

2.7V 650-3000F ULTRACAPACITOR CELLS

FEATURES AND BENEFITS

- DuraBlue™ Shock and Vibration Technology¹
- Up to 1,000,000 duty cycles or 10 year DC life*
- High power and energy
- 650F to 3,000F capacitance range
- Threaded terminals or laser-weldable posts

TYPICAL APPLICATIONS

- High shock and vibration environments
- Automotive subsystems
- Wind turbine pitch control
- Hybrid vehicles
- Rail
- Heavy industrial equipment
- UPS & telecom systems



PRODUCT SPECIFICATIONS

ELECTRICAL

| | BCAP0650 | BCAP1200 | BCAP1500 | BCAP2000 | BCAP3000 ¹ |
|--|----------|----------|----------|----------|-----------------------|
| Rated Voltage | 2.70 V | 2.70 V | 2.70 V | 2.70 V | 2.70 V |
| Minimum Capacitance, initial ² , rated value | 650 F | 1,200 F | 1,500 F | 2,000 F | 3,000 F |
| Maximum Capacitance, initial ² | 780 F | 1,440 F | 1,800 F | 2,400 F | 3,600 F |
| Maximum ESR _{DC} , initial ² , rated value | 0.8 mΩ | 0.58 mΩ | 0.47 mΩ | 0.35 mΩ | 0.29 mΩ |

POWER & ENERGY

| | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|
| Usable Specific Power, P_d^3 | 6.8 kW/kg | 5.8 kW/kg | 6.6 kW/kg | 6.9 kW/kg | 5.9 kW/kg |
| Impedance Match Specific Power, P_{max}^4 | 14 kW/kg | 12 kW/kg | 14 kW/kg | 14 kW/kg | 12 kW/kg |
| Specific Energy, E_{max}^5 | 4.1 Wh/kg | 4.7 Wh/kg | 5.4 Wh/kg | 5.6 Wh/kg | 6.0 Wh/kg |
| Stored Energy, $E_{stored}^{6,13}$ | 0.66 Wh | 1.22 Wh | 1.52 Wh | 2.03 Wh | 3.04 Wh |

SHOCK & VIBRATION

| | | | | | |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------------------|
| Vibration Specification | ISO 16750-3, Table 14 | ISO 16750-3, Table 14 | ISO 16750-3, Table 14 | ISO 16750-3, Table 14 | ISO 16750-3, Tables 12 & 14 |
| Shock Specification | SAE J2464 | SAE J2464 | SAE J2464 | SAE J2464 | SAE J2464 IEC 60068-2-27, -29 |

SAFETY

| | | | | | |
|---|---------------------|---------------------|---------------------|---------------------|---------------------|
| Short Circuit Current, typical (Current possible with short circuit from rated voltage. Do not use as an operating current.) | 3,400 A | 4,700 A | 5,700 A | 7,700 A | 9,300 A |
| Certifications | UL810a, RoHS, REACH | UL810a, RoHS, REACH | UL810a, RoHS, REACH | UL810a, RoHS, REACH | UL810a, RoHS, REACH |

THERMAL

| | | | | | |
|---|---------------------|----------------------|----------------------|----------------------|----------------------|
| Thermal Resistance (R_{ca} , Case to Ambient), typical | 6.5°C/W | 5.3°C/W | 4.5°C/W | 3.8°C/W | 3.2°C/W |
| Thermal Capacitance (C_{th}), typical | 190 J/°C | 300 J/°C | 320 J/°C | 410 J/°C | 600 J/°C |
| Maximum Continuous Current ($\Delta T = 15^\circ C$) ⁷ | 54 A _{RMS} | 70 A _{RMS} | 84 A _{RMS} | 110 A _{RMS} | 130 A _{RMS} |
| Maximum Continuous Current ($\Delta T = 40^\circ C$) ⁷ | 88 A _{RMS} | 110 A _{RMS} | 140 A _{RMS} | 170 A _{RMS} | 210 A _{RMS} |

*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.

