Type

T 4 2 : 引线钽电容 High performance to standard for general

T 4 5 : 片式钽电容 Molded chip solid tantalum electrolytic capacitor

3.2 **3** : 表示系列代码 Series code

| 代码 Code | 系 列 Series |
|---------|----------------------|
| 0 | 标准型 general purposes |
| 1 | 低阻型 low impedance |

3.3 **45** : 表示外形尺寸 Shape and dimensions

| 代 码 Code | 尺 寸 Size (max) | 代 码 Code | 尺 寸 Size (max) |
|----------|-----------------|----------|-----------------|
| A1 | 3.2×1.6×1.6 | D1 | 7.3×4.3×2.8 |
| B1 | 3.5×2.8×1.9 | E1 | 7.3×4.3×4.0 |
| C1 | 6.0×3.2×2.5 | | |

3.4 **678** : 表示标称容量 (C) Rated capacitance



| 标称容量 (μF) Rated capacitance | 代 码 Code | 标称容量 (μF) Rated capacitance | 代 码 Code |
|--------------------------------|-------------|--------------------------------|-------------|
| 0.1 | 104 | 6.8 | 685 |
| 0.15 | 154 | 10 | 106 |
| 0.22 | 224 | 15 | 156 |
| 0.33 | 334 | 22 | 226 |
| 0.47 | 474 | 33 | 336 |
| 0.68 | 684 | 47 | 476 |
| 1 | 105 | 68 | 686 |
| 1.5 | 155 | 100 | 107 |
| 2.2 | 225 | 150 | 157 |
| 3.3 | 335 | 220 | 227 |
| 4.7 | 475 | 330 | 337 |
| | | 470 | 477 |

3.5 **9****10** : 表示额定工作电压 (wv) Rated working voltage

| 电压 Voltage | 代码 Code | 电压 Voltage | 代码 Code |
|------------|---------|------------|---------|
| 4 | 0G | 25 | 1E |
| 6.3 | 0J | 35 | 1V |
| 10 | 1A | 50 | 1H |
| 16 | 1C | | |

3.6 **11** : 表示容量偏差 Capacitance tolerance

| 代码 Code | 公差 Tolerance | 代码 Code | 公差 Tolerance |
|------------|-----------------|------------|-----------------|
| J | ±5% | Q | -10~+30% |
| K | ±10% | T | -10~+50% |
| M | ±20% | Z | -20~+80% |
| V | -10~+20% | A | 特殊 Special |

3.7 **12** : A 表示产品脚型 Identification of lead configurations

3.8 **13** : 表示包装方式

| 代 码 Code | 包 装 方 式 |
|-------------|-----------|
| B | 散装 Bulk |
| P | 编带 Taping |



3.9 14 : 表示内部识别码 Internal code

1 : 标准品 Standard

2 : 特殊品 Special grade

4.0 电容性能 Performance Specification

| 项 目 Item | 主 要 特 性 Performance Characteristics | |
|--|---|---|
| 使用温度范围 Operating Temperature Range | -55~+125℃ (>85℃时降额使用) -55~+125℃ (applied rating voltage at greater than 85℃) | |
| 标称容量偏差 Capacitance tolerance | ±10% (K), ±20% (M) at 120Hz +25℃ | |
| 额定工作电压 Rated voltage | 4V~50V | |
| 降额电压 (125℃) 125℃ Derated voltage(V) | 见表一 To table 1 | |
| 漏 电 流 (25℃) Leakage current (25℃) | <ul style="list-style-type: none"> • 施加额定工作电压 1 分钟: $I \leq 0.01C_R U_R \mu A$ 或 $0.5 \mu A$ 取较大值。 • After 1minute's application of rated voltage, leakage current at 25℃ is not more than $0.01C_R U_R \mu A$ or $0.5 \mu A$., whichever is greater. | |
| 损耗角正切值(tg δ) Dissipation Factor | 测试频率 100Hz Test frequency 100Hz 0.1~1 μF 4% Max、1.5~68 μF 6% Max 100 uF~150 μF 8% Max、220 μF ~ 18% Max | |
| 特殊规格损耗角正切值(tg δ) In special | 测试频率 100Hz Test frequency 100Hz 10V 22 μF A 壳为 8%、6.3V 47 μF A 壳为 10%、 16V 10 μF A 壳为 8%、25V 10 μF B 壳为 10%、 6.3V 68 μF B 壳为 10%、6.3V 100 μF B 壳为 15%、 10V 33 μF B 壳为 8%、10V 47 μF B 壳为 10%、 16V 22 μF B 壳为 8%、16V 47 μF C 壳为 8%、 16V 100 μF C 壳为 12%、16V 100 μF D 壳为 12% | |
| 浪涌电压(85℃) 85℃ Surge voltage(V) | 在 85℃环境中, 电容器接 33Ω 电阻, 加上浪涌电压(见表一), 以 30 秒开, 30 秒关为一个周期, 共经 1000 个周期实验后, 电容器的性能符合下列要求: After application of surge voltage (table 1) in series with a 33 Ω resistor in 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85℃, capacitors meet the characteristics requirements listed below. | |
| | 标称容量变化 Capacitance Change | 初始值的±5%以内 Within ±5% of initial value |
| | 损耗角正切值 Dissipation Factor | 不大于初始规定值 Initial specified value or less |
| | 漏电流 Leakage Current | 不大于初始规定值 Initial specified value or less |



