

## FEATURES AND BENEFITS\*

- Up to 1,000,000 duty cycles or 10 year DC life
- 48V DC working voltage
- Active cell balancing
- Temperature output
- Overvoltage outputs available
- High power density

## TYPICAL APPLICATIONS

- Hybrid vehicles
- Rail
- Heavy industrial equipment
- UPS systems



## PRODUCT SPECIFICATIONS

## ELECTRICAL

|                                                                 | BMOD0083 P048 B01 | BMOD0165 P048 BXX |
|-----------------------------------------------------------------|-------------------|-------------------|
| Rated Capacitance <sup>1</sup>                                  | 83 F              | 165 F             |
| Minimum Capacitance, initial <sup>1</sup>                       | 83 F              | 165 F             |
| Maximum Capacitance, initial <sup>1</sup>                       | 100 F             | 200 F             |
| Maximum ESR <sub>DC</sub> , initial <sup>1</sup>                | 10 mΩ             | 6.3 mΩ            |
| Test Current for Capacitance and ESR <sub>DC</sub> <sup>1</sup> | 100 A             | 100 A             |
| Rated Voltage                                                   | 48 V              | 48 V              |
| Absolute Maximum Voltage <sup>2</sup>                           | 51 V              | 51 V              |
| Absolute Maximum Current                                        | 1,150 A           | 1,900 A           |
| Leakage Current at 25°C, maximum <sup>3</sup>                   | 3.0 mA            | 5.2 mA            |
| Maximum Series Voltage                                          | 750 V             | 750 V             |
| Capacitance of Individual Cells <sup>11</sup>                   | 1,500 F           | 3,000 F           |
| Stored Energy, Individual Cell <sup>11</sup>                    | 1.5 Wh            | 3.0 Wh            |
| Number of Cells                                                 | 18                | 18                |

## TEMPERATURE

|                                               |       |       |
|-----------------------------------------------|-------|-------|
| Operating Temperature (Cell Case Temperature) |       |       |
| Minimum                                       | -40°C | -40°C |
| Maximum                                       | 65°C  | 65°C  |
| Storage Temperature (Stored Uncharged)        |       |       |
| Minimum                                       | -40°C | -40°C |
| Maximum                                       | 70°C  | 70°C  |

\*Results may vary. Additional terms and conditions, including the limited warranty, apply at the time of purchase. See the warranty details and enclosed information for applicable operating and use requirements.

## PRODUCT SPECIFICATIONS (Cont'd)

## PHYSICAL

|                               | BMOD0083 B01       | BMOD0165 BXX       |
|-------------------------------|--------------------|--------------------|
| Mass, typical                 | 10.3 kg            | 13.5 kg            |
| Power Terminals               | M8/M10             | M8/M10             |
| Recommended Torque - Terminal | 20/30 Nm           | 20/30 Nm           |
| Vibration Specification       | SAE J2380          | SAE J2380          |
| Shock Specification           | SAE J2464          | SAE J2464          |
| Environmental Protection      | IP65               | IP65               |
| Cooling                       | Natural Convection | Natural Convection |

## MONITORING / CELL VOLTAGE MANAGEMENT

|                             |                   |                   |
|-----------------------------|-------------------|-------------------|
| Internal Temperature Sensor | NTC Thermistor    | NTC Thermistor    |
| Temperature Interface       | Analog            | Analog            |
| Cell Voltage Monitoring     | Overvoltage Alarm | Overvoltage Alarm |
| Connector                   | Deutsch DTM       | Deutsch DTM       |
| Cell Voltage Management     | VMS 2.0           | VMS 2.0           |

## POWER &amp; ENERGY

|                                             |            |            |
|---------------------------------------------|------------|------------|
| Usable Specific Power, $P_d^4$              | 2,700 W/kg | 3,300 W/kg |
| Impedance Match Specific Power, $P_{max}^5$ | 5,600 W/kg | 6,800 W/kg |
| Specific Energy, $E_{max}^6$                | 2.6 Wh/kg  | 3.9 Wh/kg  |
| Stored Energy <sup>7</sup>                  | 27 Wh      | 53 Wh      |

