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**DuraBlue™**  
Advanced Shock & Vibration Technology

## FEATURES AND BENEFITS\*

- 8,000 hour DC life at rated current at 25°C operating temperature
- Up to 1,000,000 duty cycles or 10 year life at room temperature
- Active cell balancing
- Temperature output
- Overvoltage outputs available
- Extreme vibration environment compatible

## TYPICAL APPLICATIONS

- Hybrid vehicles
- Railway
- Heavy industrial equipment

## ORDERING INFORMATION

Model Number	BMOD0165 P048 C0B
Part Number	<b>135896</b>
Package Quantity	60



## PRODUCT SPECIFICATIONS

### ELECTRICAL

### BMOD0165 P048 C0B

Rated Capacitance <sup>1</sup>	165 F
Minimum Capacitance, initial <sup>1</sup>	165 F
Maximum Capacitance, initial <sup>1</sup>	198 F
Maximum ESR <sub>DC</sub> , initial <sup>1</sup>	6.0 mΩ
Test Current for Capacitance and ESR <sub>DC</sub> <sup>1</sup>	100 A
Rated Voltage	48 V
Stored Energy <sup>4</sup>	53 Wh
Absolute Maximum Voltage <sup>2</sup>	51 V
Module Over Voltage (OV) Alarm "ON" (Nominal) <sup>†</sup>	48.7 V
Cell Over Voltage (OV) Alarm (Nominal)	2.70 V
Cell Balance Voltage (Nominal)	2.30 V
Absolute Maximum Current	1,600 A
Maximum Series Voltage	800 V
Capacitance of Individual Cells <sup>8</sup>	3,000 F
Stored Energy, Individual Cell <sup>8</sup>	3.0 Wh
Number of Cells	18

### TEMPERATURE

Operating Temperature (Cell Case Temperature)	
Minimum	-40°C
Maximum	65°C

\* Results may vary. Additional terms and conditions, including the limited warranty, apply at the time of purchase. See the warranty details for applicable operating and use requirements.  
† Estimated based on alarm circuit tolerance.

## PRODUCT SPECIFICATIONS (Cont'd)

### PHYSICAL

### BMOD0165 P048 C0B

Mass, typical	13.8 kg
Power Terminals	M8 / M10
Recommended Torque - Terminal	20 Nm (M8) / 30 Nm (M10)
Vibration Specification	ISO 16750-3, Table 12
Shock Specification	IEC 60068-2-27, 25 g / 6 ms / 3 cycles/axis
Environmental Protection	IP65
Cooling	Natural Convection

### MONITORING / CELL VOLTAGE MANAGEMENT

Internal Temperature Sensor <sup>3</sup>	NTC Thermistor (10 kΩ)
Temperature Interface	Analog
Cell Voltage Monitoring <sup>3</sup>	Overvoltage Alarm (open collector)
Connector (Mating)	Deutsch DTM04-4P, Amphenol ATM04-4P
Cell Management System	CMS 2.8-Z18

### SAFETY

Short Circuit Current, typical (Current possible with short circuit from rated voltage. Do not use as an operating current.)	8,000 A
Certifications	RoHS
High-Pot Test <sup>9</sup>	3,700 VDC
Insulation Resistance, minimum (20°C, <70% RH)	150 MΩ
After Humidity Exposure, (40°C, 85%, 21 days), minimum	50 MΩ

## TYPICAL CHARACTERISTICS

### THERMAL CHARACTERISTICS

BMOD0165 P048 C0B

Thermal Resistance ( $R_{ca}$ , All Cell Cases to Ambient), typical <sup>5</sup>	0.50°C/W
Thermal Capacitance ( $C_{th}$ ), typical	13,900 J/°C
Maximum Continuous Current ( $\Delta T = 15\text{ °C}$ ) <sup>5</sup> (BOL, Beginning of Life)	71 A, RMS

### LIFE

<b>DC Life at High Temperature<sub>1</sub></b> (held continuously at Rated Voltage and Maximum Operating Temperature)	3,000 hours
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Capacitance Change (% decrease from minimum initial value)	20%
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ESR Change (% increase from maximum initial value)	100%
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<b>Projected DC Life at 25°C<sub>1</sub></b> (held continuously at Rated Voltage)	10 years
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Capacitance Change (% decrease from minimum initial value)	20%
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ESR Change (% increase from maximum initial value)	100%
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<b>Projected Cycle Life at 25°C<sub>1,6,7</sub></b>	1,000,000 cycles
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Capacitance Change (% decrease from minimum initial value)	20%
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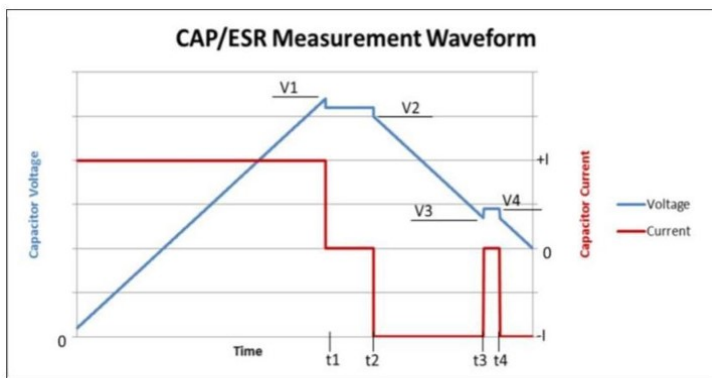
ESR Change (% increase from maximum initial value)	100%
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Test Current	100 A
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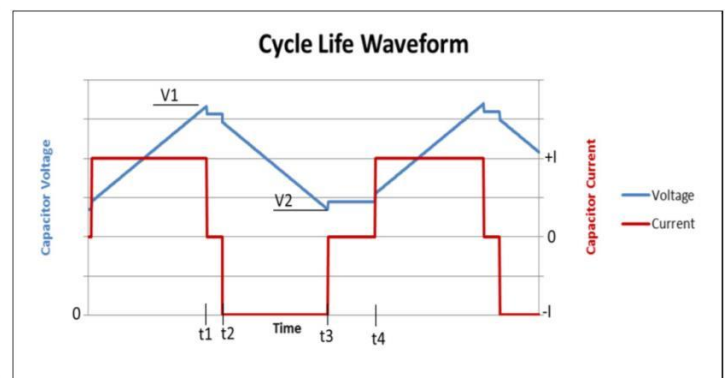
<b>Shelf Life</b> (Stored uncharged at 25°C)	4 years
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## NOTES

