Primary Lithium Cells
Lithium Manganese Dioxide LiMnO$_2$

Sales Program and Technical Handbook

www.varta-microbattery.com
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1. GENERAL INFORMATION

The VARTA Microbattery lithium manganese dioxide cell chemistry was one of the first solid cathode cells commercially developed and is still the most widely used system today. These cells offer an excellent shelf life, good high-rate and low-rate capability, a wide operating temperature range and availability in button and cylindrical cell designs. Potential design-in applications for these products are electronic, telecommunication, metering, instrumentation, office and other portable equipment use. Based on the outstanding cell performance and reliability of these products, they have been able to meet and exceed the requirements of our customer base worldwide.

Advantages for VARTA Microbattery LiMnO₂ Cells

- High open circuit and load voltage (above 3.0 volts per cell)
- High energy density (400 Wh/kg and 600 Wh/l)
- High capacity and high rate cell construction
- Operation over a wide temperature range
- Flat discharge profile under low to medium rate applications
- Low self discharge (less than 1% per year at RT)
- Superior shelf life and operational life (Up to 10 years and more)
- UL Recognition
- Ability to provide a variety of laser welded termination tabs for all cell types

Energy Density for Primary Systems

Comparison of different primary battery systems

A = Lithium
B = Silver-oxide
C = Alkaline
D = Zinc-chloride
VARTA Microbattery offers a complete range of primary lithium manganese dioxide cylindrical and button cells for memory backup and portable applications worldwide. The cylindrical cell configurations offer the high-capacity bobbin construction and high-power spirally wound product. The bobbin construction is targeted at low to moderate power requirements, dedicated for applications requiring up to a 10 years operational life at 20°C. Our spirally wound electrode product offers high-rate discharge capability, with an operational life in excess of 5 years. For compact and light weight equipment use we have a complete range of high performance primary lithium button cells.

**Lithium Cylindrical Batteries**

**BOBBIN CONSTRUCTION**

Schematic construction of a Li/MnO₂ cylindrical cell (CR 1/2 AA).

**SPIRAL CONSTRUCTION**

Schematic construction of a Li/MnO₂ cylindrical cell (CR 2/3 AH).
Lithium Button Cells
Schematic construction of a Li/MnO₂ Button Cell

Sealing Technologies
CRIMP-SEALING
CR High Power Cylindrical Cells

LASER-SEALING
CR High Capacity Cylindrical Cells
1.2 CHARACTERISTICS AND APPLICATIONS

Main Applications

Both mechanical and electrical properties, together with reliability, ensure that VARTA Microbattery lithium batteries meet the requirements of modern electronics. They are therefore ideally suited as power sources for the long term supply of microelectronic circuitry.

Main Characteristics

- Long life expectancy and long operational life
- Low self discharge rate
- High energy density
- High cell voltage (3 V)
- Wide temperature range
- High operating safety
- High reliability
- Resistance to corrosion with stainless steel case
- No leakage problems with an organic non-corrosive electrolyte

Temperature characteristics

Temperature characteristics of CR 1/2 AA and CR AA cylindrical cells
(Load: 5.6 kΩ CR AA, 12 kΩ CR 1/2 AA)

A = -40°C
B = +80°C
C = +60°C
D = -20°C
E = +23°C

System properties of VARTA Microbattery Lithium Cells

<table>
<thead>
<tr>
<th>Series</th>
<th>CR Series Cylindrical Cells</th>
<th>CR Series Button Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>Li/MnO₂</td>
<td>Li/MnO₂</td>
</tr>
<tr>
<td>Gravimetric energy density</td>
<td>250–300 Wh/kg</td>
<td>250–300 Wh/kg</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>3.0 V</td>
<td>3.0 V</td>
</tr>
<tr>
<td>Open circuit voltage</td>
<td>3.2 V</td>
<td>3.2 V</td>
</tr>
<tr>
<td>Available capacity range</td>
<td>950–2000 mAh</td>
<td>25–560 mAh</td>
</tr>
<tr>
<td>Storage life</td>
<td>&gt;10 years</td>
<td>&gt;10 years</td>
</tr>
<tr>
<td>Self discharge d=20°C</td>
<td>&lt;1% p.a.</td>
<td>&lt;1% p.a.</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-30 ... +75°C</td>
<td>-20 ... +65°C</td>
</tr>
<tr>
<td>Maximum temperature range (short term)</td>
<td>-40 ... +80°C</td>
<td>-40 ... +80°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-55 ... +70°C</td>
<td>-55 ... +70°C</td>
</tr>
</tbody>
</table>

1) CR 2/3 AH, CR 2; (>5 years)
2) CR 2/3 AH (-20 ... +65°C)
3) max. two weeks
4) µA-range
5) Recommended room temperature
1.3 APPLICATIONS

Utility Meters

Electricity Meters, Gas Meters, Water Meters, Calorimeters, Automatic Meter Reading (AMR), Heat Cost Allocator.

Safety/Security Systems


Automotive Electronics


Asset Tracking

Automation

Memory back-up, Intelligent Interfaces, Personal Computers, Intelligent Typewriters, Address Printers, Envelopment Franking Machines, Cash Points, Scales, Copy Machines, Cash Register.

Vending Machines

Ticket Vending Machines, Newspaper Vending Machines, Cigarette Vending Machines, Sweet Vending Machines, Drink Vending Machines, Parking Meter.

High End Consumer

Audio and Video Memory back-up and RTC, Video Games, Gambling Machines, SCUBA Diving Meters, Altimeters, Marine Electronics, Ski Bindings, Portable Timing Units for sports events, Pigeon Flight Time Recorders.

Industrial/Medical Instrumentation

To enable battery selection the following is required:

- discharge current and maximum discharge time
- capacity
- operating temperature range
- self discharge
- surplus capacity requirement
- cell size

**CAPACITY RETENTION**
Capacity retention characteristics of VARTA Microbattery Lithium Cells
Cylindrical Cells CR…AA and CR…A

