



# Specification For Approval

Customer: \_\_\_\_\_

Battery model name: GEB 502020

Customer model number: \_\_\_\_\_

Revision: \_\_\_\_\_

Date: \_\_\_\_\_

|                                    |
|------------------------------------|
| Customer approval                  |
| Comment:                           |
| Customer's signature/ Date : _____ |

| Prepared | Checked | Approved |
|----------|---------|----------|
|          |         |          |



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### 1.Scope

This document describes the Product Specification of the Lithium-Polymer (LIP) rechargeable battery cell supplied by General Electronics Battery Co., Ltd.

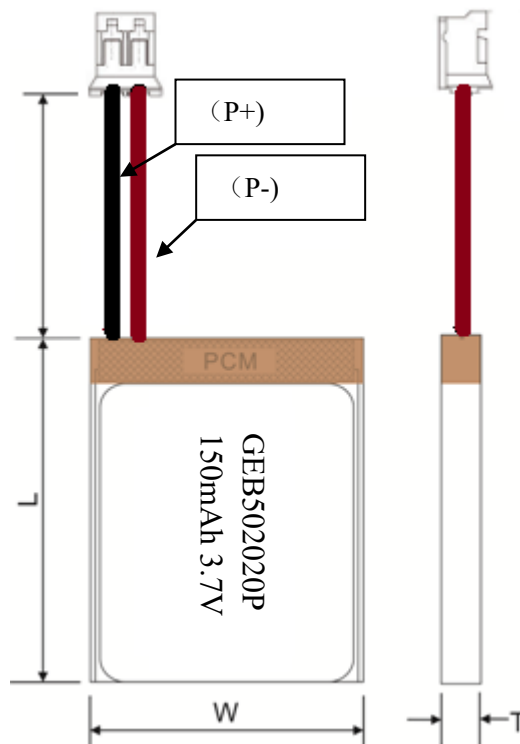
Model: GEB 502020

GEB

PCB

### 3.Dimensions of battery pack

T:≤5.2mm \* W:≤20.3mm \* L:≤22mm



- Connecting Wires
- Red: connect to “+”
- Black : connect to “ — ”

### 4. Battery configuration

4. 1 Battery portfolio primarily BOM



| No. | Item                   | criteria                           | Remarks |
|-----|------------------------|------------------------------------|---------|
| 1   | Semi-manufactured cell | 502020                             |         |
| 2   | PCB                    | DW01+8205                          |         |
| 3   | Wire/connector         | UL1007-AWG26, JST-XHR-2.54 reverse |         |

4. 2 Specifications of battery pack

| No. | Item                              | Specifications  | Comments  |
|-----|-----------------------------------|---|-----------|
| 1   | Assemble model                    | Simple link   |           |
| 2   | Nominal Capacity                  | 150mAh  |           |
| 3   | Rated Impedance                   | $\leq 240\text{m}\Omega$ (Added after the board) at 25 °C |           |
| 4   | Battery Weight                    | Approx: 10g   |           |
| 5   | Overcharge protection voltage     | 4.30±0.05V  |           |
| 6   | Max. charge current               | 1 C   |           |
| 7   | Over discharge protection voltage | 2.5v  |           |
| 8   | Max discharge current             | 1C  |           |
| 9   | Charge temperature                | 0°C ~ +45°C   |           |
| 10  | Discharge temperature             | -10°C ~ +55°C   |           |
| 11  | Storage temperature               | less than 1 month   | -10~+55°C |
|     |                                   | less than 3 month   | -10~+40°C |
|     |                                   | less than 1 year  | 0~+25°C   |
| 6   | Storage humidity                  | $\leq 75\%$   |           |



