Battery Pack Test Report
(Package Drop & UN38.3)

Customer: Lenovo
Pack Model: L17C3PG1
Nominal voltage: 11.4V
Nominal capacity: 4645mAh/52.5Wh
Configuration: 3S1P
Customer P/N: 5B10Q88561
Celxpert P/N: 921300185
Cell Type: Coslight CA595490HV 4645mAh
Dec. 08. 2017

Approved by ____________________________

Reviewed by ____________________________

Prepared by ____________________________
Figure photo of the pack

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Model Name 型号/型号: L17C3PG1
3ICP6/54/90
Rating: 11.4V TYP: 4645mAh/525Wh MIN: 4510mAh/51Wh
额定容量：4510mAh 充电限制电压：13.05V

For use with Lenovo personal computer

Manufactured by Celxpert(Kunshan) Energy Co., Ltd.
Rechargeable Li-ion Battery / 锂离子电池组
Made in China 制造地：中国

CAUTION: Replace with same type only.
Use of another battery may present a fire or explosion.

PS: 此報告僅針對送檢樣品有效
The test report is valid for the tested samples only.
## 1. Package Drop Test Report

<table>
<thead>
<tr>
<th>Test Period</th>
<th>2017/11/13</th>
<th>Test Spec.</th>
<th>IATA A58 &amp; QS-3Q-043</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Level</td>
<td>Mass Production</td>
<td>Sample Mode</td>
<td>Finished Product</td>
<td>32 PCS</td>
</tr>
</tbody>
</table>

### 1.1 DESCRIPTION OF TEST EQUIPMENTS

Kingdom Technology KD-128AS drop tester. Description of performance:
- Payload capacity: 160 lbs. (72.6 kg)
- Payload dimensions: Length: 61 cm / Width: 76 cm / Height: 90cm
- Drop height range: 30 - 180 cm
- Base Plate Material: Solid Steel (Std.)
- Base Plate Size: 76.2×114.3×1.3cm

### 1.2 TEST CONDITION

- Drop height: 120cm
- Drop weight: 8.167kg
- Drop position: One corner, three edges and three faces with 1 time. (Total: 7 drops).
- Drop Position and sequence: Ref. attachment 1

### 1.3 SUMMARY OF TEST

Concluding the follow check items, the result of the test is pass.

<table>
<thead>
<tr>
<th>Check items</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery pack function</td>
<td>Normal</td>
<td>Fail</td>
</tr>
<tr>
<td>Battery pack appearance</td>
<td>Normal</td>
<td>Fail</td>
</tr>
<tr>
<td>Package internal status</td>
<td>Normal</td>
<td>Fail</td>
</tr>
<tr>
<td>Package outside status</td>
<td>Normal</td>
<td>Fail</td>
</tr>
</tbody>
</table>

Test photographs please refer to Attachment 2

Function Check details please refer to Attachment 3

### Attachment 1:
DROP POSITION

DROP SEQUENCE

<table>
<thead>
<tr>
<th>DROP</th>
<th>IMPACT SURFACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Corner (2-3-4)</td>
</tr>
<tr>
<td>2</td>
<td>Edge 1 (2)</td>
</tr>
<tr>
<td>3</td>
<td>Edge 2 (3)</td>
</tr>
<tr>
<td>4</td>
<td>Edge 3 (4)</td>
</tr>
<tr>
<td>5</td>
<td>Bottom (Flat 5)</td>
</tr>
<tr>
<td>6</td>
<td>Front (Flat 6)</td>
</tr>
<tr>
<td>7</td>
<td>Right (Flat 7)</td>
</tr>
</tbody>
</table>