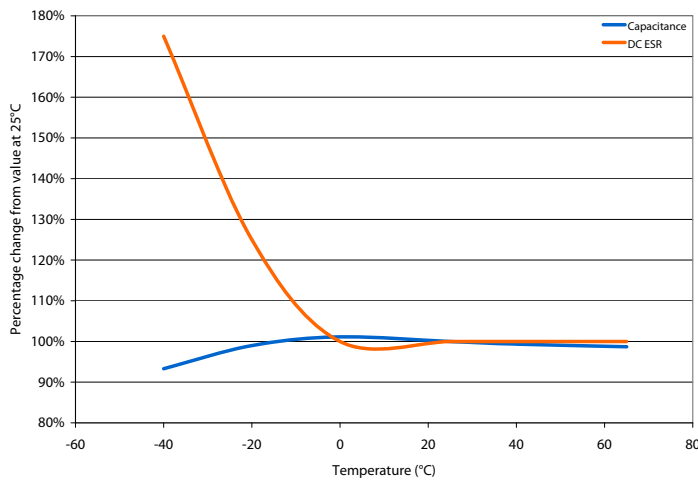
## SAFETY

|                                                                                                                                 |           |                                    |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------|
| Short Circuit Current, typical<br>(Current possible with short circuit from rated voltage. Do not use as an operating current.) | 4,800 A   | 7,600 A                            |
| Certifications                                                                                                                  | RoHS      | UL810a (B01 & B06 only, 150 Volts) |
| High-Pot Capability <sup>12</sup>                                                                                               | 2,500 VDC | 2,500 VDC                          |

## TYPICAL CHARACTERISTICS

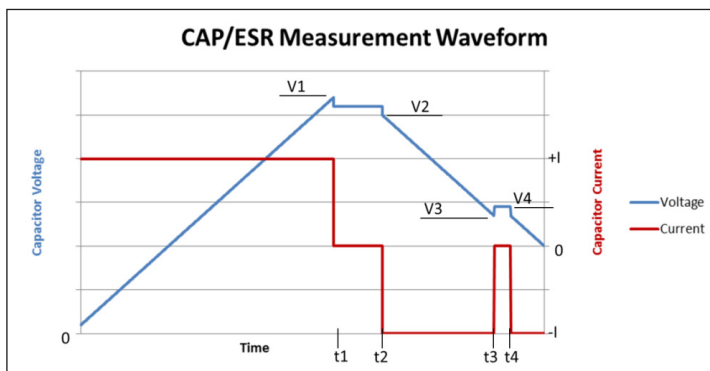
| THERMAL CHARACTERISTICS                                                                                            | BMOD0083 B01     | BMOD0165 BXX     |
|--------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| Thermal Resistance ( $R_{ca}$ , All Cell Cases to Ambient), typical <sup>8</sup>                                   | 0.40°C/W         | 0.40°C/W         |
| Thermal Capacitance ( $C_{th}$ ), typical                                                                          | 7,700 J/°C       | 13,000 J/°C      |
| Maximum Continuous Current ( $\Delta T = 15\text{ °C}$ ) <sup>8</sup>                                              | 61 A, RMS        | 77 A, RMS        |
| Maximum Continuous Current ( $\Delta T = 40\text{ °C}$ ) <sup>8</sup>                                              | 100 A, RMS       | 130 A, RMS       |
| LIFE                                                                                                               |                  |                  |
| DC Life at High Temperature <sup>1</sup><br>(held continuously at Rated Voltage and Maximum Operating Temperature) | 1,500 hours      | 1,500 hours      |
| Capacitance Change<br>(% decrease from minimum initial value)                                                      | 20%              | 20%              |
| ESR Change<br>(% increase from maximum initial value)                                                              | 100%             | 100%             |
| Projected DC Life at 25°C <sup>1</sup><br>(held continuously at Rated Voltage)                                     | 10 years         | 10 years         |
| Capacitance Change<br>(% decrease from minimum initial value)                                                      | 20%              | 20%              |
| ESR Change<br>(% increase from maximum initial value)                                                              | 100%             | 100%             |
| Projected Cycle Life at 25°C <sup>1,9,10</sup>                                                                     | 1,000,000 cycles | 1,000,000 cycles |
| Capacitance Change<br>(% decrease from minimum initial value)                                                      | 20%              | 20%              |
| ESR Change<br>(% increase from maximum initial value)                                                              | 100%             | 100%             |
| Test Current                                                                                                       | 100 A            | 100 A            |
| Shelf Life<br>(Stored uncharged at 25°C)                                                                           | 4 years          | 4 years          |

