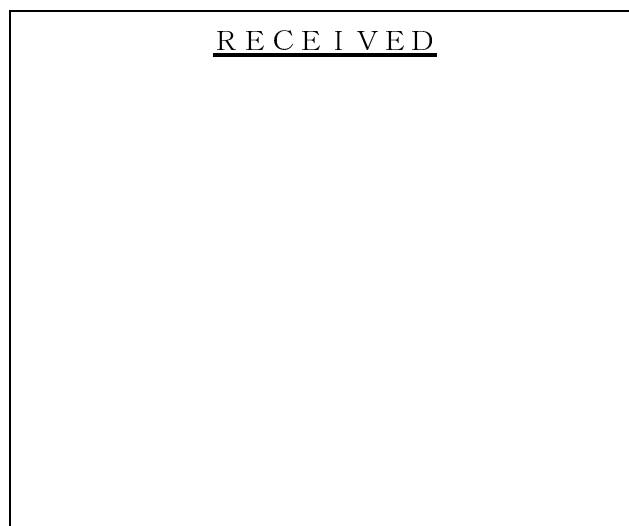


SPECIFICATION FOR
MANGANESE DIOXIDE LITHIUM BATTERY
Type : CR1220-P/H [TOSHIBA Brand]



AUG. 25. 2011

TOSHIBA HOME APPLIANCES CORPORATION
Battery Business Div.

| G. Manager | Manager | Issued by |
|------------|---------|-----------|
| | | |

PRODUCT SPECIFICATION

1. Applicability

This specification is applicable to the following product :

Coin Type Manganese Dioxide Lithium Battery CR1220-P/H

2. Model Name and Performance

2.1 Model Name CR1220-P/H

2.2 Nominal Voltage 3 V

2.3 Nominal Capacity 40 mAh (Load Resistance: 62 k Ω , Cutoff Voltage:2.0 V)

2.4 Operating Temperature -20 ~ 70°C
(If the operating temperature exceeds 60°C, the operating time shall be within 1000 hours.)

2.5 Nominal Weight 0.8g

2.6 External Dimension Shape and dimensions shall be as shown in Figure 1.

2.7 Chemical System
Anode : Lithium
Cathode : Manganese Dioxide
Electrolyte : Organic Solvent with Lithium Salt

3. Characteristic

3.1 Open-Circuit Voltage The characteristics shown below in Table 1 should be satisfied.

3.2 Impedance The characteristics shown below in Table 1 should be satisfied.

3.3 Duration The characteristics shown below in Table 1 should be satisfied.

3.4 Duration (Acceleration) The characteristics shown below in Table 1 should be satisfied.

3.5 Leakage The characteristics shown below in Table 1 should be satisfied.

3.6 Appearance There shall be no remarkable defects that could deteriorate reliability such as scratches, stains, deformation, and leakage.

3.7 Use recommendation limit It makes 5 years after battery manufacture.
It makes the standard of the unit the moon and it counts from the first half manufacture date of it.

3.8 UL Approval Lithium Manganese Dioxide Batteries are approved by UL.
(UL1642 File No. MH12828)

(Table 1) Characteristics

| No | Test Item | | Characteristic | | Test Condition |
|----|----------------------------|------|--|---------------|---|
| | | | Initial* ¹ | After 1 Year | |
| 1 | Open-Circuit Voltage | 23°C | 3.00 ~3.40 V | 3.00 ~3.40 V | |
| 2 | Impedance* ² | 23°C | 40 Ω maximum | — | AC 1 kHz |
| 3 | Duration | 60°C | 730 h minimum | — | Load Resistance: 62k Ω Cutoff Voltage: 2.0 V |
| | | 23°C | 750 h minimum | 735 h minimum | |
| | | 0°C | 600 h minimum | — | |
| 4 | Duration (Acceleration) | 23°C | 720 h minimum | | After storage at 60°C for 40 days Load Resistance: 62k Ω Cutoff Voltage: 2.0 V |
| | | | 670 h minimum* ³ | | After storage at 60°C for 100 days Load Resistance: 62k Ω Cutoff Voltage: 2.0 V |
| 5 | Leakage | | No leakage being obstacles to practical use. | | After storage at 60°C for 30 days |

*¹ Initial: within 1 month after delivery.

*² *³ Impedance and Duration after storage at 60°C 100 days are reference value.

