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广东科尼盛电子科技有限公司
KNSCHA ELECTRONICS CO., LIMITED

规格承认书

Specification For Approval

客户名称: (Customer Name)	
产品名称: (Product Name)	锂离子超级电容 Lithium-ion supercapacitor
客户料号: (Customer part number)	
科尼盛料号: (KNSCHA number)	LIC1020N3R8C080
型号规格: (Specifications)	LIC 80F/3.8V 8*20mm
日期: DATE	2025.8.19

制 造 Manufacture	
核 准 APPROVAL	制 作 PREPARED
王师	张优美

客户承认栏 CUSTOMER APPROVED		
核 准 APPROVED	确 认 CHECKED	经 办 DESIGNED

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1. Scope 适用范围

This specification describes the properties, testing methods and notice of the Radial-Type Lithium ion capacitor (LIC 1020 3R8 C080) developed by KNSCHA ELECTRONICS CO.,LIMITED..

本产品规格书对广东科尼盛电子科技有限公司开发的引线型锂离子电容器产品LIC 1020 3R8 C080的性能、测试方法及注意事项等进行了说明。

2. Basis standard 依据标准

- IEC 62813:2020《Lithium ion capacitors for use in electric and electronic equipment. Test methods for electrical characteristics》
  IEC 62813:2020《电气和电子设备用锂离子电容器电气特性试验方法》；
- IEC 62931-1:2015《Fixed electric double-layer capacitors for use in electronic equipment – Part 1: Sectional specification - Electric double layer capacitors for power application》
  IEC 62931-1:2015《电子设备用固定电双层电容器--第 1 部分通用规范》；
- QC/T 741-2014《Ultra-capacitor for electric vehicles》
  QC/T 741-2014 《车用超级电容器》；
- IEC 62931-2:2006《Fixed electric double-layer capacitors for use in electronic equipment – Part 2: Sectional specification-Electric double-layer capacitors for power application》
  IEC 62931-2:2006《电子设备用固定电双层电容器--第 2 部分通用规范》。

3. General Features 产品通用特性

3.1 Features and Advantages 特点与优势

- Low Self Discharge 低自放电
- High Capacitance(Near 10 time of EDLC) 高容量(同体积EDLC10倍)
- High operating Voltage(3.8V) 高工作电压(3.8V)
- Green and Environmental 绿色环保
- Maintenance-Free 免维护

3.2 Typical Applications 典型应用领域

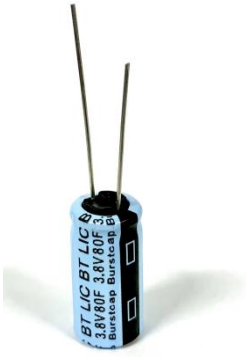
- With 3.67V Li-primary Battery: Water meter, Gas meter, Electric meter et al.
  3.67V一次锂电池市场：水表、气表、电表等

- ❖ GPS tracking, RF and Communication power supply
  GPS跟踪/RF和通信电源
- ❖ NB IOT/Pulse power supply
  NB通信/脉冲功率电源
- ❖ Electric Tool/ETC/Quick Charge power
  电动工具/ETC及其它快充电源
- ❖ Power industry
  电力行业

4. Product identification 产品标识图例

A-side
A 面

B-side
B 面



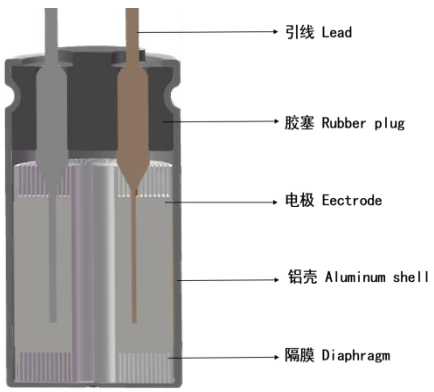
Product legend
产品图例

5. Product inspection standards 产品结构尺寸

5.1 Product structure 产品结构

This product is a radial cell with the parallel of electric double-layer capacitor + lithium ion battery. It consists of two electrodes, an insulation separator and electrolyte filled in the cell. Rubber stoppers are used to seal the aluminum case, with two radials located on the top.

