COIN CELL
CR2032
(Only for LED flash light)

BRIEF SPECIFICATION

Model: CR2032
Nominal Voltage: 3.0V
Nominal Capacity: 210mAh
Standard Discharge with load: 15KΩ
Weight: 3.1g
Stainless steel container
ISO9001 Certified
UL Certified MH20555
Manufacturer: EEMB Co., Ltd.
Website: http://eemb.com
Lithium Coin battery structure

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1. SUBJECT

This specification presents typical and guaranteed ex-work values of the Lithium Manganese Dioxide Coin Cells (Li / MnO₂), of Model CR2032

Manganese dioxide (MnO₂) is used for the active cathode material, and high voltage, high activity lithium metal for the anode material. Battery discharge reactions are as follows:

Anode reaction: \( \text{Li} \rightarrow \text{Li}^+ + e^- \)
Cathode reaction: \( \text{Mn}^{(IV)}\text{O}_2 + \text{Li}^+ + e^- \rightarrow \text{Mn}^{(III)}\text{O}_2 (\text{Li}^+) \)
Total reaction: \( \text{Mn}^{(IV)}\text{O}_2 + \text{Li}^+ \rightarrow \text{Mn}^{(III)}\text{O}_2 (\text{Li}^+) \)

2. LI-MnO₂ BUTTON CELL FEATURES AND APPLICATIONS

Features:

- Light Weight, High Voltage and High Energy Density
- Excellent Stable Discharge Characteristics
- Outstanding Temperature Characteristics
- Excellent Leakage Resistance
- Excellent Long-term Reliability

Applications:

- Watches
- Calculators
- PC notebooks
- Electronic Keys
- Card-Type Radios
- IC Cards
- Memory Cards
- Medical Equipment
- CMOS memory backup

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### 3. GENERAL SPECIFICATION

#### 3.1 Item Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Specifications</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Voltage</td>
<td>V</td>
<td>3.0</td>
<td>Standard Discharge</td>
</tr>
<tr>
<td>Nominal Capacity</td>
<td>mAh</td>
<td>210</td>
<td>Standard discharge with load 15kΩ</td>
</tr>
<tr>
<td>Instantaneous short-circuit current</td>
<td>mA</td>
<td>≥ 120</td>
<td>Time ≤ 0.5 second</td>
</tr>
<tr>
<td>Off-load voltage</td>
<td>V</td>
<td>≥ 3.2</td>
<td>Without load</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>℃</td>
<td>-20~60</td>
<td></td>
</tr>
<tr>
<td>Standard Weight</td>
<td>g</td>
<td>3.1</td>
<td>Unit cell</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service output</th>
<th>Initial</th>
<th>Standard</th>
<th>1180h</th>
<th>Continuous discharge with load 15kΩ, till 2.0V end-voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 12 months storage</td>
<td>Standard</td>
<td>1110h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Red LED light flash test | Times | ≥ 500 000 | Pulse discharge with 6pcs red LED light, flash each 1.5 second till 1.6V end-voltage |
| Blue LED light flash test | Times | ≥ 2 000 000 | Pulse discharge with 6pcs blue LED light, flash each 1.5 seconds till 2.0V end-voltage |

#### 3.2 Item Conditions Characteristics

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CONDITIONS</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal durability</td>
<td>Kept for 20 days at 60°C±3°C, then continuously discharge with 15kΩ load, till 2.0V end-voltage</td>
<td>standard 1110h</td>
</tr>
<tr>
<td>Self-discharge rate</td>
<td>Stored for 12 months at normal temperature and humidity</td>
<td>≤ 5%</td>
</tr>
</tbody>
</table>

### 4. PERFORMANCE AND TEST METHODS

Unless otherwise stated, all the testing is carried out under the condition: environmental temperature, 20°C~25°C; environmental humidity, 65±20%. Please refer to Table 4.1

#### 4.1 Characteristics

<table>
<thead>
<tr>
<th>No</th>
<th>ITEM</th>
<th>TEST METHODS</th>
<th>STANDARED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dimension</td>
<td>Using vernier caliper (accuracy≥0.02) while avoiding short-circuit</td>
<td>Diameter 20.0 (-0.2) mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Height 3.2 (-0.2) mm</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th>Off-load voltage</th>
<th>Using multimeter (accuracy ≥ 0.25%) internal resistance ≥ 1MΩ</th>
<th>≥ 3.2V</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Instantaneous short-circuit current</td>
<td>Time of short-circuit should be less than 0.5 second and avoid repeated test within half an hour</td>
<td>≥ 120mA</td>
</tr>
<tr>
<td>4</td>
<td>Appearance</td>
<td>Eyeballing</td>
<td>Bright, clean, no rust, no leakage, And no flaw</td>
</tr>
<tr>
<td>5</td>
<td>Capacity</td>
<td>Continuously discharge for 8 hours with load 15kΩ, temperature at 20–25°C, humidity at 65±20% till 2.0V end-voltage (for fresh battery only: within 3 months )</td>
<td>≥ 1180 h</td>
</tr>
<tr>
<td>6</td>
<td>Red LED light flash test</td>
<td>Pulse discharge with red LED light, temperature at 20–25°C, humidity at 65±20%, flash each 1.5 seconds till 1.6V end-voltage (for fresh battery only: within 3 months )</td>
<td>≥ 500,000</td>
</tr>
<tr>
<td>6</td>
<td>Blue LED light flash test</td>
<td>Pulse discharge with blue LED light, temperature at 20–25°C, humidity at 65±20%, flash each 1.5 seconds till 2.0V end-voltage (for fresh battery only: within 3 months )</td>
<td>≥ 2,000,000</td>
</tr>
<tr>
<td>7</td>
<td>Vibration test</td>
<td>Put battery on the platform of the vibrations machine, start the machine and adjust the frequency from 10 times per minute to 15 times per minute, keep it running for an hour</td>
<td>Characteristics keep stability</td>
</tr>
<tr>
<td>8</td>
<td>Leakage at high temperature test</td>
<td>Stored under temperature at 60°C and relative humidity (RH) below 75% for 7 days</td>
<td>No leakage allowed</td>
</tr>
<tr>
<td>9</td>
<td>Over discharge Test</td>
<td>After 2.0V end-voltage, continuously discharged for 5 hours</td>
<td>No leakage allowed</td>
</tr>
</tbody>
</table>

