3V Lithium Batteries

General Technical Information on Lithium Batteries

Lithium is one of the lightest alkaline metal elements and its standard potential and electrochemical equivalence are the highest of all metals (-3,045V).

When speaking about Lithium, this only refers to the anode material (negative pole). The electrolyte and cathode may consist of a wide variety of materials providing very different cell characteristics.

The Lithium/manganese dioxide chemistry provided by RENATA is the safest and most reliable Lithium battery system.

Contrary to other constructions they are:

- non polluting
- admitted as user-replaceable by Underwriter Laboratories (3V)
- short circuit proof

... and offer the following advantages:

- Ideal voltage level of 3V, approximately twice the voltage level from of alkaline button cells
- * Wide operating temperature range from -40°C to +85°C
- Low self discharge of less than 1 % to 1.5% (depending on type) per year at 23°C
- Best practical volume/capacity ratio
- Superior leakage resistance
- Excellent storage characteristics, up to 10 years storage with minimum deterioration possible
- UL-recognized products
- Safe product, does not contain toxic substances
- Available in a wide range of solder contact configurations or in combination with our battery holders

* CR2016.MFR / CR2025.MFR /CR2032.MFR = -30°C to +70°C

In Application where the battery is exposed to temperatures above 60°C, please contact Renata for consultancy.

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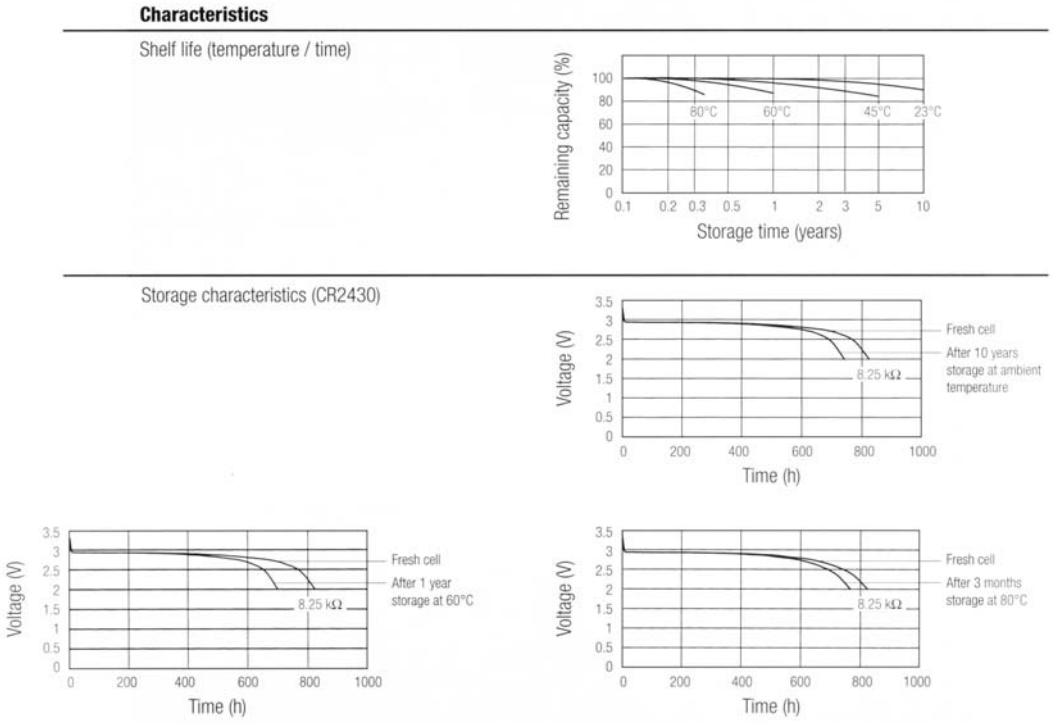
General Technical Information on Lithium Batteries (cont.)

Self discharge - Storage

RENATA lithium batteries offer excellent storage characteristics. The loss of capacity due to self discharge is from less than 1% to 1.5% per year at room temperature (23°C). Thanks to the high stability of their chemical system, MnO_2/Li batteries have a shelf life of up to 10 years, at room temperature.

The internal chemical reactions of a battery are accelerated by high temperatures and slowed by low temperatures. In other words, the loss of capacity during storage depends largely on storage temperature. Higher temperatures result in increased self discharge rates, while lower temperatures reduce self discharge (as shown by graphs below). Storage at low temperatures bears the risk, however, that batteries are short circuited by moisture condensation when transferred into a warmer environment.



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Inverse Current

Lithium primary batteries are not rechargeable. Therefore, if there is a possibility of electric current flowing from the main power source to the battery, the circuit must include two suitable blocking diodes in series or one blocking diode and one protective resistor in series. Use a silicium diode of small inverse current to prevent charging. The total amount of re-charge energy due to leakage by the blocking diodes should not exceed 1% of the battery's nominal capacity during its total service life. A higher input of re-charge energy may harm the battery or reduce its performance.

Example: A CR2450N battery with a nominal capacity of 540mAh is expected to supply power for 5 years. The amount of tolerable re-charge energy is 5.4mAh, corresponding to an inverse current of 0.1μA for the total service life. Consequently, a blocking diode with an inverse current not greater than 0.1μA should be selected. Please note that the inverse current of blocking diodes varies with temperature.

Short Circuits

When lithium batteries are short circuited, it takes time for the battery voltage to recover, even in case of slight short circuits. If electrical characteristics are measured while the battery is recovering, the battery may appear to be defective, but is not. Short circuiting leads to deterioration of the cell capacity. Short circuiting of batteries must therefore be avoided, except for wave or dip soldering. Use an instrument with a high input impedance (minimum 10 MΩ) for measuring open circuit voltage.

Superior Environmental Resistance

The combination of the sealing system and the use of organic electrolytes with low creeping tendency ensure the excellent leakage resistance of our batteries. Each production lot is subjected to a quality assurance program under difficult environmental conditions (high temperature storage, high temperature/ high humidity storage, temperature cycling, etc.). RENATA batteries can be operated in any physical position.

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