**STORAGE BEHAVIOR**
Typical storage behaviour at room temperature 21°C of CR 1/2 AA

**BATTERY SELECTION DIAGRAMM**
Discharge current/Operating time
2. CR PRIMARY LITHIUM BUTTON CELLS
2.1 TYPES – TECHNICAL DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Nominal voltage (V)</th>
<th>Typical capacity (mAh)</th>
<th>Standard load (Ω)</th>
<th>Max. discharge current (continuous) (mA)</th>
<th>Max. discharge current (pulse) (mA)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 1/3 N</td>
<td>6131 101 501</td>
<td>3</td>
<td>170</td>
<td>5.6</td>
<td>20</td>
<td>80</td>
<td>3.0</td>
</tr>
<tr>
<td>CR 1216</td>
<td>6216 101 501</td>
<td>3</td>
<td>27</td>
<td>39</td>
<td>2</td>
<td>5</td>
<td>0.7</td>
</tr>
<tr>
<td>CR 1220</td>
<td>6220 101 501</td>
<td>3</td>
<td>35</td>
<td>39</td>
<td>2</td>
<td>5</td>
<td>0.8</td>
</tr>
<tr>
<td>CR 1616</td>
<td>6616 101 501</td>
<td>3</td>
<td>55</td>
<td>39</td>
<td>3</td>
<td>8</td>
<td>1.2</td>
</tr>
<tr>
<td>CR 1620</td>
<td>6620 101 501</td>
<td>3</td>
<td>70</td>
<td>20</td>
<td>3</td>
<td>8</td>
<td>1.2</td>
</tr>
<tr>
<td>CR 2016</td>
<td>6016 101 501</td>
<td>3</td>
<td>90</td>
<td>15</td>
<td>3</td>
<td>10</td>
<td>1.8</td>
</tr>
<tr>
<td>CR 2025</td>
<td>6025 101 501</td>
<td>3</td>
<td>165</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>CR 2032</td>
<td>6032 101 501</td>
<td>3</td>
<td>230</td>
<td>5.6</td>
<td>3</td>
<td>10</td>
<td>3.0</td>
</tr>
<tr>
<td>CR 2032</td>
<td>6032 101 501</td>
<td>3</td>
<td>300</td>
<td>5.6</td>
<td>3</td>
<td>20</td>
<td>4.0</td>
</tr>
<tr>
<td>CR 2450</td>
<td>6450 101 501</td>
<td>3</td>
<td>620</td>
<td>5.6</td>
<td>2</td>
<td>20</td>
<td>6.2</td>
</tr>
</tbody>
</table>

Technical data, CR Primary Lithium Button Cells

1) Nominal capacity is determined to an end voltage of 2.0 V when the battery is allowed to discharge at standard load level at 20°C.
CR 1/3 N

Type Number ....................... 6131
Designation IEC .................... CR 11108
System .............................. Li-Manganese dioxide / Organic Electrolyte

UL Recognition ..................... MH 13654
Nominal Voltage ................... 3 V
Typical Capacity C ................. 170 mAh (Load 5.6 kOhm, at 20°C down to 2 V)

Weight (approx.) ................... 3 g
Volume ................................ 1.1 ccm
Coding ............................... TBA

Temperature Ranges
Storage ............................. -55°C to 70°C
Discharge ........................... -20°C to 65°C

Dimensions
Diameter (A) ....................... 11.40 to 11.60
Height (B) ........................... 10.40 to 10.80
Shoulder Diameter [L] ............ 7.60 to 8.00
Shoulder Height [M] ............... 0.40

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load (μA)</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>5600 0</td>
<td>Time: 335 h</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td>Capacity: 170 mAh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy: 475 mWh</td>
</tr>
</tbody>
</table>

Performance Data

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life[^2^] > 10 years

[^1^] Contact VARTA if the application is intended to be outside the range of -20°C to +65°C.
CR 1216

Type Number .................. 6216
Designation IEC ................ CR 1216
System .......................... Li-Manganese dioxide / Organic Electrolyte

UL Recognition ................ MH 13654 (N)
Nominal Voltage ............... 3 V
Typical Capacity C ............ 27 mAh (Load 39 kOhm, at 20°C down to 2 V)

Weight (approx.) ............... 0,7 g
Volume .......................... 0,17 ccm
Coding .......................... Date of Manufacturing
Month/Year

Temperature Ranges  min.    max.
Storage ...................... -55°C  70°C
Discharge ..................... -20°C  70°C¹

Dimensions  min.    max.
Diameter (A) .................. 12,20  12,50
Height (B) ..................... 1,40   1,60
Shoulder Diameter [E] ........ 10,00
Shoulder Height [C] .......... 0,20

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w Current (μA)</td>
<td>39000 Ω</td>
<td>Time: 355 h  Capacity: 27 mAh  Energy: 77 mWh</td>
</tr>
</tbody>
</table>

Performance Data

Temperature Characteristics

Operating Voltage vs. load resistance*  

Discharge Characteristics  

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption
CR 1220

Type Number .................. 6220
Designation IEC ............... CR 1220
System ........................ Li-Manganese dioxide/ Organic Electrolyte

UL Recognition ............... MH 13654 (N)
Nominal Voltage .............. 3 V
Typical Capacity C .......... 35 mAh (Load 39 kOhm, at 20°C down to 2 V)

Weight (approx.) ............ 0,8 g
Volume .......................... 0,2 ccm
Coding .......................... Date of Manufacturing Month/Year

Temperature Ranges
Storage .......................... -55°C  70°C
Discharge ....................... -20°C  70°C¹

Dimensions
Diameter (A) .................... 12,20  12,50
Height (B) ........................ 1,80  2,00
Shoulder Diameter [E] ........ 10,00
Shoulder Height [C] .......... 0,30

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w Current [μA]</td>
<td>39000 Ω</td>
<td>Time: 480 h  Capacity: 35 mAh  Energy: 100 mWh</td>
</tr>
</tbody>
</table>

Performance Data

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life²> 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption
CR 1616

Type Number ................. 6616
Designation IEC .............. CR 1616
System ........................... Li-Manganese dioxide/
Organic Electrolyte

UL Recognition ............... MH 13654 (N)
Nominal Voltage .............. 3 V
Typical Capacity C .......... 55 mAh (Load 39 kOhm,
at 20°C down to 2 V)

Weight (approx.) .............. 1,2 g
Volume .......................... 0,3 ccm
Coding .......................... Date of Manufacturing
Month/Year

Temperature Ranges  min.  max.
Storage ......................... -55°C  70°C
Discharge ....................... -20°C  70°C¹

Dimensions  min.  max.
Diameter (A) ..................... 15,70  16,00
Height (B) ....................... 1,40  1,60
Shoulder Diameter [E] ....... 12,00
Shoulder Height [C] .......... 0,20

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>39000 Ω</td>
<td>Time: 670 h</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td>Capacity: 50 mAh</td>
</tr>
<tr>
<td>Current (μA)</td>
<td></td>
<td>Energy: 142 mWh</td>
</tr>
</tbody>
</table>

Performance Data

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life²> 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption

Performance Data

**Temperature Characteristics**

- Discharge Load 30kΩ

**Operating Voltage vs. load resistance**

- Discharge depth 40%

**Capacity vs. load resistance**

- 2,0V cut off

**Discharge Characteristics**

- Temperature 23°C

- Discharge Load: 15kΩ, 30kΩ
CR 1620

Type Number .................. 6620
Designation IEC ................ CR 1620
System ...................... Li-Manganese dioxide/ Organic Electrolyte