Attachment 2:
<table>
<thead>
<tr>
<th>Drop Sequence</th>
<th>Test Setup</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>![Drop Sequence 1]</td>
<td>![Test Result 1]</td>
</tr>
<tr>
<td>2</td>
<td>![Drop Sequence 2]</td>
<td>![Test Result 2]</td>
</tr>
<tr>
<td>3</td>
<td>![Drop Sequence 3]</td>
<td>![Test Result 3]</td>
</tr>
<tr>
<td>4</td>
<td>![Drop Sequence 4]</td>
<td>![Test Result 4]</td>
</tr>
<tr>
<td>Drop Sequence</td>
<td>Test Setup</td>
<td>Test Result</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>5</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>6</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>7</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

Open Package check for internal after drop test
# 2. UN38.3 Test Report

<table>
<thead>
<tr>
<th>Test Period</th>
<th>2017/11/21~2017/12/06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Spec.</td>
<td>ST/SI/AC.10/11/Rev.5 Amend.1&amp;2</td>
</tr>
<tr>
<td>Parts Name</td>
<td>Battery Pack</td>
</tr>
<tr>
<td>Application</td>
<td>NB</td>
</tr>
<tr>
<td>Quantity</td>
<td>Pack 16PCS/Cell 25pcs</td>
</tr>
</tbody>
</table>

## 2.1 Test Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test Result</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Altitude simulation test (UN38.3-1)</td>
<td>Pass</td>
<td>Page 9</td>
</tr>
<tr>
<td>T2</td>
<td>Thermal test (UN38.3-2)</td>
<td>Pass</td>
<td>Page 10</td>
</tr>
<tr>
<td>T3</td>
<td>Vibration test (UN38.3-3)</td>
<td>Pass</td>
<td>Page 11</td>
</tr>
<tr>
<td>T4</td>
<td>Shock test (UN38.3-4)</td>
<td>Pass</td>
<td>Page 12</td>
</tr>
<tr>
<td>T5</td>
<td>Short Circuit test (UN38.3-5)</td>
<td>Pass</td>
<td>Page 13</td>
</tr>
<tr>
<td>T6</td>
<td>Crush Test (UN38.3-6)</td>
<td>Pass</td>
<td>Page 13</td>
</tr>
<tr>
<td>T7</td>
<td>Overcharge test (UN38.3-7)</td>
<td>Pass</td>
<td>Page 14</td>
</tr>
<tr>
<td>T8</td>
<td>Forced discharge test (UN38.3-8)</td>
<td>Pass</td>
<td>Page 15</td>
</tr>
</tbody>
</table>

The battery pack passes UN38.3 test.
## 2.2 Test sample list

<table>
<thead>
<tr>
<th>No.</th>
<th>Pack S/N</th>
<th>Test item</th>
<th>No.</th>
<th>Cell Num</th>
<th>Test item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sample No:1/16</td>
<td>38.3.1~5</td>
<td>1</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.6</td>
</tr>
<tr>
<td>2</td>
<td>Sample No:2/16</td>
<td>38.3.1~5</td>
<td>2</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.6</td>
</tr>
<tr>
<td>3</td>
<td>Sample No:3/16</td>
<td>38.3.1~5</td>
<td>3</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.6</td>
</tr>
<tr>
<td>4</td>
<td>Sample No:4/16</td>
<td>38.3.1~5</td>
<td>4</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.6</td>
</tr>
<tr>
<td>5</td>
<td>Sample No:5/16</td>
<td>38.3.1~5</td>
<td>5</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.6</td>
</tr>
<tr>
<td>6</td>
<td>Sample No:6/16</td>
<td>38.3.1~5</td>
<td>6</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>7</td>
<td>Sample No:7/16</td>
<td>38.3.1~5</td>
<td>7</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>8</td>
<td>Sample No:8/16</td>
<td>38.3.1~5</td>
<td>8</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>9</td>
<td>Sample No:9/16</td>
<td>38.3.7</td>
<td>9</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>10</td>
<td>Sample No:10/16</td>
<td>38.3.7</td>
<td>10</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>11</td>
<td>Sample No:11/16</td>
<td>38.3.7</td>
<td>11</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>12</td>
<td>Sample No:12/16</td>
<td>38.3.7</td>
<td>12</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>13</td>
<td>Sample No:13/16</td>
<td>38.3.7</td>
<td>13</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>14</td>
<td>Sample No:14/16</td>
<td>38.3.7</td>
<td>14</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>15</td>
<td>Sample No:15/16</td>
<td>38.3.7</td>
<td>15</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td>16</td>
<td>Sample No:16/16</td>
<td>38.3.7</td>
<td>16</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>22</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>23</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>24</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>Coolight CA596490HV 4845mAh</td>
<td>38.3.8</td>
</tr>
</tbody>
</table>
### 2.3 Test result

