



The basic requirement of switch power supply for electrolytic capacitor performance

Switch power adapter is the portable digital products, home appliances, the main power converter, for small portable electronic equipment made an indelible contribution. Power adapter is miniaturization, lightweight and high efficiency, use in electronic equipment is more and more big, the penetration rate is higher and higher. Along with the power adapter, miniaturization, lightweight and efficient rapid development of integrated circuit, electrolytic capacitors as an important component, the power adapter must also realize miniaturization, high frequency, low impedance, long service life and resistance to ripple current. In the switch power adapter on the performance of the aluminum electrolytic capacitor mainly have the following requirements.

1. Nominal static capacity and the allowable deviation.

Filter with electrolytic capacitor has a capacity of a few bigger, is helpful to reduce the ripple of dc voltage. In pressure, the greater the nominal capacitance of electrolytic capacitor, the price will be higher. To make the cost as low as possible some switching power supply, electrolytic capacitor has a capacity of comparable with the formula to calculate the numerical value slightly lower, as a compromise between consideration; For the ac mains input rectifier filter, 5 W ~ 10 W switching power supply with electrolytic capacitor, 4.7 ~ 10 μF capacity can be selected; For the 10 W - 50 W switching power supply, according to the capacity of 2.0 ~ 3.0 $\mu\text{F}/\text{W}$. If filtering electrolytic capacitor capacity is too small, will make the dc voltage ripple is too big, not only easy to cause damage to the switch transistor, and to cause a decline in power factor, harmonic content increase. Electrolytic capacitor for electrostatic capacity of the allowable deviation of plus or minus 10%, that is best for plus or minus 5%.

2. The loss tangent value.

Under 25 °C, and 100 hz, the requirement for electrolytic capacitor loss tangent value is less than 20% (n = 300 ~ 400 V). In the 105 °C environment, applying the rated working voltage and maximum permissible ripple current after 1000 hours, the performance of the aluminum electrolytic capacitor shall meet the following requirements: under 25 °C e., rated current is not more than the early loss tangent value is not more than 200% of the specified value, the electrostatic capacity of the rate of change of within + / - 15% of the initial value.

3. Use temperature range.

It is better high temperature performance. General can reach 60 °C, the temperature rise of switch power supply due to the switching power supply casing within the space is lesser, the cooling performance is poor, the environment temperature reaches 35 °C, switching power adapter internal components of the node temperature will reach above 90 °C, and its heat loss, electrolytic capacitor with a surface temperature will rise further. Using the environment temperature rise every 10 °C, the service life of aluminum electrolytic capacitor will be reduced by 50%. From the reliability and safety consideration, must choose to use temperature range is 25 ~ + 105 °C high temperature type aluminum electrolytic capacitors. If you use normal electrolytic temperature limit is 85 °C, under the condition of high temperature, due to the inside of the capacitor electrolyte heated inflation, pressure, light will cause the electrolyte by rubber sealing gap flow, accelerated the process of tithing, lead to shorten the service life; Or can make the condenser pressure value greatly reduced, burst and failure.

4. The leakage current.

Leakage current is smaller, the electrolytic capacitor leakage current is big, early failure happens. If the nominal capacity of capacitor is C (uF), the rated working voltage of V (V), when C 33 or less uF, applying the rated operating voltage (25 °C), 5 minutes to leakage current $I < 0.02 C * V$ (uA). General requirements when C 47 uF or leakage current (I) 3 x or less (C * V power) (uA).

5. The high temperature properties.

Placed in an environment of 105 °C, no load after 500 hours, the performance of the capacitor under 25 °C should comply with the high temperature load characteristic features required by the specified value. These are the requirements for aluminum electrolytic capacitors and choose the capacitor, the reliability, safety and service life of switch power supply is very beneficial.

6. The rated operating voltage.

If the capacitor on the applied voltage is higher than the rated working voltage of capacitor leakage current will increase, its electric performance in a short period of time will degradation and damage. According to the power switch tube in switching power supply selection principle, the breakdown voltage for 220 v ac input voltage, if the bridge rectifier output using a single capacitor filter, insist on pressure value of the electrolytic capacitor is not lower than 400 v; For the raising of the voltage output of the active power factor correction circuit output filter capacitor, insist on the withstand voltage value of not less than 450 v. If the two capacity electrolytic capacitor in series, such as pressure values of each capacitor can withstand voltage value of the lower 50% than when a single capacitor filter, but after series total capacity will be reduced by 50%. When used two capacitors in series, in order to prevent the range for each capacitor leakage current, voltage distribution, can be on each capacitor in parallel a 100 k to 330 k ohms voltage resistance, for the capacitor discharge during power outage.

7. High frequency pulse current.

Any communication damage to small, aluminum electrolytic capacitor can be considered by an ideal capacitor and a small resistance in series, the series resistance is called equivalent resistance (ESR). Switching power supply when the active power factor correction circuit is used, not only requires active power factor correction voltage converter output filter capacitor can bear 400 v high voltage, but also must be able to flow through the frequency of 25 ~ 200 KHZ high frequency pulse circuit. High frequency pulse current on the aluminum electrolytic capacitor charging and discharging process, produce heat consumption, cause the fluctuating temperature rise, so the demands of capacitor equivalent series resistance (ESR) is smaller, lower the heat loss.