2.7V 6F Cell

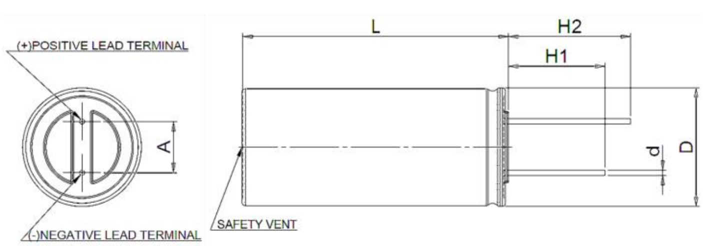
Part No. **ESHSR-0006C0-002R7**

FEATURES

- High performance product with ultra-low ESR
- Exceptional shock and vibration resistance
- Long lifetimes with up to 500,000 duty cycles
- Compliant with UL, RoHS, and REACH requirements
- Recommended Application:

  Actuators, Emergency Lighting, Telematics, Automotive, Security Equipment, Backup System, Smoke Detectors, Telematics, Automotive, Advanced Metering, and Others

See Note on Mounting Recommendations[10]



ELECTRICAL SPECIFICATIONS

Rated Voltage, V_R		**2.7 VDC**
Surge Voltage[1]		2.85 VDC
Rated Capacitance, C[2]		**6 F**
Capacitance Tolerance	Min. / Max.	-10% /+20%
	Average[4]	+5% /+10%
Initial DC-ESR, R_{DC}[3]	Max.	33 mΩ
	Average[4]	**23 mΩ**
Maximum Leakage Current[5]		17 μA
Maximum Peak Current, Non-repetitive[6]		6.7 A

TYPICAL LIFETIME CHARACTERISTICS

Projected DC Life at Room Temperature[8] (Continuous charging at V_R and 25 ± 10 °C)	10 years
DC Life at Standard High Temperature[8] (Continuous charging at V_R and 65°C)	1,500 hours
DC Life at De-Rated Voltage & Higher Temp.[8] (Continuous charging at 2.3V and 85°C)	1,500 hours
Projected Cycle Life at Room Temperature[8] (Constant current charge-discharge from V_R to 1/2V_R at 25 ± 10 °C)	500,000 cycles
Shelf Life (Stored without charge at 25 ± 10 °C)	4 years

TYPICAL THERMAL CHARACTERISTICS

Thermal Resistance, R_{th} (Housing)	60 °C/W
Thermal Capacitance, C_{th}	2.0 J/°C
Usable Continuous Current (ΔT = 15°C)[9]	2.7 A
Usable Continuous Current (ΔT = 40°C)[9]	4.5 A

DIMENSION & WEIGHT

D (+0.5)	8.0 mm	H1 (Min.)	15.0 mm
L (±1.0)	29.0 mm	H2 (Min.)	19.0 mm
d (±0.05)	0.6 mm	A (±0.5)	3.5 mm
Nominal Weight		2.1 g	

SAFETY & ENVIRONMENTAL

RoHS & REACH & UL	Compliant

OPERATING ENVIRONMENT / POWER & ENERGY

Operating Temperature Range	***Standard (-40°C to 65°C)***		***Extended (-40°C to 85°C)***	
Maximum Stored Energy, E_{max}[7]	at 2.7V	6.0 mWh	at 2.3V	4.4 mWh
Gravimetric Specific Energy[7]	at 2.7V	2.8 Wh/kg	at 2.3V	2.1 Wh/kg
Usable Specific Power[7]	at 2.7V	12.6 kW/kg	at 2.3V	9.1 kW/kg
Impedance Match Specific Power[7]	at 2.7V	26.2 kW/kg	at 2.3V	19.9 kW/kg

NOTE

1. Surge Voltage

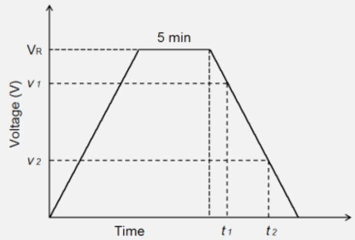
Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.

2. Rated Capacitance (Measurement Method)

> Constant current charge with 10 mA per farad to V_R.
*e.g. In case of 2.7V 6F cell, 10 * 6 = 60 mA*

> Constant voltage charge at V_R for 5 min.

