## FEATURES AND BENEFITS
- High performance product with low ESR
- Exceptional shock and vibration resistance
- Long lifetimes with up to 100,000 duty cycles*
- Compliant with RoHS and REACH requirements

## APPLICATIONS
- Flashlights
- LED
- Memory Back-Up
- Portable Hand Tools
- Solar Charger
- Off-Grid Lighting
- Automotive Subsystems (Power Windows and Door Locks)

## PRODUCT SPECIFICATIONS
### ELECTRICAL
- **Rated Voltage, $V_r$**: 2.3 VDC
- **Surge Voltage**: 2.5 VDC
- **Rated Capacitance, $C^3$**: 50 F
- **Min. / Max. Capacitance, Initial**: 45 F / 60 F
- **Typical Capacitance, Initial$^{2,3}$**: 51.2 F
- **Rated (Max.) ESR$^{DC}$, Initial$^3$**: 36 mΩ
- **Typical ESR$^{DC}$, Initial$^{2,3}$**: 27 mΩ
- **Maximum Leakage Current$^4$**: 76 μA
- **Maximum Peak Current, Non-repetitive$^5$**: 20 A

### PHYSICAL
- **Nominal Mass**: 7.0 g

### POWER & ENERGY
- **Operating Temp. Range**: -25°C to 60°C
- **Maximum Stored Energy, $E_{max}^{6,8}$**: 36 mWh
- **Gravimetric Specific Energy$^6$**: 5.2 Wh/kg
- **Usable Specific Power$^6$**: 2.5 kW/kg
- **Impedance Match Specific Power$^6$**: 5.2 kW/kg

### SAFETY
- **Certifications**: RoHS, REACH

## LIFE*
- **Projected DC Life at Room Temperature**: 10 years
- **DC Life at High Temperature**: 2,000 hours
- **Projected Cycle Life at Room Temperature**: 100,000 cycles
- **Shelf Life**: 2 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.
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 to V_{R} with 40 mA, constant voltage
     charge at V_{R} for 5 min., constant current discharge to 0.9 V with 40 mA.
   • ESR_{DC}: Constant current charge to V_{R} with 40 mA, constant voltage charge
     at V_{R} for 5 min., constant current discharge with 4 * C * V_{R} [mA] to 0.9 V.
     e.g. in case of 2.3V 50F pseudocell, 4 * 50 * 2.3 = 460 mA.

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 current.

5. Maximum Peak Current
   • Current needed to discharge cell/module from rated voltage to half-rated
     voltage in 1 second.
   \[ I = \frac{V_{R}}{\Delta t} \]
   where \( \Delta t \) is the discharge time (sec); \( \Delta t = 1 \) sec in this case
   • 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) = \( \frac{1}{2}C V_{R}^{2} \)
   • Gravimetric Specific Energy (Wh/kg) = \( \frac{E_{max}}{0.025V_{R}^{2}} \)
   • Usable Specific Power (W/kg) = \( \frac{ESR_{DC} \times \text{mass}}{\Delta V} \)
   • Impedance Match Specific Power (W/kg) = \( \frac{ESR_{DC} \times \text{mass}}{0.12V_{R}^{2}} \)
   • Present 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. 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.

9. BOL: Beginning of Life, rated initial product performance
   EOL: End of Life criteria.
   • Capacitance: 70% of min. BOL rating
   • ESR_{DC}: 2x max. BOL rating

Datasheet: 2.3V 50F PSEUDOCAPACITOR CELL

PCAP0050 P230 S01

When ordering, please reference the Maxwell Model Number below.

Maxwell Model Number: PCAP0050 P230 S01
Maxwell Part Number: 133738
Alternate Model Number: PSHLR-0050C0-002R3

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