<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
<th>Judge criteria</th>
<th>Sample(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T1</strong></td>
<td>Altitude Simulation (UN38.3-1)</td>
<td>1-1. 4 batteries are standard charged. 4 batteries are 1C cycled 50 times, ending in fully charged state. All batteries weight is measured. The charged batteries voltage are measured and recorded.</td>
<td>No mass loss (&lt;0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop &lt; 10%.</td>
<td>4 packs are standard charged (Pack#1~4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-2. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature 20+/-5 °C.</td>
<td></td>
<td>4 packs 50 cycled ending in fully charged states (Pack#5~8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-3. Vacuum is released. All cells weight is measured. The charged cell voltage are measured and recorded.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Test Period**


**Test Equipment**

- 數位電表 Q153
- 電子天平 Q090
- 真空烘箱 Q146

**Major Problem**

- 

**Warning Point**

- 

**Recommendation**

The battery packs pass the test.

### Raw Data

**Altitude Simulation Test on Charged Packs**

<table>
<thead>
<tr>
<th>No.</th>
<th>Before</th>
<th>After</th>
<th>Voltage residue</th>
<th>mass loss</th>
<th>other event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCV (V)</td>
<td>Weight (g)</td>
<td>OCV (V)</td>
<td>Weight (g)</td>
<td>Volt (%)</td>
</tr>
<tr>
<td>1</td>
<td>12.549</td>
<td>217.27</td>
<td>12.547</td>
<td>217.25</td>
<td>99.98%</td>
</tr>
<tr>
<td>2</td>
<td>12.551</td>
<td>217.23</td>
<td>12.542</td>
<td>217.18</td>
<td>99.93%</td>
</tr>
<tr>
<td>3</td>
<td>12.539</td>
<td>217.28</td>
<td>12.538</td>
<td>217.26</td>
<td>99.99%</td>
</tr>
<tr>
<td>4</td>
<td>12.557</td>
<td>217.19</td>
<td>12.554</td>
<td>217.17</td>
<td>99.98%</td>
</tr>
<tr>
<td>5</td>
<td>12.539</td>
<td>217.31</td>
<td>12.537</td>
<td>217.28</td>
<td>99.98%</td>
</tr>
<tr>
<td>6</td>
<td>12.578</td>
<td>217.29</td>
<td>12.575</td>
<td>217.25</td>
<td>99.98%</td>
</tr>
<tr>
<td>7</td>
<td>12.547</td>
<td>217.26</td>
<td>12.546</td>
<td>217.23</td>
<td>99.99%</td>
</tr>
<tr>
<td>8</td>
<td>12.553</td>
<td>217.33</td>
<td>12.549</td>
<td>217.28</td>
<td>99.97%</td>
</tr>
</tbody>
</table>

**Note:**

- L: Leakage, V: Venting, D: Disassembly, R: Rupture, F: Fire
- O: No Leakage, No Venting, No Disassembly, No Rupture, No Fire
<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
<th>Judge criteria</th>
<th>Sample(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2</td>
<td>Thermal test</td>
<td>2-1. Packs are stored for 6 hours at 72±2°C, followed by storage for 6 hours at -40±2°C. The maximum time interval between test temperature extremes is 30 minutes.</td>
<td>No mass loss (&lt;0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop &lt; 10%.</td>
<td>4 packs are standard charged (Pack#1<del>4) 4 packs 50 cycled ending in fully charged states (Pack#5</del>8)</td>
</tr>
<tr>
<td></td>
<td>(UN38.3-2)</td>
<td>2-2. Repeat 2-1 for 10 times. Then store the packs at ambient for 24 hours. All packs weight are measured. The charged battery voltage are measured and recorded.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Period

Test Equipment
數位電表 Q153, 電子天平 Q090, 冷熱衝擊機 Q0446

Major Problem
-

Warning Point
-

Recommendation
The packs pass the test.

