Primary Lithium Cells

Lithium Manganese Dioxide LiMnO₂

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 lightweight 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 1/2 AA Cylindrical Cells</th>
<th>CR AA 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 years¹</td>
<td>&gt;10 years¹</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°C²</td>
<td>-20 ... +65°C</td>
</tr>
<tr>
<td>Maximum temperature range (short term)³</td>
<td>-40 ... +80°C⁴</td>
<td>-40 ... +80°C⁴</td>
</tr>
<tr>
<td>Storage temperature⁵</td>
<td>-55 ... +75°C²</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

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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

1.4 SELECTION GUIDE

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 2430</td>
<td>6430 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  70°C
Discharge .......................... -20°C  65°C¹

Dimensions
Diameter (A) ......................... 11,40  11,60
Height (B) ........................... 10,40  10,80
Shoulder Diameter [L] .......... 7,60  8,00
Shoulder Height [M] ............. 0,40

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: 335 h, Capacity: 170 mAh, Energy: 475 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 +65°C.
² depending on environmental condition and energy consumption
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
Storage ......................... -55°C to 70°C¹
Discharge ....................... -20°C to 70°C¹

Dimensions
Diameter (A) ..................... 12,20 to 12,50
Height (B) ......................... 1,40 to 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</td>
<td>39000 Ω</td>
<td>Time: 355 h</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 -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°C¹
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: 36 mAh Energy: 100 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 -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
Temperature Ranges          
Storage  ....................... -55°C  70°C
Discharge ..................... -20°C  70°C¹
Dimensions  
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 Capacity: 50 mAh</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td>Energy: 142 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 -20°C to +70°C.
² depending on environmental condition and energy consumption
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</th>
<th>End Voltage: 2.0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous 24 h/d, 7 day Current (μA)</td>
<td>20000 0</td>
<td>500 h Capacity 70 mAh Energy: 200 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 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
                                    Month/Year

Temperature Ranges
Storage .................................... min.  max.
Discharge .............................. -55°C  70°C
                                        -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</td>
<td>15000 Ω</td>
<td>Time: 450 h</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td>200 μA</td>
<td>Capacity: 90 mAh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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

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 ............................ Date of Manufacturing Month/Year

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

Dimensions min. max.
Diameter (A) ......................... 19.70 20.00
Height (B) ........................... 2.20 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>
<tbody>
<tr>
<td>Continuous</td>
<td>10000 Ω</td>
<td>Time: 580 h</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td>Capacity: 165 mAh</td>
</tr>
<tr>
<td>Current [μA]</td>
<td></td>
<td>Energy: 475 mWh</td>
</tr>
</tbody>
</table>

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

• Self-discharge rate < 1% at room temperature
• Storage life > 10 years
• Operating life²> 10 years
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  70°C¹  
Discharge .................. -20°C  70°C¹

Dimensions  
Diameter (A) .................. 19,70  20,00
Height (B) ..................... 2,90  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>
<tbody>
<tr>
<td>Continuous</td>
<td>5600 Ω</td>
<td>Time: 600 h</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td>Capacity: 300 mAh</td>
</tr>
<tr>
<td>Current [μA]</td>
<td></td>
<td>Energy: 840 mWh</td>
</tr>
</tbody>
</table>

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

Self-discharge rate < 1% at room temperature
Storage life > 10 years
Operating life² > 10 years
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  min.  max.
Storage ......................... -55°C  70°C
Discharge ...................... -20°C  70°C¹

Dimensions  min.  max.
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 24 h/d, 7 d/w</td>
<td>5600 Ω</td>
<td>Time: 1250 h, Capacity: 620 mAh, Energy: 1730 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.
### 2.2 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>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>
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<tr>
<td>CR 1/3 N PC PCBD</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</td>
<td>±0.5</td>
<td>12.0 ±0.15</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>CR 1/3 N BE STO</td>
<td>6131 301 501</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<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>
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</table>

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

Custom made assemblies are available on request for large volume.