TYPICAL CHARACTERISTICS

| TEMPERATURE | BCAP0650 | BCAP1200 | BCAP1500 | BCAP2000 | BCAP3000 ¹ |
|--|----------|----------|----------|----------|-----------------------|
| Operating temperature (Cell case temperature) | | | | | |
| Minimum | -40°C | -40°C | -40°C | -40°C | -40°C |
| Maximum | 65°C | 65°C | 65°C | 65°C | 65°C |

ELECTRICAL

| | | | | | |
|--|--------|--------|--------|--------|--------|
| Leakage Current at 25°C, maximum ⁸ | 1.5 mA | 2.7 mA | 3.0 mA | 4.2 mA | 5.2 mA |
| Absolute Maximum Voltage ⁹ | 2.85 V | 2.85 V | 2.85 V | 2.85 V | 2.85 V |
| Absolute Maximum Current | 680 A | 930 A | 1150 A | 1500 A | 1900 A |

LIFE*

| | | | | | |
|--|------------------|------------------|------------------|------------------|------------------|
| DC Life at High Temperature ² (held continuously at Rated Voltage and Maximum Operating Temperature) | 1,500 hours | 1,500 hours | 1,500 hours | 1,500 hours | 1,500 hours |
| Capacitance Change (% decrease from rated value) | 20% | 20% | 20% | 20% | 20% |
| ESR Change (% increase from rated value) | 100% | 100% | 100% | 100% | 100% |
| Projected DC Life at 25°C ² (held continuously at Rated Voltage) | 10 years | 10 years | 10 years | 10 years | 10 years |
| Capacitance Change (% decrease from rated value) | 20% | 20% | 20% | 20% | 20% |
| ESR Change (% increase from rated value) | 100% | 100% | 100% | 100% | 100% |
| Projected Cycle Life at 25°C ^{2,10,11} | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles |
| Capacitance Change (% decrease from rated value) | 20% | 20% | 20% | 20% | 20% |
| ESR Change (% increase from rated value) | 100% | 100% | 100% | 100% | 100% |
| Shelf Life (Stored uncharged at 25°C ± 10°C) | 4 years | 4 years | 4 years | 4 years | 4 years |

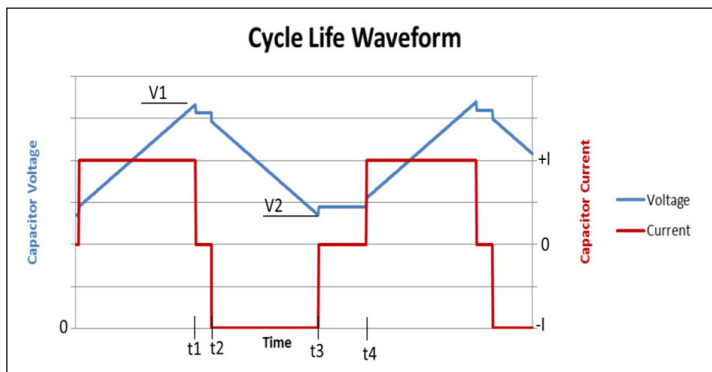
PHYSICAL

| | | | | | |
|---------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Mass, typical | 160 g | 260 g | 280 g | 360 g | 510 g |
| Terminals | Threaded ¹² or Weldable | Threaded ¹² or Weldable | Threaded ¹² or Weldable | Threaded ¹² or Weldable | Threaded ¹² or Weldable |

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NOTES

1. Only BCAP3000 currently has DuraBlue™ technology.
2. Capacitance and ESR_{DC} measured using 65 A for BCAP0650, 75 A for BCAP1200 and 100 A test current for all other cells. All tests made at 25°C per document number 1007239 available at maxwell.com.
3. Per IEC 62391-2, $P_d = \frac{0.12V^2}{ESR_{DC} \times \text{mass}}$
4. $P_{\text{max}} = \frac{V^2}{4 \times ESR_{DC} \times \text{mass}}$
5. $E_{\text{max}} = \frac{1/2 CV^2}{3,600 \times \text{mass}}$
6. $E_{\text{stored}} = \frac{1/2 CV^2}{3,600}$
7. $\Delta T = I_{RMS}^2 \times ESR \times R_{ca}$
8. After 72 hours at rated voltage. Initial leakage current can be higher.
9. Absolute maximum voltage, non-repeated. Not to exceed 1 second.
10. Cycle using specified test current per waveform below.
11. Cycle life varies depending upon application-specific characteristics. Actual results will vary.
12. Maximum Torque is 14 Nm.
13. Per United Nations material classification UN3499, all Maxwell ultracapacitors have less than 10 Wh capacity to meet the requirements of Special Provisions 361. When packaged according to the regulation, both individual ultracapacitors and modules composed of those ultracapacitors shipped by Maxwell can be transported without being treated as dangerous goods (hazardous materials).



