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# PRODUCT SPECIFICATION

## Rechargeable Lithium Ion Battery
## Model : LQ1729-A2

| Prepared | Reviewed | Approved |
|---|---|---|
| Song, Byeongmin<br><br>Date : ’14.12.11 | <br><br>Date : | Park, Minsoo<br><br>Date : ’14.12.12 |

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## Revision History

| Revision | Date | Originator | Description |
|---|---|---|---|
| 0 | 2014-12-11 | Song, Byeongmin | Original Release |
| 1 | 2015-10-07 | Lee, Hyunseok | Revised |
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# Contents

# 1. General Information

1.1 Scope

This product specification defines the performances of the rechargeable lithium ion battery to be supplied to the Customer by LG Chem.

1.2 Application: Electric vehicle

1.3 Product classification: Rechargeable lithium ion battery

1.4 Model name: LQ1729-A2

# 2. Specification

2.1 Nominal Specification

| Item | Condition / Note | Specification |
|---|---|---|
| 2.1.1 Capacity* | Std. charge / discharge | Nominal 41.4 Ah ($C_{nom}$)<br>Minimum 41.0 Ah ($C_{min}$) |
| 2.1.2 Nominal Voltage | | 3.73 V |
| 2.1.3 Voltage* | | 3.695 ~ 3.735 V |
| 2.1.4 Thickness* | | 11.3 mm (± 0.23 mm) |
| 2.1.5 Standard Charge<br>(Refer to 4.1.1) | Constant current<br>Constant voltage<br>End condition (Cut off)<br>Temperature | 41.0 A<br>4.15 V<br>2.05 A<br>25±2 ℃ |
| 2.1.6 Standard Discharge<br>(Refer to 4.1.2) | Constant current<br>End voltage (Cut off)<br>Temperature | 41.0 A<br>3.0 V<br>25 ± 2 ℃ |
| 2.1.7 Weight* | | 966 g (± 12 g) |

* measured at the End-of-Line test

2.2 Recommended Charge Specification

| Item | Condition / Note | Specification |
|---|---|---|
| 2.2.1 Normal charge | Constant current<br>Constant voltage<br>End condition (Cut off)<br>Temperature | 12.0 A<br>4.126 V*<br>2.05 A<br>10 ~ 45 ℃ |
| 2.2.2 Semi-fast Charge | Constant current<br>Constant voltage<br>End condition (Cut off)<br>Temperature | 41.0 A<br>4.126 V*<br>2.05 A<br>20 ~ 40 ℃ |
| 2.2.3 Fast charge<br>(less than 10% usage over lifetime) | Constant power**<br>End condition (Cut off)**<br><br>Temperature | Max. 224 W<br>Cutoff voltage / power :<br>4.09 V / 6.25 W<br>25 ~ 35 ℃ |
| 2.2.4 Charge<br>at low temperatures | Constant power**<br><br><br>End condition (Cut off)***<br><br><br><br>Temperature | Max. 37W at 0 ℃<br>Max. 20W at -10 ℃<br>Max. 7W at -20 ℃<br>Cutoff voltage / power :<br>4.0V / 6.25W at 0 ℃<br>4.0V / 3.16W at -10 ℃<br>4.0V / 3.16W at -20 ℃<br>-20 ~ 0 ℃ |

* This cutoff voltage shall be adjusted considering power requirements and SOC accuracy (ref. 3%).
** Constant power: Power for charge is defined within maximum power and may consist of several power values in series, where power diminish one after another, for instance, by 20% until it reaches the end condition
*** End condition: The cell voltage shall not go above the cutoff voltage and the charge ends when the power reaches the cutoff power

2.3 Operating Temperature Specification

| Item | Condition / Note | Specification |
|---|---|---|
| 2.3.1 continuous operation | Continuous operation is a condition where the battery will experience on a frequent basis and maintain its designed performance. | 10 ~ 45℃ |
| 2.3.2 excursion | Excursion is a condition where the battery may experience on an infrequent basis and be used with reduced performance. | -30 ~ 10℃, 45 ~ 55℃ |

2.4 Protection limit specification

| Item | Condition / Note | Specification |
|---|---|---|
| 2.4.1 1st over voltage limit | The battery may experience this voltage on an infrequent basis. When the battery's voltage reaches this limit, the charging power shall be reduced to zero. | 4.3V |
| 2.4.2 2nd over voltage limit | The battery shall not be used over this limit | 4.45V |
| 2.4.3 under voltage limit | The battery shall not be used below this limit | 2.0V |

## 3. Appearance and Dimension

3.1 Appearance

There shall be no such defects as deep scratch, crack, rust, discoloration or leakage, which may adversely affect the commercial value of the cell.

