

## 1. 电路设计中的注意事项

(1) 要在确认使用及安装环境的基础上,在电容器的产品目录或承认书、图纸交货申请书(以下简称交货承认书)中规定的电容器额定性能的范围内进行设计。

(2) 请依据规格书中规定的电容特性选择合适的固态电容器。

a) 切勿超电压使用,即便是短时间的过电压都可能导致固态电容器的短路;

b) 不可在超出分类上限温度(最高使用温度)的温度下使用。

c) 不可接通过电流(超过额定纹波电流的电流)。

(3) 进行电路设计时,请选用与机器寿命相符的电容器。

(4) 极性固态铝电容器具有正负极之分,不要反接固态铝电容器,反接固态铝电容器会导致漏电流的急剧增加或者使用寿命的降低。

(5) 瞬时充放电可能会导致固态铝电容器短路或漏电流增大,因此请在下列情形下设计保护电路:

a) 冲击电流大于10A;

b) 冲击电流大于10倍允许纹波电流值。另外,在测试产品漏电流时,请设置一个1kΩ的保护电阻。

(导电性高分子铝固体电解电容器有急速充放电所产生的超负荷高峰电流通过时,有时会导致短路或大漏损电流。请注意不要让高峰电流超过10A。)

(6) 被禁止使用的电路:即使客户严格按照我们所给定的焊接条件安装固态铝电容器,固态铝电容器的漏电流也可能升高,甚至大幅度升高。高温无负载测试、高温高湿无负载测试、温度急变测试等都可能引起漏电流的增大。因此,请不要将固态铝电容器应用于对漏电流敏感的电路中。比如:

a) 高阻抗电路;

b) 耦合电路;

c) 时间常数电路。

(7) 工作电压

a) 直流电压与纹波峰值电压的总和不得超过额定工作电压;

b) 当直流电压比较低的时候,反向纹波峰值电压不能超过额定工作电压的10%;

c) 对于25V以上产品,当环境温度超过85°C时,请降压使用固态铝电容器,温度每上升10°C,施加于产品上的电压请下降10%。

## 2. 特别提醒

(1) 漏电流:

焊接热和来源于运输途中的机械应力都可导致电容器的漏电流增大,但是,给产品施加不超过额定工作电压的直流电压会逐渐降低漏电流,在不超出额定工作电压和工作上限温度的前提下,施加的电压越高、环境温度越高,漏电流下降速度越快。

(2) 电容器的绝缘性:

电容器外的绝缘镀膜或绝缘胶管层并不是绝对绝缘的,另外,铝壳与负极引出线间不绝缘。安装的时候,请务必将铝壳、正负导针及PC板印刷图完全隔离开。

(3) 工作环境限制:

请不要在以下环境中使用固态铝电容器:

a) 水、盐水、油可以直接滴落的地方,以及容易发生收缩的电路板;

b) 有害气体(H<sub>2</sub>S、硫酸、硝酸、氨气、盐酸等)聚集的场所;

c) 紫外线、放射性射线、臭氧等辐射的场所。

(4) PCB板设计

a) 不要把固态电容器安装于热源元件周围或其上面;

b) PCB板上的安装孔位直径和间距要与电容器导针的直径和针距相匹配。

## 1. Circuit Design

(1) Please make sure the application and mounting conditions to which the capacitor will be exposed to are within the conditions specified in catalog or alternate product specification (Referred to as specification here after).

(2) Please select a suitable solid capacitor according to the capacitance characteristics specified in the specification.

a) Do not use over voltage, even a short overvoltage may cause a short circuit of the solid capacitor;

b) The capacitor shall not be used in an ambient temperature which exceeds the operating temperature specified in the specification.

c) Do not apply excessive current which exceeds the allowable ripple current.

(3) Appropriate capacitors which comply with the life requirement of the products should be selected when designing the circuit.

