5.0V 1.5F ULTRACAPACITOR MODULE

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

TYPICAL CHARACTERISTICS
THERMAL
Typical Thermal Resistance (Rth, Housing) 77°C/W
Typical Thermal Capacitance (Cth) 2.8 J/°C
Usable Continuous Current (BOL) (ΔT = 15 °C) 1.2 A
Usable Continuous Current (BOL) (ΔT = 40 °C) 2.0 A

LIFE*
Projected DC Life at Room Temperature (At rated voltage and 25°C, EOL)
DC Life at High Temperature (At rated voltage and 65°C, EOL) 1,500 hours
DC Life at De-rated Voltage & Higher Temperature (At 4.6V and 85°C, EOL) 1,500 hours
Projected Cycle Life at Room Temperature (Constant current charge-discharge from VR to 1/2VR at 25°C, EOL) 500,000 cycles
Shelf Life (Stored uncharged at 25°C, ≤ 50% RH) 4 years

POWER & ENERGY
Operating Temp. Range Standard (-40°C to 65°C) at 5.0V Extended (-40°C to 85°C) at 4.6V
Maximum Stored Energy, E6,9 5.2 mWh 4.4 mWh
Gravimetric Specific Energy 1.5 Wh/kg 1.3 Wh/kg
Usable Specific Power 6,9 6.7 kW/kg 5.7 kW/kg
Impedance Match Specific Power 6,9 14.1 kW/kg 11.9 kW/kg

SAFETY
Certifications RoHS, REACH, UL 810A (Cell Level)

*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_{DC} (measure method)
   - Capacitance: Constant current charge (4 * C * V_{m} [mA]) to V_{m}, 5 min hold at V_{m},
     constant current discharge (4 * C * V_{m} [mA]) to 0.1 V.
   - ESR_{DC}: Constant current charge (4 * C * V_{m} [mA]) to V_{m}, 5 min hold at V_{m},
     constant current discharge (40 * C * V_{m} [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
     results will vary.
   - Dangerous goods (hazardous materials) under transportation regulations.

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_{max} (Wh) = \frac{\text{C} \times \text{V}^2}{2000}
   - Gravimetric Specific Energy (Wh/kg) = \frac{\text{E}_{\text{max}}}{\text{mass}}
   - Usable Specific Power (W/kg) = \frac{0.12 \times \text{V}}{\text{ESR}_{\text{DC}} \times \text{mass}}
   - Impedance Match Specific Power (W/kg) = \frac{0.25 \times \text{V}}{\text{ESR}_{\text{DC}} \times \text{mass}}
   - Presented Power and Energy values are calculated based on Rated Capacitance & Rated (Max.) ESR_{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_{\text{max}} \times ESR_{\text{DC}} \times \text{R}_{\text{th}}
   - \Delta T: Temperature rise over ambient (°C)
   - I_{\text{max}}: Maximum continuous or RMS current (A)
   - R_{\text{th}}: Thermal resistance, module to ambient (°C/W)
   - ESR_{\text{DC}}: Rated (Max.) ESR_{DC}.
   (Note: Design should consider EOL ESR_{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
    EOL: End of Life criteria.
        - Capacitance: 80% of min. BOL rating
        - ESR_{DC}: \pm 10% max. BOL rating

---

BMOD0001 P005 B02

When ordering, please reference the Maxwell Model Number below.

Maxwell Model Number: BMOD0001 P005 B02
Maxwell Part Number: 133730
Alternate Model Number: EMHSR-0001C5-005R0

The information in this document is correct at time of printing and is subject to change without notice. Images are not to scale. Products and related processes may be covered by one or more U.S. or international patents and pending applications. Please see www.maxwell.com/patents for more information.