3.2 Dimension

Thickness : Shipping thickness Nom. 11.3 mm (when measured under weight of 30 kgf for 2 sec)
Width : Nom. 159 mm
Height : Nom. 290.5 mm (without terminals)

Thickness increase after 20% degradation of the initial capacity : ≤ 7% of initial thickness

## 4. Performance Specification

### 4.1 Standard test condition

#### 4.1.1 1C charge

Unless otherwise specified, “1C charge” shall consist of charging at constant current of 41.0 A. The cell shall then be charged at constant voltage of 4.15 V while the charging current is tapering to 2.05 A. For test purposes, charging shall be performed at 25 ºC ± 2 ºC.

#### 4.1.2 1C discharge

“1C Discharge” shall consist of discharging at a constant current of 41.0 A to 3.0 V. Discharging shall be performed at 25 ºC ± 2 ºC unless otherwise noted (such as capacity versus temperature).

#### 4.1.3 1C charge / 1C discharge cycle

Cells shall be charged at constant current of 41.0 A to 4.15 V with end current of 2.05 A. Cells shall be discharged at constant current of 41.0 A to 3.0 V. Cells shall be left for 20 minutes after both charge and discharge.

### 4.2 Electrical Specification

<table>
<tr><td></td><td colspan="2">Condition</td><td colspan="4">Specification</td></tr>
<tr><td>4.2.1<br>Initial Capacity*</td><td colspan="2">Cells shall be charged per 4.1.1 and discharged per 4.1.2 within 1h after full charge.</td><td colspan="4">≥ 41.0 Ah ($C_{min}$)</td></tr>
<tr><td rowspan="3">4.2.2<br>Temperature Dependency of Capacity*</td><td colspan="2">Cells shall be charged per 4.1.1 at 25 ºC ± 2 ºC and discharged per 4.1.2 at the following temperatures.</td><td colspan="4"></td></tr>
<tr><td>Charge</td><td>Discharge</td><td colspan="4">Capacity</td></tr>
<tr><td>25℃</td><td>-20 ℃<br>0 ℃<br>25 ℃<br>45 ℃</td><td colspan="4">70 % of $C_{min}$<br>90 % of $C_{min}$<br>100 % of $C_{min}$<br>100 % of $C_{min}$</td></tr>
<tr><td rowspan="6">4.2.3<br>OCV Table*</td><td colspan="2" rowspan="6">Cells shall be charged per 4.1.1, and discharged 5 % of the capacity measured as per 4.2.2 at constant current of 4.1 Ah. The discharge repeats 20 times. Cells take a pause for 60 minutes after every charge and discharge. OCV shall be recorded after every</td><td>SOC (%)</td><td>OCV (V)</td><td>SOC (%)</td><td>OCV (V)</td></tr>
<tr><td>100</td><td>4.135</td><td>45</td><td>3.836</td></tr>
<tr><td>95</td><td>4,091</td><td>40</td><td>3.807</td></tr>
<tr><td>90</td><td>4.067</td><td>35</td><td>3.767</td></tr>
<tr><td>85</td><td>4.050</td><td>30</td><td>3.713</td></tr>
</table>

