

# 2.3V 50F PSEUDOCAPACITOR CELL

PCAP0050 P230 S01  
PSHLR-0050C0-002R3

## 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 <sup>1</sup>	2.5 VDC
Rated Capacitance, $C^3$	50 F
Min. / Max. Capacitance, Initial	45 F / 60 F
Typical Capacitance, Initial <sup>2,3</sup>	51.2 F
Rated (Max.) $ESR_{DC}$ , Initial <sup>3</sup>	36 mΩ
Typical $ESR_{DC}$ , Initial <sup>2,3</sup>	27 mΩ
Maximum Leakage Current <sup>4</sup>	76 μA
Maximum Peak Current, Non-repetitive <sup>5</sup>	20 A

### PHYSICAL

Nominal Mass	7.0 g
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### POWER & ENERGY

<b>Operating Temp. Range</b>	<b>-25°C to 60°C</b>
Maximum Stored Energy, $E_{max}^{6,8}$	36 mWh
Gravimetric Specific Energy <sup>6</sup>	5.2 Wh/kg
Usable Specific Power <sup>6</sup>	2.5 kW/kg
Impedance Match Specific Power <sup>6</sup>	5.2 kW/kg

### SAFETY

Certifications	RoHS, REACH
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## TYPICAL CHARACTERISTICS

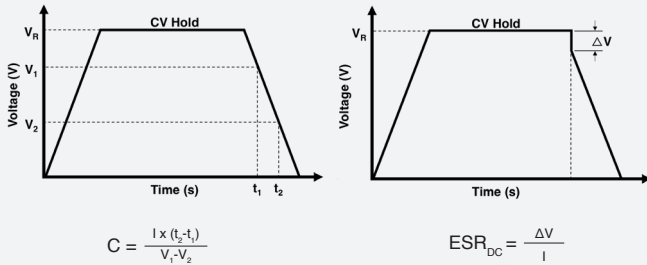
### LIFE\*

Projected DC Life at Room Temperature (At rated voltage and 25°C, EOL <sup>9</sup> )	10 years
DC Life at High Temperature (At rated voltage and 60°C, EOL <sup>9</sup> )	2,000 hours
Projected Cycle Life at Room Temperature (Constant current charge-discharge from $V_R$ to $1/2V_R$ at 25°C, EOL <sup>9</sup> )	100,000 cycles
Shelf Life (Stored uncharged at 25°C, ≤ 50% RH)	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.

# Datasheet: 2.3V 50F PSEUDOCAPACITOR CELL

- Surge Voltage**  
Absolute maximum voltage, non-repetitive. Duration not to exceed 1 second.
- "Typical" values represent mean values of production sample.
- Rated Capacitance & ESR<sub>DC</sub> (measure method)**
  - Capacitance: Constant current charge to V<sub>R</sub> with 40 mA, constant voltage charge at V<sub>R</sub> for 5 min., constant current discharge to 0.9 V with 40 mA.
  - ESR<sub>DC</sub>: Constant current charge to V<sub>R</sub> with 40 mA, constant voltage charge at V<sub>R</sub> for 5 min., constant current discharge with 4 \* C \* V<sub>R</sub> [mA] to 0.9 V. e.g. in case of 2.3V 50F pseudo cell, 4 \* 50 \* 2.3 = 460 mA.



where C is the capacitance (F);  
I is the absolute value of the discharge current (A);  
V<sub>R</sub> is the rated voltage (V);  
V<sub>1</sub> is the measurement start voltage, 2V;  
V<sub>2</sub> is the measurement end voltage, 1V;  
t<sub>1</sub> is the time from start of discharge to reach V<sub>1</sub> (s);  
t<sub>2</sub> is the time from start of discharge to reach V<sub>2</sub> (s);  
ESR<sub>DC</sub> is the DC-ESR (Ω);  
ΔV is the voltage drop during first 10ms of discharge (V).

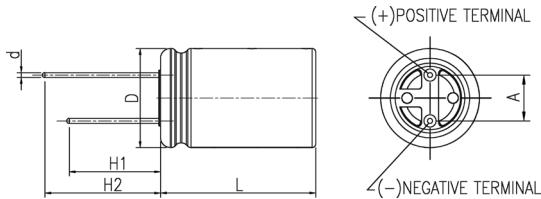
- Maximum Leakage Current**
  - Current measured after 72 hrs at rated voltage and 25°C. Initial leakage current can be higher.
  - If applicable, module leakage current is the sum of cell and balancing circuit leakage currents.

- Maximum Peak Current**
  - Current needed to discharge cell/module from rated voltage to half-rated voltage in 1 second.
$$I = \frac{\frac{1}{2}V_R}{\Delta t / C + ESR_{DC}}$$

where Δt is the discharge time (sec); Δt = 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.
- Energy & Power (Based on IEC 62391-2)**
  - Maximum Stored Energy, E<sub>max</sub> (Wh) =  $\frac{\frac{1}{2}CV_R^2}{3,600}$
  - Gravimetric Specific Energy (Wh/kg) =  $\frac{E_{max}}{mass}$
  - Usable Specific Power (W/kg) =  $\frac{0.12V_R^2}{ESR_{DC} \times mass}$
  - Impedance Match Specific Power (W/kg) =  $\frac{0.25V_R^2}{ESR_{DC} \times mass}$
  - Presented Power and Energy values are calculated based on Rated Capacitance & Rated (Max.) ESR<sub>DC</sub>, Initial values.
- Cycle Life Test Profile**  
Cycle life varies depending upon application-specific characteristics. Actual results will vary.
- 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.
- BOL: Beginning of Life, rated initial product performance**  
**EOL: End of Life criteria.**
  - Capacitance: 70% of min. BOL rating
  - ESR<sub>DC</sub>: 2x max. BOL rating

## PCAP0050 P230 S01



Part Description	Dimensions (mm)					
	L (±1.0)	D (+0.5)	d (±0.05)	H1 (min.)	H2 (min.)	A (±0.5)
PCAP0050 P230 S01	25.5	16.0	0.80	15.0	19.0	7.5

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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