UL Recognition .............. MH 13654 (N)
Nominal Voltage ............. 3 V
Typical Capacity C .......... 70 mAh (Load 20 kOhm, at 20°C down to 2 V)

Weight (approx.) ......... 1.2 g
Volume .................. 0.4 ccm
Coding .................. Date of Manufacturing
                      Month/Year

Temperature Ranges min. max.
Storage ................... -55°C  70°C
Discharge .................. -20°C  70°C¹

Dimensions min. max.
Diameter (A) ............ 15.70  16.00
Height (B) .................. 1.80  2.00
Shoulder Diameter [E] .... 12.90
Shoulder Height [C] ........ 0.20

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load (kΩ)</th>
<th>End Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>20000</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Performance Data

Self-discharge rate < 1% at room temperature
Storage life > 10 years
Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption
CR 2016

Type Number .................. 6016
Designation IEC ............... CR 2016
System ......................... Li-Manganese dioxide / Organic Electrolyte
UL Recognition ................ MH 13654 (N)
Nominal Voltage ............... 3 V
Typical Capacity C ........... 90 mAh (Load 15 kOhm, at 20°C down to 2 V)
Weight (approx.) ............... 1,8 g
Volume .......................... 0,5 ccm
Coding .......................... Date of Manufacturing
Temperature Ranges
Storage ......................... -55°C  70°C
Discharge ...................... -20°C  70°C¹
Dimensions
Diameter (A) .................. 19,70  20,00
Height (B) ...................... 1,40   1,60
Shoulder Diameter [E] ........ 18,40
Shoulder Height [C] .......... 0,10

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w Current:</td>
<td>15000 Ω 200 µA</td>
<td>Time: 450 h Capacity: 90 mAh Energy: 270 mWh</td>
</tr>
</tbody>
</table>

Performance Data

Temperature Characteristics

Operating Voltage vs. load resistance

*Voltage at 50% discharge depth

Capacity vs. load resistance

• Self-discharge rate < 1% at room temperature
• Storage life > 10 years
• Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption
CR 2025

![Image of CR 2025 battery](image)

- **Type Number**: 6025
- **Designation IEC**: CR 2025
- **System**: Li-Manganese dioxide/Organic Electrolyte
- **UL Recognition**: MH 13654 (N)
- **Nominal Voltage**: 3 V
- **Typical Capacity C**: 165 mAh (Load 10 kOhm, at 20°C down to 2 V)

**Weight (approx.):** 2.5 g  
**Volume**: 0.75 ccm  
**Coding**

**Temperature Ranges**  
- **Storage**: -55°C to 70°C  
- **Discharge**: -20°C to 70°C¹

**Dimensions**  
- **Diameter (A)**: 19.70 to 20.00  
- **Height (B)**: 2.20 to 2.50  
- **Shoulder Diameter [E]**: 18.30  
- **Shoulder Height [C]**: 0.20

**Typical Capacities (at 20°C)**

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
</table>
| Continuous     | 10000 Ω | Time: 580 h  
24 h/d, 7 d/w | Capacity: 165 mAh  
Current (μA) | Energy: 47.5 mWh |

**Performance Data**

- **Self-discharge rate**: < 1% at room temperature
- **Storage life**: > 10 years
- **Operating life**: > 10 years

1 Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

2 Depending on environmental condition and energy consumption.
CR 2032

Type Number .......................... 6032
Designation IEC ...................... CR 2032
System .................................. Li-Manganese dioxide / Organic Electrolyte
UL Recognition ......................... MH 13654 (N)
Nominal Voltage ........................ 3 V
Typical Capacity C .................... 230 mAh (Load 5,6 kOhm, at 20°C down to 2 V)

Weight (approx.) ....................... 3 g
Volume .................................. 0,95 ccm
Coding ................................. Date of Manufacturing
Month/Year

Temperature Ranges
Storage .............................. -55°C to 70°C
Discharge ............................ -20°C to 70°C¹

Dimensions
Diameter (A) .................... 19,70 to 20,00
Height (B) .......................... 2,90 to 3,20
Shoulder Diameter [E] .......... 16,00

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w Current [μA]</td>
<td>5600 Ω</td>
<td>Time: 460 h Capacity: 230 mAh Energy: 645 mWh</td>
</tr>
</tbody>
</table>

Performance Data

Temperature Characteristics

Operating Voltage vs. load resistance*

Capacity vs. load resistance

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption
CR 2430

Type Number ..................... 6430
Designation IEC .................. CR 2430
System ............................ Li-Manganese dioxide/
                                 Organic Electrolyte
UL Recognition .................. MH 13654 (N)
Nominal Voltage ................. 3 V
Typical Capacity C .............. 300 mAh (Load 5.6 kOhm, 
at 20°C down to 2 V)
Weight (approx.) .................. 4 g
Volume ............................ 1.3 ccm
Coding ............................. Date of Manufacturing
                                 Month/Year
Temperature Ranges   min.  max.
Storage ......................... -55°C  70°C
Discharge ....................... -20°C  70°C¹

Dimensions   min.  max.
Diameter (A) ................. 24.20  24.50
Height (B) ..................... 2.70   3.00
Shoulder Diameter [E] ...... 16.30  16.70

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
</table>
| Continuous 24 h/d, 7 d/w Current [μA] | 5600 Ω | Time: 600 h
| | | Capacity: 300 mAh
| | | Energy: 840 mWh |

Performance Data

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption
CR 2450

Type Number .................. 6450
Designation IEC ............... CR 2450
System .......................... Li-Manganese dioxide / Organic Electrolyte

UL Recognition ............... MH 13654 (N)
Nominal Voltage ............... 3 V
Typical Capacity C .......... 620 mAh (Load 5.6 kOhm at 20°C down to 2 V)

Weight (approx.) ............. 6.2 g
Volume ......................... 2.3 ccm
Coding .......................... Date of Manufacturing Month/Year

Temperature Ranges

<table>
<thead>
<tr>
<th>Storage</th>
<th>min.</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-55°C</td>
<td>70°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discharge</th>
<th>min.</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-20°C</td>
<td>70°C¹</td>
</tr>
</tbody>
</table>

Dimensions

| Diameter (A) | 24.20 | 24.70 |
| Height (B)   | 4.60  | 5.00  |
| Shoulder Diameter [E] | 21.00 |

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>5600 Ω</td>
<td>Time: 1250 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacity: 620 mAh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy: 1730 mWh</td>
</tr>
</tbody>
</table>

Performance Data

• Self-discharge rate < 1% at room temperature
• Storage life > 10 years
• Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.
² depending on environmental condition and energy consumption

Operating Voltage vs. load resistance*
### 2.2 ASSEMBLIES

#### CR 1/3 N

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>L</th>
<th>Fig. No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 1/3 N</td>
<td>6131 101 501</td>
<td>11.6</td>
<td>10.8</td>
<td>0.4</td>
<td>—</td>
<td>7.8</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td>CR 1/3 N PC</td>
<td>6131 201 501</td>
<td>13.0</td>
<td>1.0</td>
<td>10.0</td>
<td>1.0 ±0.3</td>
<td>11.5 ±0.5</td>
<td>12.0 ±0.15</td>
<td>—</td>
<td>1.0 ±0.3</td>
<td>11.5 ±0.5</td>
<td>12.0 ±0.15</td>
<td>—</td>
<td>3</td>
</tr>
<tr>
<td>CR 1/3 N BE</td>
<td>6131 301 501</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>11.5</td>
<td>12.0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>19.0</td>
<td>4.0</td>
<td>2</td>
</tr>
</tbody>
</table>

Tag material: nickel plated sheet-steel. SLF: tip tinned.
Custom made assemblies are available on request for large volume.

