

<b>NANFU GROUP</b>	<b>Fujian Nanping Nanfu New Energy Co., Ltd.</b> <b>Product Specification</b>	Spec No.	SPEC-LMB-CR2032
		Version	A/0

# Coin Manganese Dioxide Lithium Battery

## Product Specification

**Model: CR2032**

<b>Drafted by/Date</b>	<b>Checked by/Date</b>	<b>Approved by/Date</b>
2022-11-18	2022-11-18	2022-11-18
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## 1. Scope

This specification is applicable to Coin Manganese Dioxide Lithium Battery CR2032, produced or supervised by Nanfu Corp.

## 2. Product specification parameter table

Item	Unit	Technical Index	Condition
Dimensions	mm	Diameter: 20.00(-0.10)	Test with vernier caliper with accuracy not less than 0.02mm.
		Height: 3.20(-0.20)	
Nominal Voltage	V	3.0	
Open-Circuit Voltage	V	3.05~3.40	No-loaded.
Nominal Capacity	mAh	240	Load: 15K $\Omega$ , cut-off Voltage: 2.0V, Temperature: 20 $\pm$ 2 $^{\circ}$ C
Standard Discharge Current	mA	0.2	
Recommended Storage Temperature	$^{\circ}$ C	18~22	60% $\pm$ 15%
Applicable Temperature	$^{\circ}$ C	-20~70	See note 3.
Nominal Weight	g	About 3.1	Bare cell.
Self-Discharge Rate	/Year	$\leq$ 2%	Store at 20 $\pm$ 5 $^{\circ}$ C & 55% $\pm$ 20%RH for 1year

Note:

- The electrochemical system, dimensions and safety requirements of this product shall comply with the following standards:
  - GB/T8897.1-2013 --- Primary Batteries - Part 1: General
  - GB/T8897.2-2013 --- Primary Batteries - Part 2: Physical and electrical specifications
  - GB/T8897.4-2008 --- Primary Batteries - Part 4: Safety of lithium batteries
  - IEC 60086-2: 2015 Primary batteries Part 2: Physical and electrical specifications
- The appearance of the battery should be free from deformation, dent, stain, leakage, arch or burr of the sealing parts, and the terminal of the battery should be free of cover or foreign matter, so as not to affect the actual use or battery performance.
- For long-term use in extreme environment such as low temperature (< 0  $^{\circ}$ C) or high temperature (> 60  $^{\circ}$ C), please consult Nanfu Corp firstly.

## 3. Standard test conditions

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Unless otherwise specified, the test is generally conducted at the temperature of 20°C ±2°C and the relative humidity of 60%±15%. The test battery must be fresh, for no more than three months after delivery.

#### 4. Test instruments and methods

1) The voltage is measured with a voltmeter with the range of 0V to 4 V and the accuracy of ± 1mV, or with a more accurate multimeter with the input impedance more than 10 M Ω.

2) The resistance of the battery is tested with an internal resistance tester, the error is no more than 0.5%, and the AC signal is 1KHz.

3) Dimensions should be measured with electronic calipers (with a range of 0 to 150 mm and the accuracy is 5/100mm), or other measuring tools with higher detection accuracy

4) Appearance: Visual inspection.

5) Anti-Leakage inspection: To check the cell appearance, it is necessary to observe the cell 1meter away from the 40Watt fluorescent lamp, 30cm away from the eyes without light source sheltered, and the cell appearance must be clean, no dirt.

#### 5. Electrical performance test

Item	Unit	Technical Standard	Conditions
Internal Resistance	Ω	<15 (AC,1KHZ)	Fresh battery
Discharge duration	h	≥1200 (see Appendix I)	Load: 15K Ω , cut-off Voltage: 2.0V.
	h	≥1175	After 20days in 60±2°C, discharge with 15K Ω , cut-off Voltage: 2.0V.

