

UN38.3 Test Report



Sample name : Li-ion Battery

Model : BL0800F5424651S1PSXH

Applicant : GlobTek,Inc.

Shenzhen LCS Compliance Testing Laboratory Ltd.

UN38.3 Test Report

| | | |
|---------------------------------|---|---|
| Report reference No | LCS170804072AS | |
| Tested by (+ signature) | Linda Liang |  |
| Checked by (+ signature) | Fiona.Jin | |
| Approved by (+ signature) | Hart.Qiu | |
| Contents..... | 15 pages | |
| Date of issue | 2017.08.16 | |
| Testing Laboratory Name | Shenzhen LCS Compliance Testing Laboratory Ltd. | |
| Address | 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China | |
| Applicant's Name | GlobTek, Inc. | |
| Address | 186 Veterans Dr. Northvale, NJ 07647 USA. | |
| Manufacturer | GlobTek (Suzhou) Co.,Ltd . | |
| Address | Building 4, No.76, Jinling East Road, Suzhou Industrial Park, Jiangsu 215021,P.R.China | |
| Standard | Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6 Section 38.3) | |
| Test item description | Li-ion Battery | |
| Trade Mark |  GlobTek, Inc. | |
| Model/type reference | BL0800F5424651S1PSXH | |
| Ratings..... | 3.7V , 800mAh, 2.96Wh | |

| | | | |
|---|--------------------------|--|--|
| Classification.....: | Li-ion Battery | | |
| Type of Sample.....: | Prismatic | | |
| Details information of the battery and the cell built in the battery, as following: | | | |
| | Product | Cell | Battery |
| | Model | ---- | BL0800F5424651S1PSXH |
| | Nominal voltage | 3.7V | 3.7V |
| | Rated capacity | 800mAh | 800mAh |
| | Charge method | 0.2C CC(constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to 0.02C. | 0.2C CC(constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to 0.02C. |
| | Max. Discharging Current | 800mA | 800mA |
| | Max. Charging voltage | 4.2V | 4.2V |
| | End of discharge voltage | 3.0V | 3.0V |
| | Dimension | 64.8*23.0*5.5(mm) | 71.0*24.0*6.0(mm) |
| | Weight | 17.5g | 20.4g |
| Possible test case verdicts: | | | |
| Test case does not apply to the test object.....: | N/A | | |
| Test item does meet the requirement | P(ass) | | |
| Test item does not meet the requirement | F(ail) | | |
| Testing: | | | |
| Date of sample received.....: | 2017.08.04 | | |

| | | | |
|--|------------------------|---------------|------------------|
| Date(s) of performance of test.....: | 2017.08.04~ 2017.08.17 | | |
| Version | Report No. | Revision Data | Summary |
| V1.0 | LCS170804072AS | / | Original Version |
| Test conclusion: The Li-ion Battery submitted by GlobTek,Inc. are tested according to Section 38.3 of the Sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria(ST/SG/AC.10/11/Rev.6 Section 38.3). Test result: Pass | | | |

I 、 CONCLUSION

| Item | Sample Number | Standard | Conclusion |
|------------------------|---------------|---|------------|
| Altitude simulation | B01-B10 | Section 38.3 of the Sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6 Section 38.3) | PASS |
| Thermal test | | | PASS |
| Vibration | | | PASS |
| Shock | | | PASS |
| External short circuit | | | PASS |
| Crush/ Impact | C01-C05 | | PASS |
| Overcharge | B11-B18 | | PASS |
| Forced discharge | C06-C25 | | PASS |

Notes备注:

The conditions of the battery of sample No. B01 to B14 are at first cycle, in fully charged state;

The conditions of the cells of sample No. C01 to C05 are at first cycle at 50% of the design rated capacity, in fully charged state;

The conditions of the battery of sample No.B15 to B18 are full charged after fifty cycle;

The conditions of the cells of sample No.C06 to C15 are at first cycle, in fully discharged state;

The conditions of the cells of sample No.C16 to C25 are after fifty cycles ending in fully discharged state.

