

Primary Lithium Cells

Lithium Manganese
Dioxide LiMnO_2

Sales Program and
Technical Handbook



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1. GENERAL INFORMATION

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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.

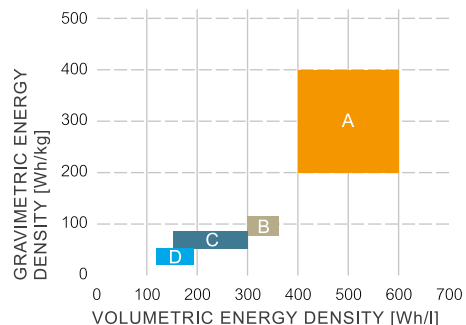
Advantages for VARTA Microbattery LiMnO₂ Cells

- 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



1.1 CONSTRUCTIONS OF LITHIUM CELLS

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

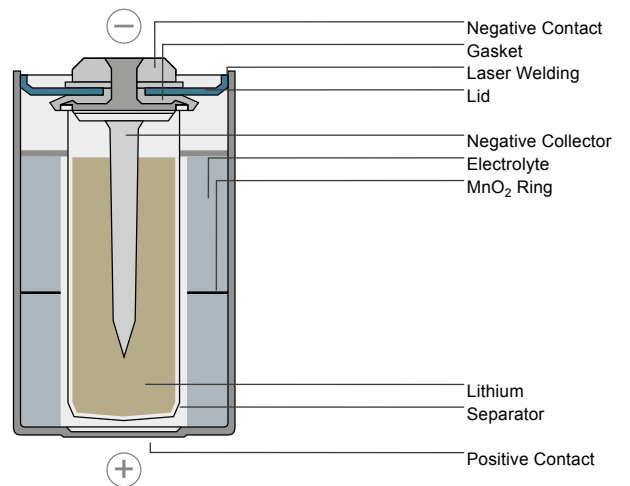
requiring up to a 10 years operational life at 20°C. Our spirally wound electrode product offers high-rate discharge capability, with an operational life in excess of 5 years.

For compact and light weight equipment use we have a complete range of high performance primary lithium button cells.

Lithium Cylindrical Batteries

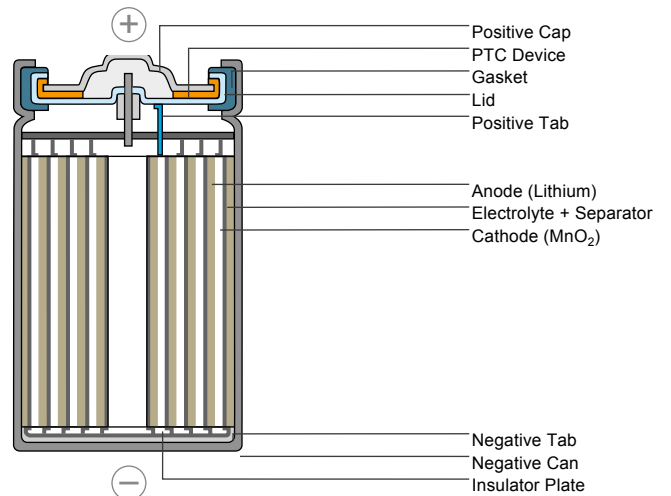
BOBBIN CONSTRUCTION

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



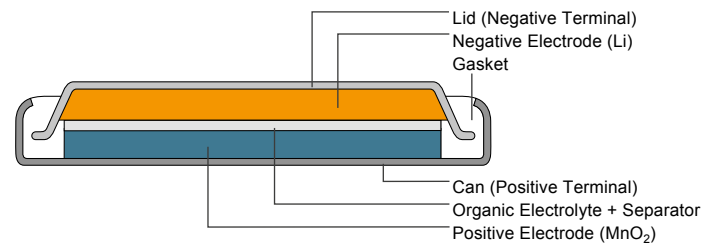
SPIRAL CONSTRUCTION

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



Lithium Button Cells

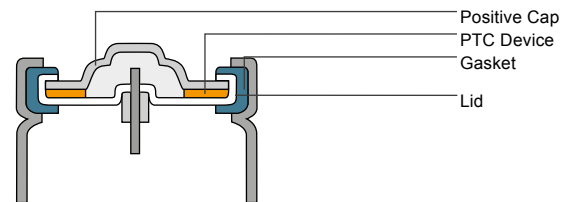
Schematic construction of a
Li/MnO₂ Button Cell



Sealing Technologies

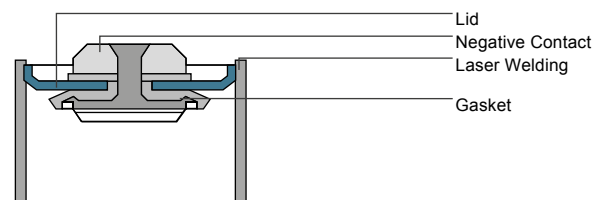
CRIMP-SEALING

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.

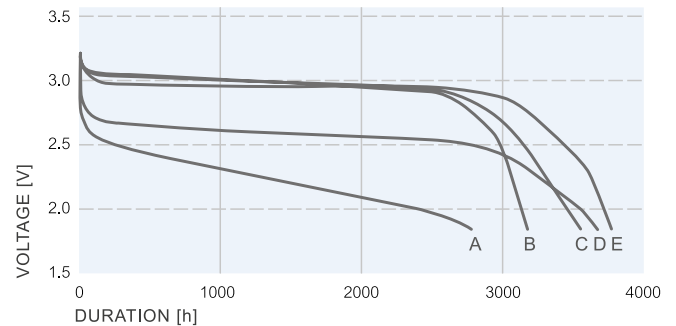
Main Characteristics

- Long life expectancy and long operational life
- Low self discharge rate
- High energy density
- High cell voltage (3V)
- 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

| Series | CR Series Cylindrical Cells | CR Series Button Cells |
|--|-----------------------------|-----------------------------|
| System | Li/MnO ₂ | Li/MnO ₂ |
| Gravimetric energy density | 250–300 Wh/kg | 250–300 Wh/kg |
| Nominal voltage | 3.0 V | 3.0 V |
| Open circuit voltage | 3.2 V | 3.2 V |
| Available capacity range | 950–2000 mAh | 25–560 mAh |
| Storage life | >10 years ¹⁾ | >10 years ¹⁾ |
| Self discharge d=20°C | <1% p.a. | <1% p.a. |
| Operating temperature | -30 ... +75°C ²⁾ | -20 ... +65°C |
| Maximum temperature range (short term) ³⁾ | -40 ... +80°C ⁴⁾ | -40 ... +80°C ⁴⁾ |
| Storage temperature ⁵⁾ | -55 ... +75°C ²⁾ | -55...+70°C |

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.



Utility Meters

Safety/Security Systems

Door Lockers, Security and Alarm Systems, Smoke and other Sensors and Detectors, Burglar Alarm Systems.



Security Systems

Automotive Electronics

Mileage or Kilometer Counters, Onboard Computers, Electronic Monitoring, Navigational Equipment, Airbag Sensor and Gas Generators, Car radios, Container temperature loggers, Community Traffic Control Systems, Traffic Volume Control, Traffic Chart Recorders, Taximeters.

Asset Tracking

Personal Identification, RF-ID Transponder, Bar Code Reader, Scanner, Goods Tracking, Trailer Identification, Goods Locationing.



Toll Pass



Asset Tracking

Automation

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



Automation

Vending Machines

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



Vending Machines

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.



High End Consumer

Industrial/Medical Instrumentation

Industrial Clocks, Pulse-/Event-Counters, High Voltage Power Line Fault Detectors, Remote Data Logging and Data Acquisition Systems, Seismic Measurement Equipment, Biotelemetry, Telemetry Equipment, Weather Balloon Transmitters, Automatic Weather Monitoring Stations, Compass Illumination, Caliper Pig for pipeline maintenance, Oscilloscopes, Medical Instruments, Gauges.



Industrial/Medical Instrumentation

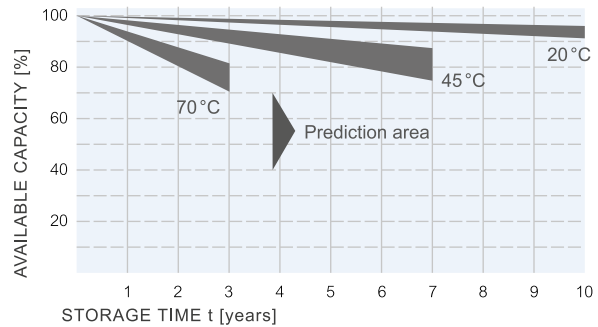
1.4 SELECTION GUIDE

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

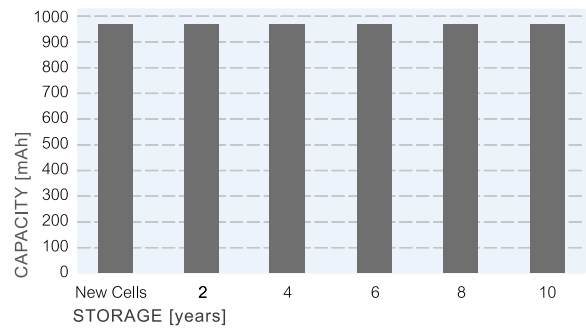
CAPACITY RETENTION

Capacity retention characteristics of VARTA Microbattery Lithium Cells Cylindrical Cells CR...AA and CR...A



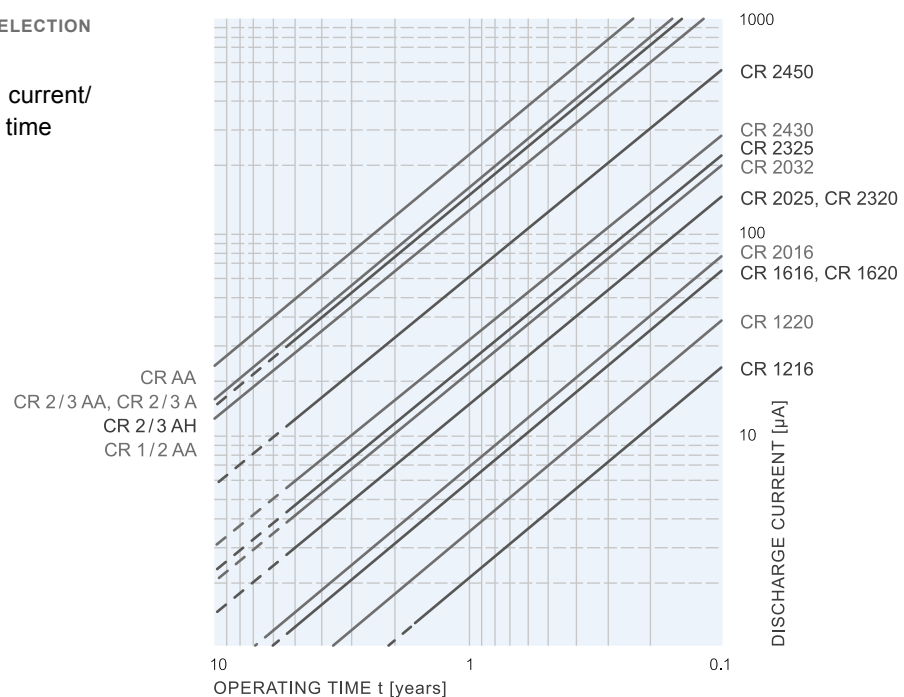
STORAGE BEHAVIOR

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..... | 12–22 |
| 2.2 | Assemblies | 23–26 |



2.1 TYPES – TECHNICAL DATA



CR 1216



CR 1616



CR 2016



CR 2025



CR 2032



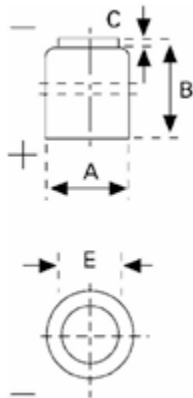
CR 2450

| Type | Order No. | Nominal voltage (V) | Typical capacity ¹⁾ (mAh) | Standard load (kΩ) | Max. discharge current (continuous) (mA) | Max. discharge current (pulse) (mA) | Weight (g) |
|----------|--------------|---------------------|--------------------------------------|--------------------|--|-------------------------------------|------------|
| CR 1/3 N | 6131 101 501 | 3 | 170 | 5.6 | 20 | 80 | 3.0 |
| CR 1216 | 6216 101 501 | 3 | 27 | 39 | 2 | 5 | 0.7 |
| CR 1220 | 6220 101 501 | 3 | 35 | 39 | 2 | 5 | 0.8 |
| CR 1616 | 6616 101 501 | 3 | 55 | 39 | 3 | 8 | 1.2 |
| CR 1620 | 6620 101 501 | 3 | 70 | 20 | 3 | 8 | 1.2 |
| CR 2016 | 6016 101 501 | 3 | 90 | 15 | 3 | 10 | 1.8 |
| CR 2025 | 6025 101 501 | 3 | 165 | 10 | 3 | 10 | 2.5 |
| CR 2032 | 6032 101 501 | 3 | 230 | 5.6 | 3 | 10 | 3.0 |
| CR 2430 | 6430 101 501 | 3 | 300 | 5.6 | 3 | 20 | 4.0 |
| CR 2450 | 6450 101 501 | 3 | 620 | 5.6 | 2 | 20 | 6.2 |

