

SPECIFICATION FOR
MANGANESE DIOXIDE LITHIUM BATTERY
Type : CR2450 [TOSHIBA Brand]

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TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORPORATION

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PRODUCT SPECIFICATION

1. Applicability : This specification is applicable to the following product :
Coin Type Manganese Dioxide Lithium Battery CR 2 4 5 0

2. Ratings :

2.1 Battery Type : CR2450

2.2 Nominal Voltage : 3.0 V

2.3 Standard Capacity : 590 mAh
(on continuous discharge at 20°C under 7.5kΩ load to 2.0V end-voltage)

2.4 Dimensions : Shape and dimensions shall be as shown in Fig.1.

2.5 Standard Weight : 6.6 g (Reference value)

2.6 Operating Temperature : -20 ~ 65°C

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

3. Quality requirements :

3.1 Dimensions : Shape and dimensions shall be as shown in Fig.1.

3.2 Appearance : Batteries shall have no deformation, dent, flaw, stain and leakage, that spoils commercial value of the product.

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

3.4 Use recommendation limit : Recommended date of use shall be within 5 years after battery manufacture.

(Table 1)

No	Test Item		Characteristic		Test Condition
			Initial*1	After 1 Year	
1	Open-Circuit Voltage	20℃	3.00 ~ 3.40 V	3.00 ~ 3.40 V	
2	Closed-Circuit Voltage	20℃	3.00 ~ 3.40 V	3.00 ~ 3.40 V	Load Resistance : 7.5k Ω 0.8sec
3	Duration	60℃	1380 h minimum	—	Load Resistance : 7.5k Ω Cutoff Voltage : 2.0 V
		20℃	1500 h minimum	1470 h minimum	
		0℃	1200 h minimum	—	
4	Duration (Acceleration)	20℃	1470 h minimum		After storage at 60℃ for 20 days Load Resistance : 7.5k Ω Cutoff Voltage : 2.0 V
			1250 h minimum*2		After storage at 60℃ for 100 days Load Resistance : 7.5k Ω Cutoff Voltage : 2.0 V
5	Leakage		No leakage being obstacles to practical use.		After storage at 60℃ for 30 days

*1 Initial : within 1 month after delivery.

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

4. Test :

4.1 Test Condition and Storage Condition

(1) Test Condition :

Unless otherwise specified elsewhere, tests shall be conducted at ordinary temperature ($20\pm 2^{\circ}\text{C}$) and ordinary humidity ($60\pm 15\%$ RH).

(2) Storage Condition :

Unless otherwise specified elsewhere, Storage shall be conducted at ordinary temperature ($20\pm 2^{\circ}\text{C}$) and ordinary humidity ($60\pm 15\%$ RH).

4.2 Measuring instruments and devices

(1) Dimension Measuring Instruments :

Micrometers, dial gauges and vernier callipers specified by JIS or those having equal or better precision shall be used for measuring dimensions.

(2) Voltmeter :

The tolerance shall be $\pm 0.005\text{V}$ and input resistance shall be $1\text{M}\Omega$ or more.

(3) Load Resistance :

Load resistance shall include resistance throughout external circuits, and its tolerance shall be $\pm 0.5\%$.

4.3 Test methods

(1) Dimension :

The diameter and overall height of batteries shall be measured with instruments specified in Subparagraph 4 above, provided that either one or both sides of such instruments shall be insulated in measuring the overall height of batteries.

(2) Appearance :

Appearance of batteries shall be inspected by visual means.

(3) Open-Circuit Voltage :

Test specimen batteries shall be kept standing open for 8 hours or longer at the ambient temperature specified in Table 1 above, and the voltage between both terminals at the same ambient temperature shall be measured with a voltmeter as specified in Subparagraph 4 above.

(4) Closed-Circuit Voltage :

Test Specimens shall be kept standing open for 8 hours at the ambient temperature specified in Table 1 above, and then the voltage between both terminals shall be measured with a voltmeter as specified in Subparagraph 4 above while the specified load is connected between both terminal at the same ambient temperature as specified above; provided that the measured value shall be based on meter readings taken 0.8 seconds after the circuit is closed.