5. Specifications of cell

| No. | Items                         | Specifications   |           |
|-----|-------------------------------|--|-----------|
| 1   | Charge voltage                | 4.2V   |           |
| 2   | Nominal voltage               | 3.7V   |           |
| 3   | Nominal capacity              | 150mAh 0.2 C Discharge   |           |
| 4   | Charge current                | Standard Charging: 0.2 C<br>Rapid charge: 1.0 C  |           |
| 5   | Standard Charge               | Charging the cell initially with constant current at 0.2 C and then with constant voltage at 4.2V till charge current declines to 0.02 C |           |
| 6   | Charging time                 | Standard Charging: 6.0 hours (Ref.)<br>Rapid charge: 1.5-2.5 hours (Ref.)  |           |
| 7   | Max. charge current           | 1.0 C  |           |
| 8   | Max. discharge current        | 1.0 C  |           |
| 9   | Discharge cut-off voltage     | 2.75V  |           |
|     | Charge temperature            | 0°C ~ +45°C  |           |
| 10  | Discharge temperature         | -10 ~ +55°C  |           |
| 11  | Temperature range for storage | less than 1 month  | -10~+55°C |
|     |                               | less than 3 months   | -10~+40°C |
|     |                               | less than 1 year   | 0~+25°C   |
| 6   | Cell Weight                   | Approx: 8.5g   |           |
| 13  | Cell Dimension                | Length: 20.5 mm Max<br>Width: 20.0mm Max<br>Thickness: 5.0mm Max   |           |



6. Battery Cell Performance Criteria

6.1 Electrical characteristics

| No.   | Items                             | Test Method and Condition  | Criteria                                 |
|-------|-----------------------------------|--|--|
| 6.1.1 | Standard Charge                   | Charging the cell initially with constant current at 0.2 C and then with constant voltage at 4.2V till charge current declines to 0.02 C   |  |
| 6.1.2 | First Discharge Capacity          | The capacity means the first discharge capacity of the cell, which is measured with discharge current of 0.5 C with 3.0V cut-off after standard charge.  | ≥150mAh                                  |
| 6.1.3 | Cycle Life                        | Test condition:<br>Charge: 0.2 C to 4.2V<br>Discharge: 0.2 C to 3.0V<br>80% or more of 1 <sup>st</sup> cycle capacity at 0.2C discharge of Operation   | ≥500 (laps)                              |
| 6.1.4 | Self-discharge                    | After the standard charging, stored the cells under the condition 25.0±5.0°C (Temperature) ≤75.0%RH (Humidity) for 28 days, then measured the capacity with 0.2 C till 3.0V with previous standard discharge capacity of the ratio | Residual capacity >90%                   |
| 6.1.5 | Initial impedance of cell         | Internal resistance measured at AC 1KHz after 50% charge , at 25°C.  | ≤240mΩ                                   |
| 6.1.6 | Temperature Characteristics       | 1. According to item 6.1.1, at 25±5°C.<br>2. Capacity comparison at each temperature, measured with constant discharge current 0.2 C with 3.0V cut-off. Percentage as an index of the capacity compared with 100% at 25°C          | -10°C: ≥50%<br>25°C: 100%<br>60°C: ≥85%  |
| 6.1.7 | Constant humidity and temperature | After standard charging, laying the battery 48h at 40±2°C, RH 93±2%. Recording 1C discharging time   | No distortion<br>No electrolytes leakage |



6.2 Mechanical characteristics

| No. | Items          | Test Method and Condition   | Criteria              |
|-----|----------------|---|-----------------------|
| 1   | Vibration Test | After standard charging, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 1.6mm.The cell shall be vibrated for 30 minutes per axis of XYZ axes. | No leakage<br>No fire |
| 2   | Drop Test      | The cell is to be dropped from a height of meter twice onto concrete ground.  | No fire, no leakage.  |