> Constant current discharge with 10 mA per farad to 0.1V.



$$C = \frac{I \times (t_2 - t_1)}{v_1 - v_2}$$

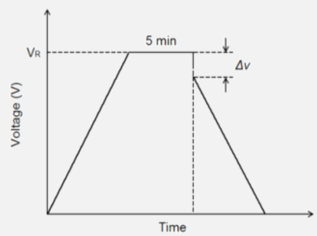
where C is the capacitance (F);
I is the absolute value of the discharge current (A);
v_1 is the measurement starting voltage, 0.8 x V_R (V);
v_2 is the measurement end voltage, 0.4 x V_R (V);
t_1 is the time from discharge start to reach v_1 (s);
t_2 is the time from discharge start to reach v_2 (s)

3. Initial DC-ESR (Measurement Method)

> Constant current charge with 10 mA per farad to V_R.

> Constant voltage charge at V_R for 5 min.

> Constant current discharge with 40 * C * V_R [mA] to 0.1V.
*e.g. In case of 2.7V 6F cell, 40 * 6 * 2.7 = 648 mA*



$$ESR_{DC} = \frac{\Delta v}{I}$$

where ESR_{DC} is the DC-ESR (Ω);
Δv is the voltage drop during first 10ms of discharge (V);
I is the absolute value of the discharge current (A)

4. Average

> Typical percentage spread that may be present in one shipment.

5. Maximum Leakage Current (Measurement Method)

> The capacitor is charged to its rated voltage V_R at 25°C.

> Leakage current is the amount of current measured after 72 hours of continuous holding of the capacitor at V_R.

6. Maximum Peak Current

> Current that can be used for 1-second discharging from the rated voltage to the half-rated voltage under the constant current discharging mode.

$$I = \frac{\frac{1}{2} V_R}{\Delta t / C + ESR_{DC}}$$

where I is the maximum peak current (A);
V_R is the rated voltage (V);
Δt is the discharge time (sec); Δt = 1 sec in this case;
C is the rated capacitance (F);
ESR_{DC} is the maximum DC-ESR (Ω)

> The stated maximum peak current should **not** be used in normal operation and is only provided as a reference value.

7. Energy & Power (Based on IEC 62391-2)

> Maximum Stored Energy, E_{max} (Wh) = $\frac{\frac{1}{2} C V_R^2}{3600}$

> Gravimetric Specific Energy (Wh/kg) = $\frac{E_{Max}}{Weight}$

> Usable Specific Power (W/kg) = $\frac{0.12 V_R^2}{ESR_{DC} \times Weight}$

> Impedance Match Specific Power (W/kg) = $\frac{0.25 V_R^2}{ESR_{DC} \times Weight}$

8. DC Life and Cycle Life Test

> End-of-Life (EOL) Conditions:
- Capacitance: -20% from the rated minimum value
- DC-ESR: +100% from the specified maximum initial value

> Capacitance and ESR measurements are taken at 25°C.

9. Usable Continuous Current

> Maximum current which can be used within the allowed temperature range under the constant current discharging mode.

$$I = \sqrt{\frac{\Delta T}{R_{th} \times ESR_{DC}}}$$

where I is the maximum continuous current (A);
ΔT is the change in temperature (°C);
R_{th} is the thermal resistance (°C/W);
ESR_{DC} is the maximum DC-ESR (Ω)

10. Mounting Recommendations

> Provide properly spaced holes for mounting according to the specified cell dimension in order to minimize the terminal leads of the cell being mechanically stressed.

> Do not place any through-holes directly underneath the cell or in the close proximity of the cell. Allow at least 5mm distance from any point on the outer diameter of the cell to the outer diameter of any through-hole.

> Protective coating of components on the PCB is strongly recommended in order to reduce the risk of the components being damaged in an event of electrolyte leakage.

> The recommended mounting orientation is with the terminal leads pointing upward.

> Provide at least 2mm clearance from the safety vent and do not position anything near the safety vent that may be damaged by the vent rupture.

> Assemble the cell on the PCB taking into account that the cell may not be completely hermetic during its lifetime. Electrolyte vapor and gases generated during normal operation may escape the package.

> Soldering guide for small and medium size cells is available and can be found at www.nesscap.com under Support -> Download.

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