本产品为引线型单体，基于双电层电容器+锂离子电池内部“并联”的新型储能器件，两极间用隔膜隔开，电解液填充于单元内部空间，用橡胶塞对铝外壳进行密封，两极的引线端子位于产品顶端。



Aluminum shell—Sealed core system to prevent electrolyte leakage.
铝壳—密封电芯体系，防止电解液泄露。

Eectrode—Key material for energy storage, consisting of a cathode providing a lithium source and a carbon anode.
电极—储能关键材料，由提供锂源的阴极和碳阳极构成。

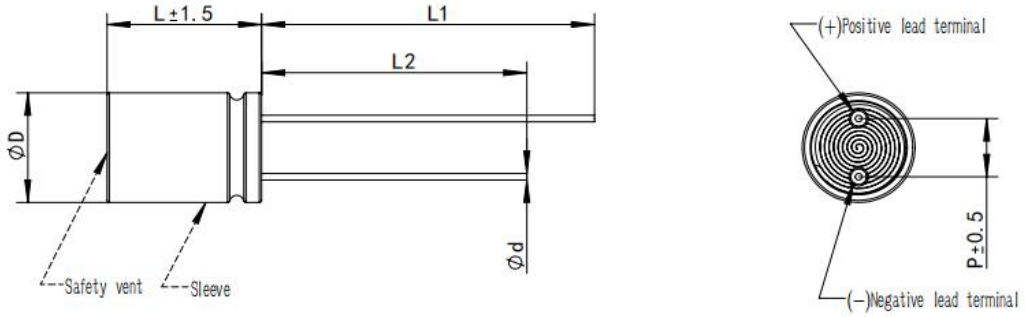
Diaphragm—Isolates positive and negative poles, preventing short circuit caused by contact between two poles. The diaphragm has the function of allowing the passage of electrolyte ions.

隔膜—隔离正负极，防止两极接触而短路。具有能使电解质离子通过的功能。

Lead—CP wire, also known as tinned copper clad steel wire, has high conductivity, good bending performance, and weldability, - a and is a bridge for internal energy transmission to the outside.
引线—CP 线，也叫做镀锡铜包钢线，具有高导电率，良好的折弯性能和可焊性，是内部能量向外部传输的桥梁。

Rubber plug—Made of elastomer material, which prevents short-circuiting between the terminals and the housing, and has a sealing and insulating effect, preventing the electrolyte from leaking out and evaporating.
胶塞—由弹性体材料制成，可防止端子与外壳之间短路，并具有密封和绝缘作用，防止电解液渗漏和蒸发。

5.2 Product size 产品尺寸：



Series 型号系列	ΦD (mm)	L (mm)	L1 (mm)	L2 (mm)	Φd (mm)	P (mm)	Weight 重量(g)
LIC 1020 3R8 C080	10＋1.5 Max	20±1.5	27±1.0	21±1.0	Φ0.6±0.1	5.0±0.5	≤3.0

6. Product Technical Index 产品技术指标

Series 序号	Merits 特性	Specifications 规格	Note 备注
1	Working Temperature 工作温度	-40℃~70℃	

2	Work Voltage 推荐工作电压区间		2.5~3.8V	
3	Min Voltage 最低电压		2.5V	
4	Max charging voltage 最高充电电压		4.2V	
5	1C Test current 1C 测试电流		28mA	
6	Rated capacity 额定容量(@25±3℃)		80F	放电区间：3.8-2.5V
	Tolerance 电容公差		-10%~+30%	
7	Equivalent capacity 等效容量		28.8mAh	
8	DCR 直流内阻		≤350mΩ	3.8V@25±3℃, 10msec
9	ACR 交流内阻		≤150mΩ	1kHz, 3.6V
10	Max discharge current 最大放电电流	Continuous 连续放电	250mA	
		Pulse (1sec) 3.8V 脉冲	6.0A	
11	Max charge current 最大充电电流		500mA	
12	漏电流 Leakage Current		≤3.0μA	@25℃@72h
13	Cycling performance 循环寿命		≥10 万次	
14	Mass (g) 标准重量		≤3.0	

