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Specification

| | |
|----------|--------------------------------|
| Customer | |
| Product | 3V Li-MnO ₂ battery |
| Model | CR2450 |
| P/N | |
| Approval | |

| | | | |
|---------------|-------------|-------------|-------------------|
| Manufacturer | MALAK | Origin | SHENZHEN |
| Sales manager | | Sample date | 2014-08-12 |
| Telephone | 18576779178 | Email | zhongmin@malak.cn |
| Design by | D.M.M | Check by | Henry Zhong |
| Design date | 2014-08-05 | Version | V1.0 |

One of the biggest and professional button cell manufacturers

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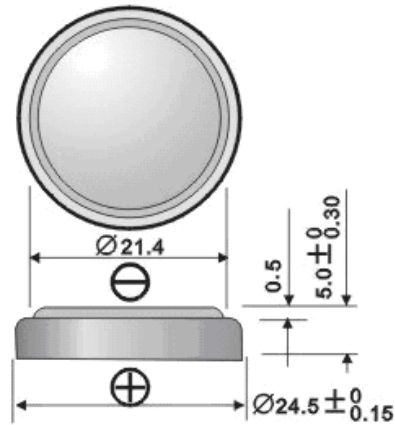
1. Product name and applicable range

This specification is applicable to the following product: 3V Coin type manganese lithium battery CR2450.

The applicable range of CR2450 are mainly used in: RTC clock circuit, RFID tags, LED products and etc.

2. Dimensions

| | |
|--------------|-------------|
| diameter(mm) | 24.5 (-0.2) |
| height(mm) | 5.0(-0.15) |
| weight(g) | 6.3±0.1 |



3. Nominal specification and Characteristics

| Item | technical parameters | Conditions |
|--|----------------------|---|
| Nominal voltage | 3.0 V | apply to all CR batteries |
| Nominal capacity | 600mAh | Continuous discharge with load 15kΩ, till 2.0v end-voltage at 20~25°C |
| Instantaneous short-circuit current | ≥250mA | Time≤0.5' |
| open-circuit voltage | ≥3.20V | No load test |
| Storage temperature | 20-30°C | apply to all CR batteries |
| Operate temperature | -20-60°C | apply to all CR batteries |
| Self-discharge rate | ≤3% / year | annual mean |
| Fast test life | New cell | ≥600hrs |
| | 12 M. | ≥550hrs |
| load 3kΩ, till 2.0v end-voltage at 20~25°C, humidity≤75% | | |

Comments 1:the product standard on electrical chemistry system and dimension is set according to IEC6008-1:2007(i.e.GB/T8897.1-2008 Primary cell, Chapter 1, Profile)..

4. Performance test

| Item | Test method | Standard |
|--------------------------|--|--|
| 1. dimension | With vernier caliper(tolerance \leq 0.02 mm) test, paste on the surface of the caliper contact insulation materials, don't short circuit. | Diameter (mm): 24.5 (-0.2) height (mm): 5.0 (-0.15) |
| 2. open-circuit voltage | With multimeter or voltmeter | \geq 3.20V |
| 3. Short-circuit current | With multimeter or amperemeter, , test time not more than 0.5 second, must avoid repeating test, test interval shall be more than 0.5 hours. | \geq 250mA |
| 4. appearance | visual inspection | Clean, clear and correct mark, no rusting, no leakage |
| 5. Fast test capacity | at 20~25 $^{\circ}$ C, humidity \leq 75%,with load 3k Ω , till 2.0v end-voltage | \geq 600 hrs |
| 6. vibration test | vibration 1 hours on a vibration machine,with frequency is 100 to 150 times/min | stable performance |
| 7. high temperature test | Store 30days at 45 \pm 2 $^{\circ}$ C | No leakage |
| 8. overdischarge test | Continuously discharge with 1K load for 5 hours while the voltage get to 2.0V | No leakage |

Comments 2: The dimension and performance standard is set according to IEC 60086-2:2007 (i.e GB/T8897.2-2008, Primary cell, Chapter 2: Dimension and technical requirement)

