



Specification Approval Sheet

Name : Lithium Manganese Dioxide Battery

Model : AKYGA ML2016

SPEC : 3V / 30mAh

Specification Modification Records

| Modification Time | Descriptions | Issued Date | Approved By |
|-------------------|--------------|-------------|-------------|
| | Release 1 | 2026-06-05 | |
| | | | |
| | | | |
| | | | |

Content

1.Scope:

This specification describes the Product Specification of Lithium Manganese Dioxide Battery produced by Akyga Battery.

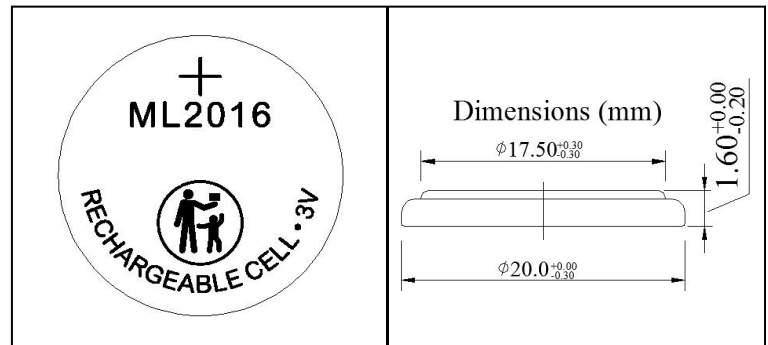
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Lithium Manganese Dioxide Battery

Model ML2016

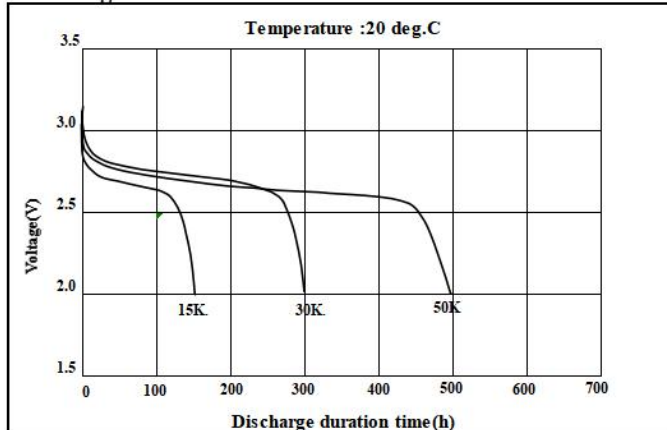
Specifications

| | |
|---------------------------|------------|
| Nominal Discharge current | 0.2mA |
| Nominal Voltage | 3V |
| Nominal Capacity | 30(mAh) |
| Continuous standard load | 15(kΩ) |
| Nominal Charge current | 2.9mA |
| Operating temperature | -20°C~70°C |
| Weight | 1.8 (g) |
| UL Recognition | MH29853 |
| Storage temperature range | 0°C-30°C |
| Storage humidity range | 35%~75% |

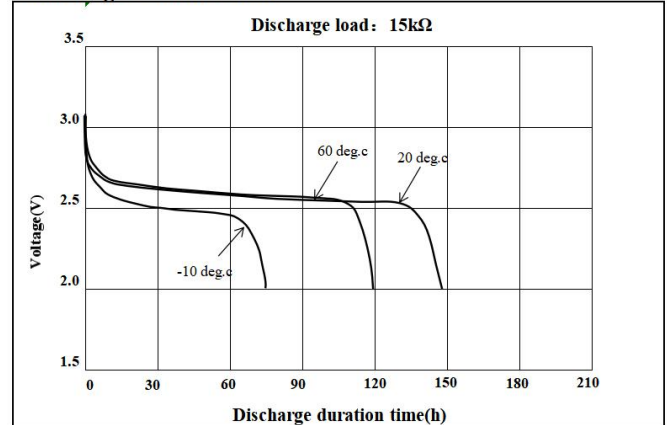


Characteristics

Discharge Characteristics



Discharge Characteristics



■ Characteristics :

[TABLE 1]

| TEST ITEMS | TEMPERATURE | INITIAL | AFTER 12 MONTHS | REMARKS |
|----------------------|-------------|--------------|-----------------|---------|
| Open-circuit Voltage | 20±2°C | 2.8V TO 3.2V | 2.5V TO 3.2V | |

[TABLE 2]

| TEST ITEMS | TEMPERATURE | INITIAL | AFTER 12 MONTHS | REMARKS |
|--------------|-------------|----------|-----------------|--|
| Service Life | 60±2°C | ≥120 Hrs | - | Continuous Discharge Under Standard Load to 2.0V End-Voltage |
| | 20±2°C | ≥150 Hrs | ≥125 Hrs | |
| | -10±2°C | ≥80 Hrs | - | |

[TABLE 3]

| TEST ITEM | STORAGE TEMP | STORAGE PERIOD | REQUIREMENT | REMARKS |
|--|--------------|----------------|-------------|--|
| Service Life After Storage At High Temperature | 60 ±2°C | 20 Days | ≥125 Hrs | Continuous Discharge At 20± 2°C Under Standard Load To 2.0V End-Voltage After Storage. |

[TABLE 4]

| TEST ITEM | TEMPERATURE | DISCHARGE DEPTH | REQUIREMENT | REMARKS |
|------------|-------------|-----------------|-------------|---------|
| Cycle life | 20±2°C | 100% | ≥16 cycles | |
| | | 10% | ≥400 cycles | |