![FIG. 1](image1)
![FIG. 2 LF](image2)
![FIG. 3 SLF](image3)
### CR Button

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>L</th>
<th>Fig. No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 1216</td>
<td>6216 101 501</td>
<td>12.5</td>
<td>1.6</td>
<td>0.2</td>
<td>–</td>
<td>10.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<td>–</td>
<td>4</td>
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<td>CR 1220</td>
<td>6220 101 501</td>
<td>12.5</td>
<td>2.0</td>
<td>0.3</td>
<td>–</td>
<td>10.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CR 1616</td>
<td>6616 101 501</td>
<td>16.0</td>
<td>1.6</td>
<td>0.2</td>
<td>–</td>
<td>12.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CR 1620</td>
<td>6620 101 501</td>
<td>16.0</td>
<td>2.0</td>
<td>0.02</td>
<td>–</td>
<td>12.9</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CR 2016</td>
<td>6016 101 501</td>
<td>20.0</td>
<td>1.6</td>
<td>0.1</td>
<td>–</td>
<td>10.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>9.1</td>
<td>4</td>
</tr>
<tr>
<td>CR 2016 SC PCBD</td>
<td>6016 201 501</td>
<td>21.3</td>
<td>1.0</td>
<td>10.0 ±0.15</td>
<td>1.0 ±0.3</td>
<td>2.1 ±0.5</td>
<td>20.3 ±0.15</td>
<td>–</td>
<td>1.0 ±0.3</td>
<td>4.5</td>
<td>–</td>
<td>10.0</td>
<td>6</td>
</tr>
<tr>
<td>CR 2016 SC STO</td>
<td>6016 301 501</td>
<td>20.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1.9</td>
<td>20.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10.0</td>
<td>4.0</td>
<td>6</td>
</tr>
<tr>
<td>CR 2016 BE PCBD</td>
<td>6016 401 501</td>
<td>20.0</td>
<td>1.0</td>
<td>10.0</td>
<td>9.1</td>
<td>1.6</td>
<td>17.8</td>
<td>7.3</td>
<td>10.0</td>
<td>4.5</td>
<td>11.4</td>
<td>–</td>
<td>7</td>
</tr>
<tr>
<td>CR 2016 FM S STO</td>
<td>6016 301 012</td>
<td>20.5</td>
<td>3.5</td>
<td>1.8</td>
<td>3.0</td>
<td>2.2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Tag material: nickel plated sheet-steel. SLF: tip tinned.

Custom made assemblies are available on request for large volume.

---

![Fig. 4](image)

![Fig. 5 SLF](image)

![Fig. 6 LF](image)

![Fig. 7 PCB 3](image)
### CR Button

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>L</th>
<th>Fig. No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 2025</td>
<td>6025 101 501</td>
<td>20.0</td>
<td>2.5</td>
<td>0.2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>CR 2025 ST</td>
<td>6025 201 501</td>
<td>21.3</td>
<td>1.0</td>
<td>10.0</td>
<td>±0.2</td>
<td>1.0</td>
<td>±0.3</td>
<td>3.0</td>
<td>±0.5</td>
<td>20.3</td>
<td>±15</td>
<td>1.0</td>
<td>±0.3</td>
</tr>
<tr>
<td>CR 2025 SC STO</td>
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<td>–</td>
<td>10.0</td>
<td>4.0</td>
<td>10</td>
<td>tag 0.15 mm</td>
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<tr>
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<td>6025 401 501</td>
<td>20.0</td>
<td>1.0</td>
<td>10.0</td>
<td>10.0</td>
<td>2.8</td>
<td>17.8</td>
<td>7.3</td>
<td>10.0</td>
<td>4.5</td>
<td>11.4</td>
<td>11</td>
<td>tag 0.15 mm</td>
</tr>
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<td>6032 101 501</td>
<td>20.0</td>
<td>3.2</td>
<td>0.02</td>
<td>–</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>CR 2032 SC PCBD</td>
<td>6032 201 501</td>
<td>21.5</td>
<td>1.0</td>
<td>10.0</td>
<td>1.0</td>
<td>±0.3</td>
<td>4.2</td>
<td>20.3</td>
<td>–</td>
<td>1.0</td>
<td>4.5</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>CR 2032 SC STO</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>3.2</td>
<td>20.3</td>
<td>–</td>
<td>–</td>
<td>10.0</td>
<td>4.0</td>
<td>10</td>
<td>tag 0.15 mm</td>
</tr>
<tr>
<td>CR 2032 PCBD</td>
<td>6032 401 501</td>
<td>20.0</td>
<td>1.0</td>
<td>10.0</td>
<td>11.0</td>
<td>3.2</td>
<td>17.8</td>
<td>7.5</td>
<td>10.0</td>
<td>4.5</td>
<td>11.4</td>
<td>11</td>
<td>tag 0.25 mm</td>
</tr>
<tr>
<td>CR 2032 BE PCBS</td>
<td>6032 701 501</td>
<td>20.0</td>
<td>1.0</td>
<td>–</td>
<td>11.0</td>
<td>3.2</td>
<td>17.8</td>
<td>7.5</td>
<td>10.0</td>
<td>4.5</td>
<td>10.0</td>
<td>–</td>
<td>12 tag 0.20 mm</td>
</tr>
<tr>
<td>CR 2032 S WC</td>
<td>6032 101 013</td>
<td>20.7</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>5.5</td>
<td>30.0</td>
<td>–</td>
<td>–</td>
<td>96.0</td>
<td>2.0</td>
<td>13</td>
<td>tag 0.20 mm(2)</td>
</tr>
<tr>
<td>CR 2032 S STO</td>
<td>6032 101 012</td>
<td>20.0</td>
<td>7.0</td>
<td>2.8</td>
<td>5.0</td>
<td>3.8</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Tag material: nickel plated sheet-steel. SLF: tip tinned.