#### 6. Electrical safety performance test

No.	Test Item	Test Procedure	Requirement
1	External Short-Circuit	The test cell or battery shall be stabilized at an external case temperature of 55 °C and then subjected to a short-circuit condition with a total external resistance of less than 0.1 Ω at 55°C. This short-circuit condition is continued for at least 1h after the cell or battery external case temperature has returned to 55°C. The test sample shall be observed for a further 6h.	No overheating, no rupture, no explosion, no fire
2	Forced Discharge	Each cell shall be force discharged at ambient temperature by connecting it in series with a 12V direct current power supply at an initial current equal to the maximum continuous discharge current specified. There shall be no explosion and no fire during this test and within 7 days after the test.	No explosion, no fire
3*	Abnormal Charge	Each test battery shall be subjected to a charging current of 3 times than the abnormal charging current specified by connecting it in opposition to a DC power supply.	No explosion, no fire

\* The allowed maximum charge current of CR2032 is 10mA, suggest to launch abnormal charge test with this parameter.

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## 7. Environmental safety performance test

No.	Test Item	Test Procedure	Requirement
1	Anti-Leakage	Test cells shall be stored at $45 \pm 2^{\circ}\text{C}$ & 75%RH for 30 days, then take out of and stored at $20 \pm 2^{\circ}\text{C}$ & $60\% \pm 15\text{RH}$ for 24 at least, check the appearance finally.	No leakage, no rust, no dirt
2	Thermal cycling	Test cells shall be stored for at least 5h at a test temperature of $75^{\circ}\text{C}$ , followed by storage for at least 6h at a test temperature of $-40^{\circ}\text{C}$ . The maximum time for transfer to each temperature shall be 30 min. Each test cell shall undergo this procedure 10 times. This is then followed by storage for 24h at ambient temperature.	No fire, no explosion, no leakage, no rust, no venting
3	Altitude simulation	Test cells shall be stored at a pressure of 11.6KPa or less for at least 6 hours at ambient temperature of $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .	No weight loss, no leakage, no venting, no short circuit, no rupture, no explosion, no fire
4	Vibration	Test cells and batteries shall be firmly secured to the platform of the vibration machine without distorting them and in such a manner as to faithfully transmit the vibration. Test cells and batteries shall be subjected to sinusoidal vibration by the battery manufacturer. This cycle shall be repeated 12 times for a total of 3 h for each of three mutually perpendicular mounting positions. One of the directions shall be perpendicular to the terminal face. The test shall be conducted using the test cells and batteries previously subjected to the thermal cycling test.	No weight loss, no leakage, no venting, no short circuit, no rupture, no explosion, no fire
5	Shock	Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test cell or battery. Each test cell or battery shall be subjected to 3 shocks in each direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. For each shock, the parameters given in by the battery manufacturer.	No weight loss, no leakage, no venting, no short circuit, no rupture, no explosion, no fire

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No.	Test Item	Test Procedure	Requirement
6	Crush	The cell or component cell shall be crushed between two flat surfaces. The force shall be applied by a vice or by a hydraulic ram with a round piston. The crushing shall be gradual with a speed of approximately 1,5 cm / s at the first point of contact. The crushing shall be continued until the applied force reaches approximately 13 kN.	No overheating no explosion, no fire
7	Thermal abuse	A test battery shall be placed in an oven and the temperature raised at a rate of 5 °C/min to a temperature of 130 °C at which the battery shall remain for 10 min.	No overheating, no explosion, no fire

## 8. Transportation and storage

### 8.1 Transportation specification

- 1) Proper packaging (seeing Appendix II) should be adopted to avoid strong shock and vibration during transportation, loading, unloading or stacking.
- 2) Appropriate stacking height should be adopted (generally, paper packaging should not exceed 1.5m and wooden case should not exceed 3m).
- 3) The battery should not be placed too close to the engine of the vehicle or ship during transportation.
- 4) Do not leave the battery in a metal boxcar or airtight container for a long time during warm seasons.

