160V ULTRACAPACITOR MODULE

FEATURES AND BENEFITS
• Up to 10 year DC life*
• 160V DC working voltage
• Resistive cell balancing
• Compact, light weight package
• Screw terminals

TYPICAL APPLICATIONS
• Wind turbine pitch control
• Small UPS systems
• Small industrial systems

PRODUCT SPECIFICATIONS

<table>
<thead>
<tr>
<th>ELECTRICAL</th>
<th>BMOD0006 E160 B02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Capacitance</td>
<td>5.8 F</td>
</tr>
<tr>
<td>Minimum Capacitance, initial</td>
<td>5.8 F</td>
</tr>
<tr>
<td>Maximum Capacitance, initial</td>
<td>7 F</td>
</tr>
<tr>
<td>Maximum ESR$_{DC}$, initial</td>
<td>240 mΩ</td>
</tr>
<tr>
<td>Test Current for Capacitance and ESR$_{DC}$, initial</td>
<td>35 A</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>160 V</td>
</tr>
<tr>
<td>Absolute Maximum Voltage</td>
<td>170 V</td>
</tr>
<tr>
<td>Absolute Maximum Current</td>
<td>170 A</td>
</tr>
<tr>
<td>Leakage Current at 25°C, maximum</td>
<td>25 mA</td>
</tr>
<tr>
<td>Maximum Series Voltage</td>
<td>750 V</td>
</tr>
<tr>
<td>Capacitance of Individual Cells</td>
<td>350 F</td>
</tr>
<tr>
<td>Maximum Stored Energy, Individual Cell</td>
<td>0.35 Wh</td>
</tr>
<tr>
<td>Number of Cells</td>
<td>60</td>
</tr>
</tbody>
</table>

TEMPERATURE

Operating Temperature (Cell Case Temperature)

| Minimum | -40°C |
| Maximum | 65°C |

Storage Temperature (Stored Uncharged)

| Minimum | -40°C |
| Maximum | 70°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.
<table>
<thead>
<tr>
<th><strong>PHYSICAL</strong></th>
<th><strong>BMOD0006 E160 B02</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass, typical</td>
<td>5.2 kg</td>
</tr>
<tr>
<td>Power Terminals</td>
<td>M5 Thread</td>
</tr>
<tr>
<td>Recommended Torque - Terminal</td>
<td>4 Nm</td>
</tr>
<tr>
<td>Vibration Specification</td>
<td>IEC60068-2-6</td>
</tr>
<tr>
<td>Shock Specification</td>
<td>IEC60068-2-27,-29</td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Cooling</td>
<td>Natural Convection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MONITORING / CELL VOLTAGE MANAGEMENT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Temperature Sensor</td>
</tr>
<tr>
<td>Temperature Interface</td>
</tr>
<tr>
<td>Cell Voltage Monitoring</td>
</tr>
<tr>
<td>Connector</td>
</tr>
<tr>
<td>Cell Voltage Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>POWER &amp; ENERGY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Usable Specific Power, $P_d$</td>
</tr>
<tr>
<td>Impedance Match Specific Power, $P_{max}$</td>
</tr>
<tr>
<td>Specific Energy, $E_{max}$</td>
</tr>
<tr>
<td>Stored Energy, $E_{stored}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SAFETY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Circuit Current, typical</td>
</tr>
<tr>
<td>(Current possible with short circuit from rated voltage. Do not use as an operating current.)</td>
</tr>
<tr>
<td>Certifications</td>
</tr>
<tr>
<td>High-Pot Capability$^{10}$</td>
</tr>
</tbody>
</table>
## TYPICAL CHARACTERISTICS

### THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance (R(_{ca}), All Cell Cases to Ambient), typical(^a)</td>
<td>1.1°C/W</td>
</tr>
<tr>
<td>Thermal Capacitance (C(_{th})), typical</td>
<td>4,800 J/°C</td>
</tr>
<tr>
<td>Maximum Continuous Current (ΔT = 15 °C)(^b)</td>
<td>7 A(_{RMS})</td>
</tr>
<tr>
<td>Maximum Continuous Current (ΔT = 40 °C)(^b)</td>
<td>12 A(_{RMS})</td>
</tr>
</tbody>
</table>

### LIFE\(^*\)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Life at High Temperature(^i) (held continuously at Rated Voltage and Maximum Operating Temperature)</td>
<td>1,500 hours</td>
</tr>
<tr>
<td>Capacitance Change (% decrease from minimum initial value)</td>
<td>20%</td>
</tr>
<tr>
<td>ESR Change (% increase from maximum initial value)</td>
<td>100%</td>
</tr>
<tr>
<td>Projected DC Life at 25°C(^i) (held continuously at Rated Voltage)</td>
<td>10 years</td>
</tr>
<tr>
<td>Capacitance Change (% decrease from minimum initial value)</td>
<td>20%</td>
</tr>
<tr>
<td>ESR Change (% increase from maximum initial value)</td>
<td>100%</td>
</tr>
<tr>
<td>Shelf Life (Stored uncharged at 25°C)</td>
<td>4 years</td>
</tr>
</tbody>
</table>

### ESR AND CAPACITANCE VS TEMPERATURE

![Graph showing Capacitance and DC ESR vs Temperature](image)

\(^a\)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.
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. \( P_{\text{max}} = \frac{\sqrt{V^2}}{4 \times ESR_{DC} \times \text{mass}} \)

6. \( E_{\text{max}} = \frac{\frac{1}{2} CV^2}{3,600 \times \text{mass}} \)

7. \( E_{\text{stored}} = \frac{\frac{1}{2} CV^2}{3,600} \)

8. \( \Delta T = I_{\text{RMS}}^2 \times \text{ESR} \times R_{ca} \)

9. 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.

10. Duration = 60 seconds. Not intended as an operating parameter.

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.
Datasheet: 160V ULTRACAPACITOR MODULE

BMOD0006 E160 B02

ORDERING INFORMATION

Model Number     BMOD0006 E160 B02
Package Quantity 3

DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (L)</td>
<td>365.0</td>
<td>366.0</td>
<td>367.0</td>
<td>mm</td>
</tr>
<tr>
<td>Width (W)</td>
<td>233.0</td>
<td>234.0</td>
<td>235.0</td>
<td>mm</td>
</tr>
<tr>
<td>Height (H)</td>
<td>78.5</td>
<td>79.5</td>
<td>80.5</td>
<td>mm</td>
</tr>
</tbody>
</table>

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See PDM System for latest revision.

Refer relevant PDM system for approval and approval dates.

Revision: 2
Revision: 6

Size: Cage Code
Part No.
Rev

X 0.5
X 0.25
XX 0.12

Angle: 0.5°

Surface Finish: 3.2 μm (125μin)

DIMENSIONED TOLERANCES: ISO-2768

UNLESS OTHERWISE SPECIFIED

Break sharp edges: 0.2 - 0.4

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