### Raw Data

<table>
<thead>
<tr>
<th>No.</th>
<th>OCV (V)</th>
<th>Weight (g)</th>
<th>OCV (V)</th>
<th>Weight (g)</th>
<th>voltage residue (%)</th>
<th>mass loss (%)</th>
<th>other event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.547</td>
<td>217.25</td>
<td>12.478</td>
<td>217.23</td>
<td>99.45%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>12.542</td>
<td>217.18</td>
<td>12.466</td>
<td>217.16</td>
<td>99.94%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>3</td>
<td>12.538</td>
<td>217.26</td>
<td>12.463</td>
<td>217.23</td>
<td>99.40%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>4</td>
<td>12.554</td>
<td>217.17</td>
<td>12.480</td>
<td>217.15</td>
<td>99.41%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>12.537</td>
<td>217.28</td>
<td>12.466</td>
<td>217.25</td>
<td>99.43%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>6</td>
<td>12.575</td>
<td>217.25</td>
<td>12.500</td>
<td>217.22</td>
<td>99.40%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>7</td>
<td>12.546</td>
<td>217.23</td>
<td>12.478</td>
<td>217.20</td>
<td>99.46%</td>
<td>0.01%</td>
<td>O</td>
</tr>
<tr>
<td>8</td>
<td>12.549</td>
<td>217.28</td>
<td>12.474</td>
<td>217.24</td>
<td>99.40%</td>
<td>0.02%</td>
<td>O</td>
</tr>
</tbody>
</table>

Note: L-Leakage; V-Venting; D-Disassembly; R-Rupture; F-Fire
O-No Leakage, No Venting, No Disassembly, No Rupture, No Fire
<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
<th>Judge criteria</th>
<th>Sample(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>Vibration test</td>
<td>3-1. Packs are firmly secured to the platform of the vibration machine without distorting the packs in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of 3 mutually perpendicular to the terminal face. 3-2. The logarithmic frequency sweep is as follows: 7-18 Hz 1 gn 18-50 Hz 0.8 mm amplitude 50-200 Hz 8 gn 3-3. All packs weight are measured. The charged packs voltage are measured and recorded.</td>
<td>No mass loss (&lt;0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop &lt; 10%.</td>
<td>4 packs are standard charged (Pack#1<del>4) 4 packs 50 cycled ending in fully charged states (Pack#5</del>8)</td>
</tr>
</tbody>
</table>

**Test Period**

Start: 2017/11/30      End: 2017/12/01

**Test Equipment**

數位電表 Q153, 電子天平 Q090, 振動測試機 Q300

**Major Problem**

- 

**Warning Point**

- 

**Recommendation**

The packs pass the test.