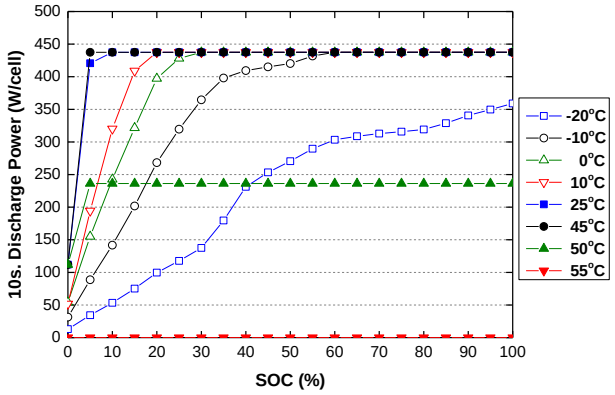
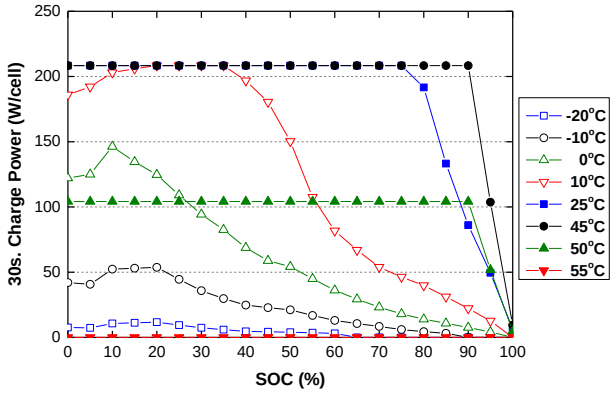
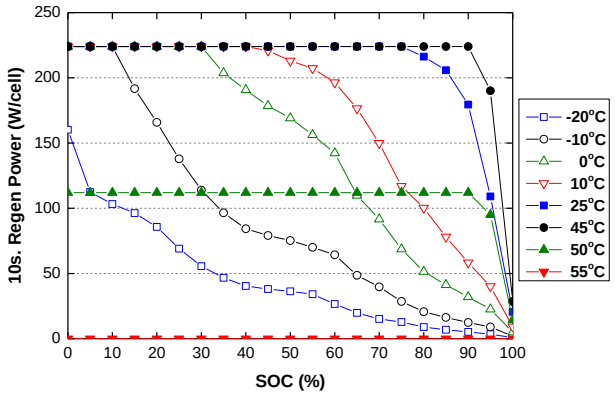
<table>
<tr><td></td><td>pause.</td><td>80</td><td>4.035</td><td>25</td><td>3.657</td></tr>
<tr><td></td><td></td><td>75</td><td>4.011</td><td>20</td><td>3.603</td></tr>
<tr><td></td><td></td><td>70</td><td>3.983</td><td>15</td><td>3.549</td></tr>
<tr><td></td><td></td><td>65</td><td>3.954</td><td>10</td><td>3.522</td></tr>
<tr><td></td><td></td><td>60</td><td>3.905</td><td>5</td><td>3.433</td></tr>
<tr><td></td><td></td><td>55</td><td>3.879</td><td>0</td><td>3.168</td></tr>
<tr><td></td><td></td><td>50</td><td>3.858</td><td></td><td></td></tr>
<tr><td rowspan="14">4.2.4<br>Discharge Resistance at R.T.*</td><td rowspan="14">Cells shall be set at a SOC as per 4.2.4 and discharged at as high current as 3.0 V is not breached within 30 seconds. If there is a value of current beyond which the system is not available, the current is defined as test current. Resistance is calculated by dividing the difference between OCV and the voltage at the end of discharge by the test current.</td><td rowspan="2">SOC (%)</td><td rowspan="2">Test Current**</td><td colspan="2">Resistance (mΩ)</td></tr>
<tr><td>10s</td><td>30s</td></tr>
<tr><td>100</td><td>200A</td><td>1.39</td><td>1.79</td></tr>
<tr><td>95</td><td>200A</td><td>1.38</td><td>1.76</td></tr>
<tr><td>90</td><td>200A</td><td>1.37</td><td>1.74</td></tr>
<tr><td>80</td><td>200A</td><td>1.39</td><td>1.78</td></tr>
<tr><td>70</td><td>200A</td><td>1.39</td><td>1.77</td></tr>
<tr><td>60</td><td>200A</td><td>1.32</td><td>1.68</td></tr>
<tr><td>50</td><td>200A</td><td>1.36</td><td>1.77</td></tr>
<tr><td>40</td><td>200A</td><td>1.42</td><td>1.90</td></tr>
<tr><td>30</td><td>200A</td><td>1.48</td><td>1.97</td></tr>
<tr><td>20</td><td>200A</td><td>1.52</td><td>1.99</td></tr>
<tr><td>10</td><td>150A</td><td>1.70</td><td>2.64</td></tr>
<tr><td>5</td><td>80A</td><td>2.28</td><td>3.68</td></tr>
<tr><td>0</td><td>20A</td><td>3.15</td><td>5.45</td></tr>
</table>

* Determined using Begin-of-Life batteries (within 3 months from the production date)
** Test current: 200A is taken as a maximum value by a battery system

| Item | Condition | Specification | | | |
|---|---|---|---|---|---|
| 4.2.5<br>Charge Resistance<br>at R.T.* | Cells shall be set at a SOC as per 4.2.4 and charged at as high current as 4.2 V is not breached within 30 seconds. If there is a value of current beyond which the system is not available, the current is defined as test current.<br>Resistance is calculated by dividing the difference between OCV and the voltage at the end of discharge by the test current. | SOC (%) | Test Current** | Resistance (mΩ) | |
| | | | | 10s | 30s |
| | | 100 | 30A | 1.63 | 2.20 |
| | | 95 | 50A | 1.40 | 1.82 |
| | | 90 | 75A | 1.33 | 1.72 |
| | | 80 | 100A | 1.32 | 1.68 |
| | | 70 | 130A | 1.31 | 1.67 |
| | | 60 | 180A | 1.34 | 1.73 |
| | | 50 | 200A | 1.30 | 1.65 |
| | | 40 | 200A | 1.36 | 1.71 |
| | | 30 | 200A | 1.41 | 1.80 |
| | | 20 | 200A | 1.48 | 1.94 |
| | | 10 | 200A | 1.49 | 1.89 |
| | | 5 | 200A | 1.77 | 2.17 |
| | | 0 | 200A | 2.32 | 3.24 |