5.0 可靠性 Reliability Data

| 项 目 Item | 主 要 特 性 Performance Characteristics | |
|--|--|---|
| 耐焊热接性 Resistance to Soldering Heat | 将电容器完全浸入 260±5℃的锡液中持续 5±0.5 秒后，电容器的性能符合下列要求： After immersing the capacitors completely for 5±0.5sec at 260±5℃,capacitors meet the characteristic requirements listed below. | |
| | 标称容量变化 Capacitance Change | 初始值的±3%以内 Within±3% of initial value |
| | 损耗角正切值 Dissipation Factor | 不大于初始规定值 Initial specified value or less |
| | 漏电流 Leakage Current | 不大于初始规定值 Initial specified value or less |
| 可焊性 Solder ability | 将端头 3/4 浸入 230±5℃锡液，3±0.5 秒，获得光亮、平滑的锡层。 Dipping 3/4 of the termination into the solder (230±5℃) for 3±0.5 sec to get a fresh and smooth surface. | |
| 耐湿性 Humidity Resistance | 在 40℃，相对湿度为 90~95% R.H.，经过 500 小时后（不充电压），电容器的性能符合下列要求： At 40℃, 90~95%R.H., For 500hours (No voltage applied). | |
| | 标称容量变化 Capacitance Change | 初始值的±12%以内 Within±12% of initial value |
| | 损耗角正切值 Dissipation Factor | 不大于初始规定值 Initial specified value or less |
| | 漏电流 Leakage Current | 不大于初始规定值 Initial specified value or less |
| 高温负荷特性 Load Life | 电容器接上 3Ω 电阻，在+85℃环境中施加额定工作电压 2000 小时后，或者在+125℃环境中施加降额工作电压 2000 小时后，电容器的性能符合下列要求： After 2000 hour's application of rated voltage in series with a 3Ω resistor at +85℃ or rated voltage in series with a 3Ω resistor at 125℃, capacitance meet the characteristics requirements listed below. | |
| | 标称容量变化 Capacitance Change | 初始值的±10%以内 Within±10% of initial value |
| | 损耗角正切值 Dissipation Factor | 不大于初始规定值 Initial specified value or less |
| | 漏电流 Leakage Current | 不大于初始规定值 Initial specified value or less |



| 项 目 Item | 主 要 特 性 Performance Characteristics |
|--------------------------------|---|
| 附着力测试 Shear test | <p>将产品焊在铝基板上，朝电容侧面无电极边中心位置水平施加 5N 的压力并保持 10 ± 1 秒，产品端子应无被剥离、刮伤等现象。</p> <p>After applying the pressure load of 5N for 10 ± 1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on an aluminum substrate. Neither exfoliation nor its sign shall be found at the terminal electrode.</p> |
| 端面镀层的结合强度 Terminal strength | <p>将电容表面安装于倒置的基板上，并使基板的两个支撑点离电容中心 45mm，用一个模具朝基板中心施加一个压力，使该基板弯曲 1mm，电容端子应无明显异常。</p> <p>Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of the capacitor, the pressure load is applied with a specified at the center of the substrate so the substrate may bend by 1mm . Then, there shall be found no remarkable abnormality on the capacitor terminals.</p> |

