

# PRODUCT SPECIFICATION

Customer : \_\_\_\_\_  
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Checked	Prepared
Customer Approve	

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**1. SCOPE :**

This specification which specifies the performance and test methods of super capacitors, is treated as the basis of the technology confirmation.

**2. General Specification :**

2.1 Application scope

The products using as a back-up source can be applied in the field of electronic devices such as RAM, intelligent instrument, motor drive, clock circuit and toys,

2.2 Standard test situation

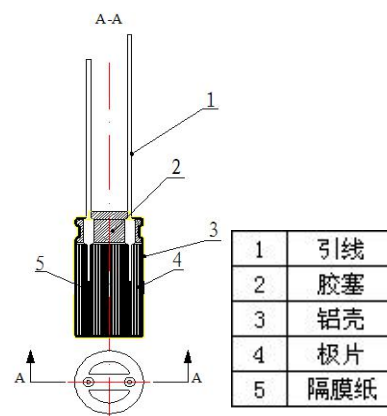
Generally speaking, test should be done at a condition of standard atmospheric press, 5~35°C temperature and a relative humidity of less than 85%; the test situation adopted by this specification is standard atmospheric, 25°C and relative humidity less than 60%.

2.3 The adopted standard :

IEC 62391-1 《Fixed electric double-layer capacitors for use in electronic equipment Part 1:Generic specification》 Q/KMNY001-2009 “Electrochemical capacitor”

**3. Product Monomer Structure**

The product, using electrolyte and separator to separate the electrodes that made by activated carbon and sealed the Aluminum case by rubber plug is base on the principal of electric double layer capacitors. The leads are at the same side of the products.



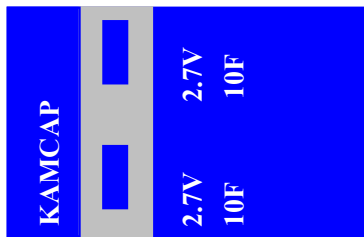
**4. General Specification**

F (25°C) Rated Cap. $\Delta V = 2.16V-1.35V$	Cap. Tolerance(25°C) ( $\Delta C$ )	Rated Voltage (V)	Operating Temp. (Top)	ESR (1KHz) (m $\Omega$ )
10	0% ~ +30%	2.7	-40°C~70°C	40

**5. Performance Index**

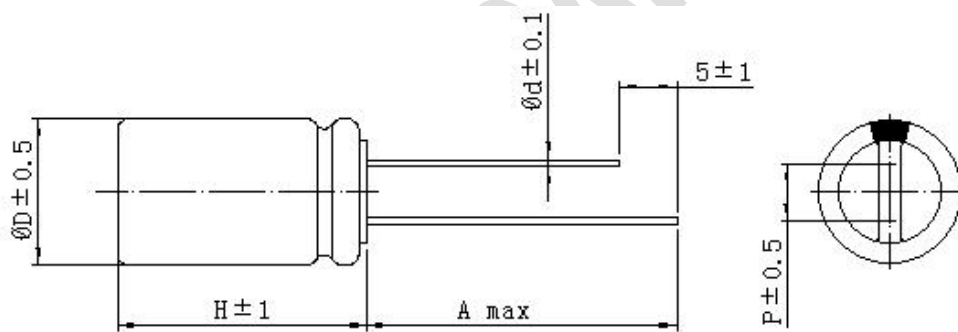
Item		Specification/Condition
01	Temperature characteristics	+70°C,   $\Delta C/C$   $\leq 30\%$ of the initial value , ESR $\leq$ specified value (25°C) -40°C,   $\Delta C/C$   $\leq 50\%$ of the initial value , ESR $\leq 4$ times of specified value ( 25°C )
02	High temperature load	After +70°C,nominal voltage , 1000h ,   $\Delta C/C$   $\leq 30\%$ of the initial value , ESR $\leq 4$ times of specified value ( 25°C ) 。
03	High temperature without load	+70°C, 1000h $\pm 4$ ,   $\Delta C/C$   $\leq 30\%$ of the initial value , ESR $\leq 2$ times of specified value ( 25°C )
04	The steady state damp heat test	After +40°C, 90--95%RH , 240h,   $\Delta C/C$   $\leq 30\%$ of the initial measured value IL $\leq 2$ times of specified value ( 25°C ) ,ESR $\leq 4$ times of specified value ( 25°C )
05	Cycle life Expectancy	Add the rated voltage and 500,000 cycles of charge and discharge experiments at room temperature.   $\Delta C/C$   $\leq 30\%$ of the initial measured value,ESR $\leq 4$ times of specified value ( 25°C ) 。