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 min. max.
 Storage -55°C 70°C
 Discharge -20°C 65°C¹

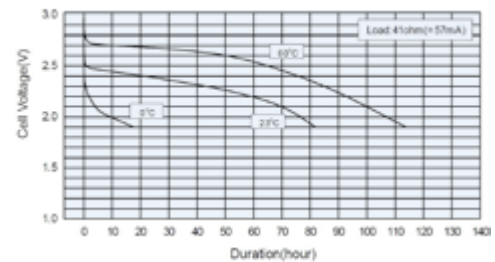
Dimensions min. max.
 Diameter (A) 11,40 11,60
 Height (B) 10,40 10,80
 Shoulder Diameter [L] 7,60 8,00
 Shoulder Height [M] 0,40

Typical Capacities (at 20°C)

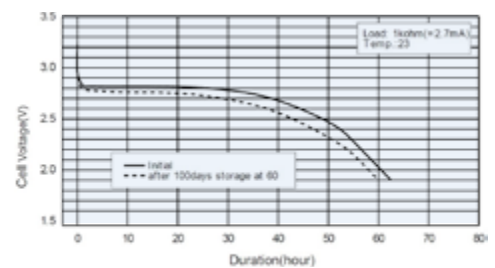
| Discharge Type | Load | End Voltage: 2,0 V |
|---|--------|---|
| Continuous 24 h/d, 7 d/w Current [µA] | 5600 Ω | Time: 335 h Capacity: 170 mAh Energy: 475 mWh |

Performance Data

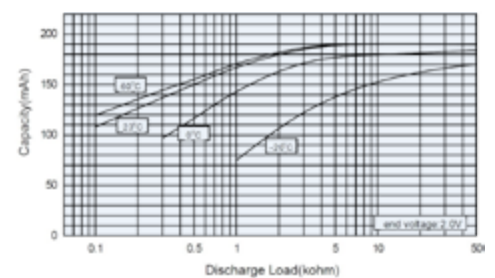
Temperature Characteristics



Operating Voltage vs. load resistance



Capacity vs. load resistance

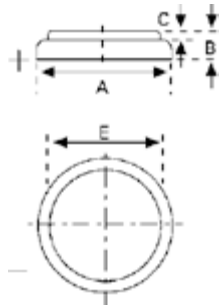


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +65°C.

² depending on environmental condition and energy consumption

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

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

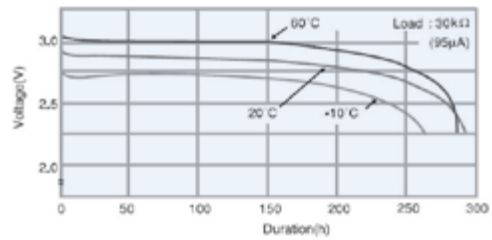
Dimensions min. max.
 Diameter (A) 12,20 12,50
 Height (B) 1,40 1,60
 Shoulder Diameter [E] 10,00
 Shoulder Height [C] 0,20

Typical Capacities (at 20°C)

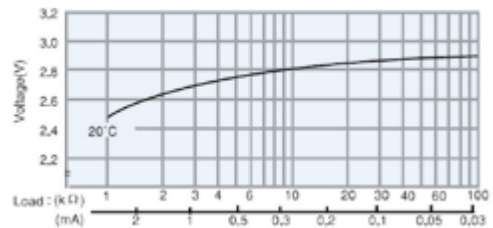
| Discharge Type | Load | End Voltage: 2,0 V |
|---|---------|---|
| Continuous 24 h/d, 7 d/w Current [µA] | 39000 Ω | Time: 355 h Capacity: 27 mAh Energy: 77 mWh |

Performance Data

Temperature Characteristics

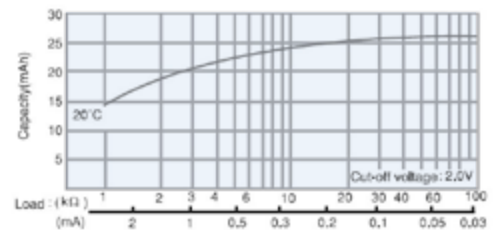


Operating Voltage vs. load resistance*

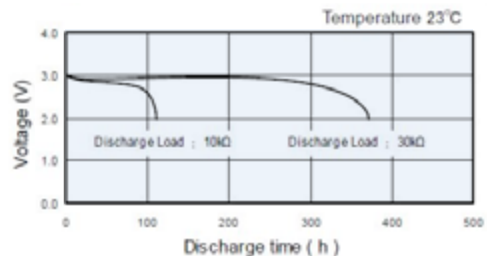


*Discharge depth 50%

Capacity vs. load resistance



Discharge Characteristics

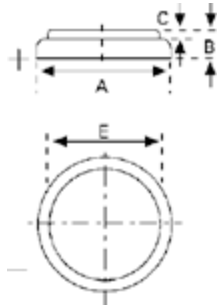


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

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

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 | min. | max. |
| Storage | -55°C | 70°C |
| Discharge | -20°C | 70°C ¹ |

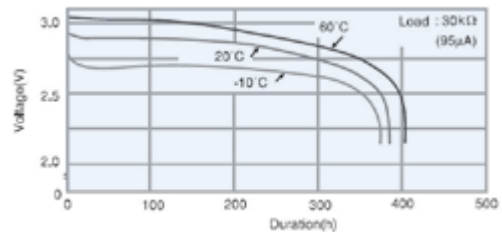
| | | |
|-----------------------------|-------|-------|
| Dimensions | min. | max. |
| Diameter (A) | 12,20 | 12,50 |
| Height (B) | 1,80 | 2,00 |
| Shoulder Diameter [E] | 10,00 | |
| Shoulder Height [C] | 0,30 | |

Typical Capacities (at 20°C)

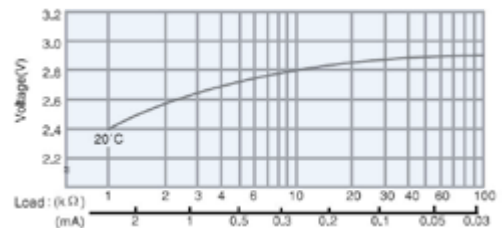
| Discharge Type | Load | End Voltage: 2,0 V |
|---|---------|--|
| Continuous 24 h/d, 7 d/w Current [µA] | 39000 Ω | Time: 480 h Capacity: 35 mAh Energy: 100 mWh |

Performance Data

Temperature Characteristics

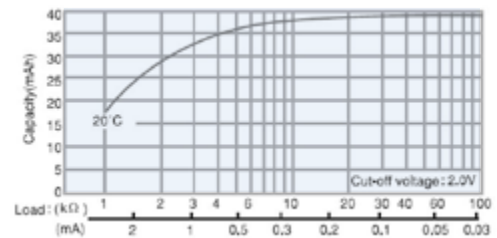


Operating Voltage vs. load resistance*

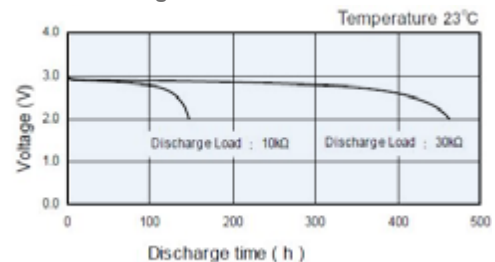


*Discharge depth 50%

Capacity vs. load resistance



Discharge Characteristics

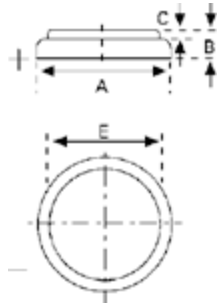


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

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

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

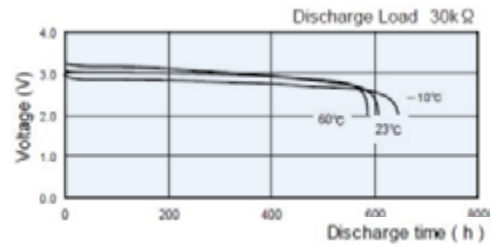
Dimensions min. max.
 Diameter (A) 15,70 16,00
 Height (B) 1,40 1,60
 Shoulder Diameter [E] 12,00
 Shoulder Height [C] 0,20

Typical Capacities (at 20°C)

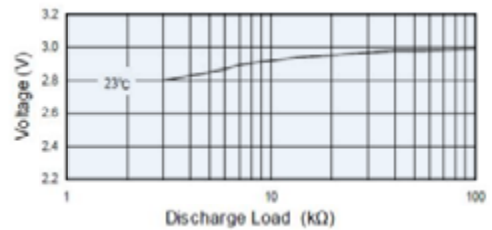
| Discharge Type | Load | End Voltage: 2,0 V |
|---|---------|--|
| Continuous 24 h/d, 7 d/w Current [µA] | 39000 Ω | Time: 670 h Capacity: 50 mAh Energy: 142 mWh |

Performance Data

Temperature Characteristics

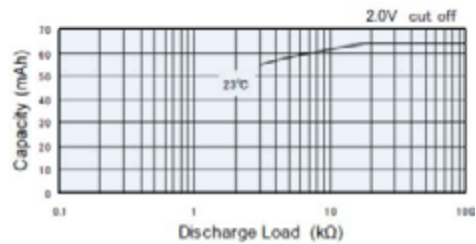


Operating Voltage vs. load resistance*

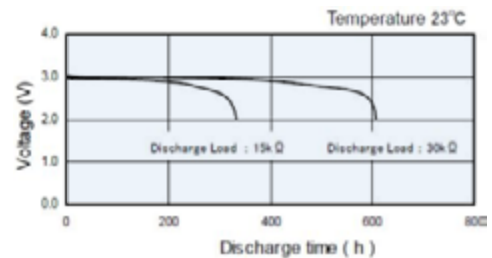


*Discharge depth 40%

Capacity vs. load resistance



Discharge Characteristics

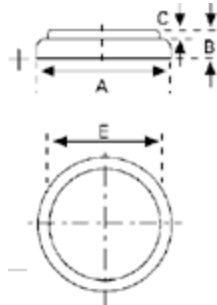


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

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

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

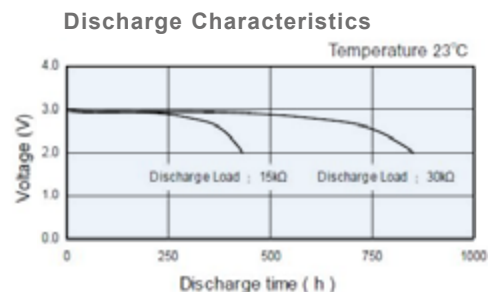
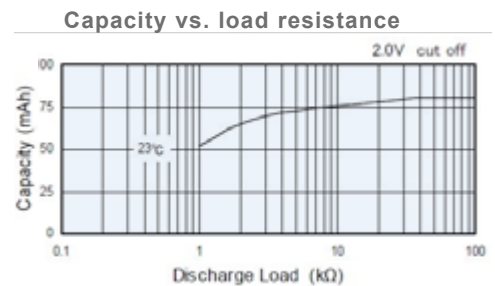
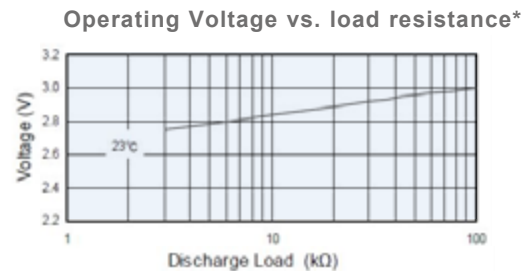
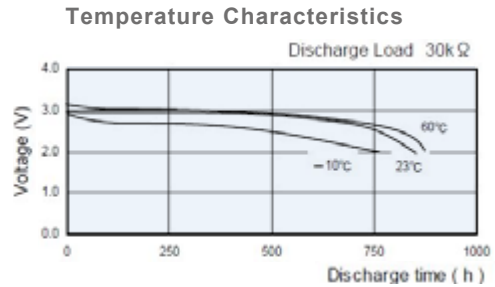
Temperature Ranges min. max.
 Storage -55°C 70°C
 Discharge -20°C 70°C¹