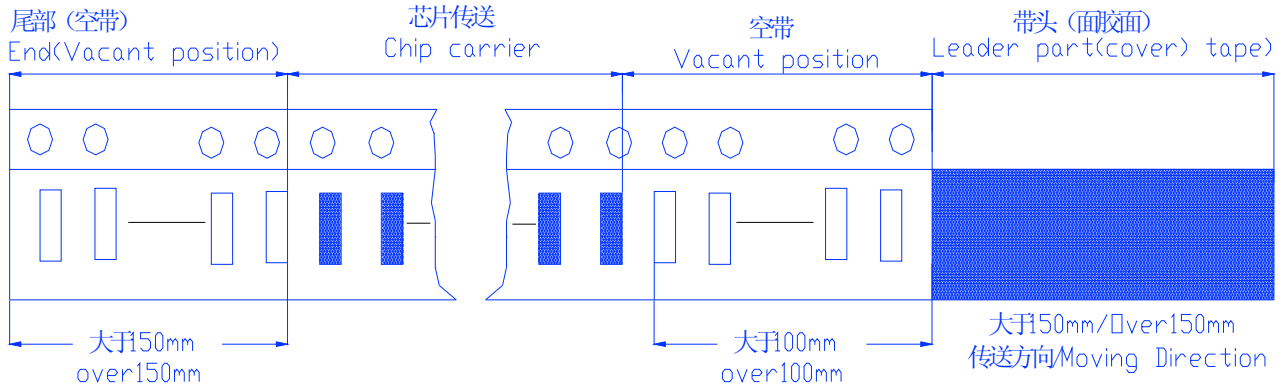
表 1 Table 1

| 额定工作电压 (V) Rated voltage (V) | 浪涌电压 (85℃) 85℃ Surge voltage (V) | 降额电压 (125℃) 125℃ Rated voltage (V) |
|---------------------------------|--|---------------------------------------|
| 4 | 5.2 | 2.5 |
| 6.3 | 8 | 4 |
| 10 | 13 | 6.3 |
| 16 | 20 | 10 |
| 20 | 26 | 12 |
| 25 | 32 | 16 |
| 35 | 46 | 22 |
| 50 | 65 | 32 |



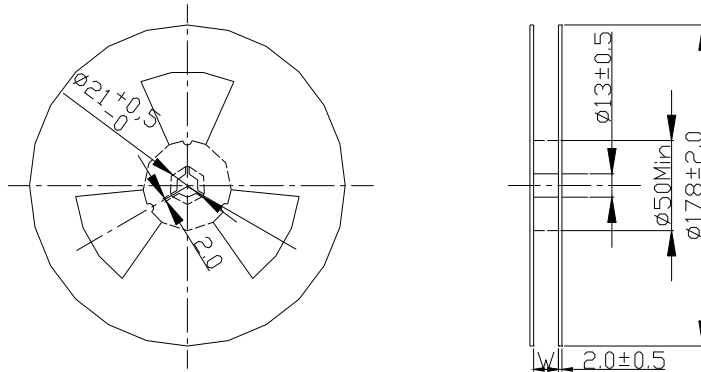
6.0 包装 Packing

6.1 载带的前后结构 Structure of lesder part and part of the carrier taping



6.2 卷盘尺寸 Reel Dimensions (unit:mm)

