Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

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Maxwell TECHNOLOGIES
Enabling Energy's Future™

DATASHEET

2.7V 25F ULTRACAPACITOR CELL

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 UL, RoHS and REACH requirements

TYPICAL APPLICATIONS

- Actuators
- Emergency Lighting
- Telematics
- Automotive
- Security Equipment
- Backup System
- Smoke Detectors
- Advanced Metering

PRODUCT SPECIFICATIONS & CHARACTERISTICS

BCAP0025 P270 S01 I BCAP0025 P270 S12
ESHSR-0025C0-002R7 |

ELECTRICAL

Rated Voltage, V_R	2.7 VDC
Surge Voltage[1]	2.85 VDC
Rated Capacitance, C[3]	25 F
Min. / Max. Capacitance, Initial	22.5 F / 30 F
Typical Capacitance, Initial[2,3]	24.8 F
Rated (Max.) ESR_{DC}, Initial[3]	25 mΩ
Typical ESR_{DC}, Initial[2,3]	16 mΩ
Typical ESR_{DC}, Initial, 5 sec[2,3]	27 mΩ
Maximum Leakage Current[4]	49 µA
Maximum Peak Current, Non-repetitive[5]	20 A

PHYSICAL

Nominal Mass	6.7 g

POWER & ENERGY

Operating Temp. Range	**Standard (-40°C to 65°C) at 2.7 V**	**Extended (-40°C to 85°C) at 2.3 V**
Maximum Stored Energy, E_{max}[6,9]	25.3 mWh	18.3 mWh
Gravimetric Specific Energy[6]	3.7 Wh/kg	2.7 Wh/kg
Usable Specific Power[6]	5.2 kW/kg	3.7 kW/kg
Impedance Match Specific Power[6]	10.8 kW/kg	7.8 kW/kg

THERMAL

Typical Thermal Resistance (R_{th}, Housing)[8]	43°C/W
Typical Thermal Capacitance (C_{th})	5.5 J/°C
Usable Continuous Current (BOL) (ΔT = 15 °C)[8,10]	3.7 A
Usable Continuous Current (BOL) (ΔT = 40 °C)[8,10]	6.1 A

LIFE*

Projected DC Life at Room Temperature (At rated voltage and 25°C, EOL[10])	10 years
DC Life at High Temperature (At rated voltage and 65°C, EOL[10])	1,500 hours
DC Life at De-rated Voltage & Higher Temperature (At 2.3V and 85°C, EOL[10])	1,500 hours
Projected Cycle Life at Room Temperature[7] (Constant current charge-discharge from V_R to $1/2V_R$ at 25°C, EOL[10])	500,000 cycles
Shelf Life (Stored uncharged at 25°C)	4 years

SAFETY

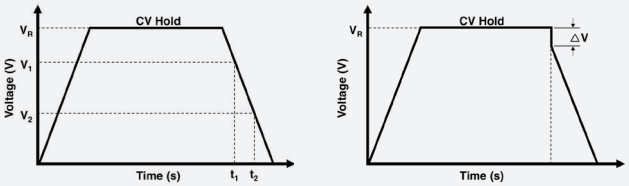
Certifications	RoHS, REACH, UL 810A

*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 (10 mA/F) to V_R, 5 min hold at V_R, constant current discharge 10 mA/F to 0.1V.
     e.g. in case of 2.7V 25F cell, 10 * 25 = 250 mA
   - ESR_{DC}: Constant current charge (10 mA/F) to V_R, 5 min hold at V_R, constant current discharge (40 * C * V_R[mA]) to 0.1 V.
     e.g. in case of 2.7V 25F cell, charge with 10 * 25 = 250 mA and discharge with 40 * 25 * 2.7 = 2,700 mA



$$C = \frac{I \times (t_2 - t_1)}{V_1 - V_2} \qquad ESR_{DC} = \frac{\Delta V}{I}$$

where C is the capacitance (F);
I is the absolute value of the discharge current (A);
V_R is the rated voltage (V);
V_1 is the measurement start voltage, 0.8xV_R (V);
V_2 is the measurement end voltage, 0.4xV_R (V);
t_1 is the time from start of discharge to reach V_1 (s);
t_2 is the time from start of discharge to reach V_2 (s);
ESR_{DC} is the DC-ESR (Ω);
ΔV is the voltage drop during first 10ms of discharge (V).