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

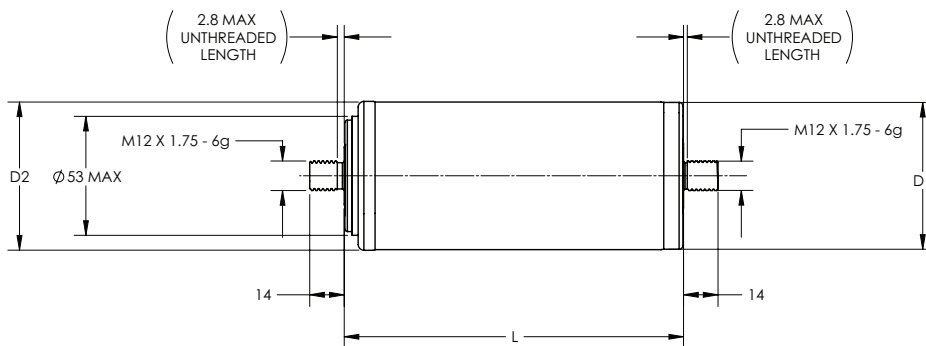
MOUNTING RECOMMENDATIONS

Do not reverse polarity. Please refer to document number 1016419, available at maxwell.com for welding recommendations.

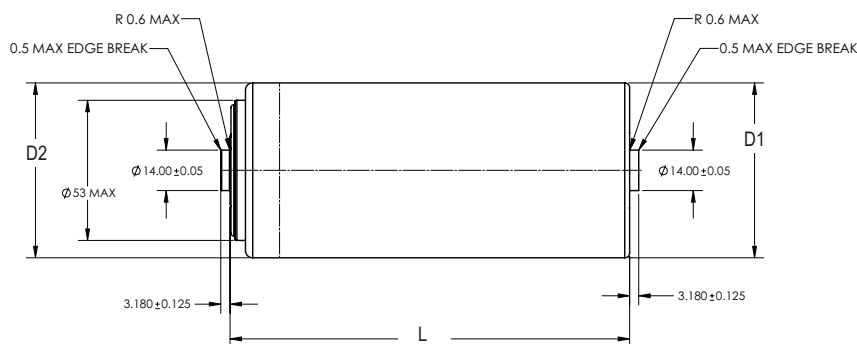
MARKINGS

Products are marked with the following information:
 Rated capacitance, rated voltage, product number, name of manufacturer, positive terminal, warning marking, serial number.

BCAPXXXX P270 K04



BCAPXXXX P270 K05



| Part Description | Dimensions (mm) | | | Package Quantity |
|----------------------|-----------------|----------------|----------------|------------------|
| | L (±0.3mm) | D1 (±0.2mm) | D2 (±0.7mm) | |
| BCAP0650 P270 K04/05 | 51.5 | 60.4 | 60.7 | 30 |
| BCAP1200 P270 K04/05 | 74 | 60.4 | 60.7 | 30 |
| BCAP1500 P270 K04/05 | 85 | 60.4 | 60.7 | 30 |
| BCAP2000 P270 K04/05 | 102 | 60.4 | 60.7 | 15 |
| BCAP3000 P270 K04/05 | 138 | 60.4 | 60.7 | 15 |

Product dimensions are for reference only unless otherwise identified. Product dimensions and specifications may change without notice. Please contact Maxwell Technologies directly for any technical specifications critical to application. 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.

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