II、MAIN TEST EQUIPMENT

| NO. | Instrument Name |
|-----------|---------------------------------------|
| LCS-S-224 | Battery charge tester |
| LCS-S-218 | Battery low press tester |
| LCS-S-222 | Rapid temperature rise tester |
| LCS-S-213 | Vibration tester |
| LCS-S-214 | Vertical shock Tester |
| LCS-S-220 | Battery external short-circuit tester |
| LCS-S-231 | DC source |
| LCS-S-215 | Battery crush tester |
| LCS-S-379 | Scales |
| LCS-S-230 | Digital multimeter |
| LCS-S-115 | Temperature recorder |
| LCS-S-223 | Free fall tester |

III. TEST METHOD AND DATA

Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries. Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries.

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

In order to quantify the mass loss, the following procedure is provided.

$$\text{mass loss} = (M_1 - M_2) / M_1 \times 100\%$$

Where M_1 is the mass before the test and M_2 is the mass after the test, when mass loss does not exceed the values in Table below, it shall be considered as "no mass loss".

| Mass M of cell or battery | Mass lost limited |
|------------------------------------|-------------------|
| $M < 1\text{g}$ | 0.5% |
| $1\text{g} \leq M \leq 75\text{g}$ | 0.2% |
| $M > 75\text{g}$ | 0.1% |

Test T1: Altitude simulation

Test procedure:

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient

temperature (20 ± 5 °C).

Requirement :

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Data:

| No. | Pre-test | | After test | | Mass loss (%) | Voltage loss (%) | Verdict# |
|-----|----------|------------|------------|------------|---------------|------------------|----------|
| | Mass(g) | Voltage(V) | Mass(g) | Voltage(V) | | | |
| B01 | 20.401 | 4.18 | 20.401 | 4.17 | 0.000 | 0.24 | PASS |
| B02 | 20.398 | 4.17 | 20.396 | 4.17 | 0.010 | 0.00 | PASS |
| B03 | 20.394 | 4.17 | 20.394 | 4.17 | 0.000 | 0.00 | PASS |
| B04 | 20.397 | 4.17 | 20.397 | 4.17 | 0.000 | 0.00 | PASS |
| B05 | 20.389 | 4.17 | 20.389 | 4.17 | 0.000 | 0.00 | PASS |
| B06 | 20.387 | 4.17 | 20.386 | 4.17 | 0.005 | 0.00 | PASS |
| B07 | 20.388 | 4.17 | 20.388 | 4.17 | 0.000 | 0.00 | PASS |
| B08 | 20.386 | 4.18 | 20.384 | 4.17 | 0.010 | 0.24 | PASS |
| B09 | 20.394 | 4.18 | 20.394 | 4.17 | 0.000 | 0.24 | PASS |
| B10 | 20.395 | 4.17 | 20.395 | 4.17 | 0.000 | 0.00 | PASS |

#: No leakage, No venting, No disassembly No rupture and no fire

Test T.2: Thermal test

Test procedure

Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2 °C, followed by storage for at least six hours at a test temperature equal to -40 ± 2 °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

Requirement

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Data:

| No. | Pre-test | | After test | | Mass loss (%) | Voltage loss (%) | Verdict# |
|-----|----------|------------|------------|------------|---------------|------------------|----------|
| | Mass(g) | Voltage(V) | Mass(g) | Voltage(V) | | | |
| B01 | 20.401 | 4.17 | 20.341 | 4.13 | 0.294 | 0.96 | PASS/合格 |
| B02 | 20.396 | 4.17 | 20.321 | 4.13 | 0.368 | 0.96 | PASS/合格 |
| B03 | 20.394 | 4.17 | 20.324 | 4.13 | 0.343 | 0.96 | PASS/合格 |

| | | | | | | | |
|-----|--------|------|--------|------|-------|------|---------|
| B04 | 20.397 | 4.17 | 20.332 | 4.13 | 0.319 | 0.96 | PASS/合格 |
| B05 | 20.389 | 4.17 | 20.327 | 4.13 | 0.304 | 0.96 | PASS/合格 |
| B06 | 20.386 | 4.17 | 20.314 | 4.13 | 0.353 | 0.96 | PASS/合格 |
| B07 | 20.388 | 4.17 | 20.324 | 4.13 | 0.314 | 0.96 | PASS/合格 |
| B08 | 20.384 | 4.17 | 20.324 | 4.13 | 0.294 | 0.96 | PASS/合格 |
| B09 | 20.394 | 4.17 | 20.327 | 4.13 | 0.329 | 0.96 | PASS/合格 |
| B10 | 20.395 | 4.17 | 20.333 | 4.13 | 0.304 | 0.96 | PASS/合格 |