1) using Molex 51021-03 connector (Other wire connectors and wire length are available on request.)  2) in shrink sleeve with wire and connector

Custom made assemblies are available on request for large volume.
CR Button

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>J</th>
<th>Fig No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 2430</td>
<td>6430 101 501</td>
<td>24.5</td>
<td>3.0</td>
<td>0.3</td>
<td>–</td>
<td>20.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>15</td>
<td>–</td>
</tr>
<tr>
<td>CR 2430 SLF</td>
<td>6430 201 501</td>
<td>25.6</td>
<td>1.0</td>
<td>10.0</td>
<td>1.0</td>
<td>4.0</td>
<td>25.0</td>
<td>–</td>
<td>1.0</td>
<td>4.5</td>
<td>–</td>
<td>16</td>
<td>tag 0.25 mm</td>
</tr>
<tr>
<td>CR 2430 LF</td>
<td>6430 301 501</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3.2</td>
<td>25.0</td>
<td>–</td>
<td>–</td>
<td>10.0</td>
<td>4.0</td>
<td>17</td>
<td>tag 0.15 mm</td>
</tr>
<tr>
<td>CR 2430 PCB 3</td>
<td>6430 401 501</td>
<td>24.5</td>
<td>1.0</td>
<td>10.0</td>
<td>11.0</td>
<td>3.0</td>
<td>17.8</td>
<td>7.5</td>
<td>10.0</td>
<td>4.5</td>
<td>11.4</td>
<td>18</td>
<td>tag 0.25 mm</td>
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<tr>
<td>CR 2430 PCB 2</td>
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<td>1.0</td>
<td>–</td>
<td>11.0</td>
<td>3.0</td>
<td>20.0</td>
<td>7.5</td>
<td>10.0</td>
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<td>11.4</td>
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<td>6430 301 012</td>
<td>24.5</td>
<td>5.2</td>
<td>4.0</td>
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<td>3.3</td>
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<td>–</td>
<td>–</td>
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<td>–</td>
<td>20</td>
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</tr>
<tr>
<td>CR 2450</td>
<td>6450 101 501</td>
<td>24.7</td>
<td>5.0</td>
<td>0.5</td>
<td>–</td>
<td>21.8</td>
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<td>–</td>
<td>–</td>
<td>15</td>
<td>–</td>
</tr>
<tr>
<td>CR 2450 SLF</td>
<td>6450 201 501</td>
<td>25.6</td>
<td>1.0</td>
<td>10.0</td>
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<td>6.0</td>
<td>25.0</td>
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<td>1.0</td>
<td>4.5</td>
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<td>16</td>
<td>tag 0.25 mm</td>
</tr>
<tr>
<td>CR 2450 PCB 3</td>
<td>6450 401 501</td>
<td>24.5</td>
<td>1.0</td>
<td>10.0</td>
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<td>17.8</td>
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<td>18</td>
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<tr>
<td>CR 2450 PCB 2</td>
<td>6450 701 501</td>
<td>24.7</td>
<td>1.0</td>
<td>–</td>
<td>12.7</td>
<td>5.0</td>
<td>17.8</td>
<td>7.5</td>
<td>10.0</td>
<td>4.5</td>
<td>11.4</td>
<td>19</td>
<td>tag 0.20 mm</td>
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<tr>
<td>CR 2450 SMT</td>
<td>6450 301 013</td>
<td>24.5</td>
<td>4.5</td>
<td>2.8</td>
<td>3.5</td>
<td>5.3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>20</td>
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Tag material: nickel plated sheet-steel. SLF: tip tinned.
1) using Molex 51021-03 connector (Other wire connectors and wire length are available on request.)
2) in shrink sleeve with wire and connector
Custom made assemblies are available on request for large volume.
3. CR HIGH CAPACITY PRIMARY LITHIUM CYLINDRICAL CELLS
### 3.1 TYPES – TECHNICAL DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity at 20°C from 2.0 V to 2.0 V (mAh)</th>
<th>Max. continuous discharge current (mA)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 1/2 AA</td>
<td>6127 101 301</td>
<td>3</td>
<td>950 mAh–5.6 kΩ</td>
<td>5</td>
<td>11.5</td>
</tr>
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<td>CR 2/3 AA</td>
<td>6237 101 301</td>
<td>3</td>
<td>1350 mAh–1.0 kΩ</td>
<td>10</td>
<td>15.0</td>
</tr>
<tr>
<td>CR AA</td>
<td>6117 101 301</td>
<td>3</td>
<td>2000 mAh–1.0 kΩ</td>
<td>15</td>
<td>21.5</td>
</tr>
</tbody>
</table>

Technical data, CR High Capacity Primary Lithium Cylindrical Cells
CR 1/2 AA

Type Number ................. 6127
Designation IEC ............. -
System .......................... Li-Manganese dioxide/ Organic Electrolyte

UL Recognition ................ MH 13654 (N)
Nominal Voltage .............. 3 V
Typical Capacity C .......... 950 mAh (Load 5,6 kOhm, at 20°C down to 2 V)

Weight (approx.) ............ 11,5 g
Volume .......................... 5 ccm
Coding ........................... Date of Manufacturing Month/Year

Temperature Ranges min. max.
Storage .......................... -55°C 70°C
Discharge ...................... -30°C 75°C¹

Dimensions min. max.
Diameter (A) .................... 14,15 14,45
Height (B) ....................... 25,09 25,30
Shoulder Diameter [L] ........ 7,00
Shoulder Height [M] .......... 0,90

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage</th>
<th>Time</th>
<th>Capacity:</th>
<th>Energy:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w</td>
<td>5600 Ω</td>
<td>2.0 V</td>
<td>1860 h</td>
<td>950 mAh</td>
<td>2700 mWh</td>
</tr>
<tr>
<td>Continuous 24 h/d, 7 d/w</td>
<td>2000 Ω</td>
<td></td>
<td>670 h</td>
<td>930 mAh</td>
<td>2600 mWh</td>
</tr>
<tr>
<td>Continuous 24 h/d, 7 d/w</td>
<td>1000 Ω</td>
<td></td>
<td>335 h</td>
<td>980 mAh</td>
<td>2400 mWh</td>
</tr>
<tr>
<td>Constant current</td>
<td>50 μA</td>
<td></td>
<td></td>
<td>1000 mAh</td>
<td></td>
</tr>
</tbody>
</table>

¹ Contact VARTA if the application is intended to be outside the range of -30°C to +75°C.