**6. KAM MARK**



- ① KAM Brand
- ② Cathode sign
- ③ Rated capacitance and rated voltage

**7. KAM Dimension ( Unit :mm )**



( $\varnothing D \times H$ )	(P)	( $\varnothing d$ )	(A max)
12.5*34	5	0.6	30

## 8. KAM performance test method

(1) According to the standard

IEC 62391-1 《Fixed electric double-layer capacitors for use in electronic equipment – Part 1:Generic specification》

Q/KMNY001-2009 《Electrochemical capacitor 》

(2) **test method**

**capacitance**

1、Constant current discharge method

2、Measuring circuit

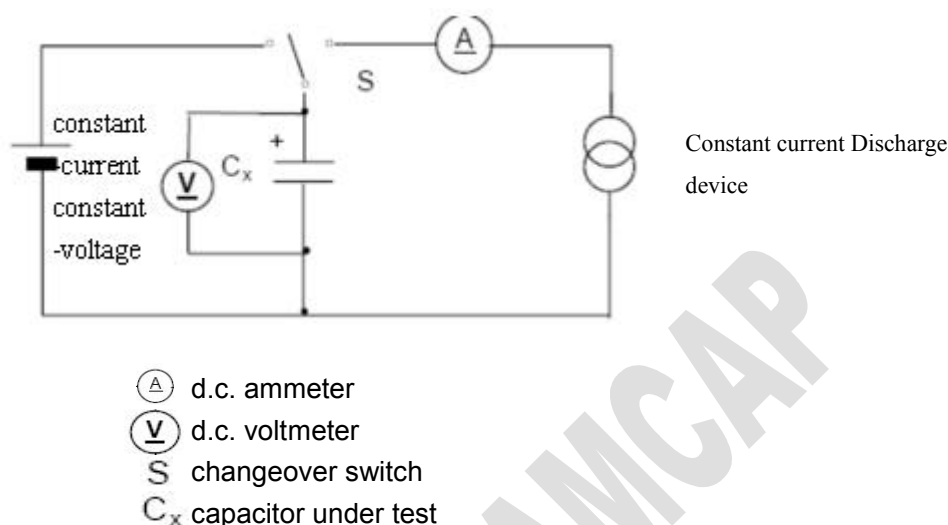


Figure 1 – Circuit for constant current discharge method

### Measuring method

- a) Setting the direct current voltage of constant current/constant voltage power supply as rated voltage ( $U_R$ ).
- b) Setting the constant current value of the constant current discharge device , according to Table 2 specified.
- c) Turn the switch S to the d.c. power supply, and unless otherwise specified in the individual standards, apply voltage and charge for 30 min after the constant current/ constant voltage power supply has achieved the rated voltage.
- d) After charging for 30 min has finished, change over the switch S to the constant current discharge device , and discharge with a constant current.
- e) Unless otherwise specified in the individual standards, measure the time  $t_1$  and  $t_2$  where the voltage between capacitor terminals at the time of discharge reduces from  $U_1$  to  $U_2$  as shown in Figure 2, and calculate the capacitance value by the following formula:

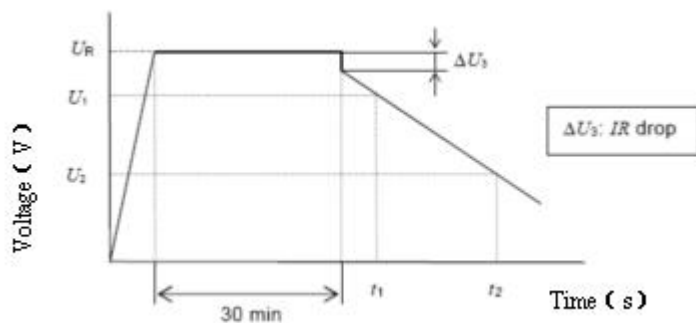


Figure 2 – Voltage characteristic between capacitor terminals

$$C = \frac{I \times (t_2 - t_1)}{U_1 - U_2}$$

C is the capacitance (F);

I is the discharge current (A);

U1 is the measurement starting voltage (V);

U2 is the measurement end voltage (V);

t1 is the time from discharge start to reach U1 (s);

t2 is the time from discharge start to reach U2 (s).

discharge current I and decrease in voltage of discharge voltage U1, U2 , according to table 2

Table 2 – Discharge conditions

Classification	HT、HV、X	SE、HE	SP、MK	LR、HP、HEV、LEV
Application	Memory backup	Energy storage	Power	Instantaneous power
Charge time	30min	30min	30min	30min
I (mA)	1×C	0.4×C <sub>UR</sub>	4×C <sub>UR</sub>	40×C <sub>UR</sub>
U1	The value to be 80 % of the charging voltage (0.8×U <sub>R</sub> )			
U2	The value to be 40 % of the charging voltage (0.4×U <sub>R</sub> )			
NOTE C is the rated capacitance in F (Farad), and UR is the rated voltage in V (Volt).				