6.3 Visual inspection

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

6.4 Standard environmental test condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:

Temperature:  $25.0 \pm 5.0^{\circ}\text{C}$

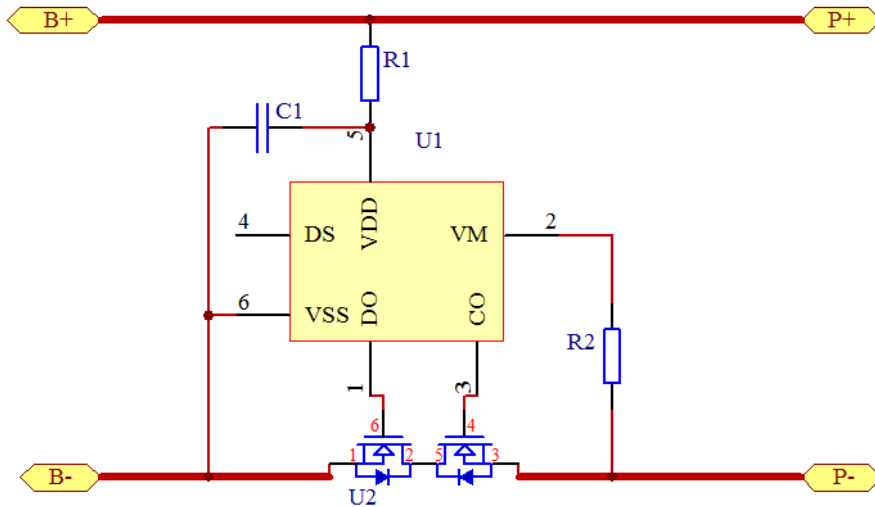
Humidity:  $\leq 75.0\% \text{RH}$

7. PCM parameter PCM

7.1 PCM

| Item                   | Symbol     | Content   | Criteria                                |
|------------------------|------------|---|---|
| Over charge Protection | $V_{DET1}$ | Over charge detection voltage                     | $4.3V \pm 0.05V$                        |
| Over discharge         | $V_{DET2}$ | Over discharge detection voltage                  | $2.4V \pm 0.1V$                         |
| Over Current           | $I_{DP}$   | Over current detection current                    | $3 \pm 1A$                              |
| Interior resistance    | $R_{DS}$   | Main loop electrify resistance (Battery Vol=3.9V) | B- to P- B-至 P- $R_{DS} \leq 60m\Omega$ |
| Current consumption    | $I_{DD}$   | Current consume in normal operation               | MIN: $0.3 \mu A$ MAX: $8.0 \mu A$       |

