| Library Sort | Product Specifications | VER | А |
|--------------|-----------------------------|------|------------|
| Library Name | Li-ion Rechargeable Battery | Date | 2013/06/05 |

Li-ion Battery Specification

Model: <u>18650P-3.7-2800</u>

| Prepared | Auditing | Approved |
|------------|------------|------------|
| WUYJUN | LVCHENGXUN | SILING |
| 2013.06.01 | 2013.06.03 | 2013.06.05 |

| Library Sort | Product Specifications | VER | А |
|--------------|-----------------------------|------|------------|
| Library Name | Li-ion Rechargeable Battery | Date | 2013/06/05 |

| 1. Primary to | echnical Parameters |
|-----------------|--|
| Туре | Rechargeable Lithium-ion |
| Model | 18650P-3.7-2800 |
| Dimension | D18.6,H68.5d7.5 |
| C₅mAh | 2800 |
| C₅mA | 2800 |
| Nominal Voltage | 3.7V |
| G | Nominal 2800mAh |
| Capacity | Minimum 2700mAn |
| | when discharged at 0.205mA to 2.65 V |
| Charging | |
| Conditions | $0.2C_5$ mA charge termination control parameters taper current $0.01C_5$ mA at 4.2V |
| Service Life | 300cycles (\geq 60% C ₅ mAh,0.2C discharge) |
| Weight | < 50 |
| Charging | |
| Voltage | 4.2 ± 0.03 V |
| Protection | Over Voltage Limit: 4.275 +/- 0.04 V |
| Circuit Module | Under Voltage Limit: 2.5 +/- 0.5 V |
| | Over Current Protection: 4A~ 5A |
| Coll protocted | Max. Quiescein Diani. / μA PTC (Positive temperature coefficient device) |
| Cell protected | protect against over temperature and indirectly over current and will automatic reset |
| | CID (Current interrupt device) |
| | pressure valve, will disable the cell permanently if the pressure is to high in the cell (Can be |
| | due to over charge). |
| Ambient | Charging $: 0 \sim +45^{\circ}$ C |
| Temperature | Discharging :-20 \sim +60°C |
| Range | Storage :-20 \sim +50°C |

Subject to change without prior notice

Dimension (mm)



| Library Sort | Product Specifications | VER | А |
|--------------|-----------------------------|------|------------|
| Library Name | Li-ion Rechargeable Battery | Date | 2013/06/05 |

2 Characteristics

2.1 Standard Charge This "Standard Charge" means charging the cell with charge current 1400mA and constant voltage 4.2V at 25° C for 3hours.

2.2Standard Discharge Capacity The standard discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 560mA with 2.75V cut-off at 25° C within 1hour after the standard charge. Standard Discharge Capacity ≥ 2700 mAh

2.3 Initial internal impedance Initial internal impedance measured at AC 1kHz after rated charge. Initial internal impedance $\leq 160 \text{m}\Omega$

2.4 Temperature Dependence of Discharge Capacity

Capacity comparison at each temperature, measured with discharge

constant current 560mA and 2.75V cut-off after the standard charge is as follows.

Note: If charge temperature and discharge temperature is not the same,

the interval for temperature change is 3 hours. Charge Temperature Discharge temperature

25°C -10°C 0°C 25°C 40°C

Relative Capacity 50% 80% 100% 80% Percentage as an index of the capacity at $25^{\circ}C(=2700\text{mAh})$ is 100%.

2.5 Temperature Dependence of Charge Capacity

Capacity comparison at each temperature, measured with discharge constant current 560mA and 2.75V cut-off after the standard charge is as follows.

Note: If charge temperature and discharge temperature is not the same,

the interval for temperature change is 3 hours.

Percentage as an index of the capacity at $25^{\circ}C(=2700\text{mAh})$ is 100%.

2.6 Charge Rate Capabilities

Discharge capacity is measured with constant current 560mA and 2.75V cut-off after the cell is charged with 4.2V as follows.

Note: Percentage as an index of the capacity at $25^{\circ}C(=2700\text{mAh})$ is 100%.

2.7 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in under table and 2.75V cut-off after the standard charge.

Note: Percentage as an index of the capacity at 25°C(=2700mAh)

| Library Sort | Product Specifications | VER | А |
|--------------|-----------------------------|------|------------|
| Library Name | Li-ion Rechargeable Battery | Date | 2013/06/05 |

Protection



3 Polymer Li-ion Battery Pack Characteristics

| Test item | Test conditions | Requirements |
|----------------|--|------------------------|
| (1)Outside | Visual check | No abnormal stain, |
| Appearance | | Deformation nor damage |
| (2) Standard | Measurements are carried out at $20\pm5{}^\circ\!{}^\circ$ and | |
| test | relative humidity of 65 \pm 20% without other | |
| conditions | specified condition. Accuracy of voltmeters and | |
| | ammeters used in test is equal to or better than | |
| | the grade 0.5. | |
| (3) Full | Cells shall be charged continuously at the | |
| charge | constant current 1.4A to 4.2V, then charge at the | |
| | constant voltage of 4.2V until the end current of | |
| | 0.01C₅mA | |
| (4)Standard | Cells shall be discharged continuously at the | |
| discharge | constant current of $0.28A$ to $2.75V$ | |
| (5) | | ≥3.7V |
| Open-circuit | | |
| voltage (OCV) | | |
| (6)Rated | Cells shall be charged in Item (3) and discharged in Item (4) within 10 minutes after full | Rated capacity: |
| Capacity | charged. If the discharge duration does not reach | \geqslant 2700mAh |
| | the specified value, the test may be repeated up | |
| | to three times in total. | |
| (7) Cycle Life | Cells shall be charged continuously at the | |
| (20°C) | constant current of $0.\ 2C_{\text{s}}\text{mA}$ to $4.\ 2V$ and discharged | ≥300 cycles |
| | continuously at the constant current of $0.\ 2C_{\text{s}}\text{mA}$ to | |
| | 2.75V.A cycles defined as one charge and | |
| | discharge .carry out cycles until discharge | |
| | capacity <60% C₅mAh | |

| Library Sort | Product Specifications | VER | А |
|--------------|-----------------------------|------|------------|
| Library Name | Li-ion Rechargeable Battery | Date | 2013/06/05 |