4. Test

4.1 Test Condition and Storage Condition

4.1.1 Test Condition

Tests shall be done at $23 \pm 3^\circ\text{C}$ with $(65 \pm 20)\%$ R.H. unless particularly specified.

4.1.2 Storage Condition

Storage shall be done at $23 \pm 5^\circ\text{C}$ with $(65 \pm 20)\%$ R.H. unless particularly specified.

4.2 Test Instrument or Apparatus

4.2.1 Dimension Measuring Instrument

Instruments should be micrometers and dial gauges with minimum reading of 0.01mm or those that have the equal or more accuracy. Overall height shall be measured with insulator between measured faces.

4.2.2 Voltmeter

Tolerance: within $\pm 0.005\text{V}$, Input Resistance: $1\text{M } \Omega$ min.

4.2.3 Impedance Meter

LCR meter, 1kHz AC

4.2.4 Load Resistance

Load resistance shall include all resistance of external circuits, and the tolerance shall be 0.5% or less.

4.3 Test Procedure

4.3.1 Dimension

Dimensions shall be measured with dimension measuring instruments specified in Item 4.2.1.

4.3.2 Open-Circuit Voltage

After storage at $23 \pm 3^\circ\text{C}$ for more than 2 hours, the battery shall be measured with the voltmeter specified in Item 4.2.2 at the same temperature.

4.3.3 Impedance

After storage at $23 \pm 3^\circ\text{C}$ for more than 2 hours, the battery shall be measured with a LCR meter specified in Item 4.2.3 at the same temperature.

4.3.4 Duration

After storage at each specified temperature ($60\pm 2^{\circ}\text{C}$, $23\pm 3^{\circ}\text{C}$, and $0\pm 2^{\circ}\text{C}$) for more than 2 hours, the battery shall be discharged under the conditions specified in Table 1 at the same temperature. The time when the closed-circuit voltage drops below the cutoff voltage in Table 1 is defined as the end time of discharge.

4.3.5 Duration (Acceleration)

After storage at $60\pm 2^{\circ}\text{C}$ for the period of time specified in Table 1 and then at $23\pm 3^{\circ}\text{C}$ for more than 2 hours, the battery shall be discharged under the conditions specified in Table 1. The time when the closed-circuit voltage drops below the cutoff voltage in Table 1 is defined as the end time of discharge.

4.3.6 Leakage

After storage at $60\pm 2^{\circ}\text{C}$ for the period of time specified in Table 1, leakage shall be visually inspected.

4.3.7 Appearance

Appearance shall be visually inspected.

