

# Specification Approval

Customer	
Product	Lithium Manganese Dioxide Button Cell
Model	ML2032
Prepared	FL
Approved	DL
Date	

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## 1. Scope

This specification applicable to the 3.0 V lithium manganese rechargeable button cell ML2032 supplied by Daily Power Batteries Limited.

## 2. Technical Parameters

- 2.1 Model No. : ML2032
- 2.2 Nominal Voltage  3.0V

- 2.3 Nominal Capacity □65mAh□20±2 □15KΩ load continuously discharge to end voltage of 2.0V□
- 2.4 Dimensions □Figure 1
- 2.5 Average Weight □3.3g
- 2.6 Polarity □Positive terminal marked “+”□“-” : no mark
- 2.7 Operating Temperature □-20□~60□
- 2.8 Environmental substances□The various substances used in the batteries comply with ROHS directives.

### 3. Electrical Properties

#### 3.1 Appearance

Neat appearance, clear mark, no deformation, rust, stains and leakage on button cell surface.

#### 3.2 Dimensions

Battery dimension is measured according to 4.3□2□□Diameter □20.0□-0.20□mm□Height □3.2□-0.3□mm□

#### 3.3 Properties

##### □1 Open Voltage

Open voltage is measured according to 4.3□3 □and should satisfy the requirements of table 1.

##### □2 Loaded Voltage

Loaded Voltage is measured according to 4.3□4□□should satisfy the requirements of table 1.

[Table 1]

Test Item	Temperature	Start period	Storage period	Testing conditions
Open Voltage	20±2□	≥2.9V	≥2.8V	No load
	0±2□	≥2.9V	≥2.8V	
Loaded Volatge	20±2□	≥2.9V	≥2.8V	15KΩ loaded□ 0.8 sec take reading
	0±2□	≥2.9V	≥2.8V	

**Remarks** “Start period” means within 30 days of battery delivery□“Storage period” means 12 months after delivery of battery.

### 3 Charge and discharge properties

Item	Index	
<b>Charge / Discharge standard current</b>	0.5mA	
<b>Max Discharge Current</b>	<b>Continuous</b>	5mA
	<b>Pulse</b>	10mA
<b>Charge / Discharge cycle characteristics</b>	<b>5 discharge</b>	3000
	<b>20 discharge</b>	500
<b>Charge method</b>	<b>Common Charging Voltage</b>	3.1±0.15V
	<b>High Temperature Charging Voltage</b>	2.95±0.15V

### 4 Operating Life

Battery life is measured according to 4.3□5□□should satisfy requirements of table

3.

**[Table 3]**

Test Item	Temperature	Start Period	Storage Period	Testing Conditions
Operating Life	20±2□	Above 320h	Above 270h	15KΩ loaded continuously discharge to end voltage of 2.0V
	0±2□	Above 260h	Above 240h	

**5 High Temperature Storage Operating Life**

High Temperature Storage Operating Life is measured according to 4.3□6□□ should satisfy the requirements of Table 4.

**[Table 4]**

Test Item	Storage Temperature	Storage Time	Discharge Time	Testing Conditions
High Temperature Operating Life	60±2□	20 days	Above 270h	15KΩ loaded continuously discharge to end voltage of 2.0V

**6 Leakage Property**

Leakage property is measured according to 4.3□7□ should satisfy the requirements of Table 5.

**[Table 5]**

Test Item	Requirements	Test Conditions
Leakage Property	No leakage	Temperature □45±2□ Relative Humidity □≤75%RH Storage 30 days, Visual observation

**7 Leakage property under over-discharge**

Leakage property under over-discharge is measured according to 4.3□8 , should satisfy the requirements of table 6.

**[Table 6]**

Test Item	Requirements	Testing Conditions
Leakage property under over-discharge	No Leakage	Over-discharge Time□5hours□Discharge time after reached end voltage of 2.0V□

**4. Test**

**4.1 Testing Conditions**

- 1□Temperature and Relative Humidity

Without any other specified special conditions, test conditions are :  
Temperature 20±2□□Relative Humidity 45 -75% RH.

- 2□Battery Storage

Battery to be inspected should be stored at temperature 20±2□□Relative Humidity 45 -75%RH.

**4.2 Testing Equipment**

- 1□Tools

Vernier of precision not less than 0.02mm□ruler or thickness test equipment

with precision less than 0.01 mm.

□2□Multi-meter

Precision of multi-meter not less than 0.25% □ internal resistance larger than 1MΩ □

□3□Loaded Resistance

Loaded resistance should include resistance of external circuit and the tolerance has to be less than 0.5%.

### 4.3 Test Method

□1□ Appearance

By visual observation.

(2□ Dimensions

Dimensions are measured according to 4.2□1 . When measuring the total height of battery, protector should be mounted on one or two sides of the measuring contact to avoid battery short-circuit.

□3□Open Voltage

Measure the battery according to the stipulated temperature of table 1 stored for 4 hours or above and using multi-meter at the same temperature and should comply the requirements of 4.2□2□.

□4□Loaded Voltage

Measure the battery according to the stipulated temperature of table 1 stored for 4 hours or above and using multi-meter at the same temperature and should comply the requirements of 4.2□2□, loaded resistance should comply with the requirements of 4.2□3□□ when circuit is closed and take the reading within 0.8 seconds.

□5□Operating Life

Measure the battery according to the stipulated temperature of table 3 stored for 4 hours or above and under the same temperature with loaded resistance to discharge in table 3, continuously discharge to end voltage of 2.0V, the battery life will be the discharge time under the conditions of continuously discharge.

□6□High temperature operating life

Measure the battery according to the stipulated temperature and storage time of table 4. Then the battery is taken out and stored under the temperature of  $20 \pm 2$  for 4 hours or above and then discharge continuously to end voltage of 2.0V. This discharge time will be the high temperature operating life.

□7□Leakage Property

Measure the battery according to the stipulated temperature, relative humidity and storage time as listed in table 5. Then the battery is taken out and stored under the temperature of  $20 \pm 2$  for 4 hours or above to conduct the visual observation of leakage property.

□8□Leakage under over-discharge

Measure the battery according to the stipulated conditions as listed in table 6. Then the battery is taken out and stored under the temperature of  $20 \pm 2$  for 4 hours or above to conduct the visual observation of leakage property.

## 5. Marks

5.1 Model No. □ML2032

5.2 Polarity □+□“-” no need to mark□

5.4 Other designated marks

### **3. Instructions**

- 3.1 Do not dismantle the battery by yourself□
- 3.2 Do not short-circuit the battery□
- 3.3 Do not mix the battery with other metal objects;
- 3.4 Do not throw the battery into water or get wet;
- 3.5 Do not use pointed objects to hit on the battery;
- 3.6 Connect the battery with the right polarity “+”/“-”□
- 3.7 Do not mix different types, brands, new and old batteries together;
- 3.8 Do not expose the battery to the environment of direct sunlight, high temperature, high humidity□
- 3.9 Suggest battery to be stored under the temperature of  $23\pm 5$ □□Relative Humidity of 45 -75%RH□
- 3.10 Please read this instruction before use.

### **4. Warning**

- 4.1 Do not heat, short-circuit and assemble randomly□
- 4.2 Do not heat or expose the battery to the fire source in the proximity;
- 4.3 Do not let children contact the battery. If the battery is accidentally swallowed by children, please consult the doctor immediately.
- 4.4 Battery cannot be short-circuited and cannot be hit strongly.

### **5. Amendments to Product Specification**

- 5.1 Our company reserved the right to amend the product specifications according to the requirements when necessary.