² depending on environmental condition and energy consumption

Performance Data

Temperature Characteristics*

Operating Voltage vs. load resistance*

Capacity vs. load resistance

Discharge Characteristics*

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years
CR 2/3 AA

Type Number .......................... 6237
Designation IEC ...................... -
System ................................. Li-Manganese dioxide / Organic Electrolyte

UL Recognition ....................... MH 13654 (N)
Nominal Voltage ....................... 3 V
Typical Capacity C ................... 1350 mAh (Load 1,0 kOhm, at 20°C down to 2 V)

Weight (approx.) ....................... 15 g
Volume .................................. 5,6 ccm
Coding ................................. Date of Manufacturing Month/Year

Temperature Ranges  
Storage ................................ -55°C  70°C
Discharge ......................... -30°C  75°C¹

Dimensions  
Diameter (A) ......................... 14,45  14,75
Height (B) ........................... 33,10  33,00
Shoulder Diameter [L] ………… 7,00
Shoulder Height [M] .............. 0,60

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>1000 Ω</td>
<td></td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td>Time: Capacity: Energy:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>500 h</td>
<td>1350 mAh 3600 mWh</td>
</tr>
</tbody>
</table>

Performance Data

Temperature Characteristics*  

Operating Voltage vs. load resistance*  

Capacity vs. load resistance

Discharge Characteristics*

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -30°C to +75°C.
² depending on environmental condition and energy consumption
CR AA

Type Number .................. 6117
Designation IEC ................ -
System ......................... Li-Manganese dioxide/ Organic Electrolyte

UL Recognition ................ MH 13654 (N)
Nominal Voltage ................ 3 V
Typical Capacity C ............. 2000 mAh (Load 1.0 kOhm, at 20°C down to 2 V)

Weight (approx.) .............. 21,5 g
Volume ........................ 8,5 ccm
Coding .......................... Date of Manufacturing Month/Year

Temperature Ranges min. max.
Storage .......................... -55°C  70°C
Discharge ........................ -30°C  75°C¹

Dimensions min. max.
Diameter (A) .................... 14,45  14,75
Height (B) ....................... 49,50  50,50
Shoulder Diameter [L] ........... 7,00
Shoulder Height [M] ............ 0,60

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage:</th>
<th>Time:</th>
<th>Capacity:</th>
<th>Energy:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>1000 Ω</td>
<td>2,0 V</td>
<td>745 h</td>
<td>2000 mAh</td>
<td>8600 mWh</td>
</tr>
<tr>
<td>Continuous</td>
<td>620 Ω</td>
<td>2,0 V</td>
<td>430 h</td>
<td>1850 mAh</td>
<td>5000 mWh</td>
</tr>
</tbody>
</table>

¹ Contact VARTA if the application is intended to be outside the range of -30°C to +75°C.
² depending on environmental condition and energy consumption

Performance Data

Temperature Characteristics*

- Discharge Load 5,6 kΩ

Operating Voltage vs. load resistance*

- Discharge depth 50%

Capacity vs. load resistance

Discharge Characteristics*

- at room temperature 21°C

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years
### 3.2 ASSEMBLIES

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>A (Max.)</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>Fig No.</th>
<th>Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 1/2 AA S</td>
<td>6127 101 301</td>
<td>14.75</td>
<td>25.2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7.0</td>
<td>0.6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CR 1/2 AA S PCBD</td>
<td>6127 201 301</td>
<td>14.75</td>
<td>25.2</td>
<td>10.0</td>
<td>1.0</td>
<td>1.0</td>
<td>–</td>
<td>25.4</td>
<td>3.0</td>
<td>5.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>CR 1/2 AA S ST</td>
<td>6127 301 301</td>
<td>14.75</td>
<td>25.2</td>
<td>10.0</td>
<td>–</td>
<td>3.5</td>
<td>2.1</td>
<td>25.4</td>
<td>2.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>CR 1/2 AA BE CD</td>
<td>6127 501 301</td>
<td>14.75</td>
<td>25.4</td>
<td>45.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7</td>
</tr>
<tr>
<td>CR 1/2 AA S CD</td>
<td>6127 601 301</td>
<td>14.75</td>
<td>25.4</td>
<td>–</td>
<td>7.5</td>
<td>–</td>
<td>–</td>
<td>33.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>6 (90°)</td>
</tr>
<tr>
<td>CR 1/2 AA S PCBS</td>
<td>6127 901 301</td>
<td>14.75</td>
<td>25.2</td>
<td>–</td>
<td>–</td>
<td>1.0</td>
<td>1.0</td>
<td>25.4</td>
<td>–</td>
<td>3.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>5 short pin</td>
</tr>
<tr>
<td>CR 1/2 AA S TP</td>
<td>6127 601 381</td>
<td>14.75</td>
<td>25.2</td>
<td>16.5</td>
<td>–</td>
<td>0.64</td>
<td>–</td>
<td>25.8</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>8 terminal pin</td>
</tr>
<tr>
<td>CR 1/2 AA S WC¹</td>
<td>6127 201 390</td>
<td>17.5</td>
<td>27.0</td>
<td>50.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>9 wire &amp; connector</td>
</tr>
<tr>
<td>CR 2/3 AA S</td>
<td>6237 101 301</td>
<td>14.75</td>
<td>33.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7.0</td>
<td>0.6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CR 2/3 AA S PCBD</td>
<td>6237 201 301</td>
<td>14.75</td>
<td>33.5</td>
<td>10.0</td>
<td>1.0</td>
<td>1.0</td>
<td>–</td>
<td>33.7</td>
<td>–</td>
<td>3.0</td>
<td>5.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CR 2/3 AA S ST</td>
<td>6237 301 301</td>
<td>14.75</td>
<td>33.5</td>
<td>10.0</td>
<td>–</td>
<td>3.5</td>
<td>2.1</td>
<td>33.7</td>
<td>2.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>CR 2/3 AA S CD</td>
<td>6237 501 301</td>
<td>14.75</td>
<td>33.5</td>
<td>45.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7</td>
</tr>
<tr>
<td>CR 2/3 AA S PCBS</td>
<td>6237 701 301</td>
<td>14.75</td>
<td>33.5</td>
<td>–</td>
<td>1.0</td>
<td>1.0</td>
<td>–</td>
<td>33.7</td>
<td>–</td>
<td>3.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4 single pin</td>
</tr>
<tr>
<td>CR AA S</td>
<td>6117 101 301</td>
<td>14.75</td>
<td>50.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7.0</td>
<td>0.6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CR AA S PCBD</td>
<td>6117 201 301</td>
<td>14.75</td>
<td>50.0</td>
<td>10.0</td>
<td>1.0</td>
<td>1.0</td>
<td>–</td>
<td>50.2</td>
<td>–</td>
<td>3.0</td>
<td>5.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CR AA S ST</td>
<td>6117 301 301</td>
<td>14.75</td>
<td>50.0</td>
<td>10.0</td>
<td>–</td>
<td>3.5</td>
<td>2.1</td>
<td>50.2</td>
<td>2.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CR AA S CD</td>
<td>6117 501 301</td>
<td>14.75</td>
<td>50.2</td>
<td>45.0</td>
<td>–</td>
<td>3.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>CR AA S PCBS</td>
<td>6117 701 301</td>
<td>14.75</td>
<td>50.0</td>
<td>–</td>
<td>1.0</td>
<td>1.0</td>
<td>–</td>
<td>50.2</td>
<td>–</td>
<td>3.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4 single pin</td>
<td></td>
</tr>
<tr>
<td>CR AA S WC¹³</td>
<td>6117 201 390</td>
<td>18</td>
<td>51.0</td>
<td>50.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>9 wire &amp; connector</td>
<td></td>
</tr>
</tbody>
</table>

Material: nickel plated sheet-steel, tag thickness: 0.15 mm till 0.25 mm. SLF: tip tinned, all types in green shrink sleeve.