* Determined using Begin-of-Life batteries (within 3 months from the production date)
** Test current: 200A is taken as a maximum value by a battery system

4.3 Power Limit Specification

| Item | Condition | Specification |
|---|---|---|
| 4.3.1<br>Discharge power | 10s. discharge power for the voltage limits defined below<br>3.0V @ ≥ 10˚C<br>2.8V @ -20~10°C<br>2.5V @ ≤ -20˚C |  |
| 4.3.2<br>Charge power<br>(for an on-board charger) | 30s. charge power (when charged using an on-board charger) for the voltage limit of 4.15V |  |
| 4,3.3<br>Regen power | 10s. regen power for the voltage limit of 4.15V |  |

4.4 Durability specification.

| Item | Condition | Specification |
|---|---|---|
| 4.4.1<br>Self Discharge Rate | Cells at the shipping state shall be stored in a temperature-controlled environment at 45 ºC for 1 month. After storage, cells shall be discharged per 4.1.2 and cycled per 4.1.1 and 4.1.2 for 3 cycles to obtain recovered capacity* | Capacity recovery rate ≥ 98 % of $C_{min}$ |
| 4.4.2<br>Storage<br>at High Temperature | Cells shall be charged per 4.1.1 and stored in a temperature-controlled environment at 55 / 45 ºC for 4 weeks. After storage, cells shall be discharged per 4.1.2 and cycled per 4.1.1 and 4.1.2 for 3 cycles to obtain recovered capacity.* | Capacity recovery rate ≥ 84 % of $C_{min}$ (55 ºC),<br>92 % of $C_{min}$ (45 ºC) |
| 4.4.3<br>Cycle Life at R.T | Cells shall be charged and discharged per 4.1.3, 1000 cycles at 25 ºC ± 2 ºC. The last discharge capacity is to be compared to the first in percentage. | ≥ 86 % of 1st cycle's capacity<br>(at 25 ºC. 1000 cycles) |
| 4.4.4<br>Cycle Life<br>at High Temperature | Cells shall be charged and discharged per 4.1.3, 300 cycles at 45 ºC ± 2 ºC. The last discharge capacity is to be compared to the first in percentage. | ≥ 87 % of 1st cycle's capacity<br>(at 45 ºC. 300 cycles) |

* Recovered capacity: After storage, the cells shall be discharged with 1C discharge condition(4.1.2), 1C charge and 1C discharge cycle shall be repeated (4.1.3) three times to have the third discharge capacity as recovered capacity.

4.5 Safety Specification

| Item | Condition | Specification |
|---|---|---|
| 4.5.1<br>Shock Test | Cells charged per 4.1.1 shall be subjected to a half-sine shock of peak acceleration of 50 $g_n$ and pulse duration of 11 milliseconds. Cells are subjected to 6 shocks for each of the three mutually perpendicular axes (x, y, z). (UN Test) | No leakage |
| 4.5.2<br>Vibration Test | Cells charged per 4.1.1 shall be vibrated for 1 hour per each of the three mutually perpendicular axes (x, y, z). The vibration is a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. (UN Test) | No leakage |
| 4.5.3<br>Impact Test | The cell charged per 4.1.1 is to be placed on a flat surface. Onto a 15.8 mm diameter bar placed across the center of the sample, a 9.1 kg mass is to be dropped from a height of 61 ± 2.5 cm. (UN Test) | No explode, No fire |
| 4.5.4<br>External Short Circuiting Test* | Cells shall be charged as per 4.1.1, and the positive and the negative terminal is connected with a total resistance of less than 100 mΩ for 1 hour. (UN Test) | No explode, No fire |
| 4,5.5<br>Overdischarge Test* | Cells charged per 4.1.1 shall be discharged at constant current of 41.0 A for 1.5 hours. | No explode, No fire |
| 4.5.6<br>Heating Test* | The cell charged as per 4.1.1 shall be set between two aluminum plates (325 x 195 x 10 mm), the distance of which is 14 mm from each other. The cell shall be heated in a circulating air oven at a rate of 5 ºC per minute. The test shall be terminated when the temperature of the cell reaches 150 ºC. | No explode, No fire |

