

SPECIFICATION
OF
Battery Type: Keppower P1835J

| Approved by | Checked by | Prepared by |
|------------------|---------------|----------------|
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1. Scope.

The specification shall be applied to Li-ion rechargeable battery pack of P1835J , which is manufactured by KEEPOWER TECHNOLOGY CO.,LTD. The product is ROHS compliant.

2. Battery Pack Datasheet:

| NO | Items | Criteria | Remarks |
|------|----------------------------|--|--|
| 2.1 | Typical Capacity | 3500mAh | Discharge:700mA cut-off voltage:2.50V |
| | Minimum Capacity | 3400mAh | |
| 2.2 | Energy | 12.95Wh | |
| 2.3 | Nominal Voltage | 3.7V | |
| 2.4 | Open Circuit Voltage | 3.5-3.8V | |
| 2.5 | Internal Impedance | Cell: $\leq 60\text{m}\Omega$ | AC 1KHz after standard charge |
| | | Battery pack: $\leq 150\text{m}\Omega$ | |
| 2.6 | Charge voltage | 4.2V | |
| 2.7 | Charge Time(Std.) | 3 hours | |
| 2.8 | Standard charge current | 1750mA | 25°C |
| 2.9 | Standard discharge current | 700mA | 25°C |
| 2.10 | Max. discharge current | 7000mA | 0°C ~ +45°C |
| 2.11 | Discharge cut-off voltage | 2.5V | |
| 2.12 | Operating Temperature | Charge 0 ~ +45°C | |
| | | Discharge -20 ~ +60°C | |
| 2.13 | Storage Temperature | -20°C ~ +60°C | Less than 1 month |
| | | -20°C ~ +45°C | Less than 3 months |
| 2.14 | Weight | 55g | |
| 2.15 | Size(mm) | Max. (D)18.95*(H)69.85 | |

3. Battery pack configuration

| NO | Item | Criteria | Remarks |
|-----|---------------------|---------------------|------------|
| 3.1 | Cell | NCR18650GA /3500mAh | Sanyo cell |
| 3.2 | PCM | KEEPPOWER-1600 | |
| 3.3 | PVC | Black | |
| 3.4 | Plastic Rack of PCM | Black | |
| 3.5 | Label | KEEPPOWER | 44*16mm |

4. Battery Performance Criteria

4.1 Appearance

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt. The structure and dimensions see attached drawing of the battery.

4.2 Measurement Apparatus

(1) Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

(2) Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance not less than 10 K Ω /V.

(3) Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01 Ω .

(4) Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (AC 1kHz LCR meter).

4.3 standard Test Condition

Test should be conducted with new batteries within one month after shipment from our

factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of $20\pm 5^{\circ}\text{C}$ and relative humidity of 45~85%.

4.4 Standard Charge

4.2V /1750mA Full charge condition: Constant current 1750mA, Constant voltage 4.2V for 50mA end in all at $25\pm 3^{\circ}\text{C}$.

4.5 Common Performance

| No | Items | Testing method and determinant standard |
|----|---------------------------------|---|
| 1 | Charge Performance | The battery can be charged when using the original charger. The standard charge mode :under the temperature of 25°C ,charge the battery with the current of 650mA until the voltage reaches up to 4.2V for 8 hours ,then stop charging. |
| 2 | Discharge Performance | When connecting with load, the battery can supply power. Charge the battery with standard charge mode, then rest for 1hour, then discharge with 650mA until the voltage is 2.50V at 25°C , the standard discharge capacity $\geq 3400\text{mAh}$. |
| 3 | Cycle Performance | Under the temperature of 25°C ,charge the battery with 0.5C, when the voltage reaches up to 4.2V charge with constant voltage until the charge current $\leq 0.05\text{C}$, then stop charging, then rest for 1h, then discharge with 0.5C to 2.50V. Cycle with the above mode, Capacity after 499 cycles and plus 1 day, measured under the same condition in 4.5.2, Capacity $\geq 2450\text{mAh}$. |
| 4 | Charged Storage Characteristics | Charge the battery with 0.2C, then shift to charge with constant voltage until the voltage reaches up to 4.2V, when the charge current $\leq 0.05\text{C}$ stop charging; rest under the temperature of 25°C for 28days then discharge with 0.2C to 2.50V. The discharge time is required $\geq 4.25\text{h}$. |
| 5 | Storage Characteristics | Charge the battery ,which is new manufactured shorter than 3 months, with 0.2C until the capacity reaches to 40~50%, after resting for 12 months under the temperature of 25°C and the humidity of 45~75%, then charge with 0.5C to 4.2V then shift to charge with constant voltage, after full-charge rest for 0.5h,then discharge with 0.2C to 2.50V. The discharge time is required $\geq 4\text{h}$. |