¹) using connector: JST type: PHR2 (Other connector types available on request.)

Custom made assemblies are available on request for large volume.
4. CR HIGH POWER PRIMARY LITHIUM CYLINDRICAL CELLS
## 4.1 TYPES – TECHNICAL DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Nominal voltage (V)</th>
<th>Nominal capacity at 20°C, load (mAh)</th>
<th>Max. continuous discharge current 1) (mA)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 2/3 AH</td>
<td>6215 101 501</td>
<td>3</td>
<td>1500 mAh–200 Ω</td>
<td>1500</td>
<td>16</td>
</tr>
<tr>
<td>CR 123 A</td>
<td>6205 210 501</td>
<td>3</td>
<td>1500 mAh–200 Ω/2.0 V</td>
<td>1400</td>
<td>17</td>
</tr>
<tr>
<td>CR 2</td>
<td>6208 210 501</td>
<td>3</td>
<td>850 mAh–200 Ω/1.8 V</td>
<td>885</td>
<td>11</td>
</tr>
</tbody>
</table>

Technical data, CR High Power Primary Lithium Cylindrical Cells

1) Current value for obtaining 50% capacity  
2) in blister card (1 pc)
CR 2/3 AH

Type Number ....................... 6215
Designation IEC .................. CR 17345
System ............................. Li-Manganese dioxide/ Organic Electrolyte

UL Recognition ................. MH 13654 (N)
Nominal Voltage ............... 3 V
Typical Capacity C ............ 1500 mAh (Load 200 kOhm, at 20°C down to 2 V)

Weight (approx.) ............. 17 g
Volume ....................... 7 ccm
Coding .................. Date of Manufacturing Month/Year

Temperature Ranges  min. max.  
Storage ............... -20°C  45°C
Discharge ............ -40°C  70°C¹

Dimensions min. max.  
Diameter (A) ............ 16,00  17,00
Height (B) ............... 32,40  33,90
Shoulder Diameter [L] .... 6,10
Shoulder Height [M] ........ 1,00

Typical Capacities (at 20°C)  

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w</td>
<td>200 Ω</td>
<td>108 h Capacity: 1500 mAh Energy: 4180 mWh</td>
</tr>
</tbody>
</table>

Performance Data

Temperature Characteristics*  

Pulse discharge characteristics*  

Typical discharge curve*  

Discharge Characteristics*  

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -40°C to +70°C.
² depending on environmental condition and energy consumption
**CR 2**

**Performance Data**

**Temperature Characteristics**

**Pulse discharge characteristics**

**Discharge Characteristics**

**Typical Capacities (at 20°C)**

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w</td>
<td>200 Ω</td>
<td>Time: 63 h, Capacity: 870 mAh</td>
</tr>
</tbody>
</table>

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

---

² depending on environmental condition and energy consumption

---

¹ Contact VARTA if the application is intended to be outside the range of -40°C to +70°C.
CR 123 A

Type Number ......................... 6205
Designation IEC ....................... CR 17345
System ............................... Li-Manganese dioxide/Organic Electrolyte

UL Recognition ...................... MH 13654 (N)
Nominal Voltage ..................... 3 V
Typical Capacity C ................... 1550 mAh (Load 100 kOhm, at 20°C down to 2 V)

Weight (approx.) ...................... 17 g
Volume ................................ 7 ccm
Coding ................................. Date of Manufacturing

Temperature Ranges .................. min.  max.
Storage ............................... -20°C  45°C
Discharge ............................. -40°C  70°C¹

Dimensions ........................... min.  max.
Diameter (A) ......................... 16,40  17,00
Height (B) ............................. 34,30  34,50
Shoulder Diameter [L] .......... 6,20  6,40
Shoulder Height [M] .............. 1,18  1,23

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 d/w</td>
<td>100 Ω</td>
<td>Capacity: 1550 mAh</td>
</tr>
</tbody>
</table>

Performance Data

Temperature Characteristics*

Pulse discharge characteristics*

Typical discharge curve*

Discharge Characteristics*

- Self-discharge rate < 1% at room temperature
- Storage life > 10 years
- Operating life² > 10 years

¹ Contact VARTA if the application is intended to be outside the range of -40°C to +70°C.
² depending on environmental condition and energy consumption
### 4.2 ASSEMBLIES

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>Fig No.</th>
<th>Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 2/3 AH S</td>
<td>6215 101 501</td>
<td>17.0</td>
<td>-1</td>
<td>33.9</td>
<td>-1.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.3 ±0.2</td>
<td>1.0</td>
</tr>
<tr>
<td>CR 2/3 AH S PCBD</td>
<td>6215 201 013</td>
<td>16.5</td>
<td>33.3</td>
<td>10.0</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>33.7</td>
<td>-</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>CR 123A P1</td>
<td>6205 210 501</td>
<td>17.0</td>
<td>-1</td>
<td>34.5</td>
<td>-0.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.4</td>
</tr>
<tr>
<td>CR 2 P1</td>
<td>6206 210 501</td>
<td>15.6</td>
<td>-0.5</td>
<td>27.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Material: nickel plated sheet-steel, tag thickness: 0.15 mm till 0.25 mm. SLF: tip tinned.
Custom made assemblies are available on request for large volume.

**FIG. 1**

**FIG. 2**
Basically, **VARTA** lithium batteries are safely designed to endure various environmental conditions. The design of the hermetically seal rim and the glass-to-metal welding can give the battery high endurance in various environmental conditions such as variant temperatures, humidity and vibration. Also, the position of lithium against the inner wall of the cell case makes heat dissipated to the outside easier when inside heat is generated. Therefore, there is no concern over safety when the suggested cautions are followed during usage, handling or storage.

However, there might be some possibilities of mishandling or misuse by the customer. Thus, following simulation tests have been performed. The test conditions are based on the procedures of the UL standard tests and Military Standards for environmental and safety testing. The abnormal test is only carried out to check the behavior of the batteries under misuse conditions and make certain the batteries react in a safe manor.
Battery Selection:

In order to ensure optimum battery performance for the primary CR Button, the cylindrical CR High Power and cylindrical High Capacity cells, we suggest consideration of the following design-in requirements. They are the nominal and operating voltage, load current and profile, the duty cycle, temperature requirements and shelf life for the application. These characteristics for each battery type must be evaluated against the design requirements to select the most appropriate product that fulfills these requirements.