![FIG. 1](image1.png)

![FIG. 2 LF](image2.png)

![FIG. 3 SLF](image3.png)
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>
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<tr>
<td>CR 1216</td>
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<td>6220 101 501</td>
<td>12.5</td>
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<td>–</td>
<td>10.0</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<td>12.0</td>
<td>–</td>
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<td>–</td>
<td>12.9</td>
<td>–</td>
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<td>–</td>
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<tr>
<td>CR 2016</td>
<td>6016 101 501</td>
<td>20.0</td>
<td>1.6</td>
<td>0.1</td>
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<td>–</td>
<td>–</td>
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<td>–</td>
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<td>1.0</td>
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<td>20.3±0.15</td>
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<td>1.0±0.3</td>
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<td>10.0</td>
<td>9.1</td>
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<td>10.0</td>
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</table>

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

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>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>Fig. No.</th>
<th>Remarks</th>
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<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>–</td>
<td>–</td>
<td>8</td>
<td>–</td>
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<tr>
<td>CR 2025 ST</td>
<td>6025 201 501</td>
<td>21.3</td>
<td>1.0</td>
<td>10.0 ±0.3</td>
<td>1.0 ±0.3</td>
<td>3.0 ±0.5</td>
<td>20.3 ±0.15</td>
<td>–</td>
<td>1.0 ±0.3</td>
<td>4.5</td>
<td>–</td>
<td>–</td>
<td>9</td>
<td>tag 0.25 mm</td>
<td></td>
</tr>
<tr>
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<td>6025 301 501</td>
<td>20.0</td>
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<td>20.3</td>
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<td>–</td>
<td>–</td>
<td>10.0</td>
<td>4.0</td>
<td>10</td>
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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>
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<td>17.8</td>
<td>7.3</td>
<td>10.0</td>
<td>4.5</td>
<td>11.4</td>
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<td>21.5</td>
<td>1.0</td>
<td>10.0</td>
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<td>20.3</td>
<td>–</td>
<td>1.0</td>
<td>4.5</td>
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<td>tag 0.25 mm</td>
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<tr>
<td>CR 2032 SC STO</td>
<td>6032 301 501</td>
<td>–</td>
<td>–</td>
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<td>20.3</td>
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<td>tag 0.15 mm</td>
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<td>6032 401 501</td>
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<td>11.0</td>
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<td>4.5</td>
<td>11.4</td>
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<td>6032 701 501</td>
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<td>–</td>
<td>11.0</td>
<td>3.2</td>
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<td>7.3</td>
<td>10.0</td>
<td>4.5</td>
<td>10.0</td>
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<td>12</td>
<td>tag 0.20 mm</td>
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<td>–</td>
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<td>30.0</td>
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<tr>
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<td>20.0</td>
<td>7.0</td>
<td>2.8</td>
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</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>L</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>
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<td>20.0</td>
<td>–</td>
<td>–</td>
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<tr>
<td>CR 2430 SLF</td>
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<td>25.6</td>
<td>1.0</td>
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<td>25.0</td>
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<td>1.0</td>
<td>4.5</td>
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<td>16 tag 0.25 mm</td>
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<td>1.0</td>
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<td>11.0</td>
<td>3.0</td>
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<td>7.5</td>
<td>10.0</td>
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<td>7.5</td>
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<td>6450 101 501</td>
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<td>CR 2450 PCB 3</td>
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<td>7.5</td>
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<td>4.5</td>
<td>11.4</td>
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<td>19 tag 0.20 mm</td>
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<td>6450 301 013</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 2.0 °C to 2.0 V (mAh)</th>
<th>Max. continuous discharge current (mA)</th>
<th>Weight (g)</th>
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</thead>
<tbody>
<tr>
<td>CR 1/2 AA</td>
<td>6127 101 301</td>
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<td>950 mAh–5.6 kΩ</td>
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<td>6237 101 301</td>
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<td>1350 mAh–1.0 kΩ</td>
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<td>15.0</td>
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<td>6117 101 301</td>
<td>3</td>
<td>2000 mAh–1.0 kΩ</td>
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<td>21.5</td>
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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: 2,0 V</th>
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</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>5600 Ω</td>
<td>Time: 1860 h Capacity: 950 mAh Energy: 2700 mWh</td>
</tr>
<tr>
<td>Continuous</td>
<td>2000 Ω</td>
<td>Time: 670 h Capacity: 930 mAh Energy: 2600 mWh</td>
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<tr>
<td>Continuous</td>
<td>1000 Ω</td>
<td>Time: 335 h Capacity: 900 mAh Energy: 2400 mWh</td>
</tr>
<tr>
<td>Constant current</td>
<td>50 μA</td>
<td>Capacity: 1000 mAh</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

