TECHNICAL SPECIFICATION

Super Pulse Battery Capacitor

Model: SPC1520

Approved	Checked	Draft

Customer signature
Company name: **Approved by:** **Signature date：**

Document Revision Record

Mark	Revision date	Revision	Revise page	Description
0	2012.8.20	1		……Formulated first edition

1 Scope

This specification can be applied in SPC1520 Super Pulse Battery Capacitor to specify the property index, test method, quality control, points for attention, etc.

2 Product type

Super Pulse Battery Capacitor.

3 Properties

No.	Item	General Parameter		Remark
1	Capacity	Typical	45mAh	(23±5)℃ Discharge at 20mA
		Minimal	38mAh	
2	Nominal voltage	≥3.60V		
3	Internal Impedance	≤160mΩ		
4	End Voltage	2.5V		
5	Standard Charge Current	3.67V		
6	Max. Charge Voltage	3.95V		
7	Standard Charge Current	20mA		
8	Max. Charge Current	100mA		
9	Min. Charge Current	0.1mA		
10	Standard charge process	(23±5)℃, Charge at 20mA		
11	Max. Dis. Current	500mA		
12	Max. pulse discharge current	2.0A		Pulse 1S
13	Weight	约 7.5g		
14	Operating Temperature Range	-40℃~+85℃		60±25%RH
15	Storage Temperature Range	-30℃~+60℃		Prefer 20degC when transferred
16	Dimension 尺寸	Diameter： 15.1mm max		
		Height： 22.0mm max		

4 Appearance

When using the SPC1520 capacitor, there shall be no defects such as flaw, inflate, out of shape,

corrosion and leakage.

5 Performance and test conditions

5.1 Standard test conditions

Tests shall be conducted with the new Super Pulse Battery Capacitor which is shipped within 10 days . All tests stated in this Product Specification are conducted at temperature 20℃±5℃ and humidity 65%±20% RH.

5.2 Measuring instrument or apparatus

5.2.1 Measuring instrument or Apparatus

The dimension measurement shall be implemented by vernier micrometer with equal or more precision scale of 0.01mm.

5.2.2 Weighting instrument or Apparatus

The weight of the cell capacitor shall be implemented by electronic scale with equal or more precision scale of 0.05g.

5.2.3 Voltmeter

According to GB*, the voltage of the cell capacitor shall be implemented by voltmeter with equal or more precision level of 0.5 and more resistance of 10kΩ/V.

5.2.4 Ammeter

According to GB*, the current of the cell capacitor shall be implemented by ammeter with equal or more precision level of 0.5.

5.2.5Impedance meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

5.3 Initial performance test

No.	Item	Test Method and Condition	Requirements
1	Open-circuit Voltage	The Open-circuit Voltage shall be measured within 24 hours after standard charge.	≥3.60V
2	Internal Impedance	Internal impedance shall be measured under the standard charging condition.	≤160mΩ
3	Minimal Capacity	The capacity on 20mA discharge till the voltage tapered to 3.0V shall be measured after rested for 30min then finish standard charge.	C_5≥38mAh

5.4 Temperature dependence of discharge capacity

Discharge capacity of SPC1520 Super Pulse Battery Capacitor shall be measured with discharge constant current 20mA and 3.0V cut-off after the Standard charge. For -10℃ test condition, Super Pulse Battery Capacitor shall be stored at -10℃ temperature for 16 hours before discharging. For

23℃ and 55℃ test condition, Super Pulse Battery Capacitor shall be stored at the test temperature for 8 hours before discharging. Each SPC1520 shall meet or exceed the requirements listed below.

No.	Item	Temperature		
1	Discharge Temperature	-10℃	23℃	55℃
2	Discharge Capacity	60%	100%	95%

5.5 Charge retention and recovery

Test Item		Test Conditions	Criteria
RT	1	Stored for 30 days at RT after standard charge, measured with discharge current 20mA with 3.0V cut-off at RT.	Capacity Retention
	2	After Capacity Retention test, the SPC1520 shall be measured with current 20mA and 3.0V cut-off after the standard charge for 3 cycles. Choosing the maximum capacity as Capacity recovery.	Capacity Recovery

6 Cycle life

Number of charge-discharge cycles to 85% of initial capacity.

