

TECHNICAL INFORMATION

Manganese Dioxide Lithium Primary Battery

CR2032

FDK CORPORATION

FDK ENERGY CO., LTD.

Contents herein do not constitute a warranty

1. Service out-put (load characteristics)

Continuous discharge, E.P.V : 2.5V, Temp. : $23\pm 3^{\circ}\text{C}$

Load	
15k Ω	30k Ω
1139 hours	2308 hours

Average of 10 batteries

2. Service out-put (Temperature characteristics)

15k Ω continuous discharge, E.P.V. : 2.0V

Temperature		
- 20 $^{\circ}\text{C}$	23 $^{\circ}\text{C}$	60 $^{\circ}\text{C}$
705 hours	1215 hours	1099 hours

Average of 10 batteries

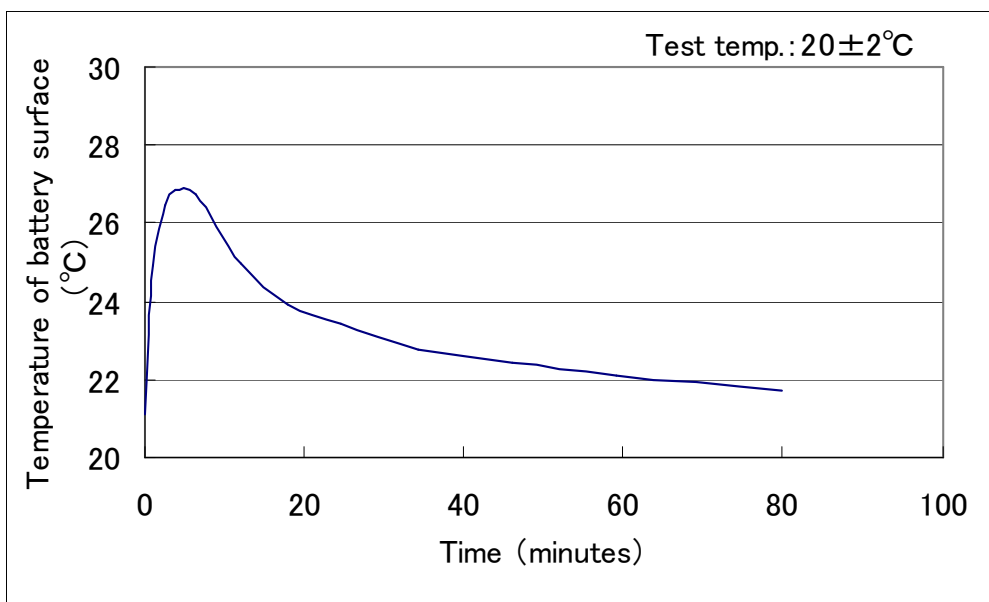
3. Storage characteristics at high temperature (60 $^{\circ}\text{C}$, ordinary humidity)

Item	Storage periods		
	Initial	After 40 days	After 80 days
Off-load-voltage (V)	3.189	3.258	3.260
Internal resistance (Ω)	6.2	7.8	9.1
Leakage (pcs)	0	0	0
Service Out-put at 15k Ω Continuous discharge (hours) E.P.V. : 2.5V	1139	1080	1075