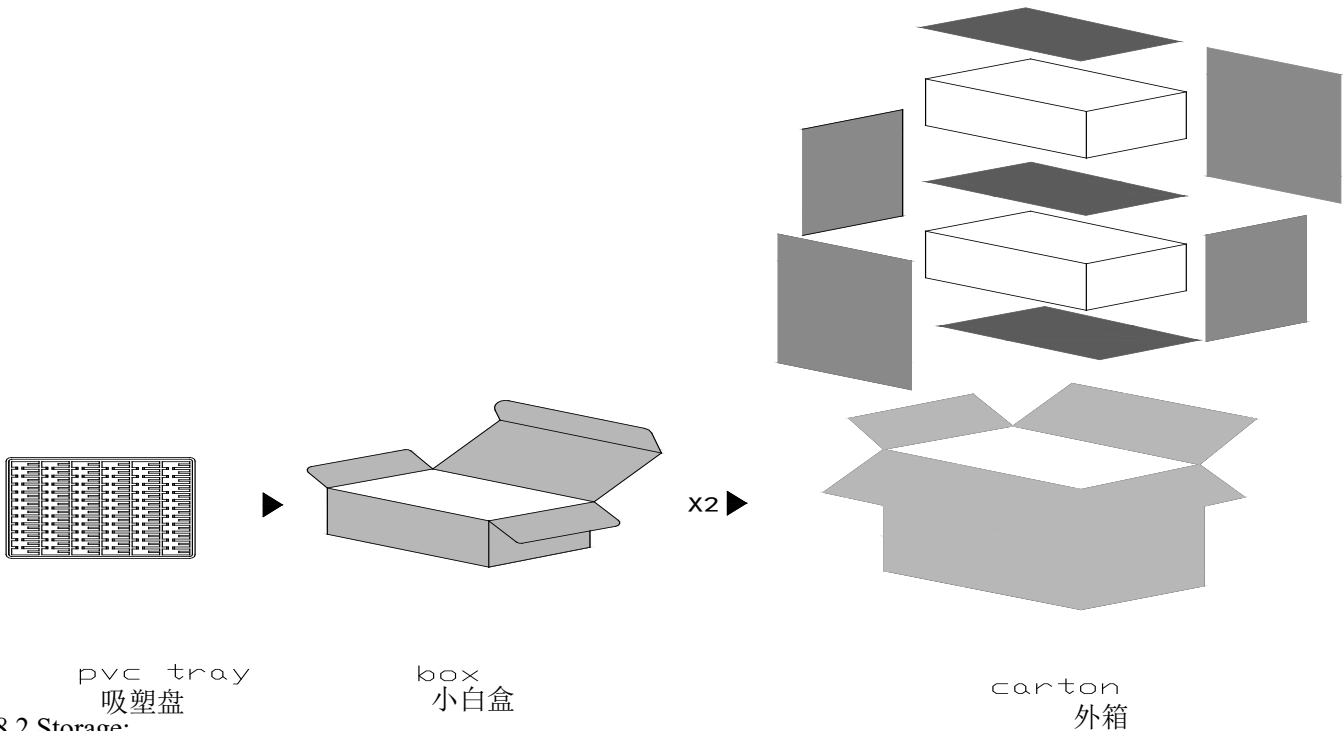
7.2 Application Schematic



8. Packaging、 Storage and Transportation

8.1 Packaging model





8.2 Storage:

- 8.2.1 The Li-ion battery pack should be stored in a cool, dry and well-ventilated area, and should be far from the fire and the high temperature.
- 8.2.2 The battery should store in the product specification book stipulation temperature range, the best storage temp. is  $25\pm 5^{\circ}\text{C}$ . The best humidity is  $60\pm 15\%$ .
- 8.2.3 The battery should be stored within room temperature, and charged to 40%~60% electric quantity (3.85V) . In order to avoid over-discharge, we suggest charge and discharge the batteries every three months., Then charge to 40%~60%electric quantity (3.85V).

8.3 Transportation:

- 8.3.1 Do not mix the battery products with other cargos.
- 8.3.2 Do not immerse the battery products in water or allow it to get wet.
- 8.3.3 Do not over 7 layers staking and upside-down.
- 8.3.4 The highest temperature in transportation is lower than  $65^{\circ}\text{C}$ .

9. Use Attentions:

To ensure proper use of the battery please read the manual carefully before using it.

9.1 Warnings:

- 9.1.1 Do not expose to, dispose of the battery in fire.
- 9.1.2 Do not put the battery in a charger or equipment with wrong terminals connected.
- 9.1.3 Avoid shorting the battery.
- 9.1.4 Avoid excessive physical shock or vibration.
- 9.1.5 Do not disassemble or deform the battery.
- 9.1.6 Do not immerse in water.
- 9.1.7 Do not use the battery mixed with other different type or model batteries.
- 9.1.8 Keep out of the reach of children.

9.2 Charge:

- 9.2.1 Battery must be charged in appropriate charger only.



9.2.2 Never use a modified or damaged charger.

9.2.3 Do not leave battery in charger over 24 hours.

9.2.4 Charging current: Can not surpass the biggest charging current which in this specification book stipulated.

9.2.5 Charging voltage: Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage.

9.2.6 Charge temperature: The battery must carry on the charge in the ambient temperature scope which this specification book stipulated.

9.2.7 Uses constant current and constant voltage way charge. Pls connect the positive and negative terminals in right way, or the battery may be damaged.

9.3 Discharge:

9.3.1 The discharging current should not surpass the biggest discharging current this specification book stipulation, The large discharge current can cause heat and lower capacity.

9.3.2 Discharge temperature: The battery discharge must carry on in the ambient temperature scope which this specification book stipulated.

9.3.3 Over-discharge: After short time over discharge, then charge immediately won't damage the battery. But the battery will be damaged for being long time over discharged. During long-term storage, the battery may be within over-discharging condition for self discharge. To prevent the occurrence of over discharging, the battery should maintain the certain capacity when storage.

9.4 Handling of Cells

1 Soft Al foil

- Don't strike battery with any sharp edge parts
- Trim your nail or wear glove before taking battery
- Clean worktable to make sure no any sharp particle

2 Sealed edge may be damaged by heat above 100°C, bend or fold sealed edge.

3 Handling of Tabs

The battery tabs are not so stubborn especially for aluminous tab.

Do not bend tabs unnecessarily.

4 Tab Connection

Ultrasonic welding or spot welding is recommended for LIP tab connection method.

Battery pack should be designed that shear force are not applied to the LIP tabs.

If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

- The solder iron should be temperature controlled and ESD safe;
- Soldering temperature should not exceed 370°C;
- Soldering time should not be longer than 3s;
- Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;
- Directly heat cell body is strictly prohibited; Battery may be damaged by heat above approx. 100°C

9.5 Disposal

Regulations vary for different countries. Dispose of in accordance with local regulations.

9.6 Note:

Any other items which are not covered in this specification shall be agreed by both parties.