No.	100% DOD	10% DOD	1% DOD
Charge to 3.67V in standard mode	Carry out 800 cycles	Carry out 8000 cycles	Carry out 80000 cycles8

notes：DOD (depth of discharge)

7 Safety and environmental adaptability

7.1 Environmental adaptability

7.1.1 Temperature Cycling Test

According to the requirements of UL*, the Super Pulse Battery Capacitor is to be placed in a test chamber and subjected to the following cycles:

a) Raising the chamber-temperature to 70 ±3° C (158 ±5° F) within 30 minutes and maintaining this temperature for 4 hours.

b) Reducing the chamber temperature to 20 ±3° C (68 ±5° F) within 30 minutes and maintaining this temperature for 2 hours.

c) Reducing the chamber temperature to minus 40 ±3° C (minus 40 ±5° F) within 30 minutes

and maintaining this temperature for 4 hours.

d) Raising the chamber temperature to 20 ±3° C (68 ±5° F) within 30 minutes.

e) Repeating the sequence for a further 9 cycles.

f) After the 10th cycle, storing the capacitors for a minimum of 24 hours, at a temperature of 20± 5° C (68 ±9° F) prior to examination.

Criteria：The samples shall not explode, catch fire or leak.

7.1.2 Low Pressure (Altitude Simulation) Test

According to the requirements pointed in UL*, Super Pulse Battery Capacitor are to be stored for 6 hours at an absolute pressure of 11.6 kPa (1.68 psi) and a temperature of 20 ± 3° C (68 ± 5° F).

Criteria：The samples shall not explode, catch fire or leak.

7.1.3 Free-fall test

According to the requirements pointed in IEC62133-2002, Super Pulse Battery Capacitor are to be dropped from a height of 1 meter 3 times onto concrete ground.

Criteria：The samples shall not explode or catch fire.

7.1.4 Vibration test

According to the requirements pointed in UL*, Super Pulse Battery Capacitor are installed onto the vibration desk with clamps. The frequency is to be varied at the rate of 1 Hz /min between 10 and 55 Hz, and repeat vibration for 95±5min.The Super Pulse Battery Capacitor are to be tested in three mutually perpendicular directions), for which has only two axis of symmetry could conduct vibration test with two vertical directions.

Criteria：The samples shall not explode, catch fire or leak.

Warning: The description of the following abuse tests is for demonstration purposes only. During handling and application of capacitor, abusive conditions must be avoided. Any application or test requiring performance beyond the limits given hereby must be approved by the manufacturer.

7.2 Safety

7.2.1 Heating Test

According to the requirement pointed in UL*, a cell capacitor is to be heated in a gravity convection or circulating air oven with an initial temperature of 20±5° C (68 ±9° F). The temperature of the oven is to be raised at a rate of 5 ±2° C (9 ±3.6° F) per minute to a temperature of 130±2° C (266 ±3.6° F) and remain for 10 minutes. The sample shall return to room temperature (20 ± 5° C) and then be examined.

Criteria：Discharge from the relief valve is allowed, but the samples shall not explode or catch fire.

7.2.2 Impact Test

According to the requirement pointed in UL*, a test sample cell capacitor is to be placed on a flat surface. A 15.8 ±0.1 mm (5/8 ±0.004 inch) diameter bar is to be placed across the center of the sample. A 9.1 ±0.46 kg (20 ± 1 pound) weight is to be dropped from a height of 610 ±25 mm (24 ±1 inch) onto the sample.

Criteria：The samples shall not explode or catch fire.

7.2.3 Crush Test

According to the requirement pointed in UL*, a cell capacitor is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the Super Pulse Battery Capacitor and the crushing is to be continued until an applied force of 13±0.78kN (3000 ±224 pounds) is reached. Once the maximum force has been obtained it is to be released.