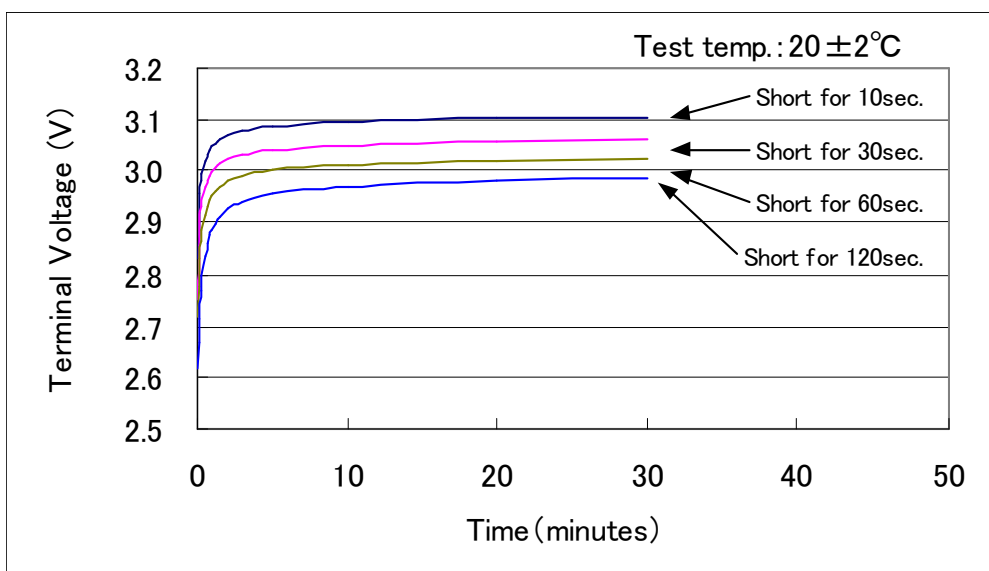
Test temp. : $23\pm 3^{\circ}\text{C}$, Average of 10 batteries

4. Short circuit characteristics

(1) Temperature of battery surface



(2) Change of off-load voltage after short circuit



(3) Shape, Dimension, Appearance

No change is recognized for 80minutes. (temp.: $20 \pm 2^\circ\text{C}$)

5. Over-discharge characteristics

Test temp. : $23\pm 3^{\circ}\text{C}$

Test method	Test result
The discharge is further continued for 20 days at $15\text{ k}\Omega$ load after the voltage has become less than the end-point voltage (2.5V)	Appearance: No change

10 batteries are tested.

6. Charge characteristics

Test temp. : $23\pm 3^{\circ}\text{C}$

Charge current	Charging time	Test result
0.28 mA	24 hours	Appearance: No change

10 batteries are tested

7. Heat shock test

Range of temperature : $-10\sim +60^{\circ}\text{C}$, Time : each for 1 hour

Item	Initial	After 100 cycles
Off-load voltage (V)	3.256	3.265
Internal resistance (Ω)	6.8	7.1
Leakage (pcs.)	—	0

Measuring temp. : $23\pm 3^{\circ}\text{C}$, Average of 10 batteries

Measurement of internal resistance is done by 1kHz alternating current.

Leakage proof is done by visual check.

8. Vibration test

Amplitude : 1.5mm, Frequency : $10\sim 55\text{Hz}$,

Time : X, Y, Z direction, each for 90 minutes

Item	Initial	After 100 cycles
Off-load voltage (V)	3.241	3.241
Internal resistance (Ω)	5.7	6.4
Leakage (pcs.)	—	0

Average of 10 batteries

Measurement of internal resistance is done by 1kHz alternating current.

Table 1. Testing items and results for safely

No.	Testing items	Number of Samples	Battery condition	Temp. °C	Duration Hr	Test Condition	Requirement Note)	Results
1	Internal short circuit	5	Undercharge	23°C	—	Sample shall be crashed to 1/4 size of the primary total height with round-shaped stick.	NE, NF, NV	0/5
2	External short Circuit	5	Undercharge	23°C	144h	Single sample shall be forced to be shorted.	NE, NF, NV	0/5
3	Free fall	5	Undercharge	23°C	—	(UL condition) Height: 190cm, Time: 10times at random Dropped face: Concrete	NE, NF, NV	0/5
4	Vibration	5	Undercharge	23°C	90~100min.	(UL Condition) Frequency: 10~55Hz, Amplitude: 1.6mm Sweep time: 45min. Direction: X.Y.Z	NE, NF, NV	0/5
5	Heating	5	Undercharge	23°C	—	Hot plate heating 5°C/min. (50→200°C)	NF	0/5
6	Charge	5	Undercharge	23°C	10h	(UL Condition) Charge Voltage: 12V, Charge current: 10mA Max. 2.5×c/mA Charge temperature: 23°C	NE, NF, NV	0/5

Note) NE: No explosion

NF: No fire

NV: No venting