NOTE : The discharge current I shall be chosen according to the following condition :

a) If ΔU3 exceeds 5 % (0.05 × UR) of the charging voltage in the initial characteristics, the current value may be

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reduced by one half, one fifth or one tenth.

- b) The number of significant digit for the discharge current value of 10 A or less shall be one digit; the second digit of the calculated value should be rounded
- c) The number of significant figures for the discharge current value exceeding 10 A shall be two digits; the third digit of the calculated value should be rounded down.

(4) Equipment:

- A、 ARBIN super capacitor test system
- B、 Linear DC stabilized voltage power supply
- C、 Constant current discharging device
- D、 Voltage recording device

(5) Constant resistance charging method

Measuring circuit

It should be measured according to measuring circuit in figure3

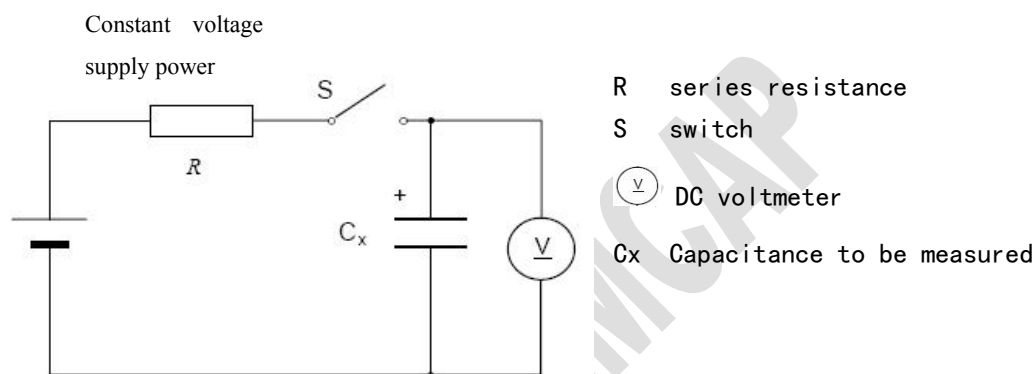


Figure 3 – constant resistance charging method circuit

(6) Measuring method

Before measuring , short-circuit two sides of capacitor for 30 minutes in order to fully discharging  
 Testing time constant (τ) when apply DC voltage UR ,  
 Calculate the value of the capacitor by the following equation:

$$C = \frac{\tau}{R}$$

C capacitance (F)

τ charging time to 0.632×UR (s)

R series resistance (Ω)

Choose R value , the time of τ is 60s~120s

(7) equipment : switch, DC voltmeter, resistance , function recorder

**Internal resistance**

A AC impedance method

Measuring circuit

As shown in the measurement circuit for testing.

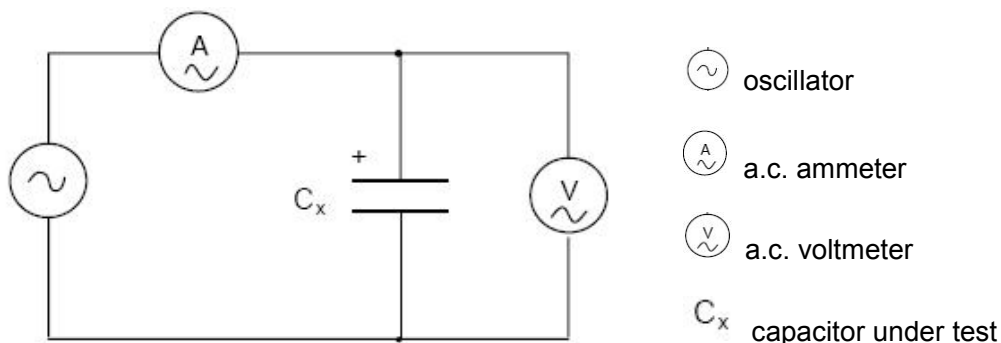


Figure 4–Circuit for a.c. resistance method

Measuring method

The internal resistance Ra of a capacitor shall be calculated by the following formula:

$$R_a = \frac{U}{I}$$

where

Ra is the a.c. internal resistance (Ω);

U is the effective value of a.c. voltage (V r.m.s.);

I is the effective value of a.c. current (V r.m.s.).