Criteria：The samples shall not explode or catch fire;

7.2.4 Short-Circuit Test

According to the UL* test requirement, each test sample, in turn, was short-circuited by connecting the positive and negative terminals of the sample with a circuit load having a maximum resistance ＜0.1 ohm. The sample was discharged until a fire or explosion was obtained, or until it had reached a completely discharged state of less than 0.2 volts and the cell case temperature had returned to +10° C (+18° F) of ambient temperature.

Criteria：The samples shall not explode or catch fire.

7.2.5 Forced-Discharge Test

According to the requirement pointed in GB/T*, and at ambient temperature (20 ± 5 ℃), the capacitor discharge to the termination voltage by 0.2C5 current, and then reverse charging by 1C5 current，the charging time is more than 90min.

Criteria： The samples shall not explode or catch fire;

References to safety standards

****UL: Underwriters Laboratories "Standard Lithium Battery"***

*****IEC: Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications***

GB：General specification of lithinum-ion battery for cellular phone

Note: This specification use the latest release version of the standard documents above as the criterion.

8 Incoming inspection

Before shipping, the factory wills 100% check open circuit voltage of the Super Pulse Battery Capacitor (OCV) and the load voltage. Also company will sampling tests the battery capacity, visual appearance and size.

As for the customer's incoming inspection, the factory recommended sampling according to GB2828.1-2003, GB2829-2002 standard.

Table 1 Acceptability quality level

No.	Item	Technical Request	Check Level	AQL
1	Dimension	3.16	S-3	0.65
2	Appearance	4	Ⅱ	0.65
3	Open circuit voltage	3.2	Ⅱ	0.4
4	Internal Impedance	3.3	Ⅱ	0.4

Table 2 Sampling amount

Lot Size	Sampling Amount
≤3200	32
3200~10 000	50
＞10 000	80

9 Product mark

9.1 The Capacitor’s label specification：

① type

② positive and negative electrode mark

③ date code

④ safety warning

9.2 Date code

Date code will be marked on the sleeve of battery.

Method：XX MM YY, “XX” stand for：date “MM”, stand for：month, “YY” stand for: year.

10 Storage

Super Pulse Battery Capacitor should be stored in a cool, clean, dry environment, the recommended temperature is ≤+30℃, relative humidity ≤60%, should avoid contact with corrosive materials, away from fire and heat.

11 Safety

We propose to use Super Pulse Battery Capacitor process, need to comply with the following provisions:

- Before use, do not remove the capacitor from the original packaging.
- Do not scattered placed the capacitor together in order to avoid accidental short circuit.
- Do not heat the capacitor above 100℃ or incinerated.
- Do not recharge the capacitor more than 3.95V.
- Do not weld or solder directly to capacitor, should use the capacitor with terminals or wires.
- Do not mix the new and used capacitors or different brand capacitor.
- Do not disassembly or open capacitor.
- Do not short circuit the battery or reversely contact the positive and negative terminals.
- SPC1520 and Li/$SOCl_2$ cell could use in parallel, but the protection measure must equip to prevent SPC1520 from charging.

12 Transportation

The SPC1520 Super Pulse Battery Capacitor has been proven to meet the tests and Criteria requirements of UN Manual, Part III, subsection 38.3 (Document No.: ST/SG/AC.10/11/Rev 5-2011). According to U.N. "Recommendations on the Transport of Dangerous Goods Model Regulations" (Document No.: ST/SG/AC.10/1- Rev 16（Vol.Ⅰ）-2009), The SPC1520 Super Pulse Battery Capacitor’s content is not more than 0.01g, So the SPC1520 Super Pulse Battery Capacitor battery can transport as non-restricted goods.

13 Remark of production duty

Customers must strictly operate according to specification and advises of the technical specification. Operation at temperature different from ambient may lead to reduced capacity and lower voltage reading at the beginning of pulses. The company will be exemption from liability if the Super Pulse Battery Capacitor are improper used or abused and then cause fire, explosion, the human body or property damage.