

# Lithium Manganese Dioxide Product Line Application Guide



Cylindrical Format  
 $\text{LiMnO}_2$

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# 1. About Ultralife® Lithium Manganese Dioxide Batteries

## 1.1 History

Ultralife Corporation has been providing the safest, highest quality Lithium batteries worldwide for over 20 years. Ultralife Corporation has an extensive product line across many Lithium battery chemistries. Our leading edge technologies offer the safest, highest energy densities available. Ultralife continues to invest in research and development to enhance current products and deliver new product advancements to the commercial marketplace.

## 1.2 Advantages

Ultralife Lithium Manganese Dioxide cells have some of the highest energy density and performance characteristics of all Lithium based battery chemistries. Lithium Manganese Dioxide cells offer excellent temperature characteristics, a flat discharge curve, and a hermetically sealed nickel plated steel container for long term shelf life. Lithium Manganese Dioxide cells do not form a passivation layer, so after long storage periods without use can deliver high current immediately. This makes our Lithium Manganese Dioxide cells the perfect choice for applications where high currents are required after long periods of inactivity.

### 1.3 Characteristics

- High Operational Safety (UL certified)
- High Cell Voltage (3.3V)
- Wide Temperature of operation
- Low Self Discharge
- High Energy Density
- High Reliability
- Inorganic Electrolyte
- Non Pressurized System
- Solid Cathode

### 1.4 Part Numbers

The Lithium Manganese product line from Ultralife has been assigned U1### as the designation. Where applicable a compatible CR designation is listed for cross reference.

## 2. Cell Designs

### 2.1 Spiral Wound (HiRate<sup>®</sup>)

A spiral cell design is utilized when high discharge rates are required. The spiral design allows for large surface areas between the anode and the cathode materials, increasing ionic transfer between the electrodes, resulting in higher rate discharge capability.

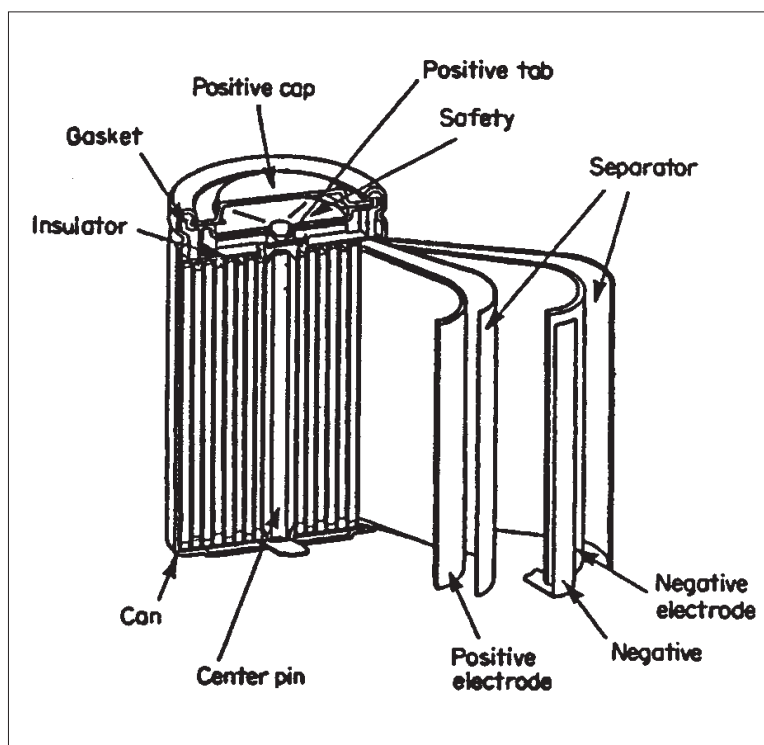


Figure 1: Spiral Wound Construction

### 3. Applications / Markets

#### 3.1 Remote Metering

- Utility Meters: Water, Gas, Electric
- Automatic Meter Readers
- Industrial meters / valves

#### 3.2 Safety / Security

- Alarm systems
- Safe / Door Lockers
- Detectors

#### 3.3 Remote Monitoring

- RFID
- Asset Tracking / GPS Systems
- Personnel ID systems
- Patient Monitoring / Biotelemetry
- Seismic Monitoring
- High Voltage Line Fault Detectors

#### 3.4 Automotive Power

- Navigational Systems
- Automotive sensors
- Taximeters
- Toll Pass Applications

#### 3.5 Backup Power

- Memory Backup
- Encryption Keys

#### 3.6 Industrial / Consumer

- Clocks / Timers
- Weather Stations
- Telemetry Equipment
- Vending Machines

## 4. Design Notes

### 4.1 Backup Power Application

A typical application of Lithium Manganese Dioxide cells is to provide memory or microcontroller backup power in the event of a power failure or rechargeable battery depletion. A typical design circuit is provided in figure 2. Note that a current limiting resistor and series diodes (two for redundancy) are typically required to comply with safety requirements under most compliance certifications (UL, IEC, etc.). Please refer to your required safety recognition specification for additional information.