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)

| Discharge Type | Load | End Voltage: 2,0 V |
|---|---------|--|
| Continuous 24 h/d, 7 d/w Current [µA] | 20000 Ω | Time: 500 h Capacity: 70 mAh Energy: 200 mWh |

Performance Data

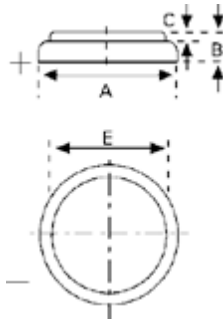


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

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

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

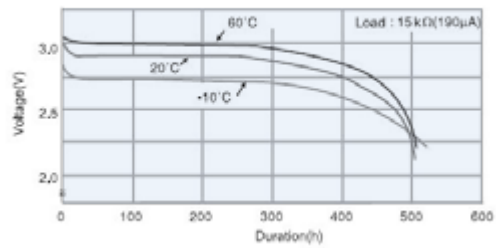
Dimensions min. max.
 Diameter (A) 19,70 20,00
 Height (B) 1,40 1,60
 Shoulder Diameter [E] 18,40
 Shoulder Height [C] 0,10

Typical Capacities (at 20°C)

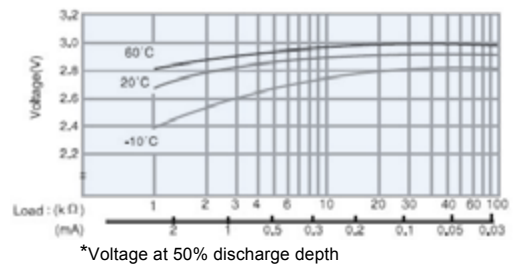
| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|---------|--|
| Continuous 24 h/d, 7 d/w | 15000 Ω | Time: 450 h Capacity: 90 mAh Energy: 270 mWh |
| | 200 μA | |

Performance Data

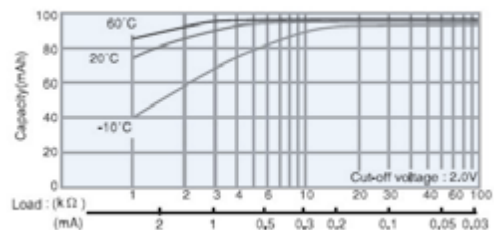
Temperature Characteristics



Operating Voltage vs. load resistance*



Capacity vs. load resistance

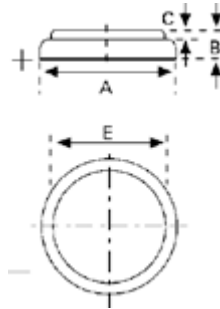


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

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

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°C ¹ |

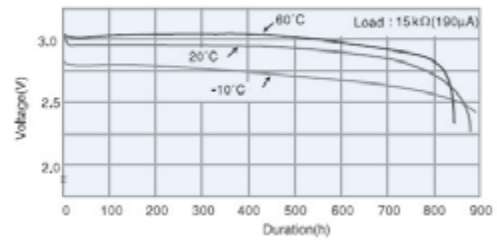
| | | |
|-----------------------------|-------|-------|
| Dimensions | min. | max. |
| Diameter (A) | 19,70 | 20,00 |
| Height (B) | 2,20 | 2,50 |
| Shoulder Diameter [E] | 18,30 | |
| Shoulder Height [C] | 0,20 | |

Typical Capacities (at 20°C)

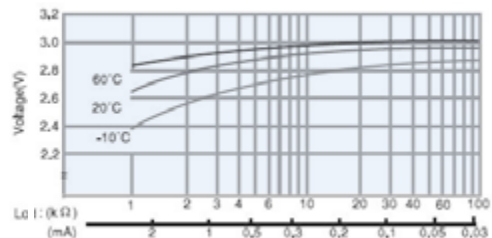
| Discharge Type | Load | End Voltage: 2,0 V |
|---|---------|---|
| Continuous 24 h/d, 7 d/w Current [µA] | 10000 Ω | Time: 580 h Capacity: 165 mAh Energy: 475 mWh |

Performance Data

Temperature Characteristics

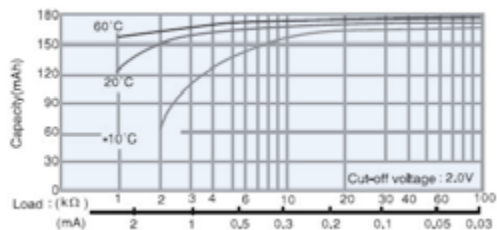


Operating Voltage vs. load resistance*



*Voltage at 50% discharge depth

Capacity vs. load resistance

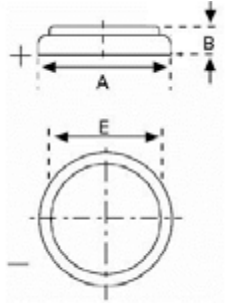


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

- Self-discharge rate < 1%/Y 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 min. max.
 Storage -55°C 70°C
 Discharge -20°C 70°C¹

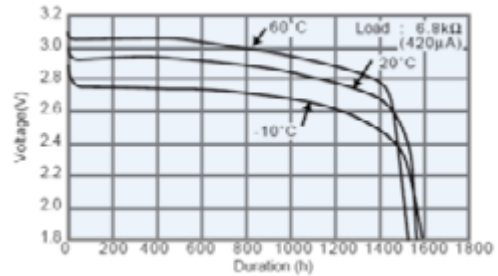
Dimensions min. max.
 Diameter (A) 19,70 20,00
 Height (B) 2,90 3,20
 Shoulder Diameter [E] 16,00

Typical Capacities (at 20°C)

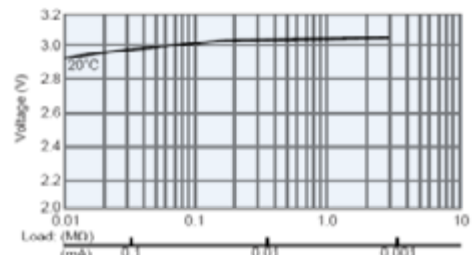
| Discharge Type | Load | End Voltage: 2,0 V |
|---|--------|---|
| Continuous 24 h/d, 7 d/w Current [µA] | 5600 Ω | Time: 460 h Capacity: 230 mAh Energy: 645 mWh |

Performance Data

Temperature Characteristics

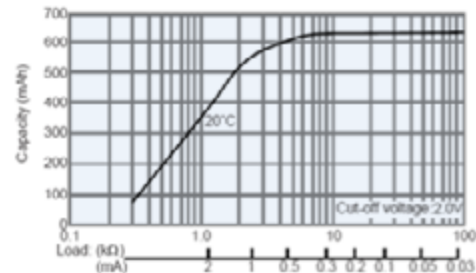


Operating Voltage vs. load resistance*



*Discharge depth 40%

Capacity vs. load resistance

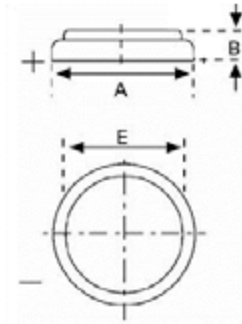


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

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

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°C ¹ |

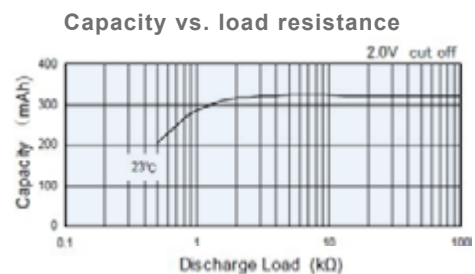
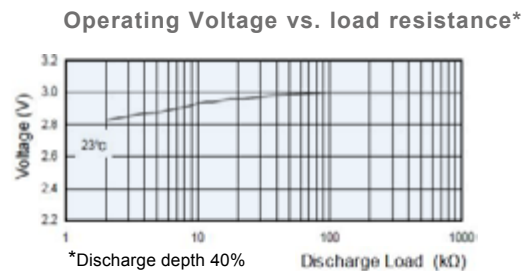
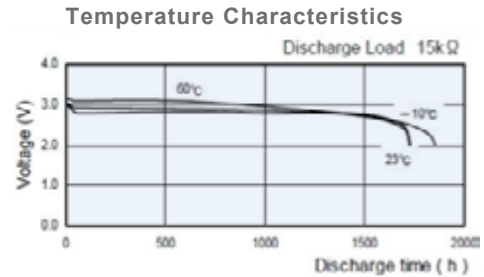
Dimensions

| | 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)

| Discharge Type | Load | End Voltage: 2,0 V |
|---|--------|---|
| Continuous 24 h/d, 7 d/w Current [µA] | 5600 Ω | Time: 600 h Capacity: 300 mAh Energy: 840 mWh |

Performance Data

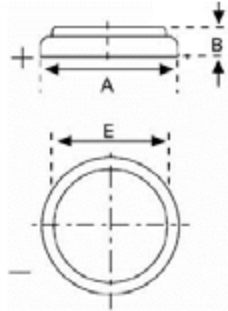


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +70°C.

² depending on environmental condition and energy consumption

- Self-discharge rate < 1%/Y 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

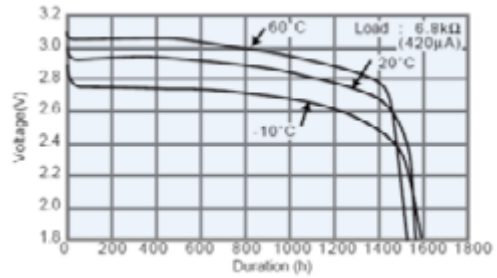
Dimensions min. max.
 Diameter (A) 24,20 24,70
 Height (B) 4,60 5,00
 Shoulder Diameter [E] 21,00

Typical Capacities (at 20°C)

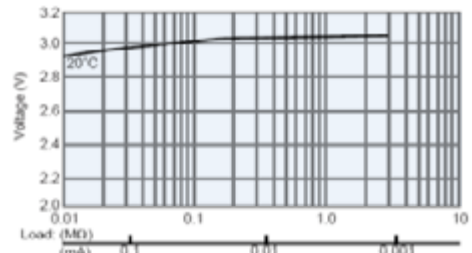
| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|--------|---|
| Continuous 24 h/d, 7 d/w | 5600 Ω | Time: 1250 h Capacity: 620 mAh Energy: 1730 mWh |

Performance Data

Temperature Characteristics

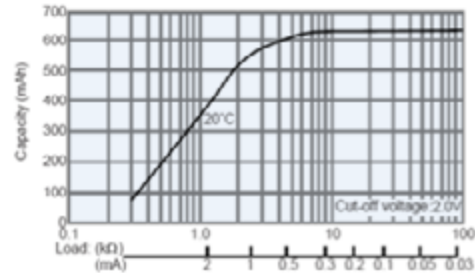


Operating Voltage vs. load resistance*



*Discharge depth 40%

Capacity vs. load resistance



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%/Y at room temperature
- Storage life > 10 years
- Operating life² > 10 years

2.2 ASSEMBLIES

CR 1/3 N

| Type | Order No. | A | B | C | D | E | F | G | H | I | K | L | Fig.No. | Remarks |
|-----------------|--------------|------|------|------|----------|-----------|-----------|---|----------|-----|------|-----|---------|---------------------|
| CR 1/3 N | 6131 101 501 | 11.6 | 10.8 | 0.4 | 7.8 | - | - | - | - | - | - | - | 1 | - |
| CR 1/3 N PC PCB | 6131 201 501 | 13.0 | 1.0 | 10.0 | 1.0 ±0.5 | 11.5 ±0.5 | 12.0 ±0.5 | - | 1.0 ±0.5 | 3.0 | - | - | 3 | tag 0.25 mm |
| CR 1/3 N BE STO | 6131 301 501 | - | - | - | - | 11.5 | 12.0 | - | - | - | 19.0 | 4.0 | 2 | tag 0.25 mm 180° |

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

Custom made assemblies are available on request for large volume.

