

5.0V 1.5F ULTRACAPACITOR CELL

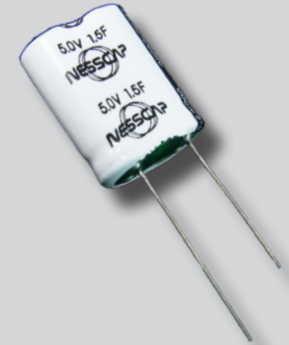
BMOD0001 P005 B02
EMHSR-0001C5-005R0

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

Rated Voltage, V_R	5.0 VDC
Surge Voltage ¹	5.4 VDC
Capacitance ³ , (Rated / Typical ²)	> 1.5 F \pm 10% / XX F \pm ???%
ESR-DC, Initial, 10ms (Rated/Typical ²)	< 1.30 m Ω / XX m Ω
ESR-DC, Initial, 5 sec (Rated/Typical ²)	< X.X m Ω / XX m Ω
Maximum Leakage Current ⁴	5 μ A
Maximum Peak Current, Non-repetitive ⁵	3.1 A

PHYSICAL

Nominal Weight	3.4 g
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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, E_{max} ^{6,9}	5.2 mWh	4.4 mWh
Gravimetric Specific Energy ⁶	1.5 Wh/kg	1.3 Wh/kg
Usable Specific Power ⁶	6.7 kW/kg	5.7 kW/kg
Impedance Match Specific Power ⁶	14.1 kW/kg	11.9 kW/kg

SAFETY

Certifications	RoHS, REACH
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TYPICAL CHARACTERISTICS

THERMAL CHARACTERISTICS

Thermal Resistance (R_{th} , Housing)	77°C/W
Thermal Capacitance (C_{th}), typical	2.8 J/°C
Usable Continuous Current (BOL) ($\Delta T = 15$ °C) ⁸	1.2 A
Usable Continuous Current (BOL) ($\Delta T = 40$ °C) ⁸	2.0 A

LIFE

Projected DC Life at Room Temperature ¹ (Hold at rated voltage and 25°C)	10 years
DC Life at Standard High Temperature ⁸ (Hold at rated voltage and 65°C)	1,500 hours
DC Life at De-rated Voltage & Higher Temperature ⁸ (Hold at 2.3V and 85°C)	1,500 hours
Projected Cycle Life at Room Temperature ^{7,8} (Constant current charge-discharge from VR to 1/2VR at 25°C)	500,000 cycles
Shelf Life (Stored uncharged at 25°C, \leq 50% RH)	4 years

*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.

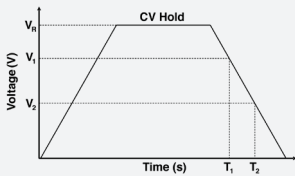
Datasheet: 5.0V 1.5F ULTRACAPACITOR CELL

Definitions:

BOL: Beginning of Life, rated initial product performance
 EOL: End of Life criteria.

- Capacitance: 80% of min. BOL rating.
- DC-ESR: 2x max. rated BOL rating.

1. Max. Surge Voltage
Absolute maximum voltage, non-repetitive. Duration not to exceed 1 second.
2. Typical
Typical values represent mean values of production sample
3. Rate Capacitance and ESR Measurement Method: (Medium & Large Cell)
 - Rest for 1 second
 - Constant current charge with 100mA/F (up to 100A) to VR
 - Hold at VR for 10 second
 - Rest for 1 second
 - Constant current discharge with 100mA/F (up to 100A) to 0.5VR
 - Rest for 5second
 - Discharge to storage voltage



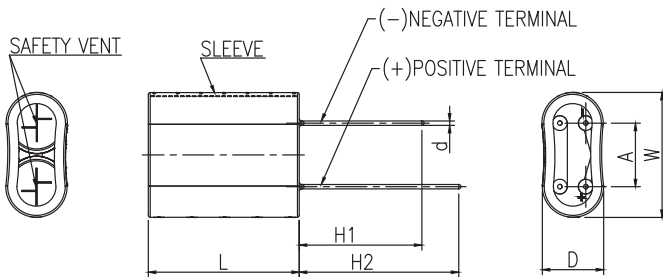
where:

- CAP is capacitance(F);
- ESR is DC ESR(Ω)
- I2 is discharge current(A)
- V1 is voltage at 100ms of discharge or the first voltage measurement of current reach I2
- T1 is the sample time at V1
- V2 is the end of discharge voltage at 0.5VR
- T2 is the sample time at V2
- V3 is the voltage at 100ms rest
- V4 is the voltage at 5 second rest

4. Leakage Current
 - Max. leakage current measured after 72 hrs at rated voltage. Initial leakage current can be higher.
 - Module leakage current is the sum of cell and balancing circuit leakag currents.

5. Maximum Peak Current
Current that can be used for 1-second discharging from the rated voltage to half-rated voltage under the constant current discharging mode. The stated maximum peak current should not be used in normal operation and is only provided as a reference value.
6. Energy & Power (Based on IEC 62391-2)
 - Maximum Stored Energy, $E_{max}(Wh) = \frac{1}{2}CV_R^2$
 - Gravimetric Specific Energy (Wh/kg) = $\frac{E_{max}}{Weight}$
 - Usable Specific Power (W/kg) = $\frac{0.12V_R^2}{ESR_{DC} \times Weight}$
 - Impedance Match Specific Power (W/kg) = $\frac{0.25V_R^2}{ESR_{DC} \times Weight}$
7. Please see Maxwell document XXXXXXX.X for details on cycle life profile. Cycle life varies depending upon application-specific characteristics. Actual result will vary.
8. Temperature Rise at Constant Current
 - $\Delta T = I_{RMS}^2 \times ESR_{DC(5sec)} \times R_{th}$
 - ΔT : Temperature rise over ambient ($^{\circ}C$)
 - I_{RMS} : Maximum continuous or RMS current (A)
 - R_{th} : Thermal resistance, cell to ambient ($^{\circ}C/W$)
 - ESR: $ESR_{DC(5sec)}$ (Ω). (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.

BMOD0001 P005 B02



Part Description	Dimensions (mm)					
	L (max)	D (max)	d (± 0.05)	H1 (min)	H2 (min)	A (± 0.1)
BMOD0001 P005 B02	23	9.5	0.6	15.0	19.0	8.6

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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