#: No leakage, No venting, No disassembly No rupture and no fire

Test T.3: Vibration

Test procedure:

1. Cells and batteries are firmly secured to the platform of the vibration machine
2. The vibration: a sinusoidal waveform with a logarithmic sweep between 7Hz and 200Hz and back to 7Hz traversed in 15 minutes
3. the logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached, The amplitude is then maintained at 0,8mm (1,6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50Hz), A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz
4. This cycle repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell

Requirement

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Data:

| No. | Pre-test | | After test | | Mass loss (%) | Voltage loss (%) | Verdict# |
|-----|----------|------------|------------|------------|---------------|------------------|----------|
| | Mass(g) | Voltage(V) | Mass(g) | Voltage(V) | | | |
| B01 | 20.341 | 4.13 | 20.339 | 4.12 | 0.010 | 0.24 | PASS |
| B02 | 20.321 | 4.13 | 20.321 | 4.13 | 0.000 | 0.00 | PASS |
| B03 | 20.324 | 4.13 | 20.324 | 4.13 | 0.000 | 0.00 | PASS |
| B04 | 20.332 | 4.13 | 20.332 | 4.12 | 0.000 | 0.24 | PASS |
| B05 | 20.327 | 4.13 | 20.327 | 4.13 | 0.000 | 0.00 | PASS |
| B06 | 20.314 | 4.13 | 20.312 | 4.13 | 0.010 | 0.00 | PASS |
| B07 | 20.324 | 4.13 | 20.323 | 4.13 | 0.005 | 0.00 | PASS |
| B08 | 20.324 | 4.13 | 20.324 | 4.12 | 0.000 | 0.24 | PASS |
| B09 | 20.327 | 4.13 | 20.326 | 4.13 | 0.005 | 0.00 | PASS |
| B10 | 20.333 | 4.13 | 20.333 | 4.12 | 0.000 | 0.24 | PASS |

#: No leakage, No venting, No disassembly No rupture and no fire

Test T4: Shock**Test procedure:**

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a halfsine shock of peak acceleration of 150gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50gn and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

| Battery | Minimum peak acceleration | Pulse duration |
|-----------------|---|----------------|
| Small batteries | 150 g _n or result of formula $\text{Acceleration}(g_n) = \sqrt{\left(\frac{100850}{\text{mass}^*}\right)}$ whichever is smaller | 6 ms |
| Large batteries | 50 g _n or result of formula $\text{Acceleration}(g_n) = \sqrt{\left(\frac{30000}{\text{mass}^*}\right)}$ whichever is smaller | 11 ms |

Requirement:

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Data:

| No. | Pre-test | | After test | | Mass loss (%) | Voltage loss (%) | Verdict# |
|-----|----------|------------|------------|------------|---------------|------------------|----------|
| | Mass(g) | Voltage(V) | Mass(g) | Voltage(V) | | | |
| B01 | 20.339 | 4.12 | 20.338 | 4.12 | 0.005 | 0.00 | PASS |
| B02 | 20.321 | 4.13 | 20.321 | 4.12 | 0.000 | 0.24 | PASS |
| B03 | 20.324 | 4.13 | 20.324 | 4.12 | 0.000 | 0.24 | PASS |
| B04 | 20.332 | 4.12 | 20.332 | 4.12 | 0.000 | 0.00 | PASS |
| B05 | 20.327 | 4.13 | 20.327 | 4.13 | 0.000 | 0.00 | PASS |
| B06 | 20.312 | 4.13 | 20.312 | 4.13 | 0.000 | 0.00 | PASS |
| B07 | 20.323 | 4.13 | 20.322 | 4.12 | 0.005 | 0.24 | PASS |
| B08 | 20.324 | 4.12 | 20.324 | 4.12 | 0.000 | 0.00 | PASS |
| B09 | 20.326 | 4.13 | 20.325 | 4.12 | 0.005 | 0.24 | PASS |
| B10 | 20.333 | 4.12 | 20.333 | 4.12 | 0.000 | 0.00 | |

#: No leakage, No venting, No disassembly No rupture and no fire

Test T.5: External short circuit**Test procedure:**

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches $57 \pm 4^\circ\text{C}$ and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at $57 \pm 4^\circ\text{C}$. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to $57 \pm 4^\circ\text{C}$.