15	Optimum storage condition 最佳存储环境	+10℃~50℃ 60%RH 或以下	

7. Technical Information 性能特性

Series 序号	Project 项目	Properties 性能
1	High-low temperature properties 高低温特性	Capacitance (-20℃): ≥ 70% of initial measured value 电容(-20℃): ≥初始测量值的 70% Internal resistance (-20℃): ≤10 times the initial specified value 内阻(-20℃): ≤初始规定值的 10 倍 Capacitance (+65℃): ≥ 70% of initial measured value 电容(+65℃): ≥初始测量值的 70% Internal resistance (+65℃): ≤2 times the initial specified value 内阻(+65℃): ≤初始规定值的 2 倍
2	High temperature and high humility storage properties 高温高湿存储特性	Capacitance: ≥ 70% of initial measured value 电容: ≥初始测量值的 70% Internal resistance: ≤2 times the initial specified value 内阻: ≤初始规定值的 2 倍
3	Charge/discharge cycling properties 充电/放电循环特性	Capacitance: ≥ 70% of initial measured value 电容: ≥初始测量值的 70% Internal resistance: ≤4 times the initial specified value 内阻: ≤初始规定值的 4 倍
4	Floating test at high temperature 高温浮充性能	Capacitance: ≥ 70% of initial measured value 电容: ≥初始测量值的 70% Internal resistance: ≤4 times the initial specified value 内阻: ≤初始规定值的 4 倍

8. Electrochemical performance test 电化学性能测试

8.1 Testing Conditions 测试条件

This specification followed the standard testing criteria: 1 atm, 25±3℃ and a relative humidity < 65%.

本产品规格书标准测试条件为：标准大气压下，温度 25±3℃，相对湿度小于 65%。

8.2 Testing Demands for Tools 测量工具要求

(1) Size: Need to use JIS B 7503 / KS B 5206 (Micrometer), JIS B 7507 / KS B 5203-2(Vernier caliper) JIS B 7502 / KS B 5205 / KS B 5202(External micrometer) or other same precision grade devices.

尺寸：必须使用 JIS B 7503 / KS B 5206(千分尺), JIS B 7507 / KS B 5203-2(游标卡尺) JIS B 7502 / KS B 5205 / KS B 5202（外部千分尺）或精度等级相同的仪表。

(2) DC Voltmeter：Need to use 0.2 grade type JIS C 1102 / KS C 1303-2(Electric Indicator) or much high precision devices, its internal resistance should over 10MΩ.

直流电压表：必须使用0.2级的JIS C 1102 / KS C 1303-2（电动指示仪）度相同或更高等级的仪表，其输入电阻超过10MΩ。

(3) DC Ammeter and AC Voltmeter：Need to use 0.2 grade type JIS C 1102 / KS C 1303-2(Electric Indicator) or much high precision devices.

直流电流表和交流电流表：必须使用0.2级的JIS C 1102 / KS C 1303-2（电动指示仪）度相同或更高等级的仪表，其输入电阻超过10MΩ。

8.3 Test for Capacitance 容量测试

At 25±3℃, discharge the battery with a constant current I to 2.5V before testing. Charge the product at 1C to the set voltage of U_R, Constant voltage charging for 30 min and cut off the current. Then, discharge the product at 1C to 2.5V. After standing for 30 seconds, repeat the above process again, and take the capacity value after the third discharge as the capacity value of the product.

在25±3℃条件下，在测试前，先将电池用恒定电流I放电至2.5V。将产品以1C充电至设定电压U_R后恒压充电30min，紧接着，以1C电流将产品放电至U_1。静置30s后，再次重复上述过程，取第3次放电后的容量值为产品的容量值。