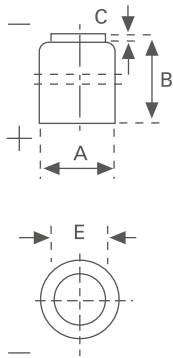


FIG. 1

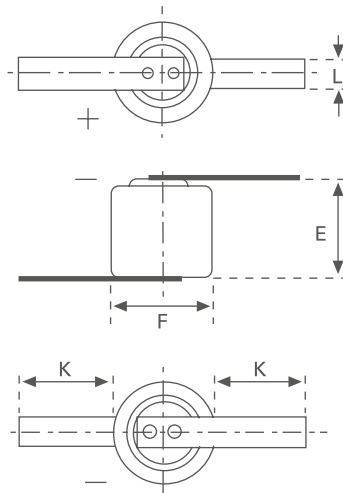


FIG. 2 LF

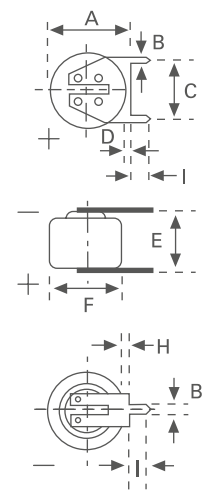


FIG. 3 SLF

CR Button

| Type | Order No. | A | B | C | D | E | F | G | H | I | K | L | Fig. No. | Remarks |
|------------------|--------------|------|-----|------------|----------|----------|------------|-----|----------|-----|------|-----|----------|-------------|
| CR 1216 | 6216 101 501 | 12.5 | 1.6 | 0.2 | - | 10.0 | - | - | - | - | - | - | 4 | |
| CR 1220 | 6220 101 501 | 12.5 | 2.0 | 0.3 | - | 10.0 | - | - | - | - | - | - | 4 | |
| CR 1616 | 6616 101 501 | 16.0 | 1.6 | 0.2 | - | 12.0 | - | - | - | - | - | - | 4 | |
| CR 1620 | 6620 101 501 | 16.0 | 2.0 | 0.02 | - | 12.9 | - | - | - | - | - | - | 4 | |
| CR 2016 | 6016 101 501 | 20.0 | 1.6 | 0.1 | - | - | - | - | - | - | - | - | 4 | |
| CR 2016 SC PCBD | 6016 201 501 | 21.3 | 1.0 | 10.0 ±0.15 | 1.0 ±0.3 | 2.1 ±0.5 | 20.3 ±0.15 | - | 1.0 ±0.3 | 4.5 | - | - | 5 | tag 0.25 mm |
| CR 2016 SC STO | 6016 301 501 | 20.0 | - | - | - | 1.9 | 20.0 | - | - | - | 10.0 | 4.0 | 6 | tag 0.15 mm |
| CR 2016 BE PCBD | 6016 401 501 | 20.0 | 1.0 | 10.0 | 9.1 | 1.6 | 17.8 | 7.3 | 10.0 | 4.5 | 11.4 | - | 7 | tag 0.15 mm |
| CR 2016 FM S STO | 6016 301 012 | 20.5 | 3.5 | 1.8 | 3.0 | 2.2 | - | - | - | - | - | - | - | |

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

Custom made assemblies are available on request for large volume.

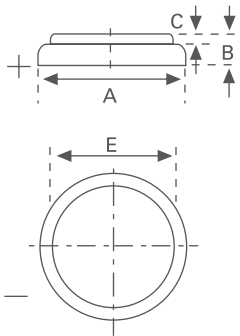


FIG. 4

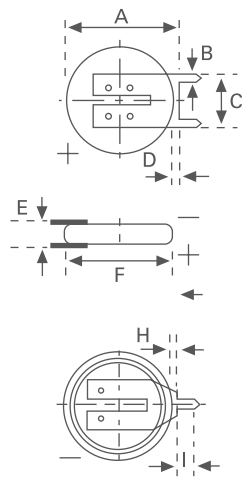


FIG. 5 SLF

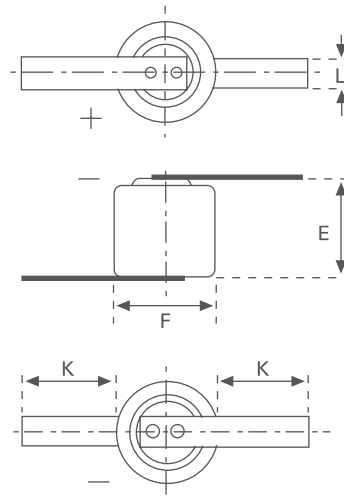


FIG. 6 LF

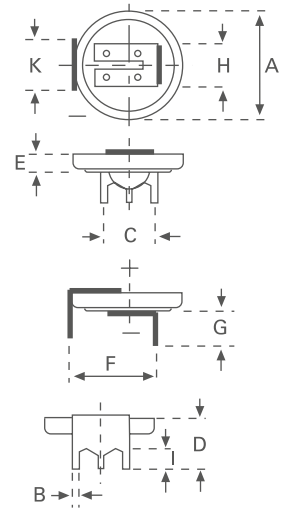


FIG. 7 PCB 3

CR Button

| Type | Order No. | A | B | C | D | E | F | G | H | I | K | L | Fig. No. | Remarks |
|----------------------------|--------------|------|-----|-----------|----------|----------|------------|-----|----------|-----|------|-----|----------|---------------------------|
| CR 2025 | 6025 101 501 | 20.0 | 2.5 | 0.2 | - | - | - | - | - | - | - | - | 8 | - |
| CR 2025 ST | 6025 201 501 | 21.3 | 1.0 | 10.0 ±0.2 | 1.0 ±0.3 | 3.0 ±0.5 | 20.3 ±0.15 | - | 1.0 ±0.3 | 4.5 | - | - | 9 | tag 0.25 mm |
| CR 2025 SC STO | 6025 301 501 | 20.0 | - | - | - | 2.8 | 20.3 | - | - | - | 10.0 | 4.0 | 10 | tag 0.15 mm |
| CR 2025 BE PCBD | 6025 401 501 | 20.0 | 1.0 | 10.0 | 10.0 | 2.8 | 17.8 | 7.3 | 10.0 | 4.5 | 11.4 | - | 11 | tag 0.15 mm |
| CR 2032 | 6032 101 501 | 20.0 | 3.2 | 0.02 | - | 16.5 | - | - | - | - | - | - | 8 | - |
| CR 2032 SC PCBD | 6032 201 501 | 21.5 | 1.0 | 10.0 | 1.0 ±0.3 | 4.2 | 20.3 | - | 1.0 | 4.5 | - | - | 9 | tag 0.25 mm |
| CR 2032 SC STO | 6032 301 501 | - | - | - | - | 3.2 | 20.3 | - | - | - | 10.0 | 4.0 | 10 | tag 0.15 mm |
| CR 2032 PCBD | 6032 401 501 | 20.0 | 1.0 | 10.0 | 11.0 | 3.2 | 17.8 | 7.5 | 10.0 | 4.5 | 11.4 | - | 11 | tag 0.25 mm |
| CR 2032 BE PCBS | 6032 701 501 | 20.0 | 1.0 | - | 11.0 | 3.2 | 17.8 | 7.3 | 10.0 | 4.5 | 10.0 | - | 12 | tag 0.20 mm |
| CR 2032 S WC ¹⁾ | 6032 101 013 | 20.7 | - | - | - | 5.5 | 30.0 | - | - | - | 96.0 | 2.0 | 13 | tag 0.20 mm ²⁾ |
| CR 2032 S STO | 6032 101 012 | 20.0 | 7.0 | 2.8 | 5.0 | 3.8 | - | - | - | - | - | - | 14 | - |

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.

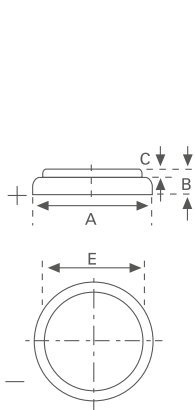


FIG. 8

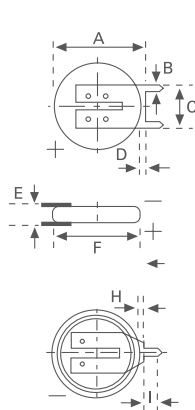


FIG. 9 SLF

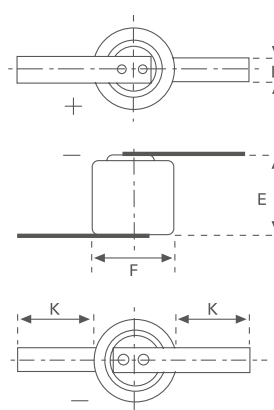


FIG. 10 LF

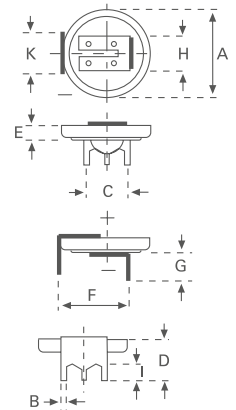


FIG. 11 PCB3

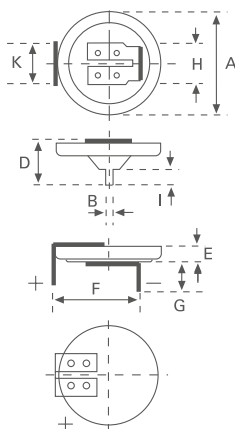


FIG. 12 PCB 2

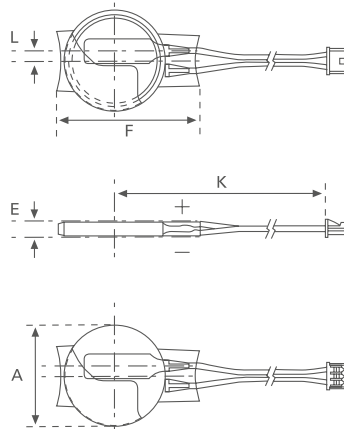


FIG. 13 WC

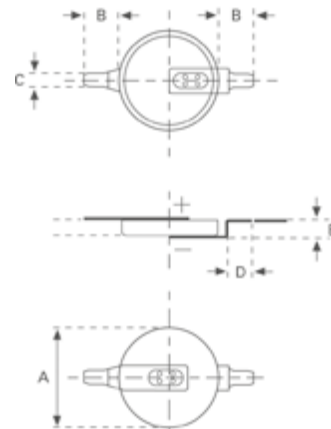


FIG. 14 SMT

CR Button

| Type | Order No. | A | B | C | D | E | F | G | H | I | K | L | Fig. No. | Remarks |
|---------------|--------------|------|-----|------|------|------|------|-----|------|-----|------|-----|----------|-------------|
| CR 2430 | 6430 101 501 | 24.5 | 3.0 | 0.3 | - | 20.0 | - | - | - | - | - | - | 15 | - |
| CR 2430 SLF | 6430 201 501 | 25.6 | 1.0 | 10.0 | 1.0 | 4.0 | 25.0 | - | 1.0 | 4.5 | - | - | 16 | tag 0.25 mm |
| CR 2430 LF | 6430 301 501 | - | - | - | - | 3.2 | 25.0 | - | - | - | 10.0 | 4.0 | 17 | tag 0.15 mm |
| CR 2430 PCB 3 | 6430 401 501 | 24.5 | 1.0 | 10.0 | 11.0 | 3.0 | 17.8 | 7.5 | 10.0 | 4.5 | 11.4 | - | 18 | tag 0.25 mm |
| CR 2430 PCB 2 | 6430 701 501 | 24.5 | 1.0 | - | 11.0 | 3.0 | 20.0 | 7.5 | 10.0 | 4.5 | 11.4 | - | 19 | tag 0.20 mm |
| CR 2430 SMT | 6430 301 012 | 24.5 | 5.2 | 4.0 | 5.0 | 3.3 | - | - | - | - | - | - | 20 | - |
| CR 2450 | 6450 101 501 | 24.7 | 5.0 | 0.5 | - | 21.8 | - | - | - | - | - | - | 15 | - |
| CR 2450 SLF | 6450 201 501 | 25.6 | 1.0 | 10.0 | 1.0 | 6.0 | 25.0 | - | 1.0 | 4.5 | - | - | 16 | tag 0.25 mm |
| CR 2450 PCB 3 | 6450 401 501 | 24.5 | 1.0 | 10.0 | 13.2 | 5.0 | 17.8 | 7.5 | 10.0 | 4.5 | 11.4 | - | 18 | tag 0.25 mm |
| CR 2450 PCB 2 | 6450 701 501 | 24.7 | 1.0 | - | 12.7 | 5.0 | 17.8 | 7.5 | 10.0 | 4.5 | 11.4 | - | 19 | tag 0.20 mm |
| CR 2450 SMT | 6450 301 013 | 24.5 | 4.5 | 2.8 | 3.5 | 5.3 | - | - | - | - | - | - | 20 | - |

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.