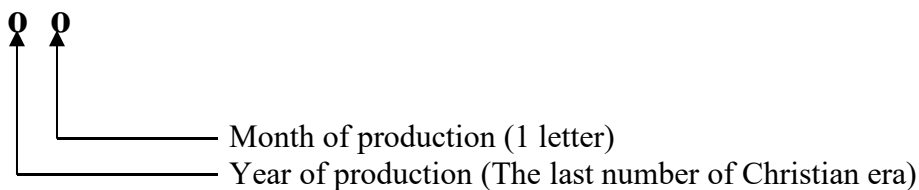
[TABLE 5]

| TEST ITEM | REQUIREMENT | TEST CONDITIONS |
|-------------------------|-------------|---|
| Leakage Characteristics | No Leakage | Temperature: 45 ± 2°C, Relative Humidity: 75% Storage: 30 Days Shall Be Inspected By Visual Means |

■ **Markings:**

Markings on batteries :

- 5.1.1 Battery type : ML2016
- 5.1.2 Brand of battery: Akyga Battery
- 5.1.3 Polarity : + [(-) shall not be indicated]
- 5.1.4 Manufacturing marks : The year and month of production shall be marked on the negative (-) terminal side



[Example] 01 Manufactured in January 2020

0X Manufactured in October 2020

0Y Manufactured in November 2020

0Z Manufactured in December 2020

Month of production.

- January to September -- 1- 9

- Oct, Nov, Dec, -----X,Y, Z

■ Cycle life:

(1) 100% Charge-Discharge Test

- Leave the battery samples at $20\pm 2^{\circ}\text{C}$ for at least 12 hours.
- Charge the battery samples at 2.9mA until $3.25\pm 0.01\text{V}$.
- Use 3.25V constant voltage for charging for next 5 hours.
- Discharge the battery samples continuously at 2.6mA for 7 hours.
- Repeat the above (b), (c) and (d).

Count the number of cycles until the discharge end-point voltage drops below 2.0V.

(2) 10% Charge-Discharge Test

- Leave the battery samples at $20\pm 2^{\circ}\text{C}$ for at least 12 hours.
- Charge the battery samples continuously at 1.2 mA until $3.25 \pm 0.01\text{V}$.
- Discharge the battery samples at 1.2mA for 3 hours.
- Repeat (b) and (c).

Count the number of cycles until the discharge end-point voltage drops below 2.0V.

■ Maximum Allowable Charge Current to Battery

| Model | Maximum allowable charging current | Model | Maximum allowable charging current | Maximum allowable charging voltage |
|--------|------------------------------------|--------|------------------------------------|------------------------------------|
| ML1220 | 5mA | ML2032 | 20mA | 5V |
| ML2016 | 5mA | ML2430 | 20mA | |
| ML2020 | 5mA | | | |
| | | | | |

Protection resistance R must exceed the value calculated in the following formula:

$$R \cong \frac{V (\text{Main power source voltage})}{I (\text{Maximum allowable charge current per battery})}$$

■ Precautions for Mounting

1. Overlapping Batteries

Lithium Manganese Dioxide Battery has exposed positive(+)and negative(-) metallic surfaces with a thin cylindrical seal, called the gasket, inbetween them. When the batteries are overlapped or mixed together in a disorderly way, their positive(+)and negative(-)terminals touch each other, causing short-circuits.

2. The Batteries Put in a Metallic Container or on a Metallic Plate

Similar to the overlapping battery problem, when the batteries are put in a metallic container or on a metallic plate, their positive(+)and negative(-)terminals may short-circuit through the conductive surface, depending on how the batteries are position.

3. When The Battery is Held with Metallic Tweezers

When held with a pair of metallic tweezers as shown, the battery short-circuits through the tweezers.

4. When The Battery Lead Plates Touch Each Other

When the battery lead plates bend and touch each other or other either terminal, the battery short-circuits.

5. older Bridges

Solder may bridge between circuit board conductors, causing a short-circuit and draining the battery.

6. Short-circuits through Soldering Irons

Similar to solder bridging, when the circuit board wiring is short-circuited by a soldering iron for an extended period the battery is drained and consumed. Complete short-circuits through soldering irons within 5 seconds.

7. Short-circuits through Piled Circuit Boards

When circuit boards with the batteries are piled on top of one another, their conductive traces may touch and form a battery discharge circuit that consumes the battery's power.

8. Discharge through Conductive Electrostatic Prevention Mats

Conductive mats are widely used to prevent static electricity from destroying semiconductors. If a circuit board with mounted battery is put on a conductive mat, the soldered conductors may touch the mat, providing a discharge path for the battery.

9. Improper Battery Mounting Polarity

When the battery's positive (+) and negative (-) terminals are reversed with respect to the battery mounting's polarity marks, the battery may be discharged, depending on the type of electric circuit.

10. Solder

When the battery lead plates are dipped in a molten solder bath, the battery is temporarily short-circuited. Therefore, complete dipping within 5 seconds.

■ Handling Precautions

Please read and observe the following precautions thoroughly.

Lithium Manganese Dioxide Battery contains flammable materials, such as organic solvent. Improper battery handling may cause leakage, heating, explosion or ignition of the battery, which may lead to injury or product failure.

■ PRECAUTIONS

1. Do not put the battery into microwave oven or drying machine.
2. Do not drop, apply excessive damage or deform the battery.
3. Do not mix the used battery together with the new battery or different type of batteries.
4. Do not store the battery in high temperature and high humidity location and where the battery is exposed to sunlight to avoid performance deterioration, swelling or leakage, of the battery.

■ <WARNING>

1. The storage temperature range and storage humidity range of the battery in the warehouse are:
0°C~30°C/35%~75%
2. Keep away from infants. If infant happens to swallow the battery, consult a doctor immediately.
3. Note: if the temperature is higher than the continuous use +60 °C or below -10 °C. Please contact the Akyga Battery.