### Vibration Test on Charged Packs

<table>
<thead>
<tr>
<th>No.</th>
<th></th>
<th>Before</th>
<th>After</th>
<th>voltage residue</th>
<th>mass loss</th>
<th>other event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCV (V)</td>
<td>Weight (g)</td>
<td>OCV (V)</td>
<td>Weight (g)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td>1</td>
<td>12.476</td>
<td>217.23</td>
<td>12.471</td>
<td>217.19</td>
<td>99.94%</td>
<td>0.02%</td>
</tr>
<tr>
<td>2</td>
<td>12.466</td>
<td>217.16</td>
<td>12.459</td>
<td>217.13</td>
<td>99.94%</td>
<td>0.01%</td>
</tr>
<tr>
<td>3</td>
<td>12.463</td>
<td>217.23</td>
<td>12.455</td>
<td>217.19</td>
<td>99.94%</td>
<td>0.02%</td>
</tr>
<tr>
<td>4</td>
<td>12.460</td>
<td>217.15</td>
<td>12.452</td>
<td>217.11</td>
<td>99.94%</td>
<td>0.02%</td>
</tr>
<tr>
<td>5</td>
<td>12.466</td>
<td>217.23</td>
<td>12.458</td>
<td>217.22</td>
<td>99.94%</td>
<td>0.02%</td>
</tr>
<tr>
<td>6</td>
<td>12.450</td>
<td>217.22</td>
<td>12.404</td>
<td>217.18</td>
<td>99.95%</td>
<td>0.02%</td>
</tr>
<tr>
<td>7</td>
<td>12.478</td>
<td>217.20</td>
<td>12.469</td>
<td>217.17</td>
<td>99.93%</td>
<td>0.02%</td>
</tr>
<tr>
<td>8</td>
<td>12.474</td>
<td>217.24</td>
<td>12.467</td>
<td>217.21</td>
<td>99.94%</td>
<td>0.01%</td>
</tr>
</tbody>
</table>

Note: L-Leakage; V-Venting; D-Disassembly; R-Rupture; F-Fire
O-No Leakage, No Venting, No Disassembly, No Rupture, No Fire
<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
<th>Judge criteria</th>
<th>Sample(s)</th>
</tr>
</thead>
</table>
| T4   | Shock test (UN38.3-4)     | 4-1. Packs shall be secured to the testing machine by means of a rigid mount, which will support all mounting surfaces.  
4-2. Packs shall be subjected to a half-sine shock of peak acceleration 150gn and pulse duration of 6 milliseconds. Each pack shall be subjected to 3 shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicularly mounting positions of the pack for a total of 18 shocks.  
4-3. All batteries weight are measured. The charged cell voltage are measured and recorded. | No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. | 4 packs are standard charged (Pack#1~4)  
4 packs 50 cycled ending in fully charged states (Pack#5~8) |

<table>
<thead>
<tr>
<th>Test Period</th>
<th>Start: 2017/12/04</th>
<th>End: 2017/12/04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Equipment</td>
<td>數位電表 Q153, 電子天平 Q090, 衝擊測試機 Q154</td>
<td></td>
</tr>
<tr>
<td>Major Problem</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Warning Point</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Recommendation</td>
<td>The packs pass the test.</td>
<td></td>
</tr>
</tbody>
</table>

![Shock Test on Charged Packs](image_url)

### Raw Data

- No.: 1
  - OCV (V): 12.471
  - Weight (g): 217.19
  - OCV (V): 12.465
  - Weight (g): 217.19
  - Voltage residue: 99.95%
  - Mass loss: 0.00%
  - Other event: O

- No.: 2
  - OCV (V): 12.459
  - Weight (g): 217.13
  - OCV (V): 12.454
  - Weight (g): 217.12
  - Voltage residue: 99.96%
  - Mass loss: 0.00%
  - Other event: O

- No.: 3
  - OCV (V): 12.455
  - Weight (g): 217.19
  - OCV (V): 12.450
  - Weight (g): 217.18
  - Voltage residue: 99.96%
  - Mass loss: 0.00%
  - Other event: O

- No.: 4
  - OCV (V): 12.472
  - Weight (g): 217.11
  - OCV (V): 12.466
  - Weight (g): 217.10
  - Voltage residue: 99.93%
  - Mass loss: 0.00%
  - Other event: O

- No.: 5
  - OCV (V): 12.458
  - Weight (g): 217.22
  - OCV (V): 12.454
  - Weight (g): 217.21
  - Voltage residue: 99.97%
  - Mass loss: 0.00%
  - Other event: O

- No.: 6
  - OCV (V): 12.494
  - Weight (g): 217.18
  - OCV (V): 12.487
  - Weight (g): 217.17
  - Voltage residue: 99.94%
  - Mass loss: 0.00%
  - Other event: O