* The cells to be constrained in between two solid flat plates (e.g. 10mm thick Al plate) for the test.

| Item | Condition | Specification |
|---|---|---|
| 4.5.7<br>Crush Test | Cells charged per 4.1.1 are to be crushed against the crushing apparatus (Freedom Car). At a displacement of 15 % of the cell's height which is held for 5 minutes, the cell shall be crushed again until either the displacement reaches 50 %, or the force does 1000 times the cell's mass, and held for 5 minutes. The test shall be performed with one of three axes (x, y, z) of each cell. | No explode, No fire |
| 4.5.8<br>Penetration* | Cells charged per 4.1.1 shall be penetrated at the center by a steel pointed rod of 3mm diameter at speed of 8 cm/sec. | No explode, No fire |
| 4.5.9<br>Overcharge* | Cells charged per 4.1.1 shall be overcharged at 1C-rate until SOC reaches 200% or cell voltage reaches 8.3V, whichever comes first. | No explode, No fire |

* The cells to be constrained in between two solid flat plates (e.g. 10mm thick Al plate) for the test.

## 5. Caution and Prohibition in Handling

Warning for using the lithium ion rechargeable battery. Mishandling of the battery may cause heat, fire and deterioration in performance. Be sure to observe the following.

### Caution

- When using the application equipped with the battery, refer to the user's manual before usage.
- Please read the specific charger manual before charging.
- When the cell is not charged after long exposure to the charger, discontinue charging
- Please check the positive(+) and negative(-) direction before packing.
- When a lead plate or wire is connected to the cell for packing, check out insulation not to short-circuit.
- Battery must be stored separately.
- Battery must be stored in a dry area with low temperature (≤25˚C) for long-term storage.
- Do not place the battery in direct sunlight or heat.
- Do not use the battery in high static energy environment where the protection device can be damaged.
- When rust or smell is detected on first use, please return the product to the seller immediately.
- The battery must be away from children or pets
- When cell life span shortens after long usage, please exchange to new cells.
- Do not wear metallic objects (ex. ring, watch, accessory, etc.) while handling battery cells.
- When use cells for an assembly of module or pack, the "first-in, first-out" (FIFO) principle should be applied.
- Charge time should not be longer than specified in the manual.
- Do not expose the battery to the outside of the operating temperature range specified in this document.