卷盘尺寸 TAPE REEL DIMENSIONS



Unit:mm

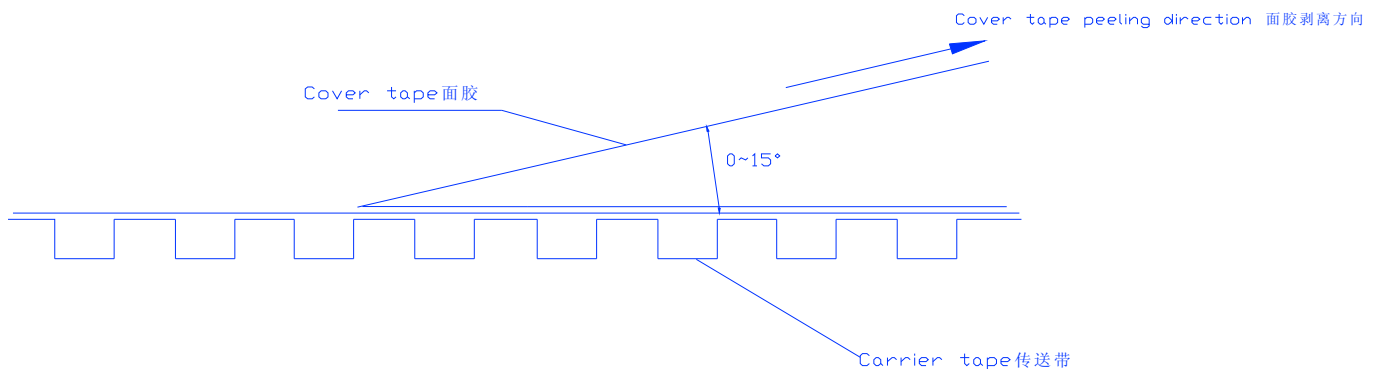
| 卷盘型号 | P | A | B | C | D |
|-------|----|----|----|----|----|
| W±0.3 | 10 | 10 | 10 | 14 | 14 |



6.3 面胶 Cover tape

标准: $0.1\text{N} < \text{剥离强度} < 0.7\text{N}$

Standard: $0.1\text{N} < \text{peeling strength} < 0.7\text{N}$



7.0 储存方法 Storage Methods

确保钽电容包装贮存, 不宜外露、受阳光直照及灰尘污染。正常温度 (5—35℃)、湿度 (75%RH 以下) 条件下存放。一般制造后可存放 2.5 年。若产品超过贮存周期, 使用前重新进行检验, 确保没有任何异常。

Store the capacitors in the package not to be exposed to direct sunlight and dust. Store in the environment holding ordinary temperature (5—35℃) and ordinary humidity (75% RH or less). Storing period is 2years and 6months after manufacturing in principle. As for products stored for more than the storing period, perform re-examination and confirm no abnormality of the products before use.

8.0 使用注意事项 Precautions For Use

8.1 使用电压 Using Voltage

为了提高产品的可靠性, 使用电压控制在标称额定工作电压 50% 以下。若使用在低阻抗电路中, 控制在标称额定工作电压的 30% 以下。(参照图 1, 2, 3)

To improve the product reliability, control the surge voltage under 50% of the rated voltage of parts, Especially if using for low impedance circuit, control the surge voltage under 30% of the rated voltage.(Refer to Figure 1, 2, 3)



b) 在开关、充电、放电或瞬时电流电路中，建议使用电压在 30%或更低，并且串联一个电阻，使电流限定在 300mA 以内，串联电阻与失效率的关系见表 1：

If applying for series protection resistance in the charge/discharge circuit with high momentary current, control the current which is applied to the capacitor under 300mA and control the surged voltage under 30% of the rated voltage.

8.2 若使用温度超过 85℃，请使用图 3 所推荐的 30%或 50%以下的降额电压。

If using over 85℃ apply the derated voltage under 50% or 30% of the Figure 3.

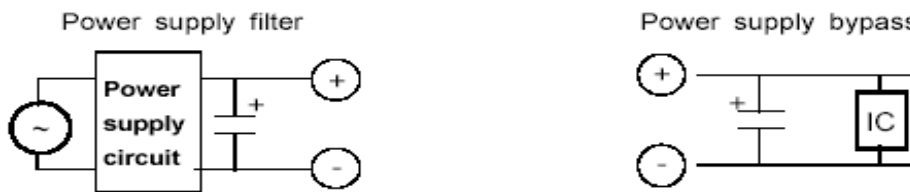


Fig. 1

Fig. 2

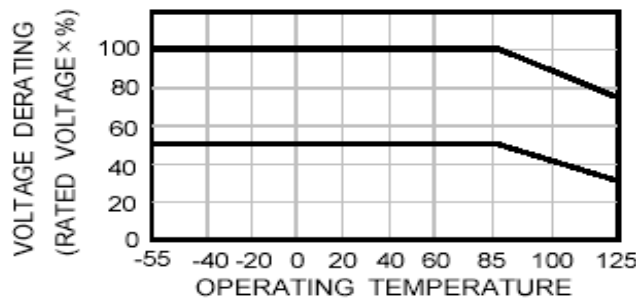


Fig. 3

表 1: Table:1

串联电阻与失效率 Cirtit Impedance Reliability Factose

| 串联电阻 (Ω/V) Cirtit Impedance(ohms/volt) | 失效率 Failure Rate Impedance |
|---|-------------------------------|
| 0.1 | 1.0 |
| 0.2 | 0.8 |
| 0.4 | 0.6 |
| 0.6 | 0.4 |
| 0.8 | 0.3 |
| 1.0 | 0.2 |
| 2.0 | 0.1 |
| 3.0 or greater | 0.07 |