### 8.2 Storage specification

- 1) Batteries should be stored in a cool, dry place with good ventilation. The normal short-term storage environment is between 20°C±5°C and 60%±15%RH.
- 2) Avoid storing the batteries in an environment exposed to direct sunlight or nearby heat sources (such as radiators, engines, boilers, etc.).
- 3) Put the unused batteries in the original package, away from the metal objects which are easy to cause short circuit. If the packaging has been removed, do not mix the batteries together, so as to avoid short circuit caused by direct accumulation of batteries.

## 9. Revision

The changes brought about by the product upgrade will be reflected in the new version of the specification, and the revision will be notified separately.

## 10. Others

### 10.1 Six restricted substances in battery

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The contents of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) meet the requirements of the RoHS directive.

## 10.2 Quality Standard

The quality standard is consistent with the "Product Specification", the contents not described in the specification shall not be lower than the national standard.

## 10.3 Inspection unit

A single battery will be regarded as an inspection unit.

## 10.4 Sampling plan

Inspection Items	Reference Standard	Sampling Standard	Inspection Level	AQL
External Dimension	GB/T8897.2-2013	GB/T2828.1-2012	II	AQL=1.0
Open-Circuit Voltage	GB/T8897.2-2013	GB/T2828.1-2012	I	AQL=0.65
Appearance	GB/T8897.2-2013	GB/T2828.1-2012	II	AQL=1.0

## 10.5 Precaution

The battery consists of lithium, organic solvents, and other flammable materials. Please use the battery properly to avoid possible deformation, leakage (accidental leakage), overheating, explosion, fire, and other personal injury or equipment damage, etc. Please strictly comply with the following requirements to avoid accidents.

- 1) Do not swallow the battery and keep them away from children to avoid accidental ingestion.
- 2) Do not charge the battery.
- 3) Do not heat or dispose of battery in fire.
- 4) Do not disassemble the battery.
- 5) Do not short circuit the battery.
- 6) Do not reverse the positive and negative terminals of the battery when installing.
- 7) Direct welding of battery is forbidden. If welding is required, please consult Nanfu group for specific technical requirements.
- 8) Mixed use of different types of battery is prohibited.
- 9) Do not touch the leaking battery. If you accidentally touch the battery liquid, rinse thoroughly and consult a doctor immediately.
- 10) Keep battery away from flammable liquids.
- 11) Do not allow batteries to overlap or cross stack (as shown below).





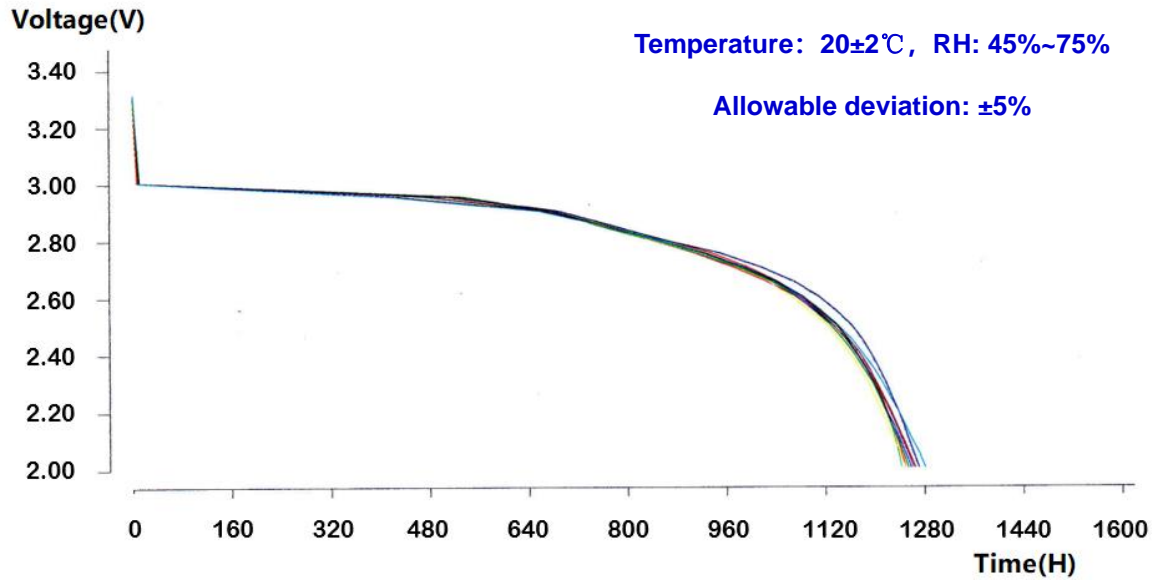
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- 12) There are different regulations for handling batteries in different countries or regions. Please comply with these regulations. It is recommended to cover the (+) and (-) ends of the battery with insulating tape before handling the battery.