5. PRECAUTIONS IN USING

- Use Nickel-plated iron or stainless steel for the terminals that contact the battery.
- Make sure that terminal contact pressure is 50g minimum, for a stable contact.
- Keep the battery and contact terminal surfaces clean and free from moisture and foreign matter.
- Before inserting the battery, check the battery contact terminals to make sure they are normal, not bent or damaged. (Bent terminals may not make good contact with the battery or may cause it to short circuit.)
- When the batteries are piled up in a disorderly way, their positive and negative terminals may short-circuit, consuming some batteries while charging others, causing them to explode.
- Lithium batteries that are almost exhausted can output a voltage that is almost the same as that of a new battery: Please does not judge a battery only with a Voltmeter. Avoid using a mixture of old and new batteries; replace all batteries in a set with new one.
- Lithium batteries require a period of time to reach their normal voltage again after even a slight short circuit. Therefore, should the battery is short-circuited, wait an adequate long time for batteries to recover before measuring their electrical characteristics.
- Use a high impedance (1M or higher) voltimeter to measure battery voltage.
- Battery characteristics vary with type and grade, even when batteries are the same size and shape. When replacing batteries with new ones, be sure to carefully check the symbols and numbers on them.

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6. STORAGE AND MOUNT
The cell should be preferably stored in dry and cool conditions. (Temperature: 0~30°C; RH≤75%)

Button lithium batteries need special method to avoid short-circuiting before and after they are installed. As short circuits tend to occur in the following cases, please take care when handing the batteries.

6.1. Overlapping Batteries
A Button lithium battery is shaped as shown below. It has exposed positive and negative metallic surfaces with a thin cylindrical seal, called the gasket, in between.

![Diagram of Button Lithium Battery](image)

When batteries are overlapped or mixed together in a disorder way, their positive and negative terminals touch each other, causing short circuits.

6.2. Batteries put in a Metallic Container or on a Metallic Plate
Similar to the overlapping battery problem, when 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 the placement.

6.3. When a Battery is Held with Tweezers
When held with a pair of metallic tweezers as shown below, the battery short-circuits through the tweezers.

6.4. When Battery Lead Plates Touch Each Other
When battery lead plates bend and touch each other or either terminal, the battery short-circuits.

6.5. Solder Bridges
Solder may bridge between board conductors, short-circuiting and draining battery.

6.6. Short-circuited though Soldering Iron

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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 manual soldering within 5 seconds.

6.7. Shorts through Piled Circuit Board
When circuit boards with 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.

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

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

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

7. SAFETY
Battery Handling Precautions to Ensure Complete Safety
Lithium batteries contain inflammable materials, such as lithium and organic solvents. Improper battery handing, particularly during transit and storage, may cause heating, explosions and fires.

Please strictly observe the precautions below in handing lithium batteries.

**WARNING!**
- DO NOT recharge, short-circuit, disassemble, deform, heat or place the battery near a direct flame. This battery contains flammable materials such as lithium and organic solvent and performing any of the above actions could cause it to ignite explode or become damaged.
- Keep this battery out of the reach of children. If it is swallowed, contact a physician immediately.
- When storing the battery or throwing it away, be sure to cover it with tape. If the battery comes into contact with other metal objects, it could ignite or become damaged.

**CAUTION!**
Closely observe the following precautions. If the battery is used incorrectly, it could leak or become damaged, causing device trouble or injury.
- Insert the battery with the "+" and "-" ends correctly oriented.
- If the battery is used together with new batteries, do not use it with a different type of battery.
- Do not apply solder directory to the battery.
- Avoid storing the battery in direct sunlight, or in excessively hot and humid locations.

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9. **CUTWAY DIAGRAM**

1. Cathode Shell  
2. Cathode (slice of lithium)  
3. Septum  
4. Gasket  
5. Anode (MnO₂)  
6. Anode collector net  
7. Anode shell

10. **DISCHARGE CHARACTERISTICS**

![Discharge Characteristics](image)

![Temperature Characteristics](image)

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