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. Please refer to module user manual for additional technical details.
4.  $E_{\text{stored}} = \frac{1}{2} \frac{CV^2}{3,600}$
5.  $\Delta T = I_{RMS}^2 \times ESR \times R_{ca}$
6. Cycle using specified test current per waveform below.
7. Cycle life varies depending upon application-specific characteristics. Actual results will vary.
8. 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.
9. Duration = 60 seconds. Not intended as an operating parameter.

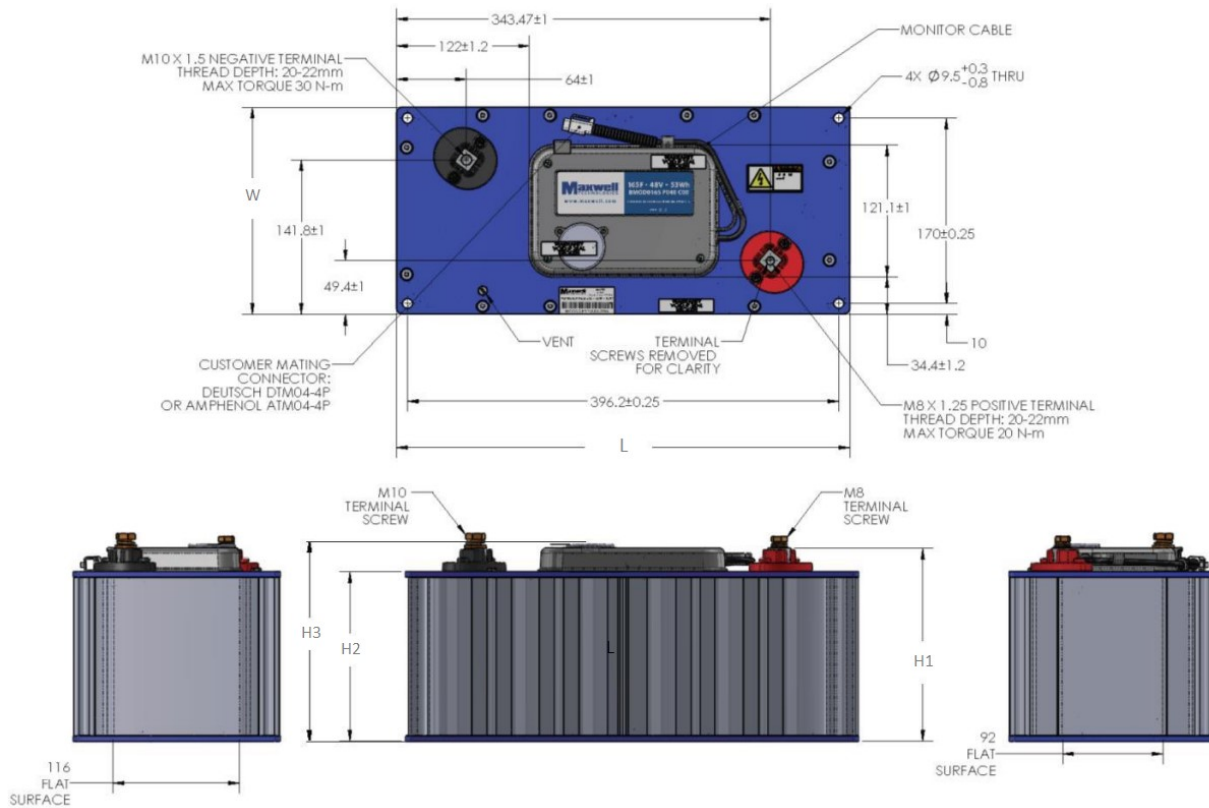


$V1 = V_{\text{rated}}$        $t2 - t1 = 15 \text{ seconds}$        $\text{Capacitance} = I \times (t3 - t2) / (V2 - V3)$   
 $V3 = 0.5 \times V_{\text{rated}}$        $t4 - t3 = 100 \text{ milliseconds}$        $ESR = (V4 - V3) / I$



$V1 = V_{\text{rated}}$        $t2 - t1 = 5 \text{ seconds (I=0)}$   
 $V2 = 0.5 \times V_{\text{rated}}$        $t4 - t3 = 15 \text{ seconds (I=0)}$

## BMOD0165 P048 C0B



Part Description	Dimensions (mm)				
	L (max)	W (max)	H1 (max)	H2 (max)	H3 (max)
BMOD0165 P048 C0B	418	194	179	157	181

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