(4) Polar solid aluminum capacitors have positive and negative electrodes. Do not reverse the solid aluminum capacitors. Reverse solid aluminum capacitors can cause a sharp increase in leakage current or a decrease in service life.

(5) Instantaneous charge and discharge may cause a short circuit in the solid aluminum capacitor or increase the leakage current, so design the protection circuit in the following situations:

a) The inrush current is greater than 10A;

b) The inrush current is greater than 10 times the allowable ripple current value. In addition, when testing the product leakage current, please set a 1kΩ protection resistor.

(If excess a rush current due to drastic charge / dis-charge was applied to conductive polymer aluminum solid electrolytic capacitors, it may cause a short circuit or an increase in leakage current. Therefore, please do not apply a rush current that is larger than 10A)

(6) Circuits that are forbidden to use: Even if the customer installs a solid aluminum capacitor in strict accordance with the welding conditions we have given, the leakage current of the solid aluminum capacitor may increase or even increase significantly. High temperature no load test, high temperature and high humidity no load test, temperature rapid change test, etc. may lead to an increase in leakage current. Therefore, do not apply solid aluminum capacitors to circuits that are sensitive to leakage currents. such as:

a) high impedance circuit;

b) a coupling circuit;

c) Time constant circuit.

(7) Working voltage

a) The sum of the DC voltage and the ripple peak voltage shall not exceed the rated operating voltage;

b) When the DC voltage is relatively low, the reverse ripple peak voltage cannot exceed 10% of the rated operating voltage;

c) For products above 25V, when the ambient temperature exceeds 85 °C, please use a solid aluminum capacitor for depressurization. For every 10 °C rise in temperature, the voltage applied to the product should be reduced by 10%.

## 2. Special reminder

(1) Leakage current:

The welding heat and the mechanical stress originating from the transportation can cause the leakage current of the capacitor to increase. However, applying a DC voltage not exceeding the rated working voltage to the product gradually reduces the leakage current, and does not exceed the rated working voltage and the working upper limit temperature. Under the premise, the higher the applied voltage and the higher the ambient temperature, the faster the leakage current decreases.

(2) Capacitor insulation:

The insulating coating or insulating hose layer outside the capacitor is not absolutely insulated, and the aluminum shell and the negative lead wire are not insulated. When installing, be sure to completely separate the aluminum casing, positive and negative guide pins and PC board prints.

(3) Working environment restrictions:

Do not use solid aluminum capacitors in the following environments:

a) water, salt water, where oil can drip directly, and boards that are prone to shrinkage;

b) where harmful gases (H<sub>2</sub>S, sulfuric acid, nitric acid, ammonia, hydrochloric acid, etc.) are concentrated;

c) In the case of ultraviolet radiation, radioactive rays, ozone, etc.

(4) PCB board design

a) Do not install solid capacitors around or above the heat source components;

b) The mounting hole diameter and spacing on the PCB should match the diameter and pitch of the capacitor pins.

(5) 并联电路：当固态电容器与另一个(液体)电容器并联时，由于固态电容器具有低得多的ESR值，因此，可能会有很大的纹波电流施加在固态电容器上，这种情况下，一定要谨慎选择电容器的规格。

(6) 固态铝电容器的电性能会受频率波动的影响，设计电路的时候要考虑这一因素。

(7) 在双面PCB板上安装固态铝电容器的时候，请不要在连接前后PCB板的穿孔处安装固态铝电容器。

### 3. 安装前的准备

(1) 焊接：请按照SPEC.中规定的焊接条件进行焊接，否则，将可能导致外绝缘层的破损、漏电流的急剧增大以及容量的下降；

(2) 安装前的注意事项：

a) 请不要重新使用已经被安装使用过的固态铝电容器；

b) 固态铝电容器储存时间久了会导致漏电流的增大，这时，可以给电容器进行一次电压处理，推荐的处理条件为：60~70°C额定电压1小时，并给电容器串联1kΩ保护电阻。