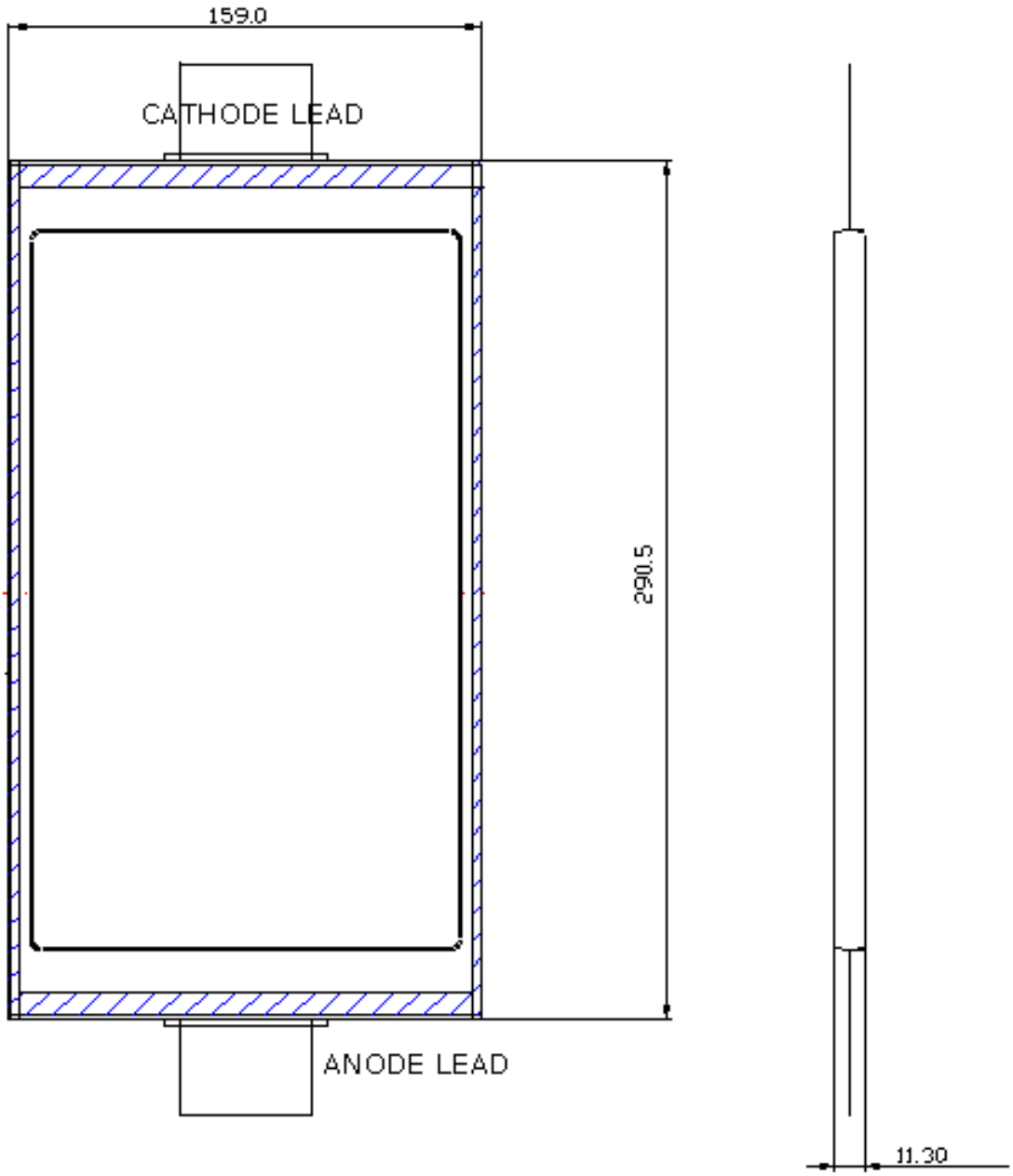
### Prohibitions

- Do not use different charger.
- Do not charge with more than maximum charge rate.
- Do not disassemble or reconstruct the battery.
- Do not throw or cause impact.
- Do not pierce a hole in the battery with sharp things. (such as nail, knife, pencil, drill)
- Do not use with other batteries or cells.
- Do not solder on battery directly.
- Do not press the battery with overload in manufacturing process.
- Do not use old and new cells together for packing.
- Do not expose the battery to high heat. (such as fire)

- Do not put the battery into a microwave or high pressure container.
- Do not use the battery reversed.
- Do not connect positive(+) and negative(-) with conductive materials (such as metal, wire)
- Do not allow the battery to be immerged in or wetted with water or sea-water.
- Do not deform the battery cell (e.g. bending the terrace area or the pouch sealing area) without written agreement with the battery manufacturer.

## 6. Dimensional Drawing

# LQ1729-A2 Dimension



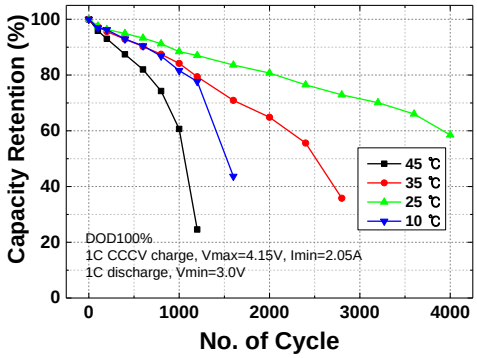
# Appendix

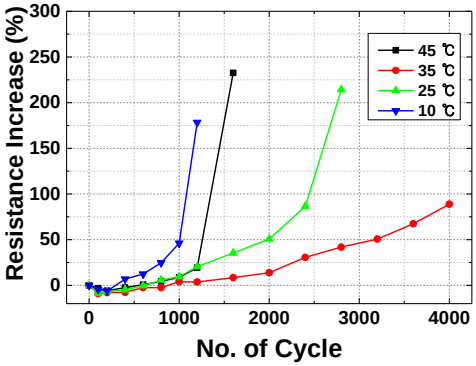
## A.1 Cycle life at selected conditions

### A.1.1 Cycle Life (DOD100%)

- Test condition

- Charge : 1C CCCV, Vmax=4.15V, Imin=2.05A
- Discharge : 1C, Vmin=3.0V
- SOC range : SOC 0~100%
- Rest time : 20 min after charge / discharge