(5) Discharge :

Test specimen batteries shall be kept for 8 hours at the ambient temperature specified in Table 1 above, and then be continuously discharged at the same ambient temperature and through the specified load resistance. The discharge shall be continued until the terminal voltage of the test specimens falls below the end voltage of 2.0V.

The time during which the terminal voltage has been maintained equal to and above the end voltage shall be taken as the service life.

(6) Duration (Acceleration) :

Test specimens shall be discharged while they are kept at ordinary temperature ($20\pm 2^{\circ}\text{C}$) and at ordinary humidity ($60\pm 15\%$ RH) after having been stored at the temperature specified in Table 1 above.

(7) Leakage :

Test specimens shall be examined for electrolyte leakage while they are kept for 8 hours at ordinary temperature ($20\pm 2^{\circ}\text{C}$) and at ordinary humidity ($60\pm 15\%$ RH) after having been stored at the temperature specified in Table 1 above.

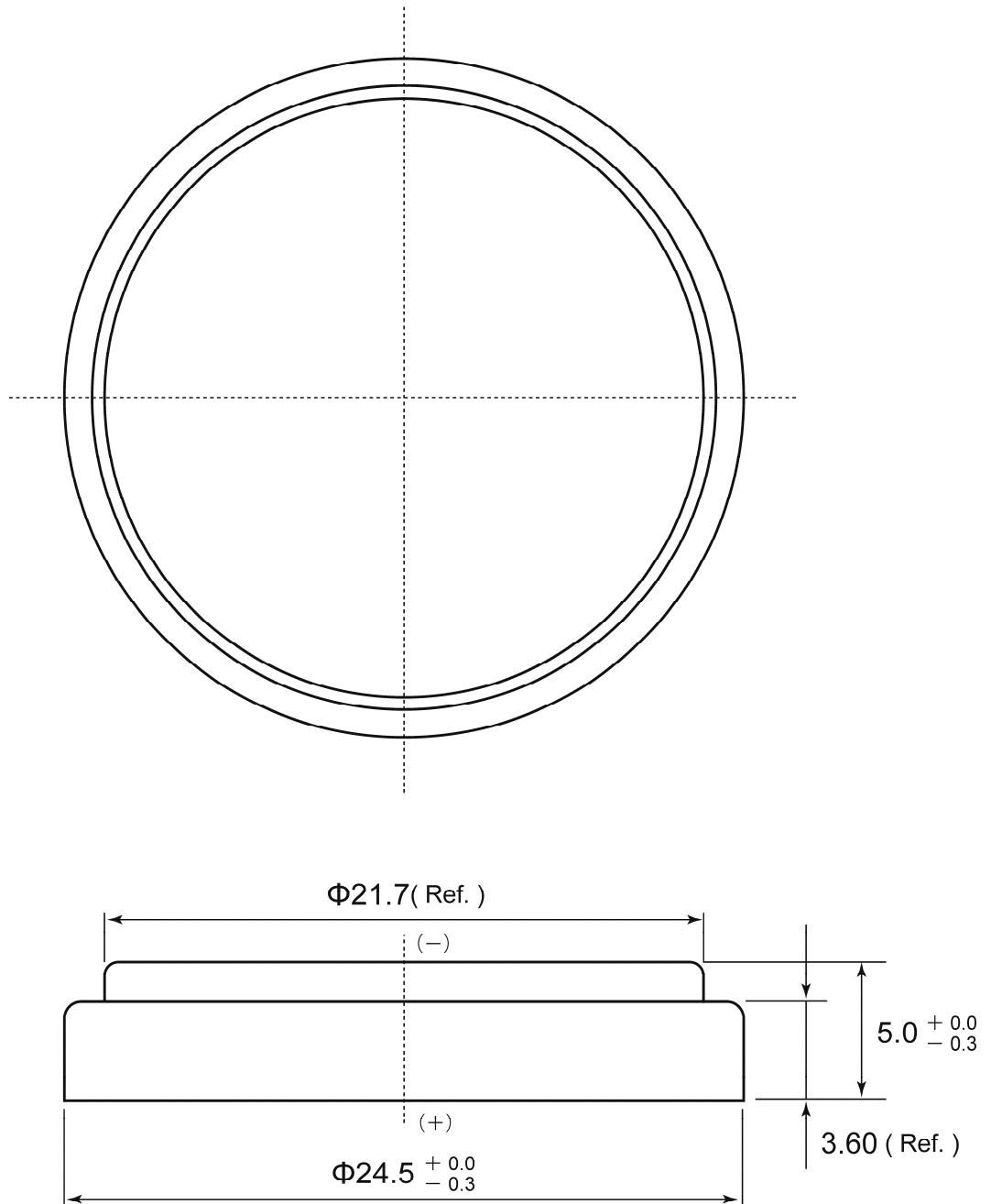
5. Marking of Batteries:

5.1 Polarity	+ (— shall not be indicated)
5.2 Brand of Battery	T O S H I B A
5.3 Battery System	L I T H I U M
5.4 Battery Type	C R 2 4 5 0
5.5 Nominal Voltage	3 V
5.6 Country of Origin	C H I N A

6. Warranty information :

- (1) Toshiba Life style warrants the battery specified in this specification is covered by a full 12 months from the date of delivery and conforms to this specification. For this period, we will immediately replace the battery at our cost for any failure that apparently occurred due to our negligence.
- (2) With respect to confirmation such as matching to equipment by product assembling and life expectancy, you (manufacture of assembled products) are kindly requested to conduct them and confirm quality assurance.
- (3) This warranty is void and of no effect if you fail to handle the battery properly, operate, install, test, care and check, or fail to follow the instructions, cautions, warnings, information stated in this specification and other reasonable instruction and advice given by us.
- (4) We will regard that you received and agreed to the content of this specification if this specification were not returned by the first delivery of the product from the date of issue.

(Fig.1) Dimension



Unit : mm

Engraved figure



Precautions for Handling Coin-type Manganese Dioxide Lithium Battery

1 . Precautions for Equipment Design of Battery Application

This battery may cause leakage, overheating, or fire if mishandled. Be sure to follow the instructions below when designing the equipment.

(1) Battery Compartment Design Guideline

- 1) Design compartments so that batteries are easily replaced and do not fall out after inserted.
- 2) To prevent small children from removing or swallowing batteries, design battery insertion port considering a lid fixing method that can prevent easy access to the battery by small children. In addition, provide a warning saying that “Keep the battery out of reach of small children” in instruction manual to get it familiarized.
- 3) When designing dimensions and shape for the battery compartment and contact portion, consider dimensions and tolerance of the battery, and +positive and -negative terminals in order to prevent poor contact or inverse loading and to make it compatible with commercially available batteries. Make sure that the compartment dimensions comply with the batteries specified in IEC (International Standards) and JIS (Japan Industrial Standards).
- 4) Clearly indicate on the battery compartment the type of batteries to be used for equipment and their correct installation direction (polarities). Clearly state them in the handling manuals if there is no enough space to indicate.
- 5) Make sure that only the battery terminals should physically contact the circuit in the compartment, making it independent of other circuits.
- 6) Taking into the account of structure and location of the battery compartment, the compartment should be completely isolated from the equipment so as to minimize possible damage to the equipment due to battery leakage.
- 7) Battery compartments should be designed to allow the gas generated from batteries or heat dissipation to escape. When the compartment cannot be completely sealed, provide some safety functions such as degassing valves.
- 8) If there is any equipment with the heat source, locate the battery compartment on a place apart from the heat source of the equipment as far as possible.
- 9) Select materials to be used for the compartment taking account of the impact and effect on the environment. When impact or vibrations are to be expected, design the compartment structure so as to absorb them.
- 10) Although the batteries that comply with the JIS specified dimensions are to be used, use caution to select contact materials and shape of the battery terminals, ensuring electrical contact. Use materials for contact, such as steel or stainless steel that are nickel plated. Particularly, if you need to minimize the contact resistance, use material such as gold plated material.
- 11) Make sure that contact force of the battery for the terminal equipment is at least 1N (0.1 kg f) and up to 10N (1 kg f).
- 12) Ensure that the internal circuits of the equipment are not in contact with the battery other than contact portion of the battery terminals.
- 13) Design the system of battery terminal contact using the differences in shape of the positive and negative poles as much as possible so that an inverse loading of the battery is avoided.
- 14) When an alternative external power supply is utilized, design the circuit system so that the battery is not charged or forced-discharged.
- 15) Provide a protective circuit to ensure the prevention of charge of batteries.
- 16) Provide a protective circuit to ensure the prevention of over discharge of batteries. In addition, set voltage for terminating the equipment operation higher than that specified by the battery manufacturer.