8.3 固体钽电容器为极性电容器，不适宜在加反向电压条件下使用。

Solid tantalum capacitors are polar capacitor. Reverse voltage is not permissible.



8.4 焊接温度曲线图

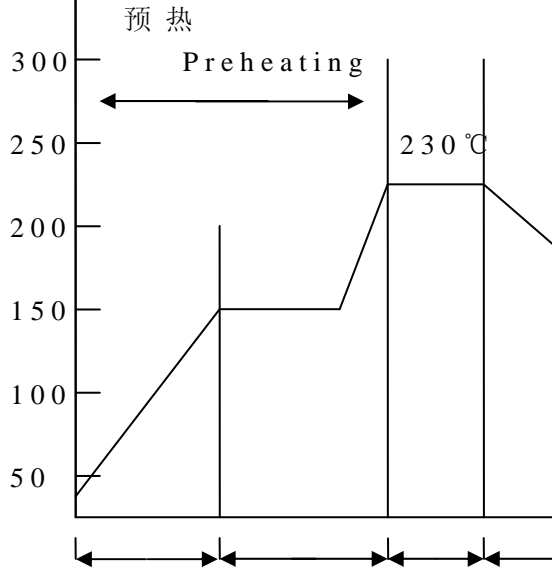
The temperature profile in the adjacent graph

回流焊接 (Re-flow soldering)

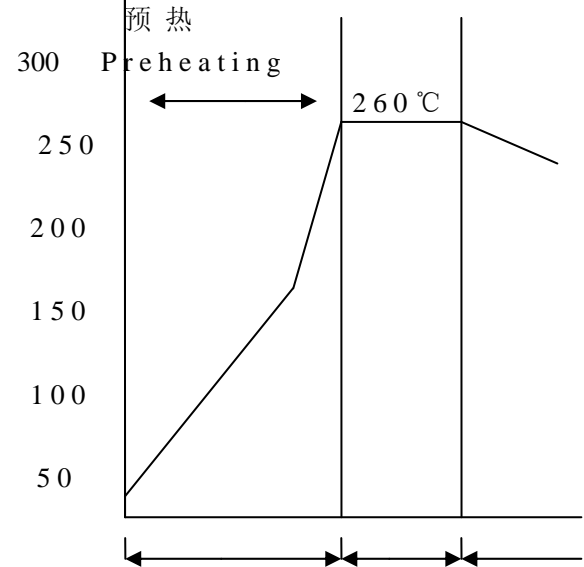
波峰焊接 (Wave soldering)

Temperature

温度 °C



温度 °C



超过一分钟 超过一分钟 5S 自然冷却

超过二分钟 三秒 max 自然冷却

Over 1 minute Over 1 minute 5S | Gradual Cooling

Over 2 minute 3S max

Gradual cooling

8.5 可靠性 Solder ability

钽电容器设计应用在 85°C 额定工作条件下每千小时的失效率 (1% 每 1000hrs)。失效率通常用每千小时失效百分比作单位。钽电容器的可靠性由许多因素决定 (如工作温度, 工作电压, 外延电路的等效串联电阻等等), 如果电路上这些因素附有一定的余量的话, 钽电容的使用寿命更长。

失效率公式:

$$\lambda_{\text{使用}} = \lambda_{85} * K_V * K_T * K_R$$

$\lambda_{\text{使用}}$: 电容器在使用条件下的失效率 λ_{85} : 85°C 时的基准失效率

K_V : 使用电压对应常数 K_T : 使用温度对应常数 K_R : 使用充电电流对应常数

The capacitors are designed as to the failure per 1000hrs in applying rated voltage at 85°C. (1% per 1000hrs)

The steady state reliability of Tantalum capacitor is determined by various factors. (eg. Operation temperature, Working voltage, Series resistance of the external circuit, etc). Therefore if the factors have a additional margins at circuit the steady state performance of the capacitor for long time could be derived.