- No.: 7
  - OCV (V): 12.469
  - Weight (g): 217.17
  - OCV (V): 12.463
  - Weight (g): 217.16
  - Voltage residue: 99.95%
  - Mass loss: 0.00%
  - Other event: O

- No.: 8
  - OCV (V): 12.467
  - Weight (g): 217.21
  - OCV (V): 12.462
  - Weight (g): 217.21
  - Voltage residue: 99.96%
  - Mass loss: 0.00%
  - Other event: O

Note: L-Leakage; V-Venting; D-Disassembly; R-Rupture; F-Fire  
O-No leakage, No venting, No disassembly, No rupture, No fire
### Item Test Item Test specification Judge criteria Sample(s)

#### T5 Short Circuit Test (UN38.3-5)

- **5-1.** Packs are placed in to a 55±2℃ oven, and exterior packs temperature are monitored.
- **5-2.** When packs exterior reach 55±2℃, they are shorted by connecting terminals with a copper wire of resistance less than 100m Ohm.
- **5-4.** The short was continued for more than 1 hour or the cell temperature return to 55℃. The packs are observed for a further 6 hours.

No rupture, no disassembly, no explosion, no fire, no smoke. Packs exterior peak temperature <170℃.

4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)

---

**Test Period** Start: 2017/12/05     End: 2017/12/06

**Test Equipment** 数位電表 Q153, 資料收集器 Q075, 烘箱 Q171

**Recommendation** The packs pass the test.

#### Raw Data

<table>
<thead>
<tr>
<th>No.</th>
<th>Max. Temp.(℃)</th>
<th>Other event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54.69</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>55.76</td>
<td>O</td>
</tr>
<tr>
<td>3</td>
<td>55.69</td>
<td>O</td>
</tr>
<tr>
<td>4</td>
<td>64.26</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>54.19</td>
<td>O</td>
</tr>
<tr>
<td>6</td>
<td>65.78</td>
<td>O</td>
</tr>
<tr>
<td>7</td>
<td>54.98</td>
<td>O</td>
</tr>
<tr>
<td>8</td>
<td>55.19</td>
<td>O</td>
</tr>
</tbody>
</table>

*Note: D-Disassembly ；R-Rupture ；F-Fire  
O- No Disassembly, No Rupture, No Fire*

---

#### T6 Crush test/ Impact test (UN38.3-6)

- **6-1.** Cell's diameter > 20mm, Execution impact test. (A 9.1 Kg mass is to be dropped from a height of 61±2.5cm onto the sample.)

External temperature of cell does not exceed 170℃ and there is no disassembly and no fire within 6 hours of the test.

5 cells are 50% charged (Cell #1~5)

---

**Test Period** Start: 2017/11/22     End: 2017/11/22

**Test Equipment** 数位電表 Q153, 資料收集器 Q152, 擠壓試驗機 Q437/撞擊測試機 Q231

**Recommendation** The Cells pass the test.

#### Raw Data

<table>
<thead>
<tr>
<th>No.</th>
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<th>Other event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.36</td>
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</tr>
<tr>
<td>2</td>
<td>20.59</td>
<td>O</td>
</tr>
<tr>
<td>3</td>
<td>21.57</td>
<td>O</td>
</tr>
<tr>
<td>4</td>
<td>20.46</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>21.34</td>
<td>O</td>
</tr>
</tbody>
</table>

*Note: D-Disassembly ；F-Fire / O-No Disassembly, No Fire*
<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
<th>Judge criteria</th>
<th>Sample(s)</th>
</tr>
</thead>
</table>
| T7   | Overcharge test (UN38.3-7) | 7-1. The charge current shall be twice the Spec’s recommended maximum continuous charge current.  
7-2. The minimum voltage of the test shall be as follows:  
(a) When the Spec’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 Spec’s recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.  
7-3. Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours. | No disassembly; no fire within seven days after the test. | 4 packs are fully charged (Pack #9~12)  
4 packs are 50 times cycled ending in fully charged state (Pack #13~16) |