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## Appendix I

CR2032 discharge curve (typical value)

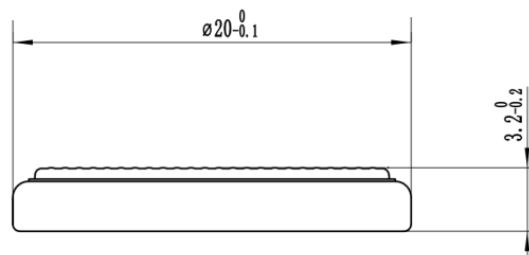
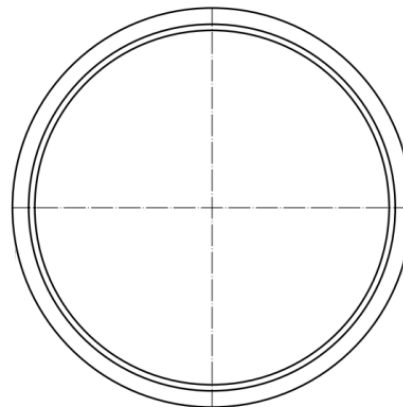


Note: 15K $\Omega$  discharge continuously, cut off voltage:2.0V.

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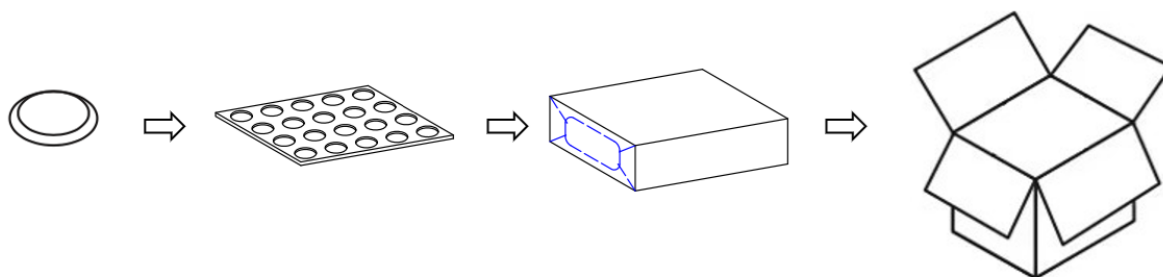
## Appendix II

Dimensions and package specification



Unit: mm

Model	Qty(pcs)	Carton Size(mm)	Weight(kg)
CR2032	3200	315×315×190	11.4



CR2032

20 pcs/tray

10 trays/stack\*16

3200 pcs/box

Note: the packing quantity is subject to the actual quantity; the packing method is as above, if there is any adjustment, it shall be subject to the agreement of both sides at the time of delivery.