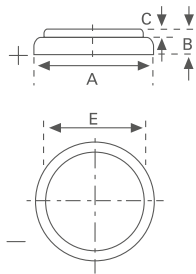


FIG. 15

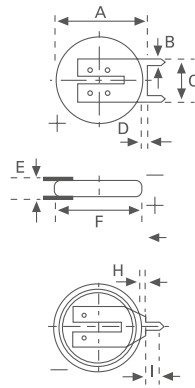


FIG. 16 SLF

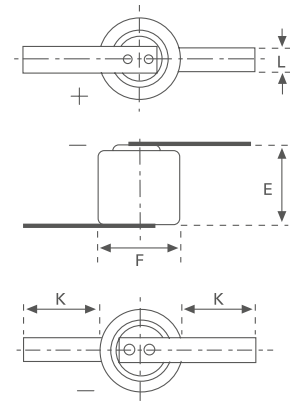


FIG. 17 LF

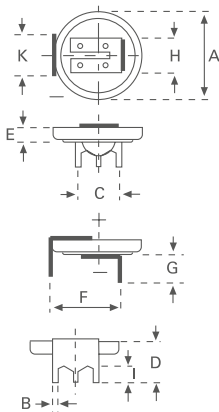


FIG. 18 PCB 3

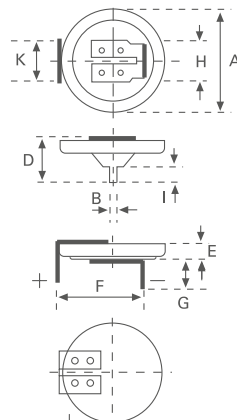


FIG. 19 PCB 2

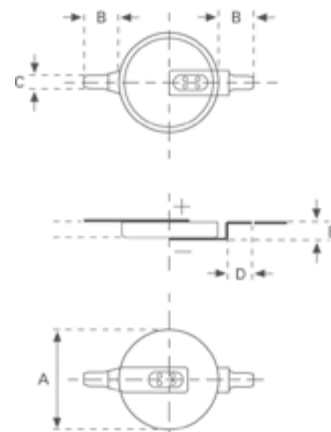
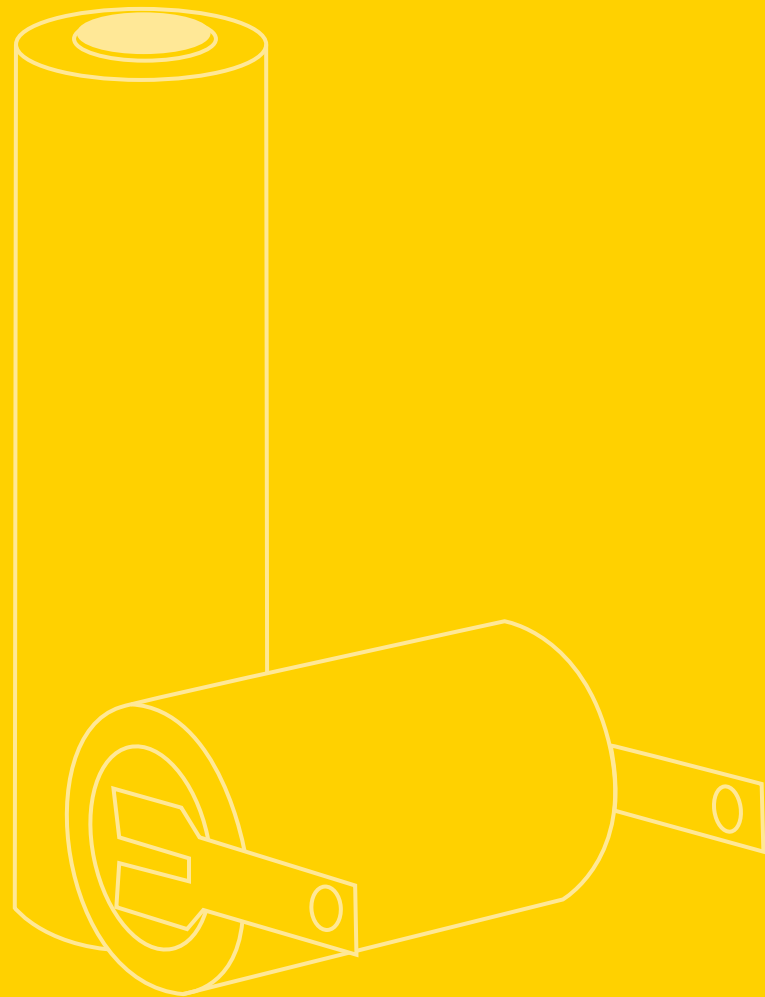


FIG. 20 SMT

3. CR HIGH CAPACITY PRIMARY LITHIUM CYLINDRICAL CELLS



| | | |
|-----|------------------------------|-------|
| 3.1 | Types – Technical Data | 28–31 |
| 3.2 | Assemblies | 32–33 |



3.1 TYPES – TECHNICAL DATA

| Type | Order No. | Nominal voltage (V) | Nominal capacity at 20°C, down to 2.0 V, load (mAh) | Max. continuous discharge current (mA) | Weight (g) |
|-----------|--------------|---------------------|---|--|------------|
| CR 1/2 AA | 6127 101 301 | 3 | 950 mAh–5.6 kΩ | 5 | 11.5 |
| CR 2/3 AA | 6237 101 301 | 3 | 1350 mAh–1.0 kΩ | 10 | 15.0 |
| CR AA | 6117 101 301 | 3 | 2000 mAh–1.0 kΩ | 15 | 21.5 |

Technical data, CR High Capacity Primary Lithium Cylindrical Cells



CR 1/2 AA

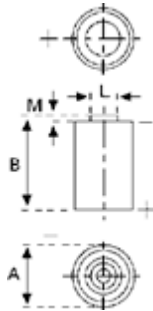


CR 2/3 AA



CR AA

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°C ¹ |

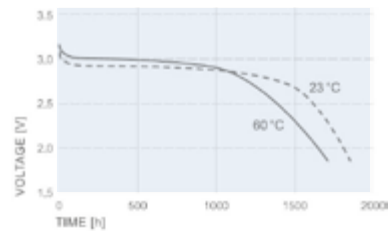
| | | |
|-----------------------------|-------------|-------------|
| Dimensions | min. | max. |
| Diameter (A) | 14,15 | 14,45 |
| Height (B) | 25,09 | 25,30 |
| Shoulder Diameter [L] | 7,00 | |
| Shoulder Height [M] | 0,90 | |

Typical Capacities (at 20°C)

| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|--------|---|
| Continuous 24 h/d, 7 d/w | 5600 Ω | Time: 1860 h Capacity: 950 mAh Energy: 2700 mWh |
| Continuous 24 h/d, 7 d/w | 2000 Ω | Time: 670 h Capacity: 930 mAh Energy: 2600 mWh |
| Continuous 24 h/d, 7 d/w | 1000 Ω | Time: 335 h Capacity: 900 mAh Energy: 2400 mWh |
| Constant current | 50 μA | Capacity: 1000 mAh |

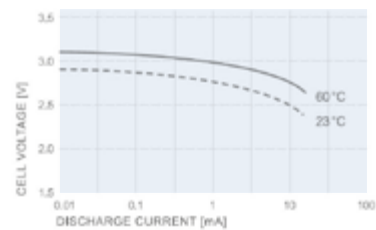
Performance Data

Temperature Characteristics*



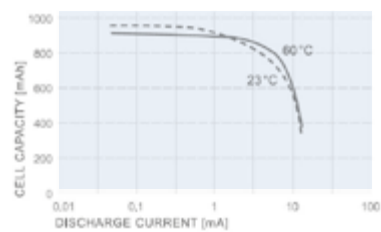
*Discharge Load 5,6 kΩ

Operating Voltage vs. load resistance*

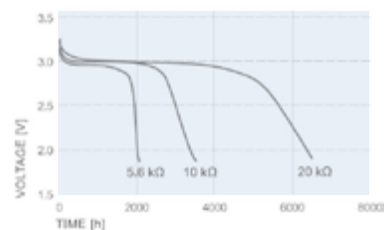


*Discharge depth 50%

Capacity vs. load resistance



Discharge Characteristics*



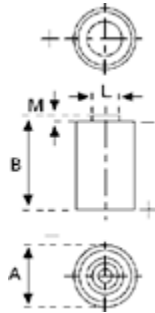
*at room temperature 21°C

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

- Self-discharge rate < 1%/Y 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 min. max.
 Storage -55°C 70°C
 Discharge -30°C 75°C¹

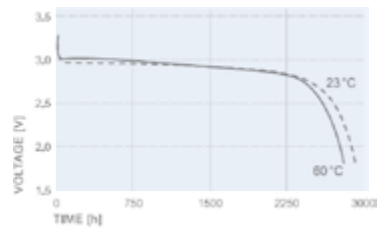
Dimensions min. max.
 Diameter (A) 14,45 14,75
 Height (B) 33,10 33,00
 Shoulder Diameter [L] 7,00
 Shoulder Height [M] 0,60

Typical Capacities (at 20°C)

| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|--------|---|
| Continuous 24 h/d, 7 d/w | 1000 Ω | Time: 500 h Capacity: 1350 mAh Energy: 3600 mWh |

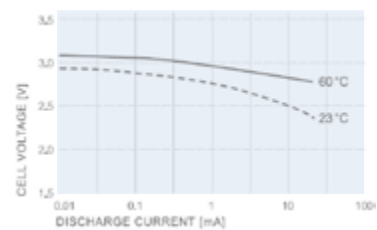
Performance Data

Temperature Characteristics*



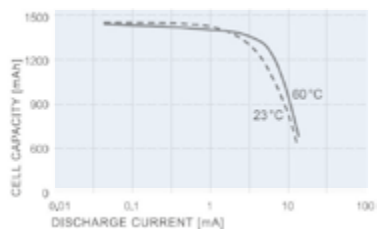
*Discharge Load 5,6 kΩ

Operating Voltage vs. load resistance*

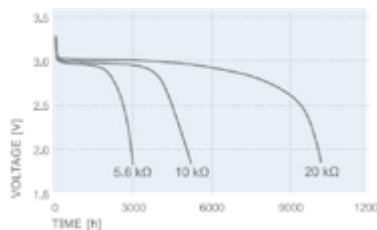


*Discharge depth 50%

Capacity vs. load resistance



Discharge Characteristics*



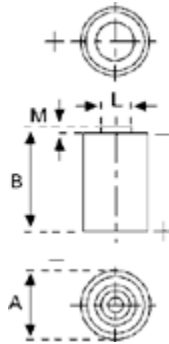
*at room temperature 21°C

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

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

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°C ¹ |

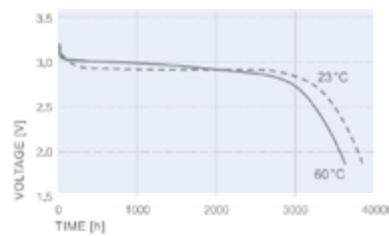
| | | |
|-----------------------------|-------|-------|
| Dimensions | min. | max. |
| Diameter (A) | 14,45 | 14,75 |
| Height (B) | 49,50 | 50,50 |
| Shoulder Diameter [L] | 7,00 | |
| Shoulder Height [M] | 0,60 | |

Typical Capacities (at 20°C)

| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|--------|---|
| Continuous 24 h/d, 7 d/w | 1000 Ω | Time: 745 h Capacity: 2000 mAh Energy: 5600 mWh |
| Continuous 24 h/d, 7 d/w | 620 Ω | Time: 430 h Capacity: 1850 mAh Energy: 5000 mWh |

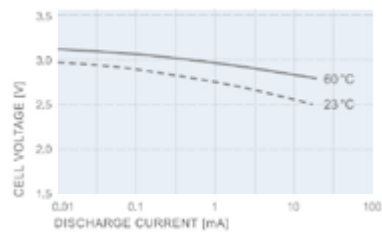
Performance Data

Temperature Characteristics*



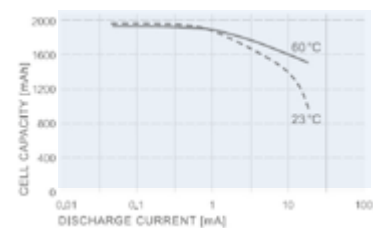
*Discharge Load 5,6 kΩ

Operating Voltage vs. load resistance*

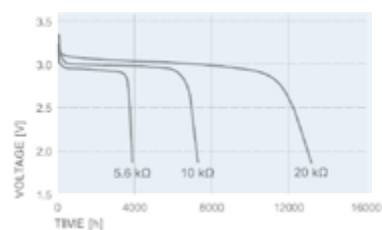


*Discharge depth 50%

Capacity vs. load resistance



Discharge Characteristics*



*at room temperature 21°C

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

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

3.2 ASSEMBLIES

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

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.