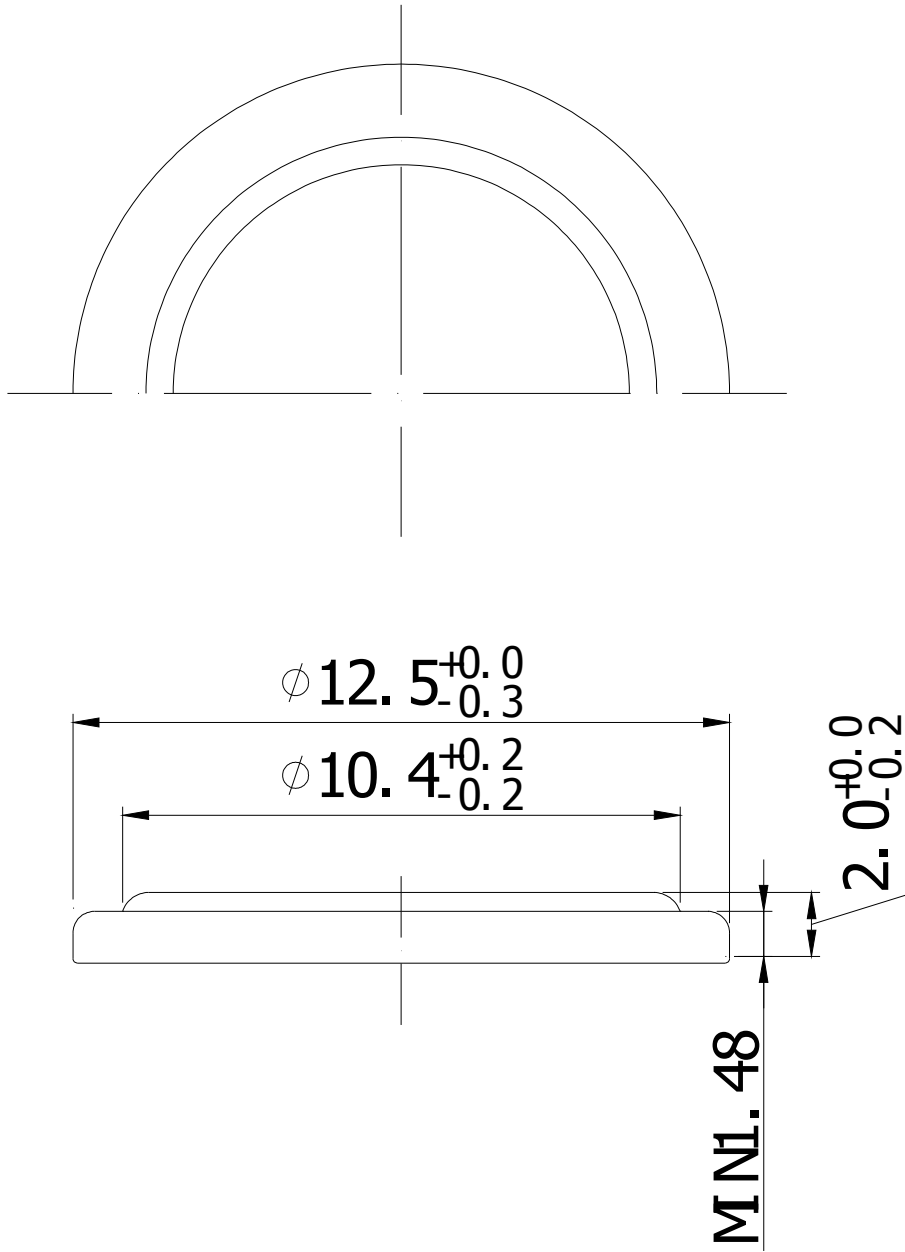
5. Markings on batteries

| | |
|-----------------------|--|
| 5.1 Battery system | L I T H I U M B A T T E R Y |
| 5.2 Model Name | C R 1 2 2 0 - P / H |
| 5.3 Brand of battery | T O S H I B A |
| 5.4 Polarity | + (- s h a l l n o t b e i n d i c a t e d) |
| 5.5 Nominal voltage | 3 V |
| 5.6 Country of origin | C H I N A |

6. Warranty term

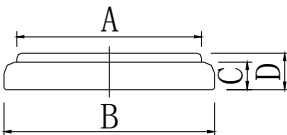
12 months after delivery.

(Figure 1) DIMENSION



(Unit: mm)

Specifications

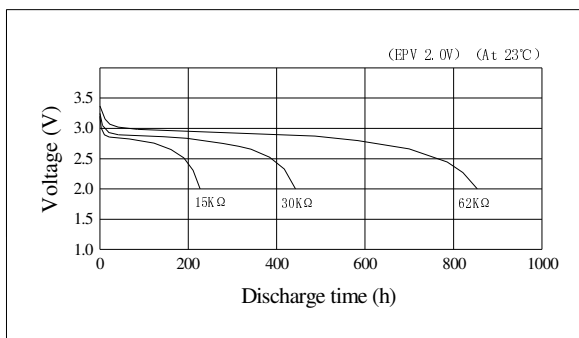
| | | | | |
|----------------------------|-----------|---|---|---------------------------------------|
| Nominal Voltage | 3V |  <p>Dimensions (mm)</p> | A | φ10.4 |
| Nominal Capacity*1 | 40 (mAh) | | B | φ12.5 ^{+0.0} _{-0.3} |
| Continuous standard load | 62 (K Ω) | | C | 1.48 (Ref.) |
| Standard Current | 0.1 (mA) | | D | 2.0 ^{+0.0} _{-0.2} |
| Continuous Current (Max)*2 | 2 (mA) | | | |
| Pulse Current (Max)*3 | 5 (mA) | | | |
| Operating temperature | -20~+70°C | | | |
| Weight | 0.8 (g) | | | |

*1.Nominal Capacity is determined to an end of 2.0V when the battery is allowed to discharge at a standard Load level at 23 ±