4.6 Safety Performance.

| No | Items | Testing method and determinant standard |
|----|---|---|
| 1 | High Temperature Characteristics | Under the temperature of 25°C, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 45±2°C for 4h, then discharge with 0.5C to 2.50V. The discharge time is required ≥51min and the battery should no deformation and smoking. |
| 2 | Low Temperature Characteristics | Under the temperature of 25°C, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 0±2°C for 4h, then discharge with 0.2C to 2.5V. The discharge time is required ≥3h and the battery should no deformation and smoking. |
| 3 | Overcharge Protection Characteristics | After full-charging the battery with 0.2C and set the constant current and voltage supplier with 2times of the nominal voltage and current, then load it to the battery for 8h. It is required the battery should be no leakage, deformation, smoking and explosion during the test processes. |
| 4 | Over-discharge Protection Characteristics | Under the temperature of 25°C, after discharging the battery with 0.2C to 2.50V, then connect the load with 30Ω then discharge for 24h. It is required the battery should be no leakage, in fire, smoking and explosion during the test processes. |
| 5 | Short-circuit Protection Characteristics | Under the temperature of 25°C, after full-charging the battery with 0.2C, then make the battery's anode and cathode short-circuit for 1h (the connecting resistance is smaller than 100mΩ), then cut the anode and cathode, After the battery momentary charge by 1C current, the voltage should come back to 3.7V, and there should be no leakage, deformation, smoking and explosion during the test processes. |

| | | |
|---|---|--|
| 6 | Constant Humidity and Temperature Characteristics | Under the temperature of 25°C, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 10±2°C and 90~95% for 48h, the battery should be no obvious deformation, leakage, rust, smoking and explosion. After testing take out the battery then rest for 2h under the temperature of 25°C, discharge with 1C to 2.50V. The discharge time is required ≥36min. |
| 7 | Drop Test | Under the temperature of 25°C, after full-charging the battery with 0.2C, then drop it freely from 1 meter height onto the hard board which 18~20mm thick (6 times each of X,Y,Z with positive and negative directions).The battery should be no smoking and explosion, After test discharge the battery with 1C, and the discharge time is required ≥54min(The battery should be cycled no more than 3 times, among them if one time is passed then stop.). |

4.7 Rest Period

Unless otherwise defined 30min, rest period after charge 30min,rest period after discharge.

5. Storage and Others

5.1 Storage

The battery shall be storied within -20°C~ 45°C range environmental condition. If stored for a long time (exceed three months), the battery should be stored in drying and cooling place. The battery's storage voltage should be 3.0~4.2V and the battery is to be stored in condition: Temperature: 23±5°C,Humidity: 65±20%RH

5.2 Others

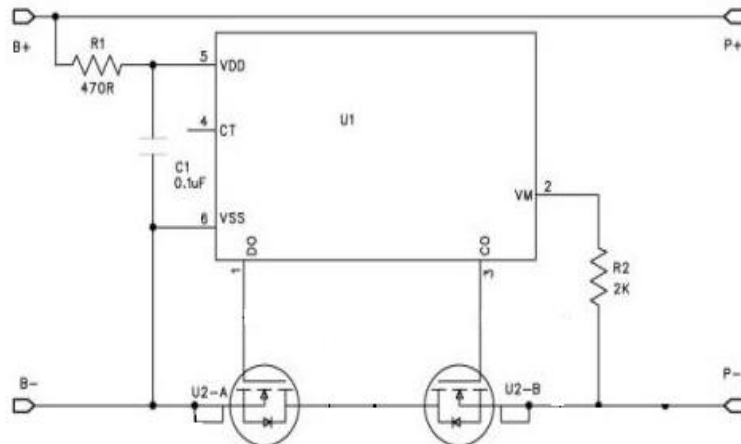
Any matters that this specification does not cover should be conferred between the customer and KEEPOWER.

6. Protection Circuit

6.1 Electrical characteristics

| Item | Symbol | Content | Criterion |
|---------------------------|--------|-------------------------------------|--------------------------------|
| Over charge protection | VDET1 | Over charge detection voltage | 4.325±0.05 V |
| | tVDET1 | Over charge detection delay time | 1.2±0.5ms |
| Over discharge protection | VDET2 | Over discharge detection voltage | 2.50±0.1V |
| | tVDET2 | Over discharge detection delay time | 1.0±0.5ms |
| Over current protection | VDET3 | Over current detection voltage | 0.15±0.015V |
| | IDP | Over current detection current | 8-10A |
| | tVDET3 | Detection delay time | 12±4ms |
| | | Release condition | Cut load and charging |
| Short protection | | Detection condition | Exterior short circuit |
| | TSHORT | Detection delay time | MAX.18ms |
| | | Release condition | Cut short circuit and charging |
| Interior resistance | RDS | Main loop electrify resistance | RDS≤50mΩ |
| Current consumption | IDD | Current consume in normal operation | 1.0μA Min 10.0μA Max |

6.2 Circuit Diagram



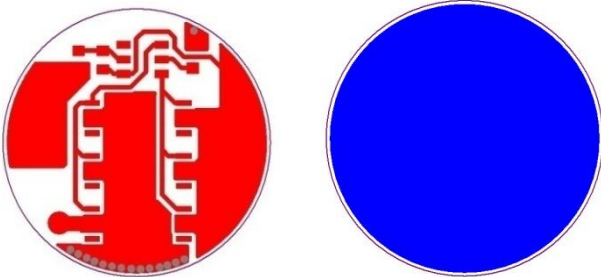
6.3 Parts list

| Name | Quantity | Brand | Part |
|--------|----------|---------------|-------------|
| CAP | 1 | Samsung | 0.1uF |
| RES | 1 | Uniohm | 470Ω±5% |
| RES | 1 | Uniohm | 2KΩ±5% |
| IC | 1 | Seiko | S-8261AAJMD |
| MOSFET | 2 | ALPHA & OMEGA | AO8814/8810 |

6.4 PCB Craft

| | |
|-----------|----------|
| Material: | FR-4 |
| Layer | 2 Layers |

6.5 PCB Layout



7. Assembly Drawing