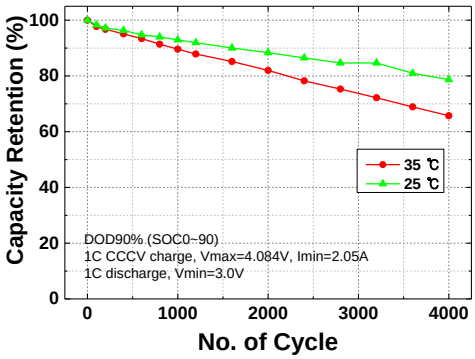


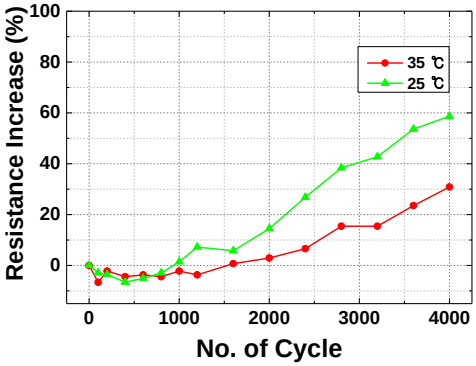




### A.1.2 Cycle Life (DOD90%)

- Test condition

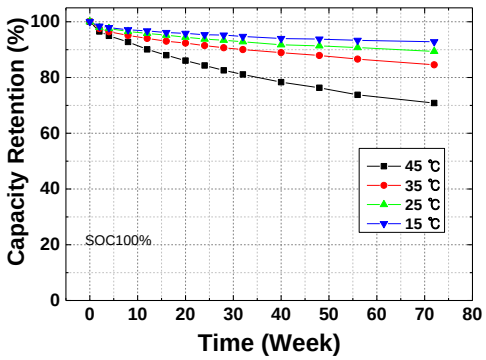
- Charge : 1C CCCV, Vmax=4.084V, Imin=2.05A
- Discharge : 1C, Vmin=3.0V
- SOC range : SOC0~90
- Rest time : 20 min after charge / discharge

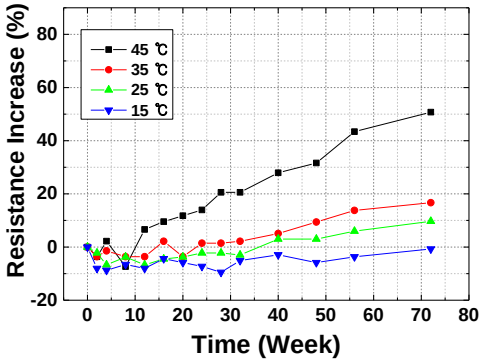


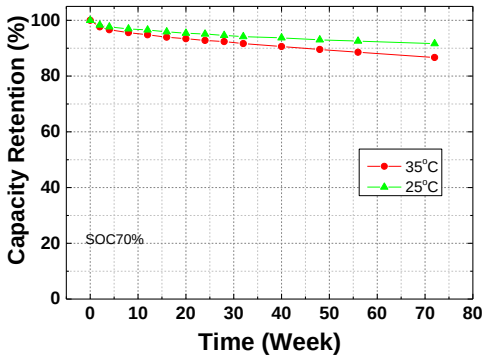
A.2 Storage life at selected conditions

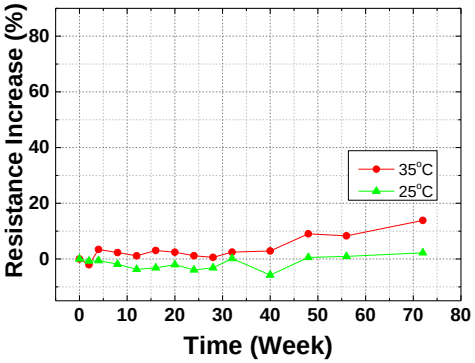
A.2.1 Storage Life at SOC 100%




A.2.2 Storage Life at SOC 70%




A.3 Protocol for the capacity measurement at each check point

- Put the battery in a chamber of 25°C and wait for an hour.
- Discharge the cell with 1C discharge condition (4.1.2)
- Then repeat the 1C charge and 1C discharge cycle (4.1.3) for three times.
- Get the third discharge capacity as the capacity for each check point.