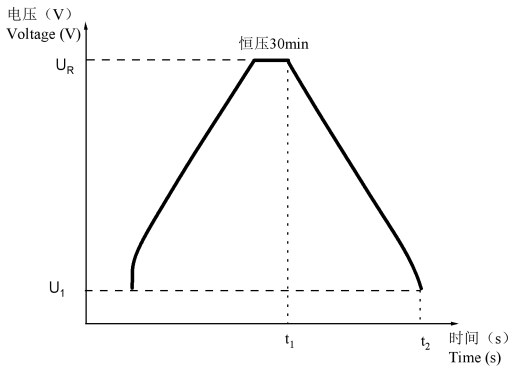


Fig1. Charge/Discharge curves for Sample

图1 样品的充放电曲线

$$C = I * (t_2 - t_1)/(U_R - U_1)$$

The formula：公式中：

I—Discharge Current 1C(mA)　　I—:放电电流 1C(mA)；

U_R—Voltage before test:UR=3.8(V)　　U_R—测量初始电压:UR=3.8(V)；

U_1—Voltage after test:U=2.5(V)　　U_1—测量结束电压:U2=2.5(V)；

t_1—Discharge time from U_R　　t_1—从 UR 开始放电时间

t_2—Timing from discharging to U_1；　　t_2—放电开始到测量结束电压 U_1 的时间(s)；

8.4 Direct current Resistance Test (DCR) 直流内阻测试

Charge the Li-ion capacitor at constant current (I) at room temperature to 3.8 V. Charge at 3.8V constant voltage for 30 minutes, and record the end moment as t_0. Discharge the capacitor again at constant current (I) to 2.5 V, and record the voltage U at t_0+10 ms. Repeat the above steps 3 times, and calculate the DC internal resistance of the 3rd cycle as the DC internal resistance of the Li-ion supercapacitor according to the following formula.

在室温下将锂离子电容器恒流(I)充电至3.8V，并恒压充电30min，将结束时刻记录为t_0。再以恒定电流(I)放电至2.5V，记录t_0+10ms时的电压U。重复上述步骤3次，根据下述公式计算第3次循环的直流内阻作为锂离子超级电容器的直流内阻（DCR）。

DCR = (3.8-U)/I

8.5 Alternating current Resistance Test (ACR)交流内阻测试

Charge the cell to 3.6V and keep this voltage for 30min, then using the AC Internal resistance to test its AC Resistance at 1kHz.

常温下，将单体充电至3.6V并恒压充电30min后，在1kHz条件下，采用交流阻抗仪进行

交流内阻测试。

8.6 High-low temperature properties 高低温性能测试

Based on the 《8.3 Test for Capacitance》 charging the cell to 3.8V at 25±3℃, and move the cell to a fixed temperature (-20±3℃,25±3℃,65±3℃), meantime charge the cell by constant voltage for 1h. After this, the cell's capacitance was tested At a current value of 1C.

25±3℃条件下，将单体参照《8.3容量测试》方式充电至3.8V后，紧接着将其转移至设定温度(设定温度分别为-20±3℃，25±3℃，65±3℃)条件下，在3.8V持续稳压的同时将样品放置1h。此后，将产品以1C放电电流要求在设定温度条件下进行容量测试。

8.7 High temperature and high humidity storage properties 高温高湿存储特性

At a current value of 1C, and the charge 1h at constant voltage condition at room temperature. After this, put the cell to 60±3℃、90±3% RH conditions to storage 1000h. Finally, cooling the cell at room temperature and check its electrochemical properties by 《8.3 Test for Capacitance》 and 《8.5 Test for AC Resistance》.

常温条件下，将产品以1C电流充电至3.6V并恒压充电1h，后将其放置在60±3℃、90±3% RH的条件下存储1000h。接着将其冷却至室温，并参照《8.3容量测试》和《8.5交流内阻测试》方法测试样品的电化学特性。

8.8 Charge/discharge cycling properties 充/放电循环性能测试

At a current value of 10C, charge the cell to 3.7V at room temperature, and the discharge it to 3.1V at the same current. Once cycling 100000times, re-checking its electrochemical properties by 《8.3 Test for Capacitance》and 《8.5 Test for AC Resistance》.

常温条件下，以10C电流将单体充电至3.7V，紧接着将其以该电流放电至3.1V循环100000次后，参照《8.3容量测试》和《8.5交流内阻测试》要求测量其电化学特性。

8.9 The floating test properties at high temperature 高温浮充性能测试

At a current value of 10C, charge the cell to 3.8V at 65±3℃, and kept the cell at this condition for 1000h. After this, cooling the cell to room temperature and testing its electrochemical properties by 《8.3 Test for Capacitance》and 《8.5 Test for AC Resistance》.

将产品置于65±3℃条件下以10C电流值将单体充电至3.8V，后在该条件下稳压1000h。紧接着将其自然冷却至室温，并参照《8.3 容量测试》和《8.5 交流内阻测试》要求进行电化学特性测试。