(3) 安装：

a) 仔细核对电容器的容量和工作电压；

b) 请注意电容器的极性；

c) 请注意勿将固态铝电容器跌落于地面，跌落的电容器请勿使用；

d) 不要使固态铝电容器变形；

e) 安装前请检查电容器导针型号是否与PCB板上的孔直径和间距相匹配，当使用自动插入机安装时，请不要使用太大的插入力；

f) 请关注由自动插入和安装机、产品检查仪器等产生的震动强度不要太大；

g) 不要施加额外的外部力量给电容器导针和电容器本身。

(4) 当使用电烙铁焊接时：

a) 请按照电容器规格书的规定设置焊接条件(温度、时间)；

b) 当固态铝电容器的导针型号与PCB板不相匹配，不得不对导针进行处理时，请在焊接前处理，以便在焊接后不会在固态铝电容器上留下应力；

c) 焊接时，不要给固态铝电容器额外的应力；

d) 当用电烙铁从电路板上移除一个安装不佳的固态铝电容器时，请确认电烙铁已经完全将焊锡熔化，然后才能取下固态铝电容器，以免给固态铝电容器留下应力；

e) 不要将电烙铁的头接触到固态铝电容器；

f) 焊接后，固态铝电容器的漏电流可能会有所增大，施加电压后，漏电流会逐渐降低。

(5) 波峰焊

a) 请不要将固态铝电容器淹没在焊锡中焊接，请在PCB板安装固态铝电容器的对立面焊接；

b) 请按照电容器规格书的规定设置焊接条件(温度、时间)；

c) 焊接后，固态铝电容器的漏电流可能会有所增大，施加电压后，漏电流会逐渐降低；

d) 请注意不要将焊锡接触除了导针之外的部分；

e) 焊接时请注意电路板上其他元件不要接触到固态铝电容器或掉落到固态铝电容器上；

f) 当使用极端不正常的焊接工艺时，可能会导致固态铝电容器的容量下降或损害电容器的其他特性。

(6) 回流焊：(对于SMD型固态铝电容器产品)，

焊接条件(预热、焊接温度、时间、回流次数)不可超出出货仕様书中规定的范围。

### 4. 焊接后的注意事项

(1) 当固态铝电容器完成焊接后，请不要使用外力倾斜、弯曲、扭曲它；

(5) Parallel circuit: When the solid capacitor is connected in parallel with another (liquid) capacitor, since the solid capacitor has a much lower ESR value, a large ripple current may be applied to the solid capacitor. Be sure to carefully select the specifications of the capacitor.

(6) The electrical performance of solid aluminum capacitors is affected by frequency fluctuations. This factor should be considered when designing the circuit.

(7) When installing a solid aluminum capacitor on a double-sided PCB, do not install a solid aluminum capacitor at the perforation of the PCB before and after the connection.

### 3. Preparation before installation

(1) Soldering: Please weld according to the welding conditions specified in SPEC. Otherwise, it may cause damage to the outer insulation layer, sharp increase of leakage current and decrease in capacity;

(2) Precautions before installation:

a) Please do not reuse the solid aluminum capacitor that has been installed and used;

b) When the storage time of the solid aluminum capacitor is long, the leakage current will increase. At this time, the capacitor can be subjected to a voltage treatment. The recommended processing conditions are: 60~70°C rated voltage for 1 hour, and the capacitor is connected in series with 1kΩ protection resistor. .

(3) Installation:

a) carefully check the capacitor's capacity and operating voltage;

b) Please pay attention to the polarity of the capacitor;

c) Please be careful not to drop the solid aluminum capacitor on the ground, and do not use the dropped capacitor;

d) Do not deform the solid aluminum capacitor;

e) Before installation, please check whether the capacitor pin type matches the hole diameter and spacing on the PCB. When using the automatic inserter, please do not use too much insertion force;

f) Please pay attention to the vibration intensity generated by the automatic insertion and installation machine, product inspection equipment, etc.

g) Do not apply additional external force to the capacitor guide pins and the capacitor itself.