- 17) Equipment design engineers should always refer to publications or documents including JIS/IEC Standards related to batteries, and “ Safety Guidelines for Equipment Design” and “Guidelines for Labeling/Marking ” issued by Battery Association of Japan for better understanding of safety (equipment/battery).

(2) Precautions for Circuit Design for Memory Back-up Use

- 1) Do not charge, because this is a primary battery and cannot be charged.

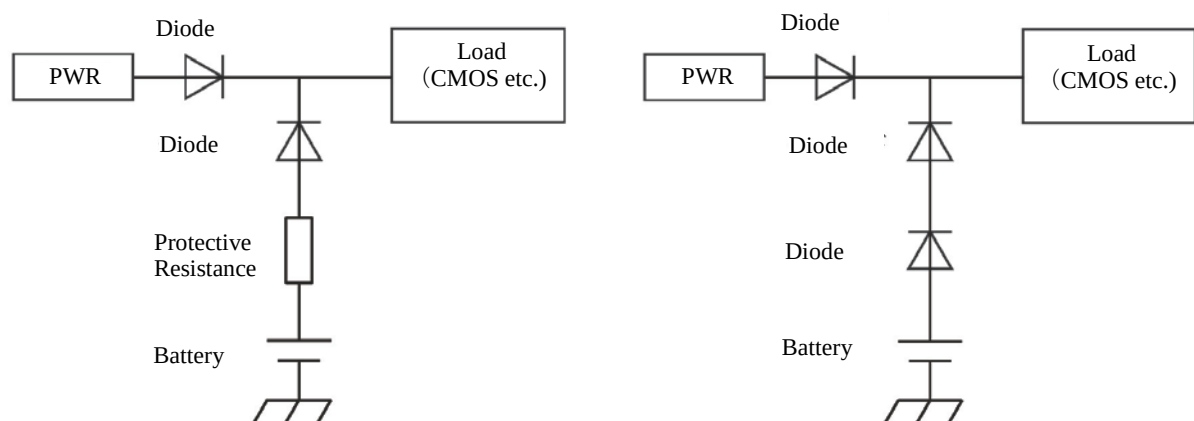
Charging may get the electrolyte in the battery heated, generate gas and increase the internal pressure, leading to leakage, overheating, explosion, or fire.

If used in memory back-up applications, be sure to use reverse current (charging) protection diodes and protective resistance to prevent charging from the main power source to battery circuits. As for UL 1642 Lithium Battery (US Safety Standards), when a lithium primary battery for application back-up is used, the diode and protective resistance mentioned above are required to be placed in series. See diagram below.

Select diodes with leak current as small as possible. Select diodes that can keep the charged capacity by reverse current to within 1 % of nominal capacity throughout the duration of use.

Please contact us/Toshiba Lifestyle for further details on handling the battery, including back-up power specification

Examples of Protective circuit



- 2) Do not connect batteries in series with a power source, which may increase forward current in the battery.
3) Do not directly solder or spot weld the battery.