Requirement:

Cells and batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

Data:

| No. | Peak temperature($^\circ\text{C}$) | No disassembly, No rupture and no fire |
|-----|--------------------------------------|--|
| B01 | 57.2 | PASS |
| B02 | 57.3 | PASS |
| B03 | 57.2 | PASS |
| B04 | 57.4 | PASS |
| B05 | 57.2 | PASS |
| B06 | 57.1 | PASS |
| B07 | 57.3 | PASS |
| B08 | 57.4 | PASS |
| B09 | 57.3 | PASS |
| B10 | 57.6 | PASS |

Test T.6: Impact (applicable to cylindrical cells not less than 18 mm in diameter) / Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter)**Test procedure– Impact:**

The sample cell or component cell is to be placed on a flat smooth surface. A $15.8 \text{ mm} \pm 0.1 \text{ mm}$ diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the Centre of the sample. A $9.1 \text{ kg} \pm 0.1 \text{ kg}$ mass is to be dropped from a height of $61 \pm 2.5 \text{ cm}$ at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.

The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the $15.8 \text{ mm} \pm 0.1 \text{ mm}$ diameter curved surface lying across the Centre of the test sample. Each sample is to be subjected to only a single impact.

Test Procedure– Crush:

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

(a) The applied force reaches $13 \text{ KN} \pm 0.78 \text{ KN}$;

Example: The force shall be applied by a hydraulic ram with a 32 mm diameter piston until a pressure of 17 MPa is reached on the hydraulic ram.

(b) The voltage of the cell drops by at least 100 mV; or

(c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.

Requirement:

Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire during the test and within six hours after this test.

Data (Crush) :

| No. | Peak temperature(°C) | No disassembly, No fire |
|-----|----------------------|-------------------------|
| C01 | 25.2 | PASS |
| C02 | 25.4 | PASS |
| C03 | 25.5 | PASS |
| C04 | 25.4 | PASS |
| C05 | 25.6 | PASS |

Test T.7: Overcharge

Test procedure:

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

(b) when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

Requirement :

Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

Data:

| No. | No disassembly, No fire |
|-----|-------------------------|
| B11 | PASS |
| B12 | PASS |
| B13 | PASS |
| B14 | PASS |
| B15 | PASS |

| | |
|-----|------|
| B16 | PASS |
| B17 | PASS |
| B18 | PASS |

Test T.8: Forced discharge (for cell)**Test procedure**

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

Requirement

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

Data:

| No. | No disassembly and no fire |
|-----|----------------------------|
| C06 | PASS |
| C07 | PASS |
| C08 | PASS |
| C09 | PASS |
| C10 | PASS |
| C11 | PASS |
| C12 | PASS |
| C13 | PASS |
| C14 | PASS |
| C15 | PASS |
| C16 | PASS |
| C17 | PASS |
| C18 | PASS |
| C19 | PASS |
| C20 | PASS |
| C21 | PASS |
| C22 | PASS |
| C23 | PASS |
| C24 | PASS |
| C25 | PASS |