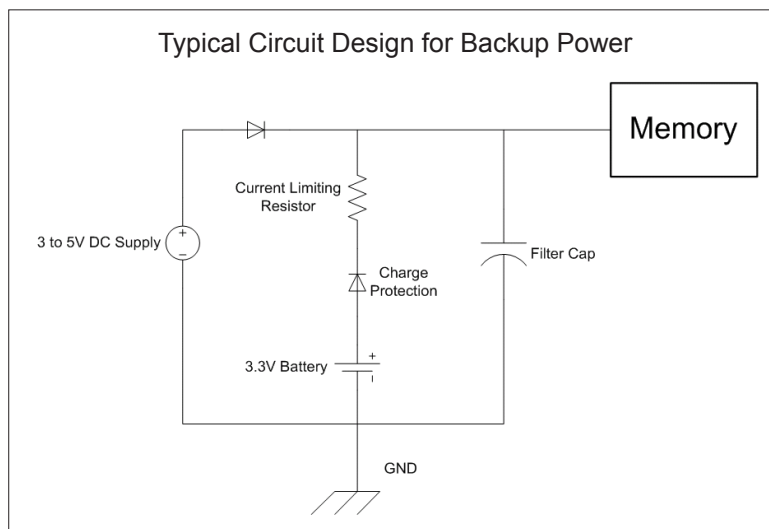


Figure 2: Backup Power Circuit Design

## 4.2 Pulse Load Applications

A typical pulse load design is included in figure 3. This type of circuit would be prevalent in applications such as remote wireless meters, toll pass, or similar applications. If the current requirement of the application is less than the recommended discharge current of the cell, a capacitor is typically not required.

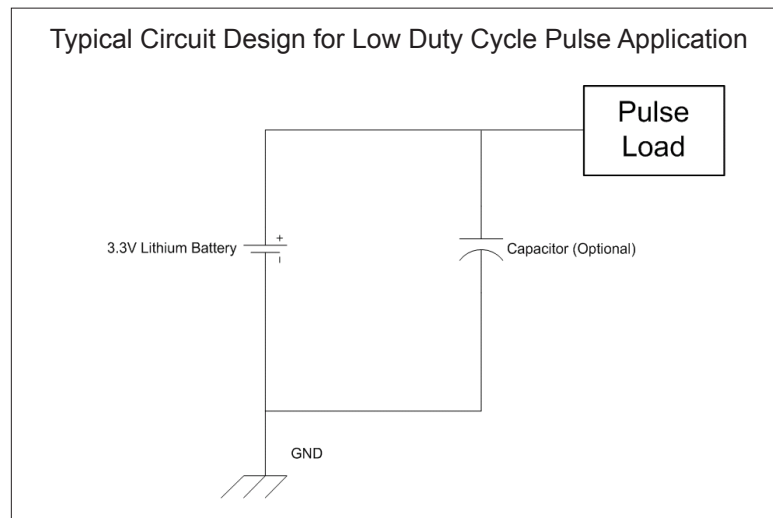


Figure 3: Pulse Power Circuit Design



## 5. Design Support

### 5.1 Battery Pack Assembly

Battery pack assembly should be completed by experienced and qualified battery manufacturers. Battery packs should be carefully constructed and fully tested to comply with all necessary regulations prior to shipment, installation, or use in any application or device. Lithium Manganese battery packs should be protected from charge, short circuit and over temperature conditions. When constructing large series packs, it is suggested to place diode in parallel with each series cell or string of cells to prevent over discharge conditions. For custom pack assemblies please contact Ultralife for design assistance and manufacturing options.

### 5.2 Cell Orientation

Cell orientation should not affect performance of the Lithium Manganese Dioxide cell performance. Consult Ultralife if there are questions about your specific application. Typical Orientations are below in figure 4.



Figure 4: Cell Orientation

### 5.3 Gamma Irradiation

Many of the Ultralife HiRate® cells have been thoroughly tested through the Gamma Irradiation process for sterilization for use in medical applications. Please contact Ultralife for your specific application and compatible products.

### 5.4 ATEX/ Intrinsically Safe

For applications that require intrinsically safe ATEX compliant cells, Ultralife has several cells that have been thoroughly tested and available for immediate use. Please contact Ultralife for your specific application and compatible products.

### 5.5 Terminations

Various cell terminals can be provided to facilitate cell mounting installation in the end use application. Custom wire harnesses can be provided to allow for easy replacement in end use applications. Please contact Ultralife for additional information on termination options.

## 5.4 Soldering

### 5.4.1 Hand Soldering

- Only skilled personnel should attempt to solder
- Wear all required personal protective gear
- Do not solder directly to the cell, solder to termination tab only
- Finish solder operation within 5 second time period
- Allow solder to fully cool prior to next solder operation
- Use proper heat sink practices when soldering to prevent cell heating

### 5.4.2 Wave Soldering

- Do not Expose cells directly to solder bath
- Keep solder bath temperature below 280°C
- Solder time should be less than 5 seconds
- Do not overheat battery during soldering

## 6. General

### 6.1 Shipment

Many Lithium metal batteries are regulated and require specific compliance and testing prior to shipping. Please visit the Ultralife Corporation website for guidance on shipping information and links to requirements.

### 6.2 Safety

- Do not solder directly to the cell or cell body
- Do not disassemble or open cells or expose contents to water
- Do not heat cells above recommended temperatures and dwell times
- Do not short circuit
- See MSDS for additional information

### 6.3 Disposal

Cells should be disposed of in accordance with all applicable local, state, federal or international regulations. Cells should be fully discharged prior to disposal if possible. Cells should be insulated prior to disposal to prevent inadvertent short circuits.



## 6.5 Legal

This document is provided as general guidance in utilizing and designing Ultralife Lithium Manganese Dioxide cells in various applications. Designs of multiple cells in series or parallel must be tested and certified with all local, state, federal, and international laws and regulations.

This document in no way replaces sound design practices and/or absolves the user of responsibility to comply with the necessary laws and regulations.

## 6.5 Contact Information

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