When connecting a wire lead to the battery, ensure to solder the tab terminals, not soldering or spot welding directly onto the battery. When hand soldering the tabs, be sure to observe the requirement given below:

Requirement for hand soldering: the temperature for the soldering iron must be below 370 °C, and the soldering time less than 5 seconds

- 4) When soldering with an automatic soldering machine, use caution to immerse only tab terminal of the battery in a soldering bath so that the battery may not stop moving or fall in the bath. Place a separator (printed circuit board, etc.) between the battery and the soldering bath. The battery may cause explosion or fire if dropped in the bath.

Be sure to observe the requirement given below when soldering with an automatic soldering machine.

Requirement for flow soldering: the soldering temperature must be below 300 °C, and the soldering time less than 5 seconds.

(Reflow soldering is not allowed because it may cause the battery to explode or ignite)

- 5) When used in equipment that generate heat, keep the battery away from the heat generating portions or shut off the heat source from the battery if located near the heat source. Make sure that the heat applied to the battery does not exceed 60° C.

(3) Precautions for Manufacturing Equipment

- 1) Do not expose the battery to ultrasonic vibration. Exposing the battery to ultrasonic vibration may cause short-circuiting because the inside material is broken into pieces, leading to leakage, overheating or explosion.
- 2) The battery can be disposed of as a general non-combustible waste. Please follow the instructions if regulated by local code of your area.
- 3) Insulate the terminals with adhesive tape or similar materials before storage or disposal. Mixing with other batteries or metals may cause short-circuiting, heat generating explosion or ignition, leading to personal injury or fire. Do not dispose of the batteries in fire. Disposed batteries in fire may cause explosion and other hazards due to rapid overheating.
- 4) Clean the equipment and battery terminals with a dry cloth or the like before inserting the battery into the equipment. Dirty terminals may cause malfunctioning of the equipment due to poor contact.
- 5) When measuring the voltage of the battery, use a voltmeter with large internal resistance. Make sure the voltmeter has a tolerance of ± 0.005 V or less and its input resistance is rated 1 M Ω or more.

(4) Precautions for Battery Replacement

This battery has been certified according to UL Standards. (UL Standard for Safety)

The UL standards provide that fixing battery circuit of equipment and battery replacement must be performed only by skilled professionals. However, there is a special provision of user replacement in the UL Standards, which provides that the battery can be replaced by users who satisfy the following requirements.

- 1) The package for replacement batteries must have the following precautionary or similar statements:

CAUTION:

Risk of fire and burns. Do not recharge, disassemble, heat above 100°C (212°F) or incinerate. Keep battery out of reach of children and in original package until ready to use. Dispose of used batteries promptly.

Also, add the precautionary statement given below to coin-type lithium primary battery (3.0 V) package.

CAUTION:

Never put batteries in mouth. Swallowing may lead to serious injury or death. If ingested, immediately seek medical attention and have the doctor phone the National Capital Poison Control Center at (202)625-3333.

(5) Precautions for transportation, display and storage.

- 1) Do not store the battery in a hot and highly humid environment. Also avoid the places where likely to cause condensation. Store the battery in a cool, dry and ventilated area.
 - *The temperature for battery storage is typically 10 °C to 25 °C; it should not exceed 30 °C. The battery performance will deteriorate, escalating leakage if stored in extremely humid environment (over 95 % or below 40 % relative humidity) for a long period of time.

- 2) Do not place the battery in direct sunlight for a long time, or allow the battery to get wet when storing or store displaying. Exposing batteries in high temperatures may result in aggravating performance deterioration and increasing the potential of leakage. Also, insulation properties may degrade when the battery gets wet, likely to cause rusting and leakage.

It should be noted that more households keep batteries in reserve these days. For this case, precautions for storage similar to the abovementioned should be observed.

- 3) Avoid mishandling in transit.

The batteries may get dent or deformed, leading to performance deterioration and leakage if mishandled. In addition, a large amount of batteries may scatter when the boxes housing batteries get damaged and may suffer damage if positive and negative terminals get shorted, causing leakage, explosion or fire.