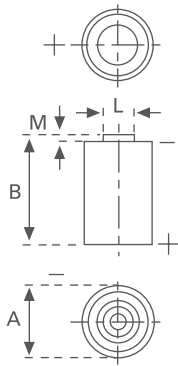


FIG. 1

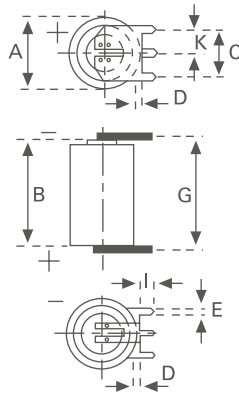


FIG. 2

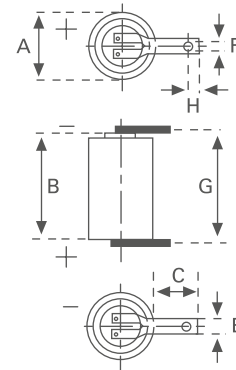


FIG. 3

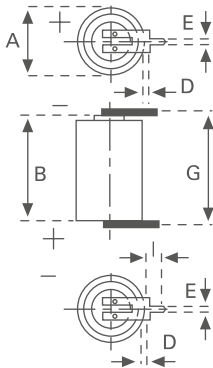


FIG. 4

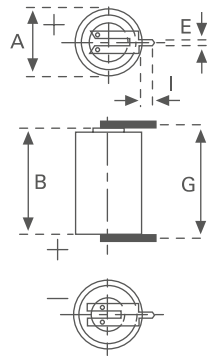
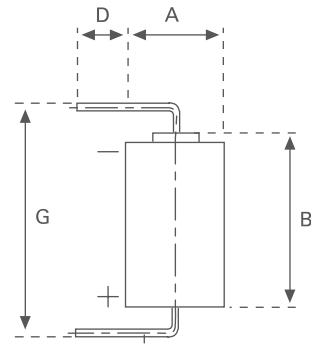


FIG. 5



Ni Ø 0,8 mm -
tinned

FIG. 6

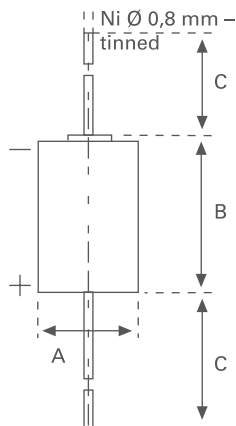


FIG. 7

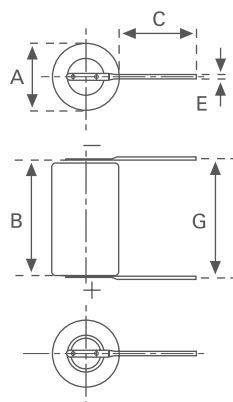


FIG. 8

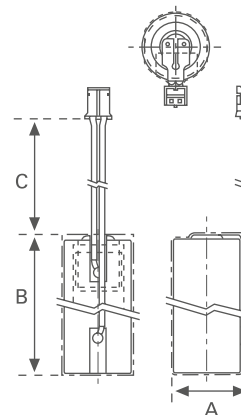
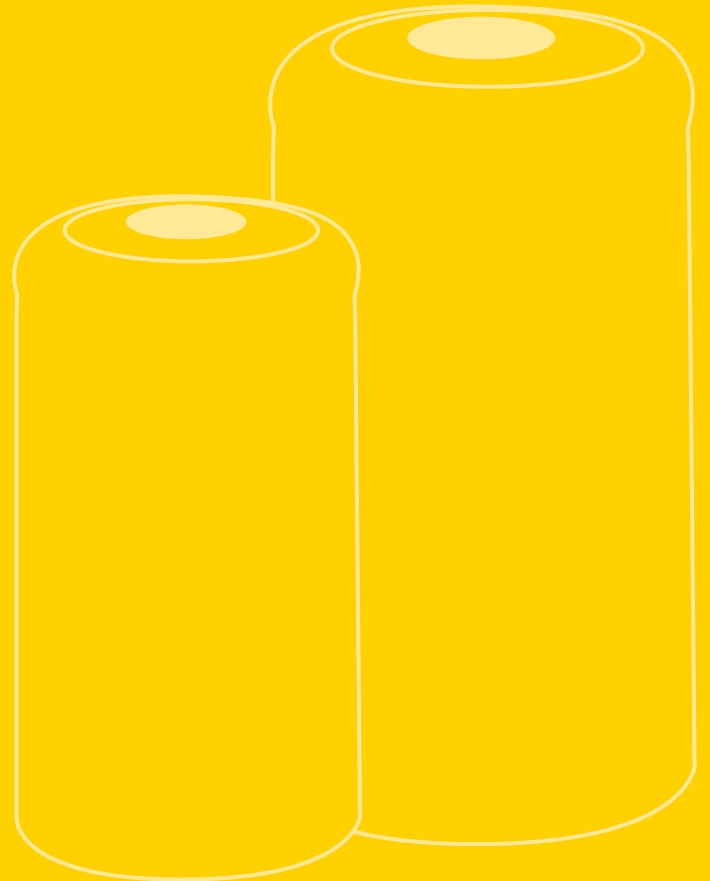


FIG. 9

4. CR HIGH POWER PRIMARY LITHIUM CYLINDRICAL CELLS



| | | |
|-----|------------------------------|-------|
| 4.1 | Types – Technical Data | 35–43 |
| 4.2 | Assemblies | 44 |



4.1 TYPES – TECHNICAL DATA



CR 2-R



CR 123 A-R



CR 1/2 AAH-R



CR 2/3 AH-R



CR AH-R



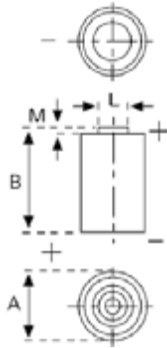
CR 2/3 AH

| Type | Order No. | Nominal voltage (V) | Nominal capacity at 20°C, load (mAh) | Max. continuous discharge current ¹⁾ (mA) | Weight (g) |
|--------------|--------------|---------------------|--------------------------------------|--|------------|
| CR 2-R | 6206 101 511 | 3 | 850 mAh–20mA/2.0 V | 885 | 11 |
| CR 123 A-R | 6205 101 511 | 3 | 1450 mAh–20mA/2.0 V | 1400 | 17 |
| CR 1/2 AAH-R | 6213 101 511 | 3 | 850 mAh–1mA/2.0 V | 800 | 9 |
| CR 2/3 AH-R | 6214 101 511 | 3 | 1600 mAh–1mA/2.0 V | 1500 | 17 |
| CR AH-R | 6217 101 511 | 3 | 2400 mAh–1mA/2.0 V | 1500 | 23 |
| CR 2/3 AH | 6215 101 501 | 3 | 1500 mAh–200 Ω/2.0 V | 1000 | 16 |
| CR 2 P1 | 6206 210 501 | 3 | 850 mAh–200 Ω/2.0 V | 885 | 11 |
| CR 123 A P1 | 6205 210 501 | 3 | 1550 mAh–200 Ω/2.0 V | 1400 | 17 |

Technical data, CR High Power Primary Lithium Cylindrical Cells

¹⁾ Current value for obtaining 50% capacity

CR 2-R



| | |
|--------------------------|---|
| Type Number | 6206 |
| Designation IEC | CR 15H270 |
| System | Li-Manganese dioxide/ Organic Electrolyte |
| UL Recognition | MH 13654 |
| Nominal Voltage | 3 V |
| Typical Capacity C | 850 mAh (Current 20 mA, at 20°C down to 2,0 V) |

| | |
|------------------------|---------|
| Weight (approx.) | 11 g |
| Volume | 5,2 ccm |

| | | |
|---------------------------|-------|-------------------|
| Temperature Ranges | min. | max. |
| Storage | -20°C | 45°C |
| Discharge | -40°C | 70°C ¹ |

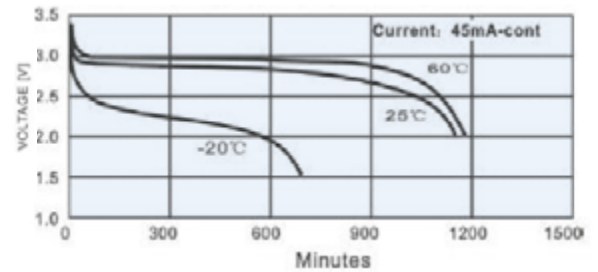
| | | |
|-----------------------------|-------|-------|
| Dimensions | min. | max. |
| Diameter (A) | 15,00 | 15,50 |
| Height (B) | 26,70 | 27,30 |
| Shoulder Diameter [L] | 6,00 | 6,60 |
| Shoulder Height [M] | 0,80 | 1,80 |

Typical Capacities (at 20°C)

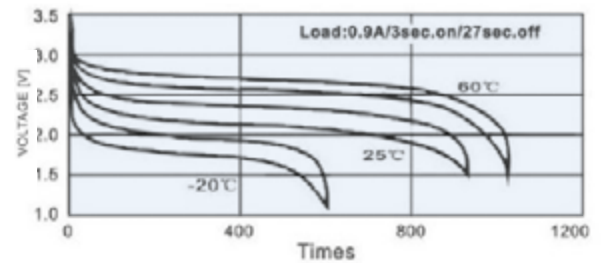
| Discharge Type | Discharge Current | End Voltage: 2,0 V |
|-----------------------------|-------------------|-------------------------|
| Continuous 24 h/d, 7 d/w | 20 mA | Capacity [mAh]: 850 mAh |

Performance Data

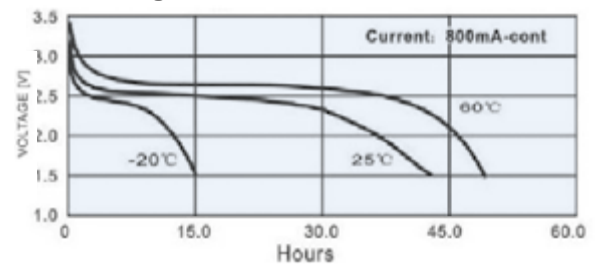
Temperature Characteristics



Pulse Discharge Characteristics



Discharge Characteristics

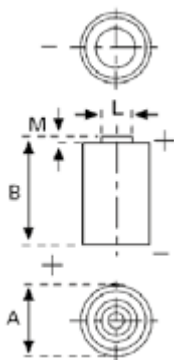


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +60°C.

² depending on environmental condition and energy consumption

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

CR 123 A-R



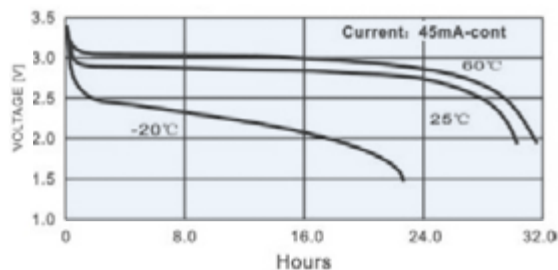
| | | |
|-----------------------------|--|-------------------|
| Type Number | 6205 | |
| Designation IEC | CR 17345 | |
| System | Li-Manganese dioxide/ Organic Electrolyte | |
| UL Recognition | MH 13654 | |
| Nominal Voltage | 3 V | |
| Typical Capacity C | 1450 mAh (Current 20 mA, at 20°C down to 2,0 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°C ¹ |
| Dimensions | min. | max. |
| Diameter (A) | 16,20 | 16,80 |
| Height (B) | 33,50 | 34,50 |
| Shoulder Diameter [L] | 6,00 | 6,60 |
| Shoulder Height [M] | 1,00 | 1,50 |

Typical Capacities (at 20°C)

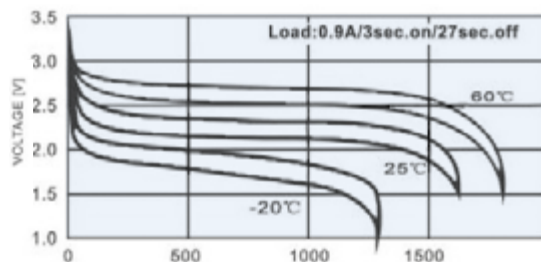
| Discharge Type | Discharge Current | End Voltage: 2,0 V |
|-----------------------------|-------------------|--------------------------|
| Continuous 24 h/d, 7 d/w | 20 mA | Capacity [mAh]: 1450 mAh |

Performance Data

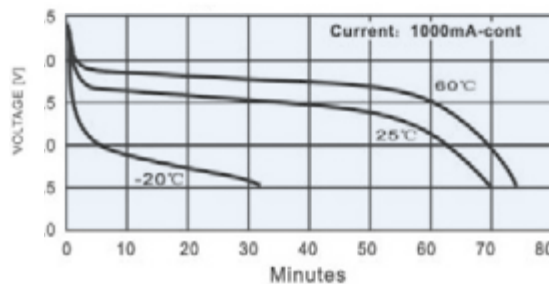
Temperature Characteristics



Pulse Discharge Characteristics



Discharge Characteristics

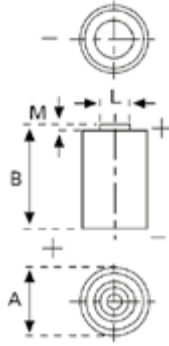


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +60°C.