## ESR AND CAPACITANCE VS TEMPERATURE



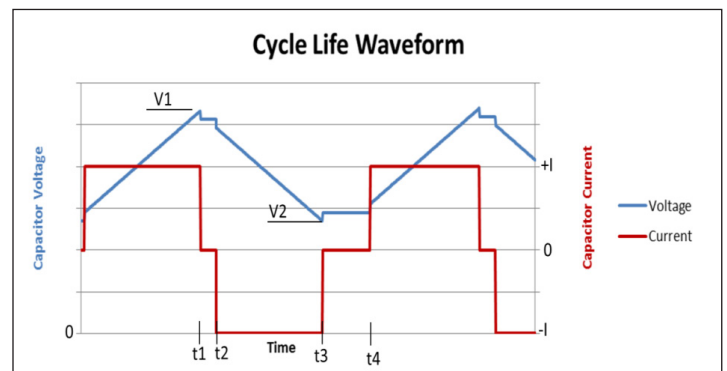
## NOTES

1. Capacitance and  $ESR_{DC}$  measured at 25°C using specified test current per waveform below.
2. Absolute maximum voltage, non-repeated. Not to exceed 1 second.
3. After 72 hours at rated voltage. Initial leakage current can be higher.
4. Per IEC 62391-2,  $P_d = \frac{0.12V^2}{ESR_{DC} \times \text{mass}}$
5.  $P_{max} = \frac{V^2}{4 \times ESR_{DC} \times \text{mass}}$
6.  $E_{max} = \frac{\frac{1}{2} CV^2}{3,600 \times \text{mass}}$
7.  $E_{stored} = \frac{\frac{1}{2} CV^2}{3,600}$
8.  $\Delta T = I_{RMS}^2 \times ESR \times R_{ca}$
9. Cycle using specified test current per waveform below.
10. Cycle life varies depending upon application-specific characteristics. Actual results will vary.
11. Per United Nations material classification UN3499, all Maxwell ultracapacitors have less than 10 Wh capacity to meet the requirements of Special Provisions 361. Both individual ultracapacitors and modules composed of those ultracapacitors shipped by Maxwell can be transported without being treated as dangerous goods (hazardous materials) under transportation regulations.
12. Duration = 60 seconds. Not intended as an operating parameter.



$$V1 = V_{rated} \quad t2 - t1 = 15 \text{ seconds} \quad \text{Capacitance} = I \times (t3 - t2) / (V2 - V3)$$

$$V3 = 0.5 \times V_{rated} \quad t4 - t3 = 5 \text{ seconds} \quad ESR = (V4 - V3) / I$$