Discharge Characteristics* at room temperature 21°C

- 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
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 24 h/d, 7 d/w</td>
<td>1000 Ω</td>
<td>Time: 550 h  Capacity: 1350 mAh  Energy: 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
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: 2,0 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>1000 Ω</td>
<td>Time: 745 h Capacity: 2000 mAh Energy: 8600 mWh</td>
</tr>
<tr>
<td>Continuous</td>
<td>620 Ω</td>
<td>Time: 430 h Capacity: 1850 mAh Energy: 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*  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
### 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>–</td>
<td>–</td>
<td>7.0</td>
<td>6.6</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>–</td>
<td>–</td>
<td>25.4</td>
<td>3.0</td>
<td>5.0</td>
<td>–</td>
<td>–</td>
<td>2</td>
<td></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>3</td>
<td></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>7</td>
<td></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>10.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>33.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>6 (90°)</td>
<td></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>–</td>
<td>–</td>
<td>25.4</td>
<td>3.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>5 short pin</td>
<td></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>8 terminal pin</td>
<td></td>
</tr>
<tr>
<td>CR 1/2 AA 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>9 wire &amp; connector</td>
<td></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>–</td>
<td>–</td>
<td>7.0</td>
<td>6.6</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>–</td>
<td>–</td>
<td>33.7</td>
<td>3.0</td>
<td>5.0</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>3</td>
<td></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>7</td>
<td></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>3.5</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>4 single pin</td>
<td></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>–</td>
<td>–</td>
<td>7.0</td>
<td>6.6</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>3.0</td>
<td>5.0</td>
<td>–</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>3.0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>4 single pin</td>
<td></td>
</tr>
<tr>
<td>CR AA WC¹</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: CR High Power Primary Lithium Cylindrical Cells

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Nominal Voltage (V)</th>
<th>Nominal capacity at 20°C, load 200 Ω (mAh)</th>
<th>Max. continuous discharge current (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>6206 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</td>
<td>200 Ω</td>
<td></td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Performance Data

- **Temperature Characteristics**
  - Discharge Load 5,6 kΩ

- **Pulse discharge characteristics**
  - Load: cont. 560 Ω, Pulse load: 2 sec/min 3Ω (parallel)

- **Typical discharge curve**

- **Discharge Characteristics**
  - at room temperature 21°C
  - 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

Type Number .................. 6206
Designation IEC ............... CR 15H270
System .......................... Li-Manganese dioxide/ Organic Electrolyte

UL Recognition ................. MH 13654 (N)
Nominal Voltage ............... 3 V
Typical Capacity C ............... 850 mAh (Load 200 kOhm, at 20°C down to 2 V)

Weight (approx.) ................ 11 g
Volume .......................... 5,2 ccm
Coding .......................... TBA

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

Dimensions  min. max.
Diameter (A) .................... 15,10  15,60
Height (B) ....................... 26,30  27,00
Shoulder Diameter [L] ........... 6,20  6,30
Shoulder Height [M] ............. 0,70  1,30

Typical Capacities (at 20°C)

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>Load</th>
<th>End Voltage:  2,0 V</th>
</tr>
</thead>
</table>
| Continuous     | 200 Ω| Time: 63 h  
| 24 h/d, 7 d/w  |      | Capacity: 870 mAh   |

Performance Data

Temperature Characteristics

Pulse discharge characteristics*

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 123 A

Performance Data

Temperature Characteristics

- Discharge Load 5.6 kΩ

Pulse discharge characteristics

- Load: cont. 560 Ω, Pulse load: 2. sec/min 3Ω (parallel)

Typical discharge curve

- Load: cont. 100 Ω, Pulse load: 2. sec/min 3Ω (parallel)

Discharge Characteristics

- at room temperature 21°C

- 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.