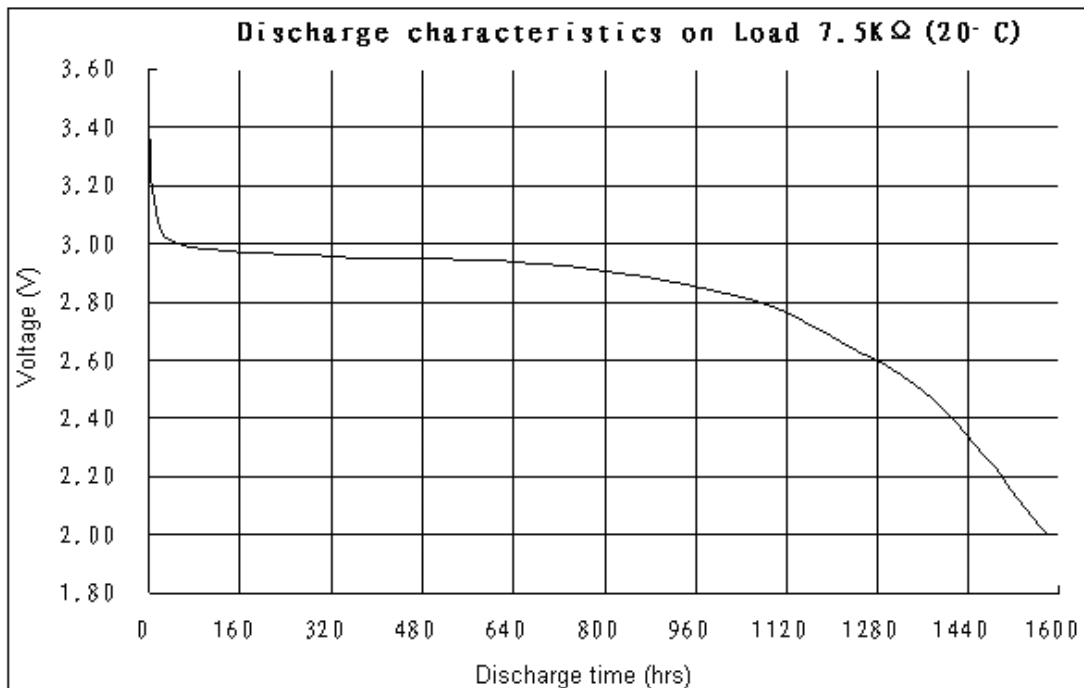
5. safety test

| Experimental project | Project name | Test condition | Standard |
|----------------------|--------------------------|---|----------------------|
| The test of the the | A Altitude simulation | battery under the condition of pressure is less than 11.6 kPa at least 6 hours. | According to the (i. |

| | | | | |
|-----------------------------|---------------|---|--|--|
| expected use | B | heat Shock | Battery under the change condition from – 40 to +75 °C for 12 hours, and repeated 10 cycles | According to IE/GB/T 8897.4-2008, Primary cell, Chapter 4: Safety requirement on lithium cell) |
| | C | vibration | Test the battery in accordance with the requirements of standard sine wave of vibration. In three perpendicular fixed bearing for 12 cycles each azimuth, the cycle time of each bearing a total of 3 hours. | |
| | D | shock | Tested the battery in three perpendicular fixed position of each azimuth through three times, a total of 18 times. | |
| The expected error use test | E | short circuit | When the battery in 55 °C environment and reaching the temperature balance. The total resistance should be less than 0.1 / Ω for short circuit to the shell temperature dropped to 55 °C for at least another short circuit after 1 hour. Continue to observe 6 hours. | |
| | F | strike | Put a 9.1 kg weight object free fall to strike the battery on a steel rod (diameter 15.8mm) from 610 + 25 mm altitude | |
| | G | extrusion | Make pressure on the battery, with the initial speed until 1.5 cm / SEC, and power to 13 kn, then release pressure immediately | |
| | H | forced discharge | Connect the battery with 12 v DC power supply series, make the battery forced discharged after the discharge current reached the maximum | |
| | I | abnormally charge | Connect the battery with a DC power supply with the cells reversed, withstand 3C (regulated by manufacturer) charging current | |
| | J | natural drop | The battery from 1m and drop to concrete surface, continue 6 times, placed observation in an hour. | |
| | K | high temperature | put the battery in oven, control the temperature rose to 130 °C at a speed of 5 °C / min, and heat preservation 10 mins. | |
| | L | improper installation | A reverse connection with three battery. Circuit resistance is less than 0.1 Ω. | |
| M | overdischarge | discharge a battery with 50% depth and in series connection with three qualified batteries. | | |

Comments 3 : The safety performance standard is set according to IEC 60086-4:2007 (i.e. GB/T 8897.4-2008, Primary cell, Chapter 4: Safety requirement on lithium cell)

6. Discharge characteristic



7. Material description and MSDS

| ITEM | ELEMENT |
|-------------|-----------------------------------|
| Anode | Manganese Dioxide Powder |
| | Colloid Graphite Powder |
| Cathode | Lithium slice |
| Electrolyte | Ethylene Glycol Dimethyl Ether |
| | Propylene Carbonate |
| | Lithium Perchloride |
| Rind | Stainless steel shell |
| others | Fiberglass Septum,Acetylene Black |

Attachment 1 : MALAK CR batteries MSDS

8. Environmental management and safety reports

This product comply with the EU RoHS directive and international/national related laws and regulations, has passed RoHS testing from SGS,and also pass CE and UL safety test.