IV、THE PHOTO OF SAMPLE



Figure 1

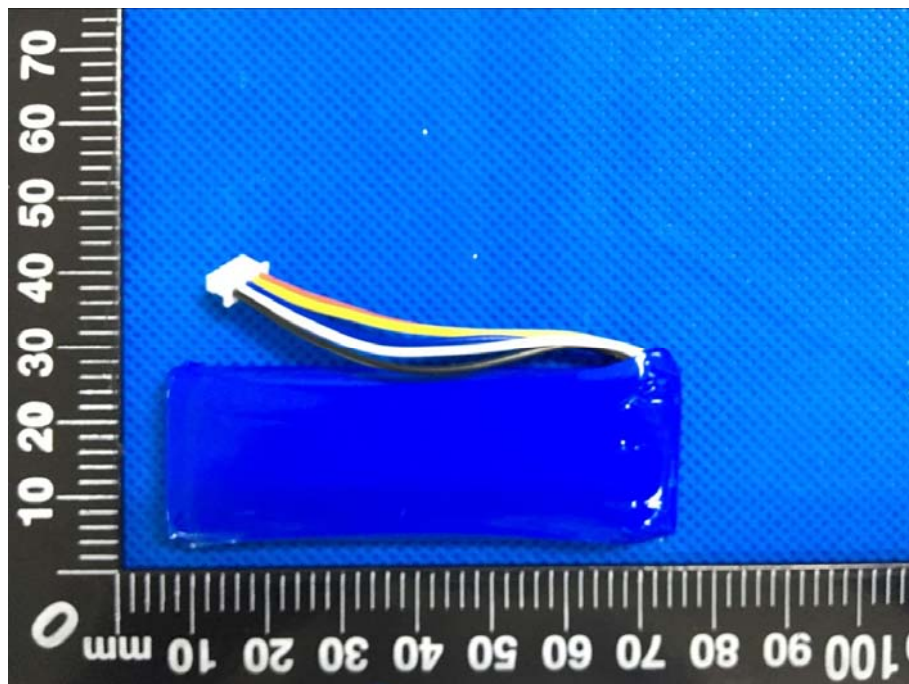


Figure 2



Figure 3

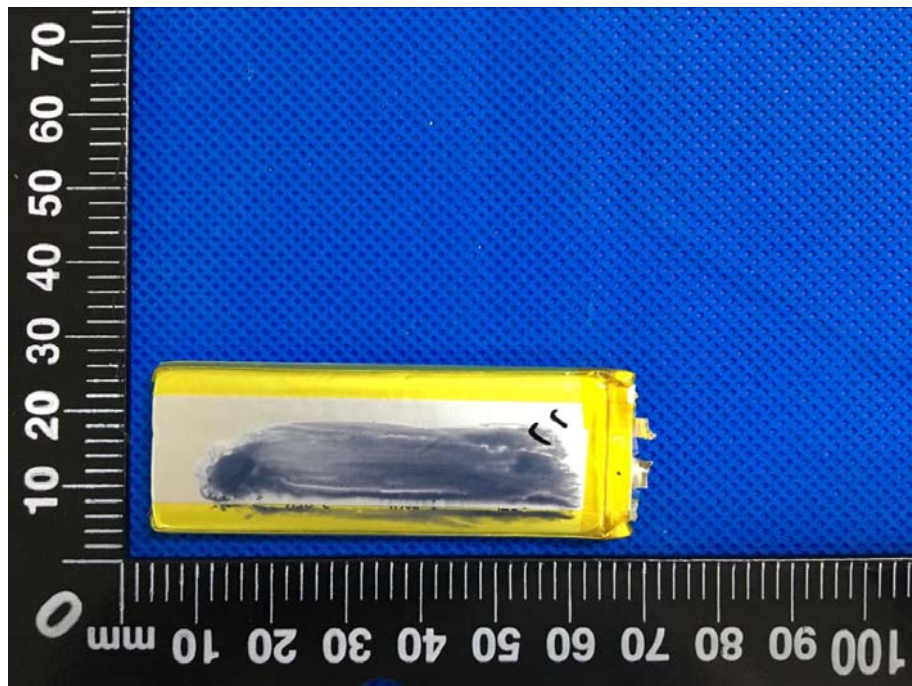


Figure 4

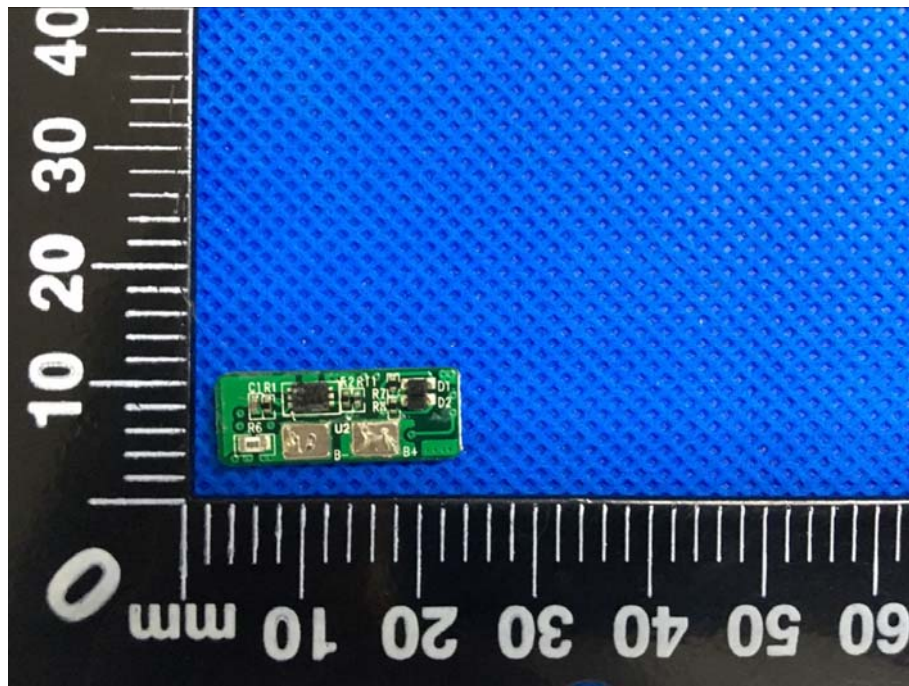


Figure 5

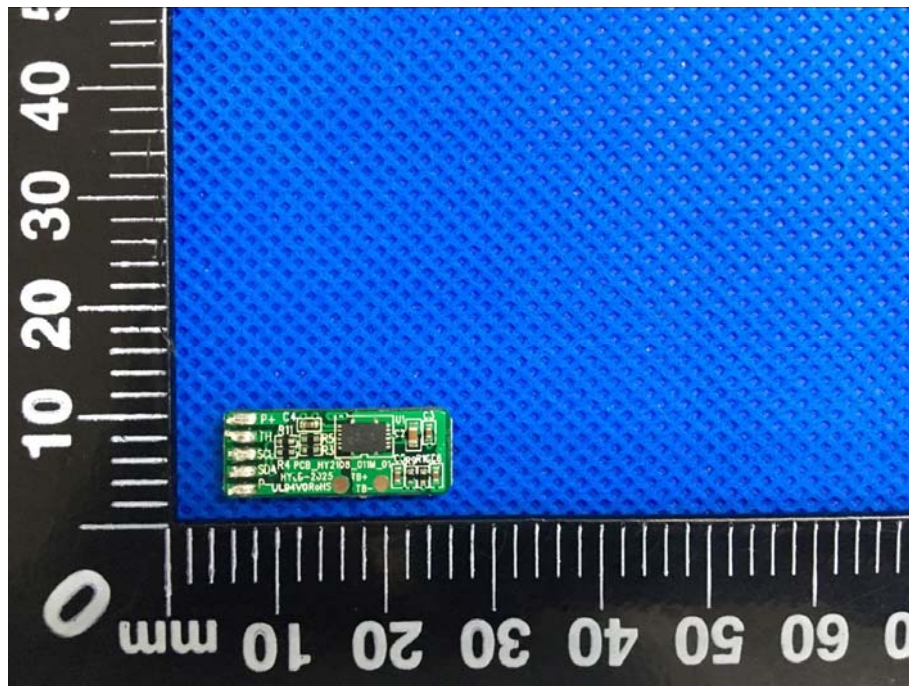


Figure 6

Important Notice

1. The test report is invalid without the official stamp of LCS.
2. The test report is invalid without the signatures of Ratifier, Reviewer and Testing engineer.
3. Nobody is allowed to partly photocopy this test report without written permission of LCS.
4. The report is invalid when anything of following happens – illegal transfer, reproduce, embezzlement, imposture, modification or tampering in any media form.
5. Product information and customer information provided by the applicant, we are not responsible for its authenticity
6. The test report is valid for the tested samples only.
7. The Chinese contents in this report are only for reference.
8. Objections to the test report must be submitted to TCT within 15 days.

End of report