### FEATURES AND BENEFITS
- High performance product with low ESR
- Exceptional shock and vibration resistance
- Long lifetimes with up to 500,000 duty cycles
- Compliant with RoHS and REACH requirements

### TYPICAL APPLICATIONS
- Automotive
- UPS System
- Actuators
- Emergency Lighting
- Telematics
- Security Equipment
- Backup System
- Smoke Detectors
- Advanced Metering

### PRODUCT SPECIFICATIONS

#### ELECTRICAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage, $V_R$</td>
<td>5.0 VDC</td>
</tr>
<tr>
<td>Surge Voltage</td>
<td>5.4 VDC</td>
</tr>
<tr>
<td>Rated Capacitance, $C^3$</td>
<td>1.5 F</td>
</tr>
<tr>
<td>Min. / Max. Capacitance, Initial</td>
<td>1.35 F / 1.8 F</td>
</tr>
<tr>
<td>Typical Capacitance, Initial$^{2,3}$</td>
<td>1.55 F</td>
</tr>
<tr>
<td>Rated (Max.) ESR$_{DC}$, Initial$^3$</td>
<td>130 mΩ</td>
</tr>
<tr>
<td>Typical ESR$_{DC}$, Initial$^{2,3}$</td>
<td>109 mΩ</td>
</tr>
<tr>
<td>Maximum Leakage Current$^4$</td>
<td>5 μA</td>
</tr>
<tr>
<td>Maximum Peak Current, Non-repetitive$^5$</td>
<td>3.1 A</td>
</tr>
</tbody>
</table>

#### PHYSICAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Mass</td>
<td>3.4 g</td>
</tr>
</tbody>
</table>

#### POWER & ENERGY

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>Standard (-40°C to 65°C) at 5.0V</th>
<th>Extended (-40°C to 85°C) at 4.6V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Stored Energy, $E_{max}^{6,8}$</td>
<td>5.2 mWh</td>
<td>4.4 mWh</td>
</tr>
<tr>
<td>Gravimetric Specific Energy$^6$</td>
<td>1.5 Wh/kg</td>
<td>1.3 Wh/kg</td>
</tr>
<tr>
<td>Usable Specific Power$^6$</td>
<td>6.7 kW/kg</td>
<td>5.7 kW/kg</td>
</tr>
<tr>
<td>Impedance Match Specific Power$^6$</td>
<td>14.1 kW/kg</td>
<td>11.9 kW/kg</td>
</tr>
</tbody>
</table>

#### SAFETY

| Certification       | RoHS, REACH |

### THERMAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Thermal Resistance ($R_{th, Housing}$)$^8$</td>
<td>77°C/W</td>
</tr>
<tr>
<td>Typical Thermal Capacitance ($C_{th}$)</td>
<td>2.8 J/°C</td>
</tr>
<tr>
<td>Usable Continuous Current (BOL) ($\Delta T = 15 , ^\circ C$)$^8,10$</td>
<td>1.2 A</td>
</tr>
<tr>
<td>Usable Continuous Current (BOL) ($\Delta T = 40 , ^\circ C$)$^8,10$</td>
<td>2.0 A</td>
</tr>
</tbody>
</table>

### LIFE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected DC Life at Room Temperature (At rated voltage and 25°C, EOL$^{10}$)</td>
<td>10 years</td>
</tr>
<tr>
<td>DC Life at High Temperature (At rated voltage and 65°C, EOL$^{10}$)</td>
<td>1,500 hours</td>
</tr>
<tr>
<td>DC Life at De-rated Voltage &amp; Higher Temperature (At 4.6V and 85°C, EOL$^{10}$)</td>
<td>1,500 hours</td>
</tr>
<tr>
<td>Projected Cycle Life at Room Temperature$^7$ (Constant current charge-discharge from $V_R$ to 1/2$V_R$ at 25°C, EOL$^{10}$)</td>
<td>500,000 cycles</td>
</tr>
<tr>
<td>Shelf Life (Stored uncharged at 25°C, ≤ 50% RH)</td>
<td>4 years</td>
</tr>
</tbody>
</table>

*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.
Datasheet: 5.0V 1.5F ULTRACAPACITOR MODULE

1. Surge Voltage
   Absolute maximum voltage, non-repetitive. Duration not to exceed 1 second.

2. “Typical” values represent mean values of production sample.