---

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 Month/Year

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</td>
<td>100 Ω</td>
<td>Capacity: 1550 mAh</td>
</tr>
<tr>
<td>24 h/d, 7 d/w</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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>$r$</th>
<th>$b$</th>
<th>$c$</th>
<th>$d$</th>
<th>$w$</th>
<th>$e$</th>
<th>$g$</th>
<th>$h$</th>
<th>$i$</th>
<th>$k$</th>
<th>$l$</th>
<th>$m$</th>
<th>$n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR 2/3 AH S</td>
<td>6215 101 501</td>
<td>17.0 -1</td>
<td>33.9 -1.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</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>
</tr>
<tr>
<td>CR 123A P1</td>
<td>6205 210 501</td>
<td>17.0 -1</td>
<td>34.5 -0.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CR 2 P1</td>
<td>6206 210 501</td>
<td>15.6 -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>-</td>
</tr>
</tbody>
</table>

Material: nickel plated sheet-steel, tag thickness: 0.15 mm till 0.25 m. SLF: tip tinned.

Custom made assemblies are available on request for large volume.

**FIG. 1**

![Diagram 1](image1.png)

**FIG. 2**

![Diagram 2](image2.png)
5. GENERAL DESIGN CHARACTERISTICS

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

<table>
<thead>
<tr>
<th>Vibration test</th>
<th>Result</th>
</tr>
</thead>
</table>
| Frequency range: 5 Hz to 55 Hz | Without changing of the electrical values
| Amplitude at frequency range: 5 to 55 Hz: ± 0.75 mm | the following Li-cell can be exposed to this vibration test:
| Acceleration at frequency range: 55 Hz to 500 Hz: 100 m/s² | CR 1/2 AA
| Cycle duration: 15 min | CR 2/3 AA
| Oscillation time of each main axis: 3 h | 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>

Competitors

- Yes [ ]
- No [ ]

Substitution of existing product

- 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>Yes [ ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No [ ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical proposal</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Preliminary drawing</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Samples to run electric tests</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Samples (with dummy cells)</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Prototypes (for qualification by the customer)</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Preliminary cost estimation (+/- 20%)</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Development and industrial cost estimation</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Product cost estimation (+/- 5%)</th>
<th>Yes [ ]</th>
<th>No [ ]</th>
</tr>
</thead>
</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>
</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>
</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

<table>
<thead>
<tr>
<th>Operating temperature min.</th>
<th>Average</th>
<th>max.</th>
</tr>
</thead>
</table>

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  □

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>Lithium Button Cells</td>
<td>VARTA H₂ Cells</td>
</tr>
<tr>
<td>Lithium-Thionyl-Chloride Cells</td>
<td>Silver Oxide Button Cells</td>
<td></td>
</tr>
<tr>
<td>Zinc Air Cells</td>
<td>NIMH Button Cells</td>
<td></td>
</tr>
<tr>
<td>Alkaline Batteries</td>
<td>(V...H / HR / HT / HRT)</td>
<td></td>
</tr>
<tr>
<td>Li-Ion Button Cells</td>
<td>NiMH Cylindrical</td>
<td></td>
</tr>
<tr>
<td>CoinPower</td>
<td>Li-Power Packs</td>
<td></td>
</tr>
<tr>
<td>Li-Ion &amp; Li-Polymer Batteries</td>
<td>CellPac PLUS</td>
<td></td>
</tr>
<tr>
<td>Cylindrical &amp; Prismatic &amp; CellPac LITE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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