**Test Period**  
Start: 2017/11/23  
End: 2017/11/26

**Test Equipment**  
數位電表 Q153, 資料收集器 Q078, 電源供應器 Q148/Q149/Q150

**Major Problem**  
-

**Warning Point**  
-

**Recommendation**  
The packs pass the test.

### Forced discharge are first cycle in fully discharged

<table>
<thead>
<tr>
<th>No.</th>
<th>Max. Temp.(°C)</th>
<th>Other event</th>
<th>No.</th>
<th>Max. Temp.(°C)</th>
<th>Other event</th>
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</thead>
<tbody>
<tr>
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<td>0</td>
<td>16</td>
<td>33.59</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>33.16</td>
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<td>17</td>
<td>35.48</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>32.59</td>
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<td>18</td>
<td>34.26</td>
<td>0</td>
</tr>
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<td>9</td>
<td>34.15</td>
<td>0</td>
<td>19</td>
<td>36.59</td>
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</tr>
<tr>
<td>10</td>
<td>34.69</td>
<td>0</td>
<td>20</td>
<td>35.48</td>
<td>0</td>
</tr>
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<td>33.58</td>
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<td>21</td>
<td>34.86</td>
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</tr>
<tr>
<td>12</td>
<td>34.19</td>
<td>0</td>
<td>22</td>
<td>35.26</td>
<td>0</td>
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<tr>
<td>13</td>
<td>35.26</td>
<td>0</td>
<td>23</td>
<td>34.78</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>32.59</td>
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<td>24</td>
<td>33.59</td>
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</tr>
<tr>
<td>15</td>
<td>38.76</td>
<td>0</td>
<td>25</td>
<td>36.95</td>
<td>0</td>
</tr>
</tbody>
</table>

**Raw Data**  
Note: D-Disassembly; F-Fire; 0-No Disassembly, No Fire
<table>
<thead>
<tr>
<th>Item</th>
<th>Test Item</th>
<th>Test specification</th>
<th>Judge criteria</th>
<th>Sample(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T8</td>
<td>Forced discharge test (UN38.3-8)</td>
<td>Cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.</td>
<td>No disassembly, no fire within seven days after the test.</td>
<td>10 cells are first cycle in fully discharged states (Pack #6<del>15), 10 cells are after 50 cycles ending in fully discharged states (Pack #16</del>25)</td>
</tr>
</tbody>
</table>

**Test Period**

Start: 2017/11/28   End: 2017/12/01

**Test Equipment**

- 数位电表 Q153,
- 資料收集器 Q160,
- 電源供應器 Q147/Q236/Q237

**Major Problem**

- 

**Warning Point**

- 

**Recommendation**

The packs pass the test.

### Raw Data

<table>
<thead>
<tr>
<th>No.</th>
<th>Max. Temp. (°C)</th>
<th>Other event</th>
<th>No.</th>
<th>Max. Temp. (°C)</th>
<th>Other event</th>
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</thead>
<tbody>
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<td>35.69</td>
<td>O</td>
</tr>
<tr>
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<td>O</td>
<td>17</td>
<td>32.59</td>
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</tr>
<tr>
<td>8</td>
<td>35.78</td>
<td>O</td>
<td>18</td>
<td>34.85</td>
<td>O</td>
</tr>
<tr>
<td>9</td>
<td>34.19</td>
<td>O</td>
<td>19</td>
<td>32.47</td>
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<td>21</td>
<td>35.61</td>
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</tr>
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<td>22</td>
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<td>23</td>
<td>32.18</td>
<td>O</td>
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<td>35.61</td>
<td>O</td>
<td>24</td>
<td>31.49</td>
<td>O</td>
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<tr>
<td>15</td>
<td>34.79</td>
<td>O</td>
<td>25</td>
<td>33.47</td>
<td>O</td>
</tr>
</tbody>
</table>

Note: D-Disassembly; F-Fire; O-No Disassembly, No Fire