9. Safety Test 安全测试

Series 序号	Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
1	Drop Test 跌落测试	A fully charged cell drop onto the cement floor from 1.5m height t in a vertical direction, then observed for 1h. 电芯从 1.5m 的高度以正负极柱的方向跌落至水泥地面，实验后放置 1h 后进行外观检查。	No explosion, no fire 不爆炸、不起火
2	Crush Test 挤压测试	A cell 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 cells and the crushing is to be continued until an applied force of 13±1 KN is reached. Once the maximum force has been obtained is to be released. 将电芯置于挤压设备的两个挤压平面之间，用液压油缸或类似的力挤压，挤压面与电芯接触，逐渐增加压力至 13±1KN 后停止。	No explosion, no fire 不爆炸、不起火
3	Heating Test 加热测试	A cell is to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of 5°C±3°C per minute to a temperature of 130°C±3°C and remain for 30 min and observed 1h. 将电芯放在电热鼓风干燥箱中加热，温度以 5°C±3°C/min 的速率由室温升至 130°C±3°C 并保持 30min，观察 1h。	No explosion, no fire 不爆炸、不起火
4	Sea Water Immersion Test 海水浸泡	The cell was immersed in 3.5%Nacl solution (mass fraction, simulated seawater composition at normal temperature) for 2h. 将电芯完全浸入 3.5%Nacl 溶液（质量分数，模拟常温下的海水成分）中搁置 2h。	No explosion, no fire 不爆炸、不起火

5	Over-discharge Test 过放电	Constant discharge with 1C current for 90min，then observed for 1h. 以 1C 电流恒流放电 90min，观察 1h。	No explosion, no fire, no leakage 不爆炸、不起火、不漏液
6	Over-charge Test 过充电	Stop charging after charging with constant 1C current until reaching 1.5 times of the charging termination voltage stipulated by the enterprise or charging time reaching 1.5h. 以 1C 电流恒流充电至达到企业规定的充电终止电压的 1.5 倍，或充电时间达到 1.5h 后停止充电。	No explosion, no fire 不爆炸、不起火
7	Short-circuit Test 短路测试	Short-circuit the standard charged cell by connecting positive and negative terminal by less 5 mΩ wire, until the cell case temperature has returned to be 20% less then peak temperature. 短接电芯的正负极，外部线路总电阻＜5mΩ，当电芯温度下降到比峰值低约 20%，结束实验。	No explosion, no fire 不爆炸、不起火

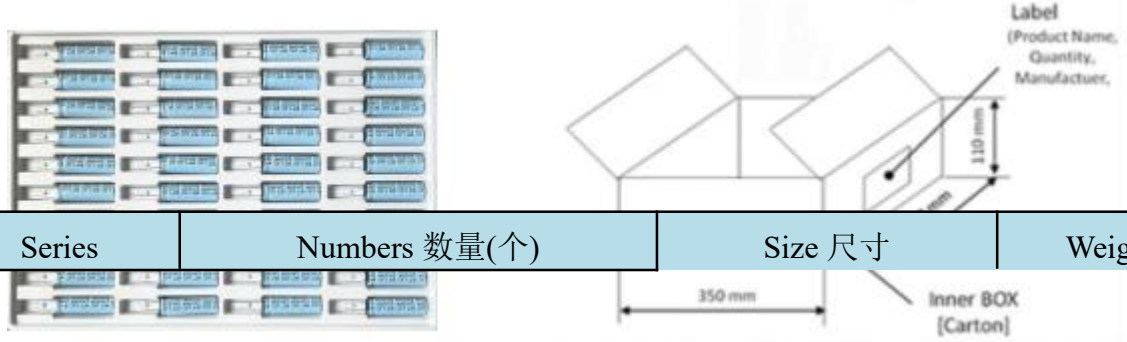
10.Satus of the Cell as of Ex-factory 电芯出厂状态

The battery cell should ensure transportation within the range of 3.3V to 3.65V (60-90% SOC).