The frequency of the measuring voltage shall be 1 kHz

The a.c. current shall be from 1 mA to 10 mA.

equipment: Multi frequency LCR Bridge

## 9. Attention

9.1 Supercapacitors cannot be used in the following states:

a) temperature above the nominal temperature

When the temperature of the capacitor exceeds the nominal temperature, it will cause the electrolyte to decompose, and the capacitor will heat up and the capacity will drop.

Moreover, the internal resistance is increased and the life is shortened.

b) voltage exceeding the rated voltage

When the capacitor voltage exceeds the nominal voltage, it will cause the electrolyte to decompose, and the capacitor will heat up and the capacity will drop.

Moreover, the internal resistance is increased and the life is shortened. Therefore, reducing the voltage used can increase the service life.

c) loading of reverse voltage or alternating voltage

9.2 Effect of ambient temperature on supercapacitors

The service life of supercapacitors is affected by the operating temperature. In general, the temperature of the supercapacitor is reduced by 10 °C, and the life of the supercapacitor is shortened by half. Try to use it in a low temperature environment below the maximum operating temperature. If it is used beyond the maximum



operating temperature, the characteristics may deteriorate rapidly and be damaged.

The use temperature of the supercapacitor should not only confirm the temperature around the device, but also the internal temperature. It is also necessary to confirm the radiant heat of the heating element (power transistor, resistor, etc.) in the device, and the self-heating temperature caused by the ripple current. Also, do not install the heating element near the supercapacitor.

9.3 Please use the positive and negative signs of the capacitor correctly.

9.4 Avoid using supercapacitors in the following environments.

- a) An environment that directly splashes water, salt water and oil, or is in a dew condensation state, filled with gaseous oil or salt.
- b) An environment filled with harmful gases (hydrogen sulfide, sulfurous acid, chlorine, ammonia, bromine, methyl bromide, etc.).
- c) An environment where acidic and alkaline solvents are splashed.
- d) Direct sunlight or dusty environment.
- e) An environment that is subject to excessive vibration and shock.

9.5 Avoid overheating the capacitor during the soldering process (1.6mm printed circuit board, soldering should be 260 ° C, no more than 5 s).

9.6 Avoid wiring the circuit between the lead terminals of the supercapacitor or the solder joints of the connection plates.

9.7 When the overvoltage and the operating temperature range exceed the rated conditions, the pressure valve may act and the electrolyte may be ejected. Therefore, please adopt a design method that has taken into account this abnormal condition.

9.8 During rapid charge and discharge, the voltage drop caused by the internal impedance (also called IR drop) occurs at the beginning of charging and at the beginning of discharge. Therefore, please adopt the design method that takes into account the magnitude of the voltage change.

9.9 Power type large-capacity products (about 10F or more) If the terminals are short-circuited during charging, there will be hundreds of amps of current flowing, which is dangerous. Please do not install or disassemble while charging.

9.10 Do not put the capacitor into the dissolved solder, only solder the solder on the guide pin of the capacitor. Do not allow the welding rod to contact the capacitor heat shrink tubing.

9.11 Do not twist or tilt the capacitor after installation.

9.12 When supercapacitors are used in series, there is a voltage equalization problem between the cells.

## **10. Saving request**

10.1 Do not store in a place with a relative humidity greater than 85% or containing toxic gases and in a high temperature, high humidity environment. It should be stored in an environment with a temperature of  $-30\text{ }^{\circ}\text{C} \sim 50\text{ }^{\circ}\text{C}$  and a relative humidity of less than 60%.

10.2 Avoid preserving supercapacitors in the following environments

- a) An environment that directly splashes water, salt water and oil, or is in a dew condensation state, filled with gaseous oil or salt.
- b) An environment filled with harmful gases (hydrogen sulfide, sulfurous acid, chlorine, ammonia, bromine, methyl bromide, etc.).
- c) An environment where acidic and alkaline solvents are splashed.
- d) Direct sunlight or dusty environment.
- e) An environment that is subject to excessive vibration and shock.

## **11. About discarding**

Do not discard it at will, and hand over the waste to industrial waste processors in accordance with regulations or local public bodies.

## **12. Packing**

**For other supercapacitor problems, please consult the manufacturer or refer to the relevant technical data of the supercapacitor instructions.**