## A.4 Cell information for BMS & Pack design guide

### A.4.1 Cell information for BMS design guide

| Cell type : L3 | Symbol | Value | comment | Refer to |
|---|---|---|---|---|
| 2nd over voltage | OV2 | 4.45 V | If the voltage of cell is over than OV2, the cell can be permanent damaged and not reversible. User never used cell over OV2. | "2.4.2 2nd over voltage limit" |
| 1st over voltage ~ 2nd over voltage | | | The margin to safety use cell. | |
| 1st over voltage | OV1 | 4.3 | The threshold of OV1 | |
| Max. operating voltage for regen. Pulse ~ 1st over voltage | | 4.15 – 4.3 V | The power derating is applied in this range. | "2.4.1 1st over voltage limit" |
| Max. operating voltage for regen. Pulse | Vmax_P | 4.15 V | If the voltage of cell is over Vmax_P, the power derating should be started. | = Max. operating V + X<br>[X = 0 for L3] |
| Max. operating voltage | Vmax_O | 4.15 V | The threshold of Vmax_O | 2.1.5 Standard Charge : Constant Voltage |
| Max. operating voltage ~ Min. operating voltage | | 4.15 – 2.5 V | The range of cell voltage to safety use. | |
| Min. operating voltage | Vmin_O | 2.5 V | The threshold of Vmin_O | |
| Min. operating voltage ~ Under voltage limit | | 2 ~ 2/5V | The margin to safety use cell. | |
| Under voltage limit | UV | 2.0 V | If the voltage of cell is under UV, the cell can be permanent damaged and not reversible. User never used cell under UV. | 2.4.3 under voltage limit |
| Max Safety temp. ℃ | Tmax | 55 ℃ | If the temperature of cell is over Tmax, the cell can be permanent damaged and not reversible. User never used cell over Tmax. | 2.3.2 ; Max temperature |
| Max Safety temp. ℃ ~ Max operating temp. ℃ | | 55 - 45 | The margin to safety use cell. The power derating should be applied. | |
| Max operating temp. ℃ | Tmax_O | 45 ℃ | If the temperature of cell is over Tmax_O, the power derating should be started. | |

| | | | | |
|---|---|---|---|---|
| Max operating temp. ℃ ~ Min operating temp. ℃ | | 45 - 10 | the range of cell temperature to safety use.(when charging) | |
| Min operating temp. ℃ | Tmin_O | 10 ℃ | If the temperature of cell is under Tmin_O, the charging power derating should be started. | |
| Min operating temp. ℃ ~ Min Safety temp. ℃ | | 10 - -30 | The margin to safety use cell. The charging power derating should be applied. | |
| Min Safety temp. ℃ | Tmin | -30 ℃ | If cell is used under Tmin, the cell can be permanent damaged and not reversible. User never used cell under Tmin. | |
| Max. operating current | Imax | | It is decided by the required power and the structure of Pack. (ex. Busbar, current sensor, heat and so on)<br>User never used cell over Imax. | |
| Max. operating current ~ Min. operating current | | - | The range of cell current to safety use. | |
| Min. operating current | Imin | | It is decided by the required power and the structure of Pack. (ex. Busbar, current sensor, heat and so on)<br>User never used cell under Imin. | |

### A.4.2 Cell information for Pack design guide

| **Cell type : L3** | **Symbol** | **Value** | **comment** | **Refer to** |
|---|---|---|---|---|
| Max. allowed pressure | Pmax | 350 kPa | | |
| Min. required pressure | Pmin | 15 kPa | | |

### A.4.3 Abbreviation

| Acronym / Term | Full Form / Definition |
|---|---|
| **SOC** | State of charge |
| **SOH** | State of health |
| **BMS** | Battery Management System |
| **CAN** | Controller Area Network |
| **DV** | Design Validation |

| Acronym / Term | Full Form / Definition |
|---|---|
| **HV** | High Voltage |
| **V** | Voltage |
| **I** | Current |
| **MSD** | Manual service disconnect |
| **IATA – DGR** | International Air Transport Association – Dangerous Goods Regulations |
| **IMDG code** | International Maritime Code for Dangerous Goods |
| **ADR** | The European Agreement concerning the International Carriage of Dangerous Goods by Road |
| **TBD** | To Be Determined |
| **TBC** | To Be Confirmed |
| **USOC** | User State-Of-Charge |
| **SCCR** | Short Circuit Current Rating |
| **APQP** | Advanced Product Quality Planning |
| **ASIC** | Application Specification Integrated Circuit |
| **ASIL** | Automotive Safety Integration Level |
| **ASPICE** | Automotive Software Process Improvement & Capability Determination |
| **BDU** | Battery Disconnect Unit |
| **BMS** | Battery Management System |
| **CAN** | Controller Area Network |
| **DIA** | Development Interface Agreement |
| **DPR** | Design Prerequisites |
| **DTC** | Diagnostic Trouble Code |
| **DV** | Design Validation |

| Acronym / Term | Full Form / Definition |
|---|---|
| **EMC** | Electro-Magnetic Compatibility |
| **FTA** | Fault Tree Analysis |
| **HV** | High Voltage |
| **HW** | Hardware |
| **PHEV** | Plug-in Hybrid Electric Vehicle |
| **PV** | Product Validation |
| **SOH** | State-Of-Health |
| **SW** | Software |
| **TBD** | To Be Determined |
| **TBC** | To Be Confirmed |
| **USOC** | Usable State-Of-Charge |
| **V** | Voltage |