² depending on environmental condition and energy consumption

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

CR 1/2AAH-R



Type Number 6213
 Designation IEC CR 14250
 System Li-Manganese dioxide / Organic Electrolyte

UL Recognition # MH 13654
 Nominal Voltage 3 V
 Typical Capacity C 850 mAh (Current 1 mA, at 20°C down to 2 V)
 Maximum cont. Discharge 800 mA
 Maximum Pulse Discharge.... 1500 mA

Weight (approx.) 9 g
 Volume 5 ccm
 Coding Date of Manufacturing Quarter/Year

| Temperature Ranges | min. | max. |
|--------------------|-------|-------------------|
| Storage | -20°C | 45°C |
| Discharge | -40°C | 70°C ¹ |

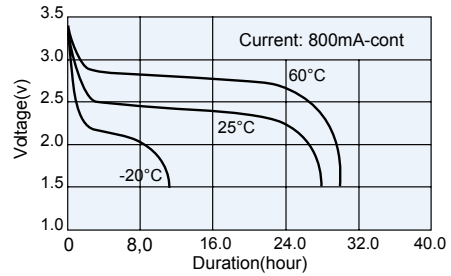
| Dimensions | min. | max. |
|-----------------------|-------|-------|
| Diameter (A) | 13,82 | 14,22 |
| Height (B) | 24,65 | 24,95 |
| Shoulder Diameter [L] | 6,30 | |
| Shoulder Height [M] | 0,50 | |

Typical Capacities (at 20°C)

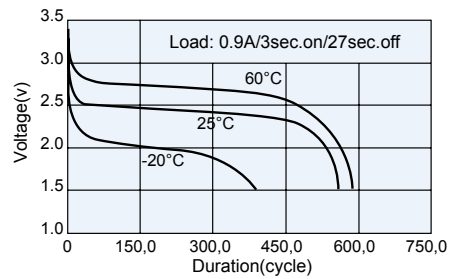
| Discharge Type | Discharge | End Voltage: 2,0 V |
|------------------------|-----------|--------------------|
| Continuous 24h/7d/w | 1 mA | Capacity[mAh]: 850 |

Performance Data

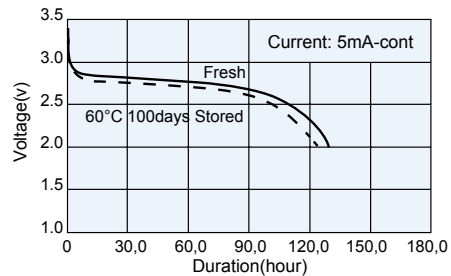
Temperature Characteristics



Pulse Discharge Characteristics



Discharge Characteristics

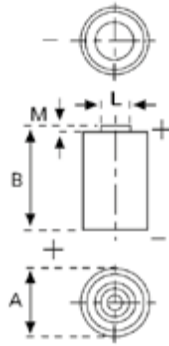


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +60°C. / # pending

² depending on environmental condition and energy consumption

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

CR 2/3AH-R



Type Number 6214
 Designation IEC CR 17335
 System Li-Manganese dioxide / Organic Electrolyte

UL Recognition # MH 13654
 Nominal Voltage 3 V
 Typical Capacity C 1600 mAh (Current 1 mA, at 20°C down to 2 V)

Maximum cont. Discharge 1500 mA
 Maximum Pulse Discharge.... 3500 mA

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

| Temperature Ranges | min. | max. |
|--------------------|-------|-------------------|
| Storage | -20°C | 45°C |
| Discharge | -40°C | 70°C ¹ |

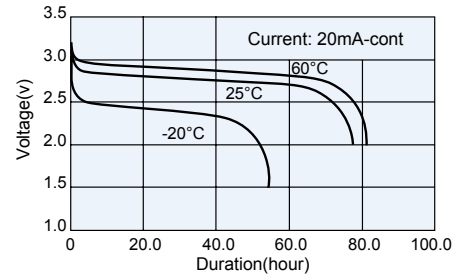
| Dimensions | min. | max. |
|-----------------------------|-------|-------|
| Diameter (A) | 16,20 | 16,80 |
| Height (B) | 32,50 | 33,50 |
| Shoulder Diameter [L] | 6,30 | |
| Shoulder Height [M] | 0,50 | |

Typical Capacities (at 20°C)

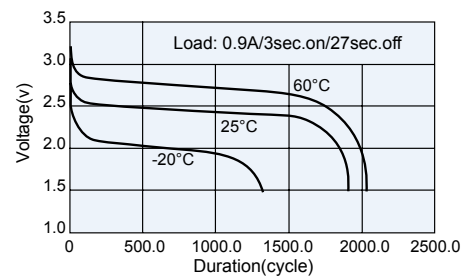
| Discharge Type | Discharge | End Voltage: 2,0 V |
|------------------------|-----------|---------------------|
| Continuous 24h/7d/w | 1 mA | Capacity[mAh]: 1600 |

Performance Data

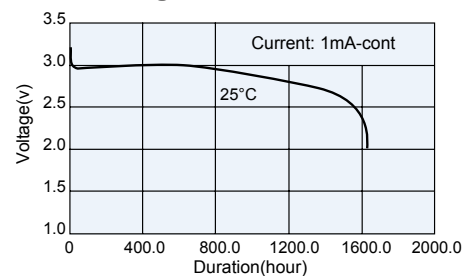
Temperature Characteristics



Pulse Discharge Characteristics



Discharge Characteristics

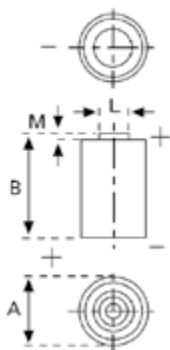


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +60°C. / # pending

² depending on environmental condition and energy consumption

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

CRAH-R



Type Number 6217
 Designation IEC CR 17450
 System Li-Manganese dioxide / Organic Electrolyte

UL Recognition MH 13654
 Nominal Voltage 3 V
 Typical Capacity C 2400 mAh (Current 1 mA, at 20°C down to 2 V)
 Maximum cont. Discharge 1500 mA
 Maximum Pulse Discharge.... 3500 mA

Weight (approx.) 23 g
 Volume 9,5 ccm
 Coding Date of Manufacturing Quarter/Year

| Temperature Ranges | min. | max. |
|--------------------|-------|-------------------|
| Storage | -20°C | 45°C |
| Discharge | -40°C | 70°C ¹ |

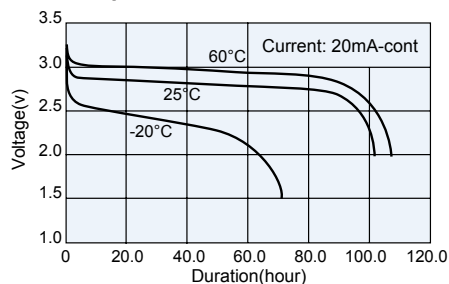
| Dimensions | min. | max. |
|-----------------------|-------|-------|
| Diameter (A) | 16,40 | 17,00 |
| Height (B) | 44,00 | 45,00 |
| Shoulder Diameter [L] | 6,30 | |
| Shoulder Height [M] | 1,45 | |

Typical Capacities (at 20°C)

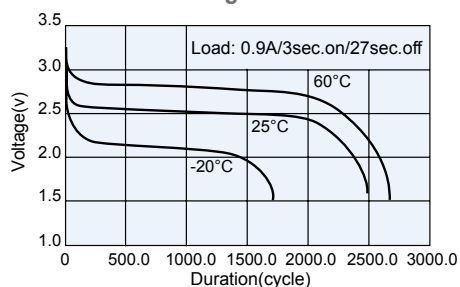
| Discharge Type | Discharge | End Voltage: 2,0 V |
|------------------------|-----------|---------------------|
| Continuous 24h/7d/w | 1 mA | Capacity[mAh]: 2400 |

Performance Data

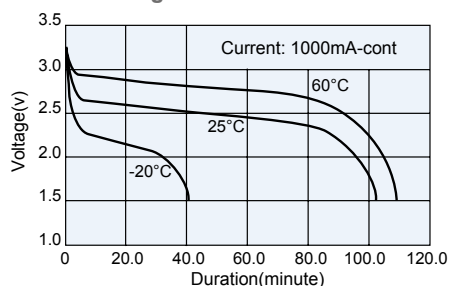
Temperature Characteristics



Pulse Discharge Characteristics



Discharge Characteristics

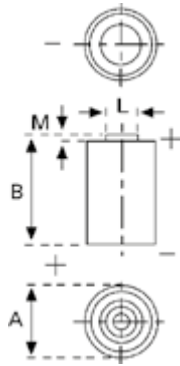


¹ Contact VARTA if the application is intended to be outside the range of -20°C to +60°C

² depending on environmental condition and energy consumption

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

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°C ¹ |

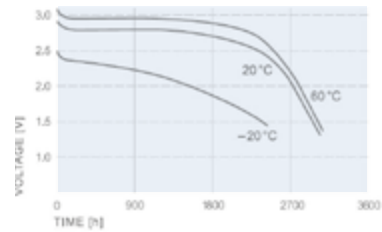
| | | |
|-----------------------------|-------------|-------------|
| Dimensions | min. | max. |
| Diameter (A) | 16,00 | 17,00 |
| Height (B) | 32,40 | 33,90 |
| Shoulder Diameter [L] | 6,10 | |
| Shoulder Height [M] | 1,00 | |

Typical Capacities (at 20°C)

| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|-------|---|
| Continuous 24 h/d, 7 d/w | 200 Ω | Time: 108 h Capacity: 1500 mAh Energy: 4190 mWh |

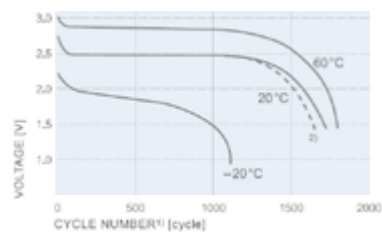
Performance Data

Temperature Characteristics*



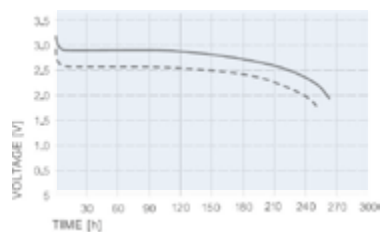
*Discharge Load 5,6 kΩ

Pulse Discharge Characteristics*



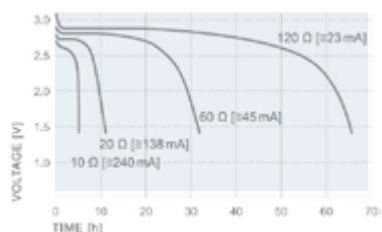
*1) Load: 0.9A, 3 sec on, 27 sec. off 2) after storage at 60°C/100 days

Typical Discharge Curve*



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

Discharge Characteristics*



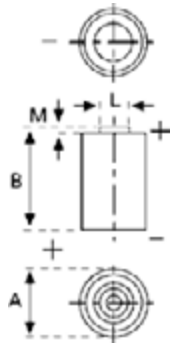
*at room temperature 21°C

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

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

CR 2 P1



| | |
|--------------------------|---|
| 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°C ¹ |

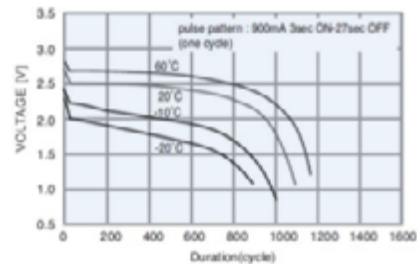
| | | |
|-----------------------------|-------|-------|
| Dimensions | min. | max. |
| Diameter (A) | 15,10 | 15,60 |
| Height (B) | 26,30 | 27,00 |
| Shoulder Diameter [L] | 6,20 | 6,30 |
| Shoulder Height [M] | 0,70 | 1,30 |