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# 承 认 书

客户名称	
品 牌	
产 品	3.0V 扣式锂-二氧化锰电池
型 号	CR2032
UL 认证号	MH60145
WERCSmart ID	1058965
制 作	周进佑
审 批	李新龙
日 期	2021-2-20

## 客 户 确 认

公司名称	部门	确认人	日期



### 1. 【范围】

本承认书的各种技术参数仅适用于 3V 锂锰扣式电池 CR2032 高容量 230mAh, 该电池由深圳市力电电池有限公司生产。

### 2. 【技术参数】

表一:

项 目	单 位	数 值	条 件
公称电压	V	3.0	
公称容量	mAh	230	标准电阻 15 KΩ
瞬时短路电流	mA	≥250	时间≤0.5 秒
开路电压	V	≥3.2	无负载
工作温度	℃	-20~60	
标准重量	g	3.1	每只电池
放电时间	初始值	标准值	在负载 15KΩ、20~25℃ 的温度、终止电压为 2.0V 的情况下持续放电时间
	经 12 个月贮存后的数值	标准值	

表二:

保存条件	条件	特性值	
高温贮存后 放电时间	60±3℃贮存 20 天后在 20~25℃下以 15KΩ 负载连续放电至终止电压 2.0V	标准值	1170 h
自放电率	常温常湿条件下贮存 12 个月	不大于 5%	

### 3. 【产品规格和测试方法】

除非特别说明,所有的测试都在下列常温条件下进行: 环境温度: 20~25℃ 环境湿度: 65±20%。见表三

### 4. 【使用注意事项】

- 4.1 正确安装和使用电池,防止短路和装错正负极。
- 4.2 安装前要检查电池极端和所用器具及其接点,以保证清洁和导电,所用器具不能造成短路。
- 4.3 新电池不要与使用过的电池混用,不同牌号、等级和品种的电池不要混用,以免增加漏液的可能性。
- 4.4 电池使用后不得加热,充电或其它的手段反复使用,以免发生爆炸、破损和



漏液。

- 4.5 不得将电池投入火中，也不要拆卸电池，以免发生危险。
- 4.6 妥善保管微型电池，以防幼儿误吞。
- 4.7 要注意电池的规定贮存期限。

表三：


序号	测试项目	测试方法	标准	
1	外形尺寸	用精确度大于 0.02mm 的游标卡尺测试时，为防止电池短路，卡尺的一端卡头上应贴上一层绝缘材料	直径	20.0(-0.1) mm
			高度	3.2(-0.2) mm
2	开路电压	万用表的精确度不低于 0.25%，内阻大于 1MΩ	≥3.2 V	
3	瞬时短路电流	用万用表测试时，每次时间不超过 0.5 秒，避免重复测试，若需再次测试时，时间间隔应在半小时以上	≥250 mA	
4	外观	目测	外观平整、光洁、无锈迹	
5	放电容量	在 20~25℃ 的温度和 65±20% 的湿度的条件下放置 8 小时以上，在负载 15KΩ，终止电压为 2.0V 的情况下持续放电时间时所测容量(新电: 生产后三个月内)	≥1200 h	
6	振摔测试	将合格样品放在振动机的振台上，启动振动机，振动频率为 10-15 次/分钟，持续振动一小时	电池性能稳定	
7	高温耐漏液测试	在 60℃ 的条件下贮存 7 天	无漏液	
8	过放电耐漏液测试	在电池终止电压达到 2.0V 后，持续放电 5 小时	无漏液	

5. 【3.0V 扣式锂-二氧化锰电池剖面图】（详见第 6 页）

6. 【放电图】（详见第 7 页）



## APPROVAL SHEET

MESSRS	
BRAND	
PRODUCT	3.0V LITHIUM-MANGANESE BUTTON CELL
MODEL	CR2032
UL NO.	MH60145
WERCSmart ID	1058965
PREPARED BY	ZHOU JINYOU
APPROVED BY	LI XILONG
DATE	FEB. 20, 2021

CUSTOMER APPROVAL RECORD			
COMPANY NAME	DEPARTMENT	APPROVED BY	DATE



## 1. 【SCOPE】

This specification applies to the following 3.0v lithium button cell CR2032 (high capacity of 230mAh) made by **SHENZHEN LIDEA BATTERY CO., LTD.**