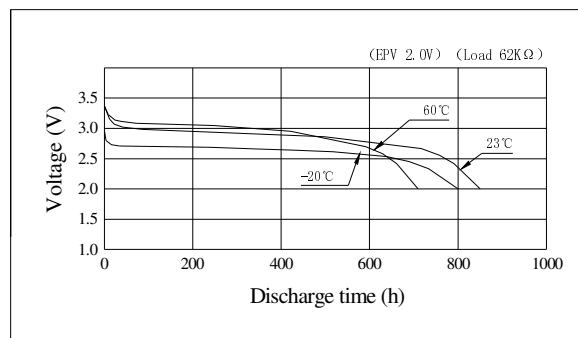
*2.Current Value is determined to be the level at which 40% of the nominal capacity is obtained with an end voltage of 2.0V at 23 ±

*3.Current Value for obtaining 2.0V cell voltage when pulse is applied for 15seconds at 40% discharge depth at 23 ±

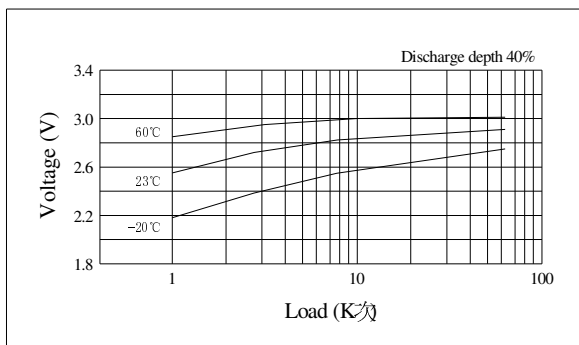
Discharge characteristics



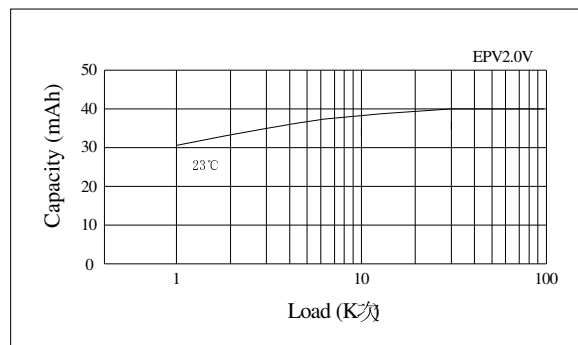
Temperature characteristics



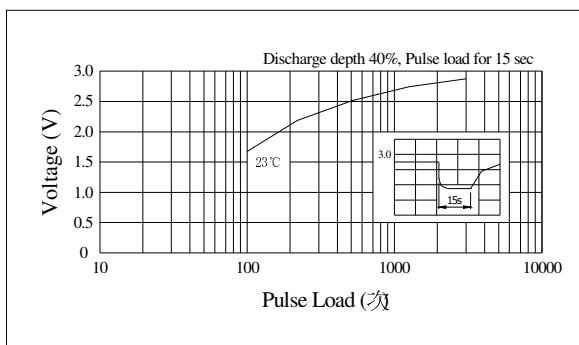
Load vs. Operating voltage



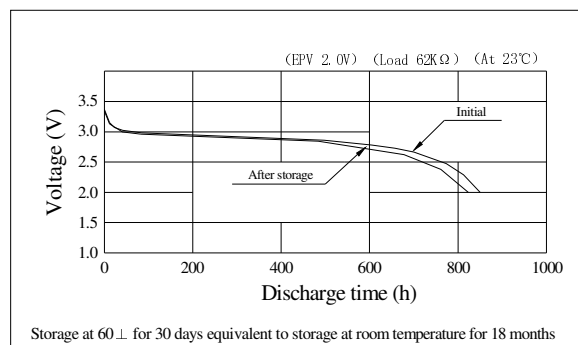
Load vs. Capacity



Pulse discharge characteristics



Storage characteristics



Precautions in Designing a Memory Backup Circuit

Lithium battery has acquired safety Standard of UL.

Connect a diode and resistor in series with the battery to prevent charging current and to limit the maximum current drain.

Note that, under the particular fault condition of the series diode becoming short circuit, the charging current must not exceed 10 mA.

The leakage current of reverse-flow preventing diode shall be designed to be within 2% of battery's nominal capacity to the whole operating term.

Acquired Safety Standard : UL1642