Typical ESR_{DC}, Initial, 5 sec tested per Maxwell Application Note, "Test Procedures for Capacitance, ESR, Leakage Current and Self-Discharge Characterizations of Ultracapacitors" available at www.maxwell.com.

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 currents.

5. Maximum Peak Current
   - Current needed to discharge cell/module from rated voltage to half-rated voltage in 1 second.

$$I = \frac{½V_R}{\Delta t / C + ESR_{DC}}$$

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.

6. Energy & Power (Based on IEC 62391-2)
   - Maximum Stored Energy, E_{max}(Wh) = $\frac{½CV_R^2}{3{,}600}$
   - 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_{DC}, Initial values.

7. Cycle Life Test Profile
   Cycle life varies depending upon application-specific characteristics. Actual results will vary.

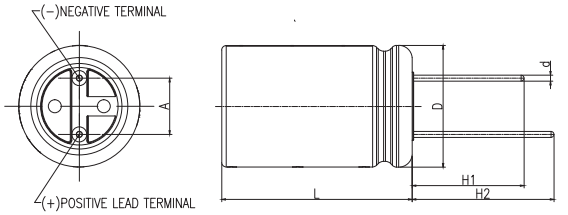
8. Temperature Rise at Constant Current
   - $\Delta T = I_{RMS}^2 \times ESR_{DC} \times R_{th}$

   where ΔT: Temperature rise over ambient (°C)
   I_{RMS}: Maximum continuous or RMS current (A)
   R_{th}: Thermal resistance, cell to ambient (°C/W)
   ESR_{DC}: Rated (Max.) ESR_{DC}(Ω).
   (Note: Design should consider EOL ESR_{DC} for application temperature rise evaluation.)

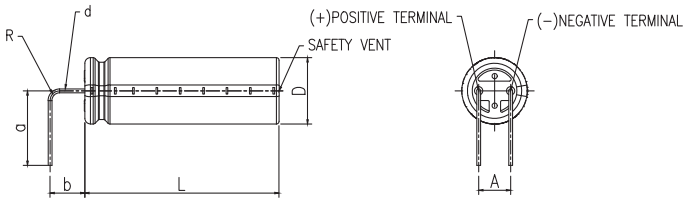
9. Per United Nations material classification UN3499, all Maxwell ultracapacitors have less than 10 Wh capacity to meet the requirements of Special Provisions 361. Both individual ultracapacitors and modules composed of those ultracapacitors shipped by Maxwell can be transported without being treated as dangerous goods (hazardous materials) under transportation regulations.

10. BOL: Beginning of Life, rated initial product performance
    EOL: End of Life criteria.
    - Capacitance: 80% of min. BOL rating
    - ESR_{DC}: 2x max. BOL rating

BCAP00025 P270 S01



BCAP00025 P270 S12



When ordering, please reference the Maxwell Model Number below.

Maxwell Model Number:	Maxwell Part Number:	Alternate Model Number:
BCAP0025 P270 S01	133518	ESHSR-0025C0-002R7
BCAP0025 P270 S12	134379	-

Part Description	Dimensions (mm)								
	L (±1.0)	D (±0.5)	d (±0.05)	A (±0.5)	H1 (min.)	H2 (min.)	R (min.)	a (±0.5)	b (±0.5)
BCAP0025 P270 S01	25.5	16.0	0.80	7.5	15.0	19.0	-	-	-
BCAP0025 P270 S12	25.5	16.0	0.80	7.5	-	-	2.0	11.6	8.4

The information in this document is correct at time of printing and is subject to change without notice. Images are not to scale.

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