3. Rated Capacitance & ESR\textsubscript{DC} (measured method)
   - Capacitance: Constant current charge (4 * C * V\textsubscript{r}[mA]) to V\textsubscript{r}, 5 min hold at V\textsubscript{r},
     constant current discharge (4 * C * V\textsubscript{r}[mA]) to 0.1 V.
     e.g. in case of 5.0V 1.5F module, 4 * 1.5 * 5.0 = 30 mA.
   - ESR\textsubscript{DC}: Constant current charge (4 * C * V\textsubscript{r}[mA]) to V\textsubscript{r}, 5 min hold at V\textsubscript{r},
     constant current discharge (40 * C * V\textsubscript{r}[mA]) to 0.1 V.
     e.g. in case of 5.0V 1.5F module, charge with 4 * 1.5 * 5.0 = 30 mA and discharge with 40 * 1.5 * 5.0 = 300mA.

4. Maximum Leakage Current
   - Current measured after 72 hrs at rated voltage and 25°C. Initial leakage current can be higher.
   - If applicable, module leakage current is the sum of cell and balancing circuit leakage currents.

5. Maximum Peak Current
   - Current needed to discharge cell/module from rated voltage to half-rated voltage in 1 second.

6. Energy & Power (Based on IEC 62391-2)
   - Maximum Stored Energy, E\textsubscript{max}(Wh) = \frac{1}{2}CV\textsuperscript{2} \textsubscript{r}
   - Gravimetric Specific Energy (Wh/kg) = \frac{E\textsubscript{max}}{mass}
   - Usable Specific Power (W/kg) = \frac{0.12V\textsubscript{r}}{ESR\textsubscript{DC} x mass}
   - Impedance Match Specific Power (W/kg) = \frac{0.25V\textsubscript{r}}{ESR\textsubscript{DC} x mass}
   - Presented Power and Energy values are calculated based on Rated Capacitance & Rated (Max.) ESR\textsubscript{DC} Initial values.

7. Cycle Life Test Profile
   Cycle life varies depending upon application-specific characteristics. Actual results will vary.

8. Temperature Rise at Constant Current
   - \Delta T = I x (R\textsubscript{DC}) x (R\textsubscript{ESR\textsubscript{DC}} x R\textsubscript{th})
     where \Delta T: Temperature rise over ambient (°C)
     I\textsubscript{rated} Minimum continuous or RMS current (A)
     R\textsubscript{DC}: Rated (Max.) ESR\textsubscript{DC} (Ω)
     R\textsubscript{th}: Thermal resistance, module to ambient (°C/W)
     ESR\textsubscript{DC}: Rated (Max.) ESR\textsubscript{DC} (Ω).
     (Note: Design should consider EOL ESR\textsubscript{DC} for application temperature rise evaluation.)

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. BOL: Beginning of Life, rated initial product performance
    - Capacitance: 80% of min. BOL rating
    - ESR\textsubscript{DC}: 2x max. BOL rating

When ordering, please reference the Maxwell Model Number below.
Maxwell Model Number: BMOD0001 P005 B02
Maxwell Part Number: 133730
Previous Model Number: EMHSR-0001C5-005R0

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BMOD0001 P005 B02

<table>
<thead>
<tr>
<th>Part Description</th>
<th>W (max.)</th>
<th>L (max.)</th>
<th>D (max.)</th>
<th>d (±0.05)</th>
<th>H1 (min.)</th>
<th>H2 (min.)</th>
<th>A (±0.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMOD0001 P005 B02</td>
<td>17.5</td>
<td>23.0</td>
<td>9.5</td>
<td>0.60</td>
<td>15.0</td>
<td>19.0</td>
<td>8.6</td>
</tr>
</tbody>
</table>

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