## 2. 【RATINGS】

TABLE I :

ITEM		UNIT	SPECIFICATIONS	CONDITIONS
Nominal voltage		V	3.0	
Nominal capacity		mAh	230	Standard discharge with load 15kΩ
Instantaneous short-circuit current		mA	≥250	Time≤0.5 second
Off-load voltage		V	≥3.2	
Operating temperature		°C	-20~60	
Standard weight		g	3.1	Unit cell
Service output	Initial	Standard	1200 h	Continuously discharge with load 15kΩ, temperature at 20°C, humidity at 65±20% till 2.0v end-voltage
	After 12 months storage	Standard	1170 h	

TABLE II :

ITEM	CONDITIONS	CHARACTERISTICS	
Thermal durability	Kept for 20 days at 60°C±3°C, then continuously discharge with 15kΩ load till 2.0v end-voltage	Standard	1170 h
Self-discharge rate	Stored for 12 months at normal temperature and humidity	≤5%	

## 3. 【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 III

## 4. 【SUGGESTIONS AND CAUTIONS】

- 4.1 Install batteries correctly.
- 4.2 Ensure the contact points to be clean and conductive.
- 4.3 Do not mix different types, different brands batteries to serve together.
- 4.4 Do not heat, recharge the batteries.
- 4.5 Do not dispose of the batteries in fire.
- 4.6 Keep away from the small children, if swallowed promptly see doctor.
- 4.7 Pay attention to the producing date.



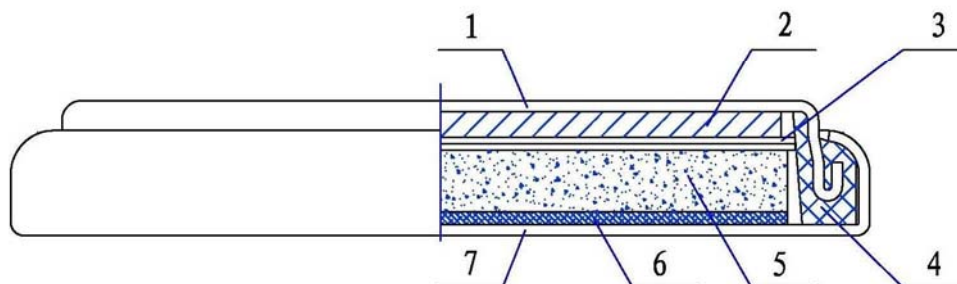
TABLE III:

No	ITEM	TEST METHODS	STANDARD	
1	Dimensions	Using vernier caliper (accuracy $\geq 0.02$ ) while avoiding short-circuit	Diameter	20.0 (-0.1) mm
			Height	3.2 (-0.2) mm
2	Off-load voltage	Using multimeter (accuracy $\geq 0.25\%$ ) internal resistance $\geq 1M\Omega$	$\geq 3.2$ v	
3	Instantaneous short-circuit current	Time of short-circuit should be less than 0.5 second and avoid repeated test within half an hour	$\geq 250$ mA	
4	Appearance	Eyeballing	Bright, clean, no rust, no leakage, And no flaw	
5	Capacity	Continuously discharge for 8 hours with load 15k $\Omega$ , temperature at 20~25 $^{\circ}C$ , humidity at 65 $\pm$ 20% till 2.0v end-voltage (for fresh battery only: within 3 months )	$\geq 1200$ h	
6	Vibration test	Put battery on the platform of the vibrations machine, start the machine and adjust the frequency form 10 times per minute to 15 times per minute. keep it running for an hour	Characteristics keep stability	
7	Leakage at high temperature test	Stored under temperature (60 $^{\circ}C$ ) for 7 days	No leakage allowed	
8	Over discharge Test	After 2.0v end-voltage, continuously discharged for 5 hours	No leakage allowed	