$$V1 = V_{rated} \quad t2 - t1 = 5 \text{ seconds (I=0)}$$

$$V2 = 0.5 \times V_{rated} \quad t4 - t3 = 15 \text{ seconds (I=0)}$$

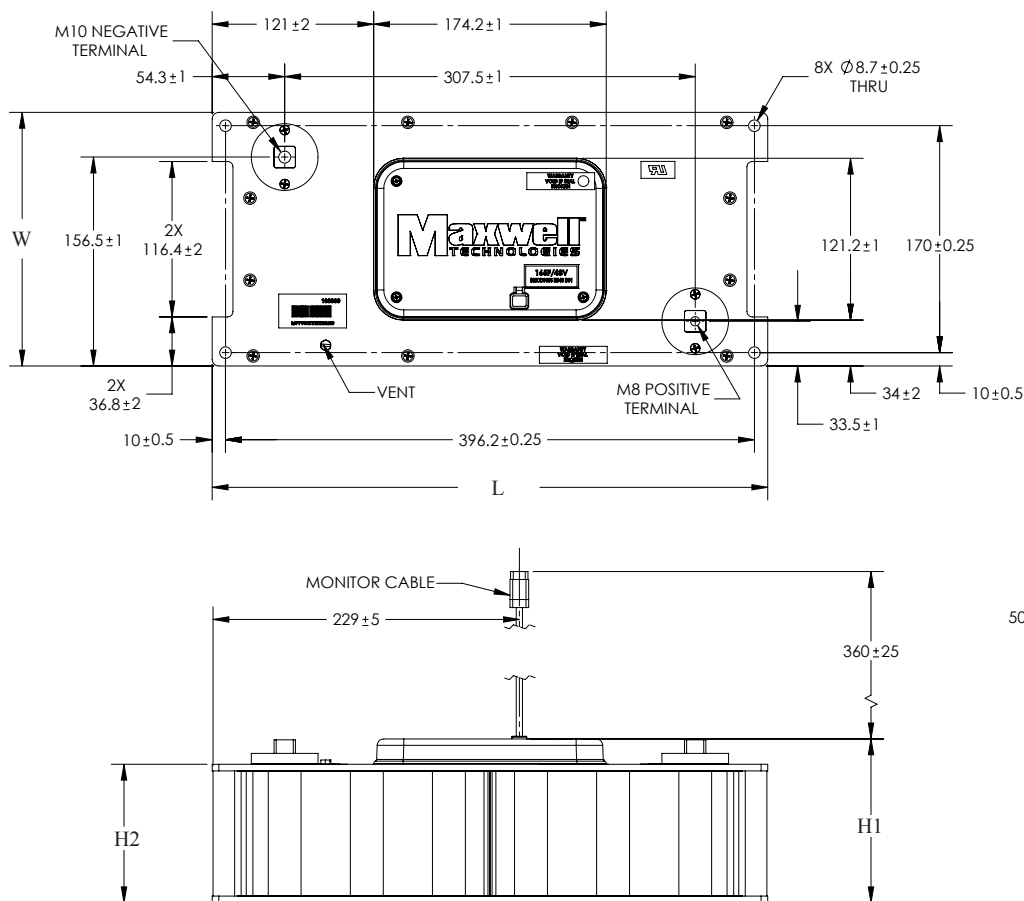
## MOUNTING RECOMMENDATIONS

Please refer to the user manual for installation recommendations.

## MARKINGS

Products are marked with the following information: Rated capacitance, rated voltage, product number, name of manufacturer, positive and negative terminal, warning marking, serial number.