- 4) When piling batteries in shipping box, keep the pilings within the number of layers indicated on the shipping box. Over piling may cause batteries in the lower layers to deform and escalate leakage.

- 5) Strictly observe a first-in/first-out system for shipping, displaying or storing in distribution, and ensure not to store batteries for a long period of time.

Generally, batteries have sufficient storage behavior at the ordinary temperature and humidity environment (at 10 °C to 25 °C and 40 to 95 % relative humidity). However, battery performance will deteriorate over time if stored for a long period of time without being used. Carry out through stock control and first-in and first-out.

2. Precautions for the customers

In order for the customers to correctly handle the battery, please provide the following precautions in the instruction manual of the equipment although the customers operate the equipment.

<Safety warnings on battery provided in instruction manual of equipment>

- This battery contains lithium, organic solvents and other combustible materials. For this reason, mishandling of the battery may lead to leakage, heat generation, explosion or fire, causing personal injury or equipment problems. Be sure to observe the following:



- 1) Keep the battery away from small children. If swallowed, immediately consult a doctor for medical advice. Batteries lodged in the esophagus should be removed immediately since chemical burns and perforation may occur, which, in the worst case, may result in death.
- 2) DO NOT charge this battery. Charging may result in leakage, overheating, explosion or fire due to heated electrolyte in the battery and increase in internal pressure by generated gas.
- 3) Do not place the battery in fire, heat or disassemble the battery. The battery contains separator and similar safety materials, which, if damaged, may lead to leakage, overheating, explosion, or fire.
- 4) Do not use the battery with the positive and negative backward so the polarity reversed. Unusual reaction will occur due to charging and short-circuiting and it may cause leakage, overheating, explosion or fire.

- 5) In the event the battery leaks and the fluid gets into your eyes, do not rub the eye, rinse well with clean water such as tap water and immediately have medical treatment. It may cause eye problems if left untreated.
- 6) In the event that battery fluid gets in your mouth, immediately rinse out and consult a doctor.
- 7) Do not connect the positive and negative terminals together with a wire or similar materials.
Do not carry or store the battery with metallic objects such as necklaces, hairpins, etc. It may cause short-circuiting and overcurrent, leading to leakage, overheating, explosion or fire.
- 8) If the battery is leaking and giving off offensive smells, immediately move the battery away from the fire since the leaked electrolyte may catch fire.
- 9) Do not solder directly onto the battery.
Separators and other safety devices may get heated and damaged, causing leakage, overheating, explosion or fire.
- 10) Insulate the terminals with adhesive tape or similar materials before storage and disposal. Mixing with other batteries or metals may cause short-circuiting, overheating explosion or fire.
- 11) Do not use the battery with different batteries together, i.e. different type or used and new or different manufacturer. It may cause leakage, overheating, explosion or fire because of the differences in battery property.
- 12) Do not attach the battery to your skin with Scotch tape. This may cause skin problems.



- 1) Do not allow the battery to drop, receive a sudden impact or get deformed.
It may damage separators or other safety devices, causing leakage, overheating or explosion.
- 2) Do not use or leave the battery in high temperature locations. For instance, the place in the direct sunlight, inside cars in hot weather. It may cause leakage, overheating or explosion.
- 3) Do not expose the battery to water, or allow the battery to get wet. It may cause overheating.
- 4) Some equipment have metallic portion that come into contact with the positive and negative terminals of the battery at insertion port, use caution when installing the battery not to get short-circuited.
- 5) The battery may not be suitable for the specific equipment due to different conditions of use or type of equipment. Use the correct battery suitable according to the instruction manuals and safety precautions of the equipment.
- 6) Do not store the battery in direct sunlight, high temperature or high humidity locations. This may cause overheating, leakage or explosion. Using the battery in this manner may also result in a loss of performance and a shortened service life.
- 7) This battery can be disposed of as a general non-combustible waste. Please follow the instructions if regulated by local code of your area.
- 8) Be sure to turn off the power of the equipment.
- 9) When storing batteries removed from their packages or keeping them in reserve at home, use caution not to get the batteries in contact each other or short-circuited.