Typical Capacities (at 20°C)

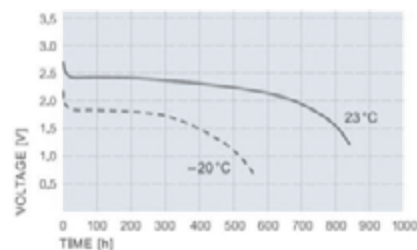
| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|-------|--------------------|
| Continuous 24 h/d, 7 d/w | 200 Ω | Capacity: 850 mAh |

Performance Data

Temperature Characteristics

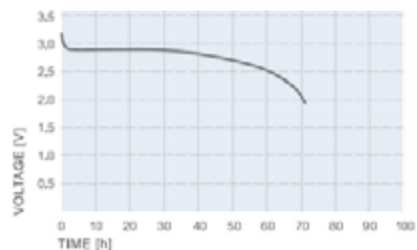


Pulse Discharge Characteristics*



*1) Load: 0.9A. 3 sec on. 27 sec. off 2) after storage at 60°C/100 days

Discharge Characteristics*



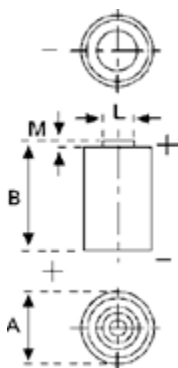
*at room temperature 21°C

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

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

CR 123 A P1



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

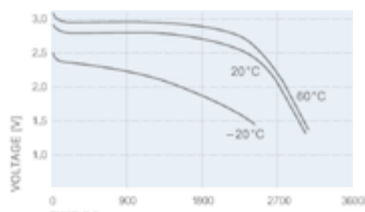
Dimensions min. max.
 Diameter (A) 16,40 17,00
 Height (B) 34,30 34,50
 Shoulder Diameter [L] 6,20 6,40
 Shoulder Height [M] 1,18 1,23

Typical Capacities (at 20°C)

| Discharge Type | Load | End Voltage: 2,0 V |
|-----------------------------|-------|--------------------|
| Continuous 24 h/d, 7 d/w | 100 Ω | Capacity: 1550 mAh |

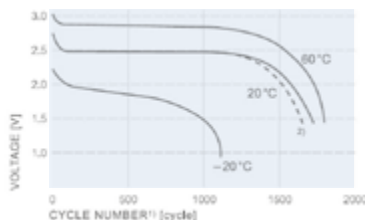
Performance Data

Temperature Characteristics*



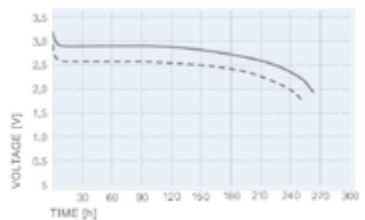
*Discharge Load 5,6 kΩ

Pulse Discharge Characteristics*



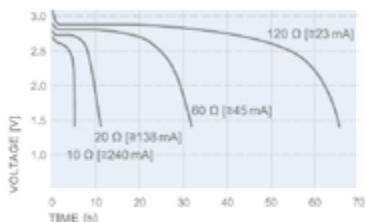
*1) Load: 0.9A. 3 sec on. 27 sec. off 2) after storage at 60°C/100 days

Typical Discharge Curve*



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

Discharge Characteristics*



*at room temperature 21°C

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

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

4.2 ASSEMBLIES

| Type | Order No. | A | B | C | D | E | F | G | H | I | K | L | M | Fig. No. | Tags |
|--------------------|--------------|------|------|------|---|------|---|------|---|-----|-----|-----|------|----------|------------------|
| CR 2/3 AH S | 6215 101 501 | 17,0 | 33,9 | - | - | - | - | - | - | - | - | 6,1 | 1,0 | 1 | - |
| CR 123A R | 6205 101 511 | 17,0 | 34,5 | - | - | - | - | - | - | - | - | 6,4 | 1,2 | 1 | - |
| CR 2 R | 6206 101 511 | 15,6 | 27,0 | - | - | - | - | - | - | - | - | 6,4 | 1,0 | 1 | - |
| CR 1/2 AAH-R | 6213 101 511 | 14,0 | 24,8 | - | - | - | - | - | - | - | - | 6,3 | 0,5 | 1 | - |
| CR 1/2 AAH-R PCBD | 6213 201 098 | 14,5 | 24,8 | 10,0 | - | 1,00 | - | 25,5 | - | 4,5 | 5,0 | - | - | 2 | - |
| CR 1/2 AAH-R S SLF | 6213 201 097 | 14,5 | 24,8 | - | - | 0,75 | - | 25,5 | - | 4,5 | - | - | - | 3 | single pin |
| CR 1/2 AAH-R TP | 6213 201 096 | 14,5 | 24,8 | 23,0 | - | 0,64 | - | 25,7 | - | - | - | - | - | 4 | terminal pin |
| CR 1/2 AAH-R WC | 6213 201 099 | 16,5 | 27,0 | 30,0 | - | - | - | - | - | - | - | - | - | 5 | wire & connector |
| CR 2/3 AH-R | 6214 101 511 | 16,5 | 33,0 | - | - | - | - | - | - | - | - | 6,3 | 0,5 | 1 | - |
| CR 2/3 AH-R PCBD | 6214 201 097 | 17,0 | 33,0 | - | - | 1,00 | - | 33,5 | - | 4,5 | 5,0 | - | - | 2 | - |
| CR 2/3 AH-R S SLF | 6214 201 099 | 17,0 | 33,0 | - | - | 0,75 | - | 33,5 | - | 4,5 | - | - | - | 3 | single pin |
| CR 2/3 AH-R TP | 6214 201 096 | 17,0 | 33,0 | 22,0 | - | 0,64 | - | 33,5 | - | - | - | - | - | 4 | terminal pin |
| CR 2/3 AH-R WC | 6214 201 098 | 18,0 | 36,0 | 30,0 | - | - | - | - | - | - | - | - | - | 5 | wire & connector |
| CR AH-R | 6217 101 511 | 16,5 | 44,5 | - | - | - | - | - | - | - | - | 6,3 | 1,45 | 1 | - |
| CR AH-R PCBD | 6217 201 098 | 17,0 | 45,0 | - | - | 1,0 | - | 45,0 | - | 4,5 | 5,0 | - | - | 2 | - |
| CR AH-R S SLF | 6217 201 097 | 17,0 | 45,0 | - | - | 0,75 | - | 45,0 | - | 4,5 | - | - | - | 3 | single pin |
| CR AH-R TP | 6217 201 096 | 17,0 | 45,0 | 22,0 | - | - | - | - | - | - | - | - | - | 4 | terminal pin |
| CR AH-R WC | 6217 201 095 | 19,5 | 47,0 | 60,0 | - | - | - | - | - | - | - | - | - | 5 | wire & connector |
| CR AH-R WC | 6217 201 099 | 19,5 | 47,0 | 80,0 | - | - | - | - | - | - | - | - | - | 5 | wire & connector |

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.

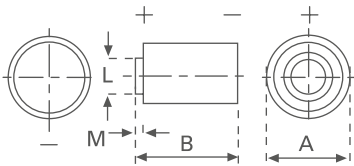


FIG. 1

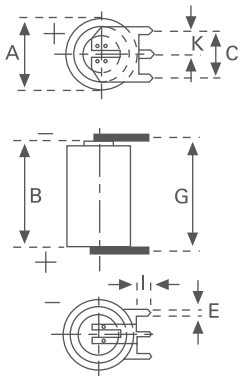


FIG. 2

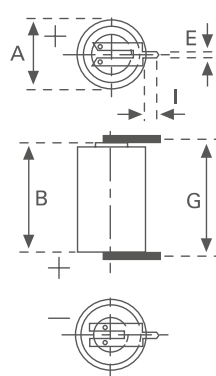


FIG. 3

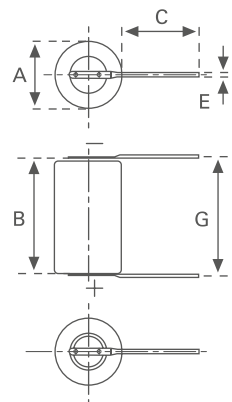


FIG. 4

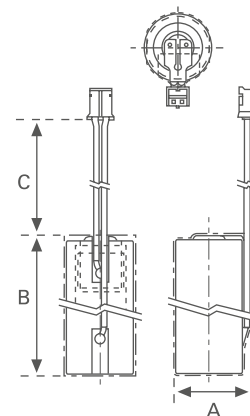


FIG. 5

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 laser 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.

| | | |
|-----|-----------------------------------|-------|
| 5.1 | Safety Tests | 48 |
| 5.2 | Safety Guidelines | 49 |
| 5.3 | OEM – Application Check List..... | 50–52 |

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 light-weight 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.

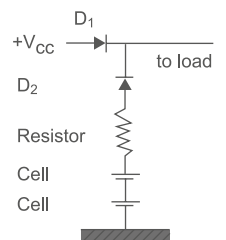
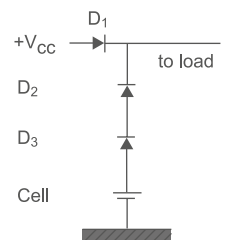
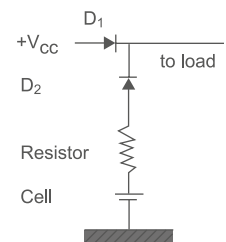
Blocking diode D2 and D3 prevents the battery from being charged through the power supply. The amount of accumulated reverse current (IR) should be kept around 1% of the cell's typical capacity during its standby life time. The leakage current of the diodes has to be considered.

Example:

- CR 1/2 AA for 5 years life time
- 1% of 950 mAh = 9,5 mAh = 9500 μ Ah
- 5 years = 43800 h
- max. reserve current = 9500 μ Ah/ 43800 h = 0,217 μ A

However a maximum of 5 μ A 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 350-380° within 3 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.



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Trademark of Underwriters
Laboratories

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.

| Ambient temperature | CR 1/2 AA | CR 2/3 AA | CR AA |
|---------------------|-----------|-----------|-------|
| 20°C | 24°C | 28°C | 24°C |
| 40°C | 50°C | 50°C | 47°C |
| 70°C | 80°C | 84°C | 77°C |

Vibration Test

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

Result

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:

https://www.varta-microbattery.com/fileadmin/varta_microbattery//mb_data/documents/material_safety_data_sheets/MSDS_08_Primary_Lithium_Cylindrical_Series_CR_en.pdf

https://www.varta-microbattery.com/fileadmin/varta_microbattery//mb_data/documents/material_safety_data_sheets/MSDS_07_Primary_Lithium_Cylindrical_Series_CR_Coiled_en.pdf

https://www.varta-microbattery.com/fileadmin/varta_microbattery//mb_data/documents/material_safety_data_sheets/MSDS_05_Primary_Lithium_Button_Series_CR_en.pdf

5.3 OEM – APPLICATION CHECK LIST

1. PROJECT INFORMATION

| | |
|---------------------|-----------------|
| From (Writer) | Sales Agreement |
| Customer | Application |
| Name of the project | Country |

2. MARKETING DATA

| | |
|---|------------------------------|
| Yearly expectation of sales | Per batch of |
| Estimated selling price | Expected data of first order |
| Lifetime of the project | Start of volume production |
| Competitors Yes <input type="checkbox"/> No <input type="checkbox"/> | Which |
| Substitution of existing product | |
| Comments | |

3. WHAT IS REQUIRED?

| | | Reply wishes for | Reply provided for |
|--|--|------------------|--------------------|
| Feasibility study, preliminary proposal | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Technical proposal | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Preliminary drawing | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Samples to run electric tests | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Samples (with dummy cells) | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Prototypes (for qualification by the customer) | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Preliminary cost estimation (+/- 20%) | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Development and industrial cost estimation | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |
| Product cost estimation (+/- 5%) | Yes <input type="checkbox"/> No <input type="checkbox"/> | | |

4. TECHNICAL REQUIREMENTS

4.1. Storage before use

| | | | |
|----------|------------------|---------|------|
| Duration | Temperature min. | Average | max. |
| Humidity | | | |

4.2. Storage into the device before operating

| | | | |
|----------|------------------|---------|------|
| Duration | Temperature min. | Average | max. |
| 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

Contact

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Factory:
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