Design-in Considerations

**VARTA** Microbattery Primary Lithium Batteries offer lightweight packaged power for a variety of portable electric and electronic equipment. They are suitable as a main or standby power source for memory (RAM) and Real-Time clock (RTC) applications.

The Lithium Batteries are blocked from the power supply by means of a diode to prevent discharge of the battery into the DC supply during shut down.

The voltage drop across D1 should be taken into account as the minimum voltage of the load that has to be maintained under all circumstances.

Blocking diode D2 and D3 prevents the battery from being charged through the power supply. The amount of accumulated reverse current (IR) should be kept around 1% of the cell’s typical capacity during its standby life time. The leakage current of the diodes has to be considered.

Example:
- CR 1/2 AA for 5 years life time
- 1% of 950 mAh = 9.5 mAh = 9500 µAh
- 5 years = 43800 h
- max. reserve current = 9500 µAh/ 43800 h = 0.217 µA

However a maximum of 5 µA continuously must not be exceeded. In the absence of a DC supply voltage, the lithium battery supplies the load with the necessary power.

As diodes fail at low current levels by an alloy-effect causing a severe reduction in impedance, an additional safety device must be incorporated.

Using 2 cells when 6 V is used in series
Printed Circuit Board Mounting

Never solder on the body of the battery directly, use a battery equipped with PC-mount terminals. When using automatic soldering apply 250–270°C within 5 seconds. Make sure that the battery is not suspended or dropped into the soldering bath.

Do not heat above 80 °C to avoid leakage caused by deterioration in the battery’s performance.

UL-Recognition

All VARTA Microbattery Lithium Cells and Batteries are recognized by Underwriters Laboratories Inc. under UL-file number MH 13654 (N).

The cells are marked with the Recognized Component Mark.

Please also pay attention to the Safety Guidelines in Section 5.2.
5.1 SAFETY TESTS

Example Short Circuit

In table 11 the temperature is listed at short circuit at an ambient temperature of 20°C, 40°C and 70°C.

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>CR 1/2 AA</th>
<th>CR 2/3 AA</th>
<th>CR AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>20°C</td>
<td>24°C</td>
<td>28°C</td>
<td>24°C</td>
</tr>
<tr>
<td>40°C</td>
<td>50°C</td>
<td>50°C</td>
<td>47°C</td>
</tr>
<tr>
<td>70°C</td>
<td>80°C</td>
<td>84°C</td>
<td>77°C</td>
</tr>
</tbody>
</table>

Vibration Test

- Frequency range: 5 Hz - 55 Hz - 500 Hz - 55 Hz - 5 Hz
- Amplitude at frequency range:
  - 5 to 55 Hz: ± 0.75 mm
- Acceleration at frequency range:
  - 55 Hz to 500 Hz: 100 m/s²
- Cycle duration: 15 min
- Oscillation time of each main axis: 3 h

Without changing of the electrical values the following Li-cell can be exposed to this vibration test:
- CR 1/2 AA
- CR 2/3 AA
- CR AA
5.2 SAFETY GUIDELINES

For the current edition of the Material Safety Data Sheet (MSDS) please see:


## 5.3 OEM – APPLICATION CHECK LIST

### 1. PROJECT INFORMATION

<table>
<thead>
<tr>
<th>From (Writer)</th>
<th>Sales Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>Application</td>
</tr>
<tr>
<td>Name of the project</td>
<td>Country</td>
</tr>
</tbody>
</table>

### 2. MARKETING DATA

<table>
<thead>
<tr>
<th>Yearly expectation of sales</th>
<th>Per batch of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated selling price</td>
<td>Expected data of first order</td>
</tr>
<tr>
<td>Lifetime of the project</td>
<td>Start of volume production</td>
</tr>
</tbody>
</table>

Substitution of existing product

- Yes [ ]
- No [ ]

Which [ ]

Comments

### 3. WHAT IS REQUIRED?

<table>
<thead>
<tr>
<th>Feasibility study, preliminary proposal</th>
<th>Reply wishes for</th>
<th>Reply provided for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical proposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preliminary drawing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samples to run electric tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samples (with dummy cells)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prototypes (for qualification by the customer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preliminary cost estimation (+/- 20%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development and industrial cost estimation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product cost estimation (+/- 5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. TECHNICAL REQUIREMENTS

4.1. Storage before use

<table>
<thead>
<tr>
<th>Duration</th>
<th>Temperature min.</th>
<th>Average</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Humidity

4.2. Storage into the device before operating

<table>
<thead>
<tr>
<th>Duration</th>
<th>Temperature min.</th>
<th>Average</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Humidity

4.3. Specific tests prior incorporation


4.4. Electric data

Required minimum life time in use

Maximum voltage

Nominal capacity

Cut off voltage

Required minimum capacity

Current profile (average current, current pulse strength, pulse duration, pulse rate…)

Others

4.5. Climatic data

Operating temperature min.

Average

max.

Humidity

Others
4.6. Mechanical data (vibration, drop, bump, shock, …)

Mention the applicable specification and enclose the document if necessary.

4.7. Available dimensions: (weight, volume, if possible enclose the user drawing of the prospect)

4.8. Assembly (describe or enclose a drawing)

4.9. Applicable specifications / standards

UL □  BS UN □  IEC86-4 □  Other □

Reference and issue

4.10. Reliability level – Guarantees

4.11. Labeling and Packaging

VARTA standard labeling and packaging □

Customised labeling □ (enclose the customer specification)  Customised packaging □ (enclose the customer specification)

4.12. Attached documents

Samples □  Competitor samples □  Drawing □  Specification of the customer □

Copy of specific standards □  Samples of connector □  Samples of specific components □  Other □

4.13. Additional information
## VARTA Microbattery GmbH Product Portfolio

<table>
<thead>
<tr>
<th>Primary Batteries</th>
<th>Rechargeable Batteries</th>
<th>Hydrogen Gas Generating Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium-Manganese Cells</td>
<td>Li-Ion Button Cells</td>
<td>VARTA H₂ Cells</td>
</tr>
<tr>
<td>Lithium-Thionyl-Chloride Cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc Air Cells</td>
<td>Li-Ion &amp; Li-Polymer Batteries</td>
<td></td>
</tr>
<tr>
<td>Alkaline Batteries</td>
<td>NIMH Button Cells</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cylindrical &amp; Prismatic &amp; CellPac LITE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Li-Power Packs CellPac PLUS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Li-Power Packs</td>
<td></td>
</tr>
</tbody>
</table>

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www.varta-microbattery.com  
www.varta-storage.com