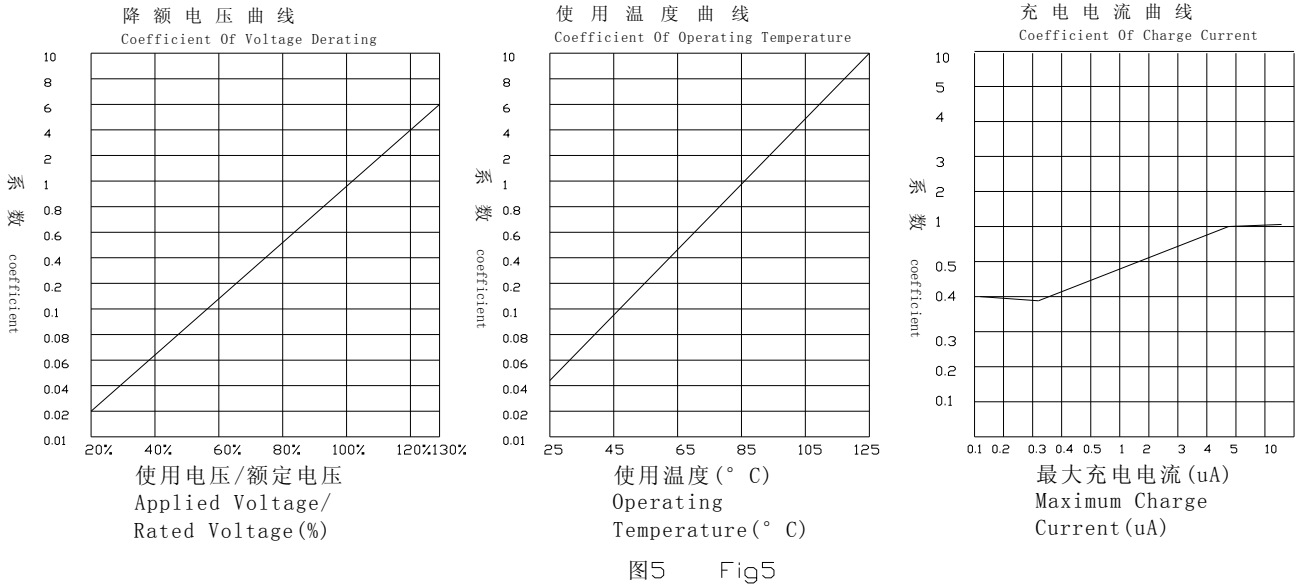
The failure rate of capacitor can be calculated as follows.

The formula of failure rate

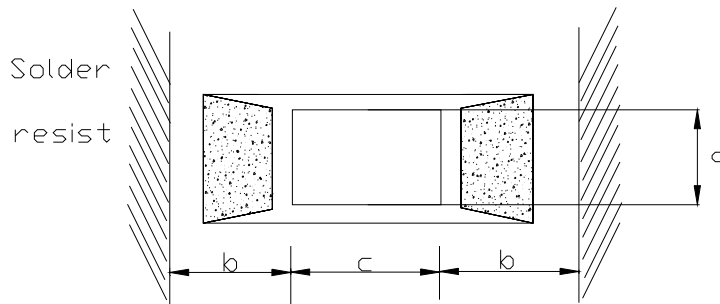
$$\lambda_{use} = \lambda_{85} \times K_V \times K_t \times K_R$$

λ_{use} : the estimated failure rate of the capacitor under operating condition λ_{85} : basic failure rate

K_V : working voltage K_t : operating temperature K_R : charging current



8.5 CA45 贴装尺寸 Lard Size



| 壳号 | Flow Soldering | | | Reflow Soldering | | |
|----|----------------|-----|-----|------------------|-----|-----|
| | a | b | c | a | b | c |
| A | 1.6 | 2.6 | 1.3 | 1.6 | 1.5 | 1.3 |
| B | 2.6 | 2.8 | 1.5 | 2.6 | 1.6 | 1.5 |
| C | 2.8 | 3.8 | 2.8 | 2.8 | 2.2 | 2.8 |
| D | 3.8 | 4.5 | 4.0 | 2.8 | 2.4 | 4.0 |