电芯应保证在3.3V至3.65V(60~90%SOC)范围内转运。

11.Packaging 包装信息

11.1 Packaging as shown below 包装按下图包装方式



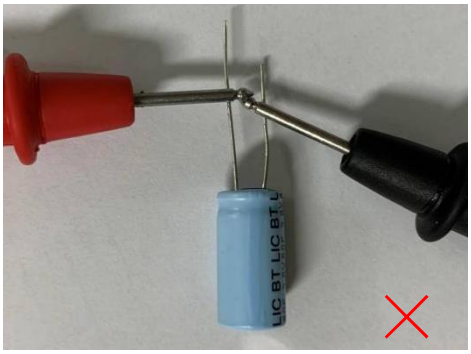
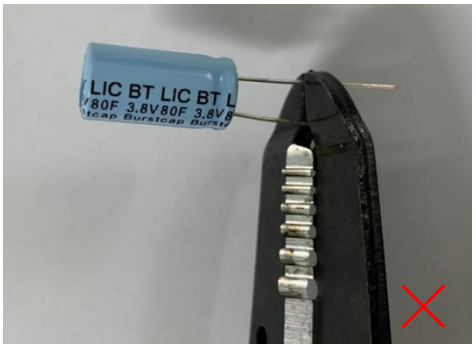
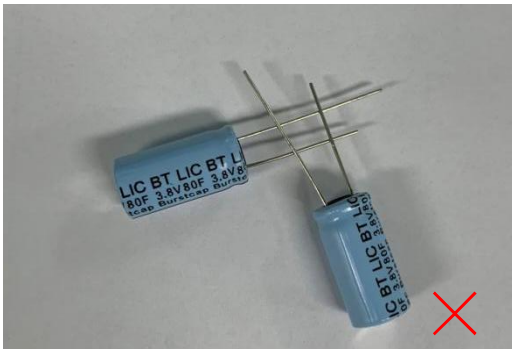
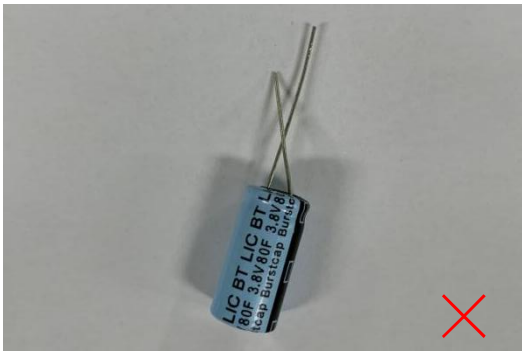
Series	Numbers 数量(个)	Size 尺寸	Weight

型号系列	Tray 托盘	District 内盒/分区	Box 外箱	(W × L × H, mm)	重量(kg)
LIC 1020 3R8 C080	50	700	2800	590 x 345 x 355	10.0

12. Precautions 注意事项

12.1 During Operation 使用规范

- Working temperature of LIC should not exceed the upper and lower limits of the rated temperature.
  锂离子电容器的使用温度不宜超过额定温度上限或下限。
- LIC should be used at rated voltage.
  锂离子电容器应在额定电压区间下使用。
- Check the polarity of LIC before power on. No reverse connecting.
  锂离子电容器在使用之前请确认极性，禁止反接。
- Keep LIC away from heat. The temperature has a big influence on the working life of LIC.
  外界环境温度对锂离子 电容器的寿命具有重要影响，请远离热源。
- No direct contacting with water, oil, acid or alkaline.
  锂离子电容器请勿直接接触水、油、酸或碱。
- No crushing, nail penetrating or disassembling LIC.
  请勿挤压、钉刺或拆解锂离子电容器。
- No discarding. Dispose LIC based on the State Environmental-protection Standard.
  请勿随意丢弃锂离子电容器，废弃时请根据国家环保标准进行处理。
- The cell embraced constant voltage before shipment, therefore, the short circuit should be extremely forbidden. Familiar short circuit is shown in the following table 4.
  本产品发货前已具有一定电压值，使用过程切勿使正负极端子短路，常见产品短路情况如下表所示。

Short Circuit during Testing 测量中发生短路	Short Circuit during connecting 产品处理中发生短路
	
Radial connecting during the storage or moving processes **产品放置在一起导致引线接触**	**Short circuit** **发生短路**
	

12.2 储存Storage

- ❖ No storage in a condition with a relative humidity exceeding 85% or with toxic gases. It is easy to cause the damage and corrosion of the terminals and case, resulting in disconnection.
  锂离子电容器不可处于相对湿度为85%以上或含有有毒气体的场所，该种环境下引线及壳体易受潮及腐蚀，导致锂离子电容器断路。
- ❖ For Long-term storage, place LIC in a well-ventilated condition at 10 to 55℃, with a relative humidity below 60%. Forbidden to sun directly.
  锂离子电容器若需长期储存，请在温度10~55℃，相对湿度60%以下，通风良好的场所存放，严禁暴晒。

12.3 Shipment 运输

The capacity of delivery cell is approximately at 80% of charging. It is not specified more than 80% capacityremain at customer, because of self-discharge. During transportation, keep the cell

from acutely vibration, impacting, solarization, drenching.

出货电芯处 80%充电状态，由于电芯存在自耗，运送到客户端的电芯无法完全保证 80%荷电量。运输过程应防止剧烈振动、冲击、日晒雨淋。