(4) When soldering with a soldering iron:

a) Please set the welding conditions (temperature, time) according to the specifications of the capacitor;

b) When the type of the guide pin of the solid aluminum capacitor does not match the PCB board, when the guide pin has to be processed, please handle it before welding so as not to leave stress on the solid aluminum capacitor after soldering;

c) Do not apply additional stress to the solid aluminum capacitor when soldering;

d) When removing a poorly mounted solid aluminum capacitor from the board with an electric soldering iron, make sure that the soldering iron has completely melted the solder before removing the solid aluminum capacitor to avoid stress on the solid aluminum capacitor;

e) Do not touch the head of the soldering iron to a solid aluminum capacitor;

f) After welding, the leakage current of the solid aluminum capacitor may increase, and the leakage current will gradually decrease after the voltage is applied.

(5) Wave soldering

a) Please do not submerge the solid aluminum capacitor in the solder. Please solder the opposite side of the solid aluminum capacitor on the PCB board;

b) Please set the welding conditions (temperature, time) according to the specifications of the capacitor;

c) After welding, the leakage current of the solid aluminum capacitor may increase, and the leakage current will gradually decrease after the voltage is applied;

d) Please be careful not to touch the solder in any part other than the guide pin;

e) When soldering, please note that other components on the board do not touch the solid aluminum capacitor or drop onto the solid aluminum capacitor;

f) When an extremely abnormal soldering process is used, it may cause the capacity of the solid aluminum capacitor to drop or damage other characteristics of the capacitor.

(6) Reflow soldering (SMD only)

Soldering condition must be confirmed to be within Huawei Specification.

### 4. Precautions after welding

(1) When the solid aluminum capacitor is soldered, do not use external force to tilt, bend or twist it;

- (2) 请不要抓住固态铝电容器来移动PCB板;
- (3) 当堆放焊接有固态铝电容器的PCB板时, 请不要将固态铝电容器互相接触或接触到其他元件;
- (4) 不要让焊接在PCB板上的固态铝电容器承受外力。
- (5) PCB板的清洗: 请选用乙醇类清洗剂, 并注意以下条件:
- 使用浸没方式和超声波清洗时, 请不要超过2分钟;
  - 清洗温度须低于60°C;
  - 请注意清洗剂带来的污染问题;
  - 清洗结束后, 请用低于额定工作温度以下的热空气进行干燥。
- (6) 固定剂、被膜剂
- 请勿使用含卤素类溶剂等固定剂, 被膜剂。
  - 在使用固定剂、被膜剂之前, 请将基板和电容器的封口部之间清扫干净, 不可留有焊剂残渣及污垢。
  - 在使用固定剂、被膜剂之前, 请对清洗剂等进行干燥。
  - 在使用固定剂、被膜剂时, 请勿将电容器封口部的整个面堵塞。固定剂、被膜剂的种类很多, 使用时详情请咨询我们。
- (7) 其他注意事项:
- 不要用手直接接触固态铝电容器的引出线;
  - 不要使用导体接通固态铝电容器的正负极, 不要让固态铝电容器接触导电性溶液(如酸和碱的水溶液);

## 5. 存储与处置

- (1) 不要将固态铝电容器储存在高温高湿环境中, 较好的储存温度为5~35°C, 湿度为75%以下;
- (2) 要使固态铝电容器保持好的可焊性, 请不要开启出厂包装, 并且, 储存期限不要超过1年;
- (3) 仅仅在安装前打开包装, 并一次性安装完全部产品, 如果有产品剩余, 则请放回包装袋并封好袋口。
- (4) 不要将固态铝电容器储存于有害气体环境。

## 6. 失效模式与寿命

- (1) 偶然失效: 主要由电路的短路导致, 当短路电路中的电流超过1A, 电容器内部温度将会上升, 内部压力增大, 封口橡胶将可能会凸起甚至开启, 电容器会释放出有害气体, 这时请离开这个场合;
- (2) 寿命失效: 长期使用后, 固态铝电容器的特性会发生衰减, 比如容量下降、ESR上升等, 当使用时间超过额定寿命, 电容器的特性劣化, 并可导致电解质绝缘, 这称为开路失效模式。