## 5. 【CUTAWAY DIAGRAM OF 3.0V LITHIUM MANGANESE DIOXIDE BUTTON CELL】

3.0V 锂—二氧化锰扣式电池剖面图

Cutaway Diagram of 3.0V Lithium Manganese Dioxide Button Cell



- |                             |                              |               |          |
|-----------------------------|------------------------------|---------------|----------|
| 1、负极壳                       | 2、负极锂片                       | 3、隔膜          | 4、密封胶圈   |
| 5、正极片                       | 6、正极集流网                      | 7、正极壳         |          |
| 1、Cathode Shell             | 2、Cathode (slice of lithium) | 3、Septum      | 4、Gasket |
| 5、Anode (MnO <sub>2</sub> ) | 6、Anode collector net        | 7、Anode shell |          |



6. 【DISCHARGE CHARACTERISTICS】

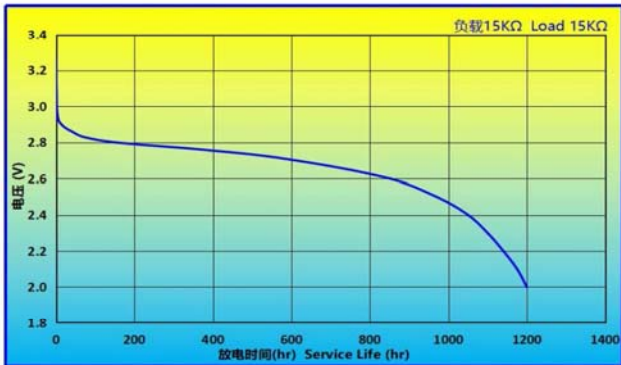
规格参数 SPECIFICATIONS



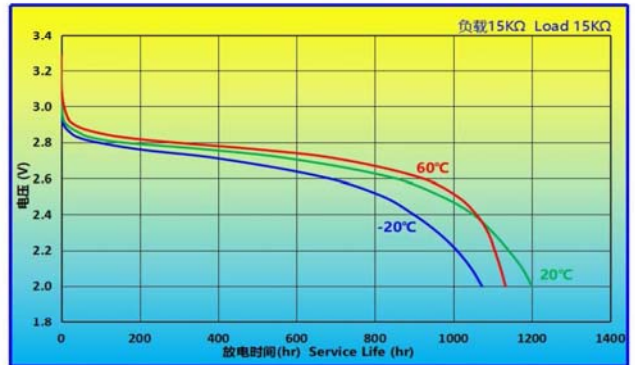
型号 Model No.	CR2032	结构图 Dimensions (mm)
标称电压 Nominal Voltage	3 (V)	
标称容量 Nominal Capacity	230 (mAh)	
标准电阻 Load Resistance	15 (kΩ)	
重量 Weight	3.0 (g)	
使用温度 Using Temperature	-20°C~60°C	

标准曲线 STANDARD CHARACTERISTICS

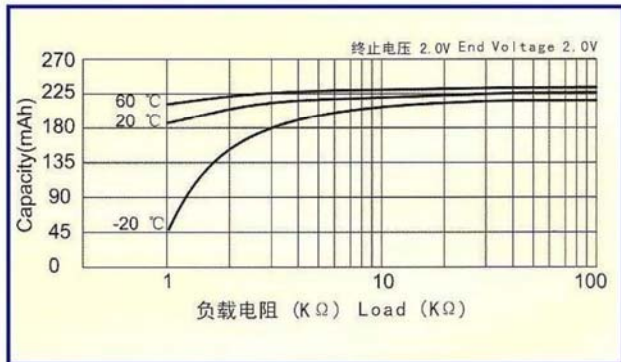
定电阻放电曲线  
Discharge Characteristics



温度放电曲线  
Temperature Characteristics



电阻容量曲线  
Load-capacity



脉冲放电曲线  
Pulse Discharge Characteristics