4 Safety Evaluation :

When Li-ion rechargeable batteries are used on above the permit voltage or current, electrolyte may disassemble, this case will affect safety performance of Li-ion rechargeable batteries. So protection circuit module were used in order to prevent overcharge , over discharge and over current .

PCM Model: SOSHINE18650-2800

Safety behavior

3.1 Short circuit behavior

The battery pack is short circuited with a 200 m Ω load.

The battery current must not exceed 30 A and the link must be cut in less than 20 ms.

3.2 Over charge protection

The battery is charged at 1C without voltage regulation. The safety IC of the battery must cut the link when battery voltage reaches $(4.275 \pm 0.10)V$

The Safety IC must keep the link cut until battery voltage

becomes lower than (4.075 ± 0.10)V. Then the charge must be possible

3.3 Over discharge protection

The battery is discharged at 1C until 2.50V / cell. The safety IC of the battery must cut the link when battery voltage reaches (2.50 ± 0.10)V

The MOSFET will remain closed until the battery voltage rises above the value of (2.90+/-0.10)V and a charge current is detected.

3.4 Over current protection

The aim of this test is to check the Over current protection when there is a excess discharge current.

The safety IC (protection circuit) should trip at(5.3±0.5)A (depending to the IC used).

The battery resets after load if removed.

| Test Item | Test Conditions | Requirements | Requirements |
|----------------|---|---------------------|------------------------|
| (1) Overcharge | Cells shall be charged in Item 1(3), | Protection | No fire, Nor explosion |
| | then charged at 280mA current with a | voltage: | |
| | voltage limit of 6.6V.charging is | 4. 275 ± 0.04 V | |
| | continued for 8 hours. | | |
| (2)0ver | Cells discharged continuously at the | Protection | No fire, Nor explosion |
| discharge | constant current of 560mA to | voltage: | |
| | 2.75V, then connect cells terminals | $2.65 \pm 0.08 V$ | |
| | with 30Ω .Discharging is continued | | |
| | for 24 hours | | |

| Library Sort | Product Specifications | VER | | А |
|------------------|---|-----------|------|------------------------|
| Library Name | Li-ion Rechargeable Battery | Date | | 2013/06/05 |
| | | | | |
| (3) Over current | Cells shall be charged in Item 1(3), | Protectio | n | No fire, Nor explosion |
| | then charge current is to be raised | current: | 4-5A | |
| | at a rate of 0.2A per second until the | | | |
| | battery pack is protective cut-off. | | | |
| (4)Short | Cells shall be charged in Item 1(3), | | | No fire, Nor explosion |
| Circuit Test | Connect battery terminals with | | | |
| | electric wire (electric resistance: | | | |
| | 0.2Ω or less), continued for 1 hours | | | |

5. Duration of Guarantee the Product

We can keep on the quality in six month. In order to keeping on the quality of the batteries, it's need to charge and discharge once every three months.

6. Cell Condition at the Shipment

To be determined (Recommendation Approx. \geq 3.7V about 50% charged state)

7. Storage

Far from the fire and the high temperature.

8. Handling Precautions

To assure product safety, describe the following precautions in the instruction manual of the equipment.

! Danger

- Do not heat or throw battery into a fire.
- Do not use, leave battery close to fire or inside of a car where temperature may be above 60°C. Also do not charge / discharge in such conditions.
- Hairpins, coins, or screws. Do not store batteries with such objects.
- Do not short circuit the (+) and (-) terminals with other metals.
- Do not place battery in a device with the (+) and (-) in the wrong way around.
- Do not hit with a hammer, step on or throw or drop to cause strong shock.
- Do not disassemble or modify the battery.
- Do not solder a battery directly.
- Do not use a battery with serious scar or deformation.

! Warning

- Do not use battery with dry cells and other primary batteries, or batteries of a different package, type, or brand.
- Stop charging the battery if charging is not completed within the specified time.

| Library Sort | Product Specifications | VER | А |
|--------------|-----------------------------|------|------------|
| Library Name | Li-ion Rechargeable Battery | Date | 2013/06/05 |

During use, charge, or storage.

- Keep away from fire immediately when leakage or foul odor is detected.
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.

If liquid leaking from the battery gets into your eyes, do not rub your eyes. Wash them well with clean water and go to see a doctor immediately.

! Caution

- Store batteries out of reach of children so that they are not accidentally swallowed.
- Batteries have life cycles. If the time that the battery powers equipment becomes much shorter than usual, the battery life is at an end. Replace the battery with a new same one.
- Remove a battery whose life cycle has expired from equipment immediately.
- When the battery is thrown away, be sure it is non-conducting by applying vinyl tape to the (+) and (-) terminals.
- When not using battery for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the battery pack is charged, used and stored, keep it away from objects or materials with static electric charges.
- The battery can be used within the following temperature ranges. Do not exceed these ranges. Charge temperature range : $0\,\%$ to $45\,\%$

Discharge temperature range : -20° C to 60° C

(When using equipment)