## 7. 废弃处理

- (1) 在废弃电容器时, 可采取以下任意一种方法。
- 在电容器上开孔或充分破碎后焚烧。
  - 不焚烧电容器时, 应交与专业的工业废弃物处理厂, 由其进行填拓等处理。
- (2) 废弃电容器(从与之相连的基板上卸下)时, 请确认其是否已被放电。

- (2) Please do not grab the solid aluminum capacitor to move the PCB board;
- (3) When stacking PCB boards with solid aluminum capacitors, do not touch or contact solid aluminum capacitors with other components;
- (4) Do not allow external aluminum capacitors soldered on the PCB to withstand external forces.
- (5) PCB board cleaning: Please choose ethanol cleaning agent, and pay attention to the following conditions:
- When using immersion method and ultrasonic cleaning, please do not exceed 2 minutes;
  - the cleaning temperature must be lower than 60 ° C;
  - Please pay attention to the pollution caused by cleaning agents;
  - After cleaning, dry with hot air below the rated working temperature.
- (6) Fixing Material and Coating Material
- Do not use any affixing or coating materials, which contain halide substance.
  - Remove flux and any contamination, which remains in the gap between the end seal and PC board.
  - Please dry the cleaning agent on the PC board before using affixing or coating materials.
  - Please do not apply any material all around the end seal when using affixing or coating materials.
- There are variations of cleaning agents, fixing and coating materials, so please contact those manufacture or our sales office to make sure that the material would not cause any problems.
- (7) Other notes:
- Do not touch the lead wire of the solid aluminum capacitor directly with your hand;
  - Do not use a conductor to connect the positive and negative poles of a solid aluminum capacitor. Do not allow the solid aluminum capacitor to contact a conductive solution (such as an aqueous solution of acid and helium);

## 5. Storage and disposal

- (1) Do not store solid aluminum capacitors in a high temperature and high humidity environment, a good storage temperature of 5 ~ 35 ° C, humidity of 75% or less;
- (2) In order to maintain good solderability of solid aluminum capacitors, please do not open the factory packaging, and the storage period should not exceed 1 year;
- (3) Open the package only before installation and install the entire product at one time. If there is any product remaining, please put it back in the bag and seal the bag.
- (4) Do not store solid aluminum capacitors in a hazardous atmosphere.

## 6. Failure mode and life

- (1) Accidental failure: mainly caused by short circuit of the circuit. When the current in the short circuit exceeds 1A, the internal temperature of the capacitor will rise, the internal pressure will increase, the sealing rubber will be raised or even opened, and the capacitor will release harmful gases. Please leave this occasion at this time
- (2) Life failure: After long-term use, the characteristics of solid aluminum capacitors will be attenuated, such as capacity drop, ESR rise, etc. When the use time exceeds the rated life, the characteristics of the capacitor deteriorate, and electrolyte insulation may be caused. This is called open circuit failure mode.

## 7. Disposal

- (1) Take either of the following methods in disposing of capacitors.
- Make a hole in the capacitor body or crush capacitors and incinerate them.
  - If incineration is not applicable, hand them over to a waste disposal agent and have them buried in a landfill.
- (2) When removing a capacitor from the circuit board or when disposing of capacitor please ensure that the capacitor is properly discharged.

### 关于商品目录中记载的ESR阻抗值

引线型: 测定位置为引线端子底部。  
芯片型: 测定位置为距离树脂板的孔口最近的电极部。

### ESR, Impedance Measuring Point

Radial lead type:  
ESR should be measured at both of the terminal ends closest to the capacitor body.  
Chip type:  
ESR should be measured at both of the terminal ends closest where the terminals protrude through the plastic platform.