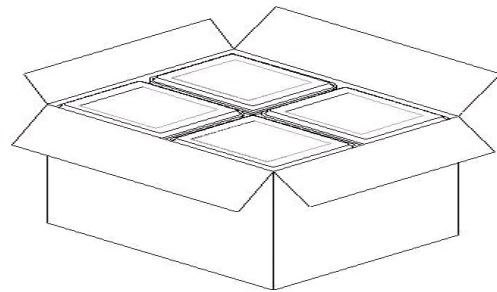
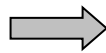
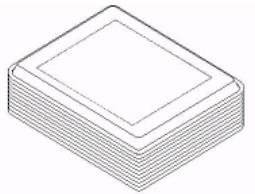
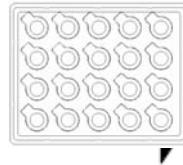
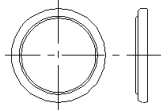
Attachment 2 : CR batteries ROHS test report.

Attachment 3 : CE and UL certification.

9. Packaging specification

| | | | |
|-----------|----------------|-------|--------|
| PART NAME | 3V Button cell | MODEL | CR2450 |
|-----------|----------------|-------|--------|

1.packing diagram



2.packing SOP:

- 1)20PCS batteries in a tray.
- 2).100PCS in a hyaline PE bag.
- 3).24 bags(2400pcs) in a carton.
- 4). Packing the carton and delivery to clients.

3.carton packing details.

| | |
|----------------------------|---------------------|
| Unit weight: 6.8g /PCS | Quantity : 24 00PCS |
| Size: 34.5*28.5*21.0 cm; ; | G.W.: 18.2KG/Ctn |

10. battery holder

The suitable battery holders:



DIP: BS-2450-1



SMT: BS-2450-3

Please download the specification of battery holder on our official site:

<http://www.malak.cn>

11. battery with pins

We supply the battery with tin-plated solder pins ,we can produce kinds of pins according to your design,please download the drawing of tagged battery with pins on our official site: <http://www.malak.cn>

12. Cautions

- 1)、Read the instructions on your device before installing batteries. Only use the size and type of battery specified in the instructions.
- 2)、Keep the contact point or surface clean .Check the contact point or surface to prevent the short circuit of the battery
- 3)、Insert the batteries properly. Follow the symbols showing the correct way to position the positive (+) and negative (-) ends of the batteries.
- 4)、Don't mix old and new batteries, or mix different types or makes of batteries.
- 5)、Don't heat,charge,crush, puncture, or otherwise damage batteries, This can result in leakage or rupture.
- 6)、Don't dispose of batteries in a fire — they may leak or rupture
- 7)、Don't dispose of batteries in water.
- 8)、Don't stack batteries.
- 9)、Don't disassemble the battery.
- 10)、Keep in a dry and cool place. Storage at place with high temperature(over +60°C)or low temperature(under -20°C) or place with humidity over 75% will lead to

the capacity loss , derated electric performance and also safety problem.

11)、 Keep away from the strong acid, alkali, oxide, and other corrosive materials.

12)、 Keep batteries out of reach of children.

13)、 Pay attention to the expire date of the battery.

14)、 Do not dispose of used battery in natural environment ,like river ,lake, sea and land .Do not bury the used in battery the soil .

13. Handling instruction for emergency

1)、 If short circuit, disconnect the wire or other conductor with the battery

2)、 If installed battery with wrong direction, take out battery and follow the symbols showing the correct way to position the positive (+) and negative (-) ends of the batteries.

3)、 If your skin get contact with the electrolyte, wash with water immediately.

4)、 If bare batteries stacked (especially with very large quantity), which may generate heat, or even explosion, please separate them immediately.

5)、 If swallowed, contact a physician immediately.

6)、 If fire or explosion happened, cover them with sand or soil to put out the fire . Dry powder fire extinguisher can be used to put out the fire. Do not use water .

7)、 Avoid inhaling the irritative gas, which generated by the fire or explosion of battery .Clothes, towel or cotton material can be used to prevent inhaling, wet clothes or towel will be better. If inhaled the irritative gas ,please contact a physician.

14. Others

With product technology updates, the specification will be updated, please visit our website for the latest information, or contact with us to get the latest version of the specification.

Website: <http://www.malak.cn>

Service hotline 400-088-2032