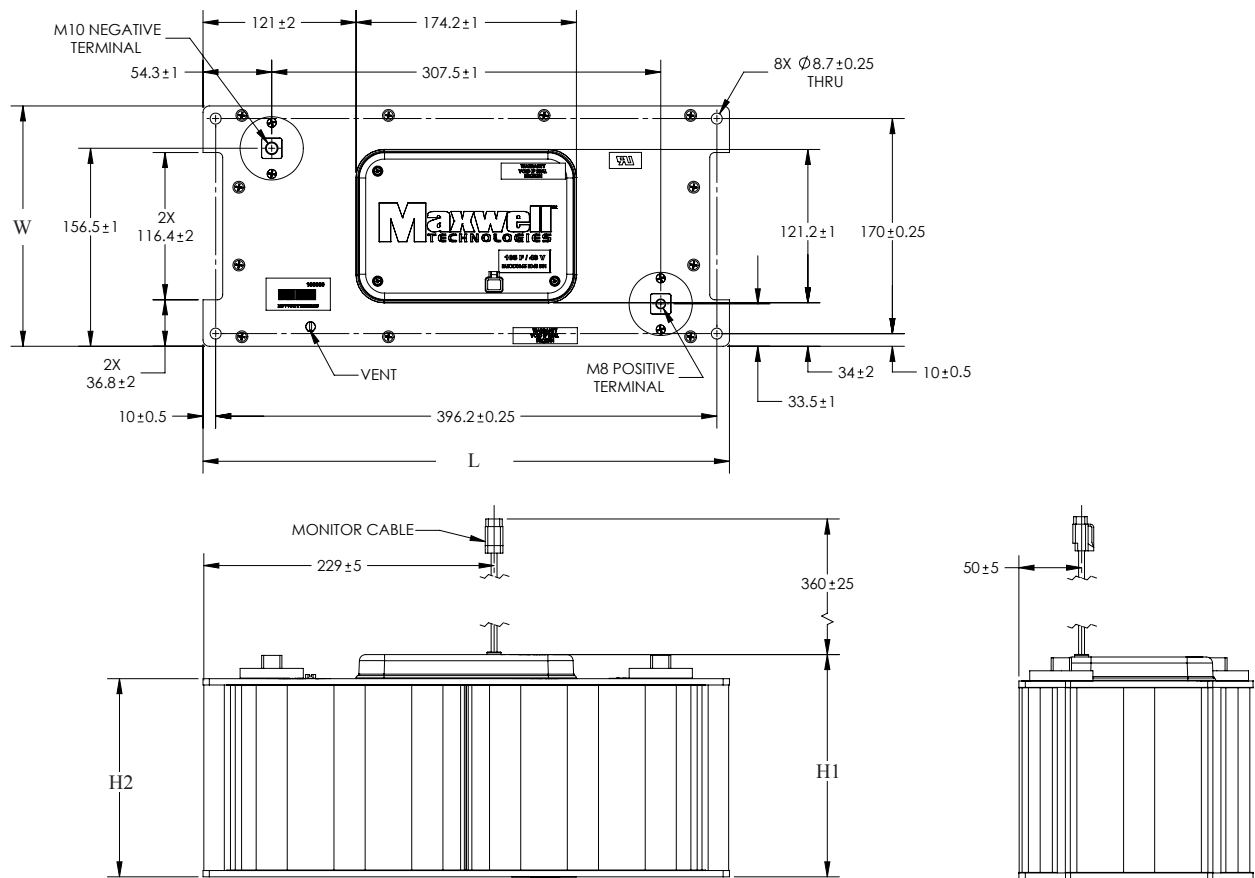
### BMOD0083 P048 B01



| Part Description  | Dimensions (mm) |         |          |          | Package Quantity |
|-------------------|-----------------|---------|----------|----------|------------------|
|                   | L (max)         | W (max) | H1 (max) | H2 (max) |                  |
| BMOD0083 P048 B01 | 418             | 194     | 126      | 106      | 1                |

Product dimensions are for reference only unless otherwise identified. Product dimensions and specifications may change without notice. Please contact Maxwell Technologies directly for any technical specifications critical to application.

## BMOD0165 P048 BXX



| Part Description   | Dimensions (mm) |         |          |          | Package Quantity |
|--------------------|-----------------|---------|----------|----------|------------------|
|                    | L (max)         | W (max) | H1 (max) | H2 (max) |                  |
| BMOD0165 P048 BXX* | 418             | 194     | 179      | 157      | 1                |

\*Refer to user manual for product variant details.

Product dimensions are for reference only unless otherwise identified. Product dimensions and specifications may change without notice.

Please contact Maxwell Technologies directly for any technical specifications critical to application. All products featured on this datasheet are covered by the following U.S. patents and their respective foreign counterparts: 6643119, 7180726, 7295423, 7342770, 7352558, 7384433, 7440258, 7492571, 7508651, 7580243, 7791860, 7816891, 7859826, 7883553, 7935155, 8072734, 8098481, 8279580, and patents pending.



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