

FEATURES

- » High performance product with low RC time constant
- » Long lifetimes with over 1,000,000 duty cycles
- » Rated capacitance of 650F
- » Weldable terminals for easy integration
- » Compliant with RoHS and REACH requirements



* Image is not to scale

SPECIFICATIONS

| Electrical | | ESHSR-0650C0-002R7A5 |
|---|----------------------------------|----------------------|
| Rated Voltage (V_R) at 65°C | | 2.7 VDC |
| Surge Voltage ¹ | | 2.85 VDC |
| Rated Capacitance ² | | 650 F |
| Capacitance Tolerance | Max. | -0% / +20% |
| | Avg. ⁴ | +5% / +12% |
| DC-ESR, Initial ³ | Max. | 0.60 mΩ |
| | Avg. ⁴ | 0.28 mΩ |
| Max. Leakage Current ⁵ | | 1.5 mA |
| Maximum Continuous Current | at $\Delta T = 15^\circ\text{C}$ | 68 A |
| | at $\Delta T = 40^\circ\text{C}$ | 112 A |
| Maximum Peak Current, Non-repetitive ⁶ | | 630 A |
| Max. Stored Energy (E_{max}) at V_R ⁷ | | 0.6 Wh |
| Usable Specific Power ⁷ | | 7.1 kW/kg |
| Impedance Match Specific Power ⁷ | | 14.8 kW/kg |
| Max. Gravimetric Specific Energy ⁷ | | 3.2 Wh/kg |

| Temperature | |
|-----------------------------|--|
| Operating Temperature Range | -40 ~ 65°C ($\Delta\text{CAP} < 5\%$ and $\Delta\text{ESR} < 100\%$ of initial value measured at 25°C) |
| Storage Temperature Range | -40 ~ 70°C (storage without charge) |

| Life | |
|---|---|
| Endurance (at V_R and 65°C) ^{8,9} | 1,500 hours |
| Room Temperature (at V_R and 25°C) ⁸ | 10 years |
| Cycle Life (at 25°C) ⁸ | 1,000,000 cycles (Estimated value when cycled from V_R to $1/2V_R$ using constant current of 65A with 10 second rest between charge and discharge steps) |
| Shelf Life | 2 years (Stored without charge at under 70°C and under 40% RH) |

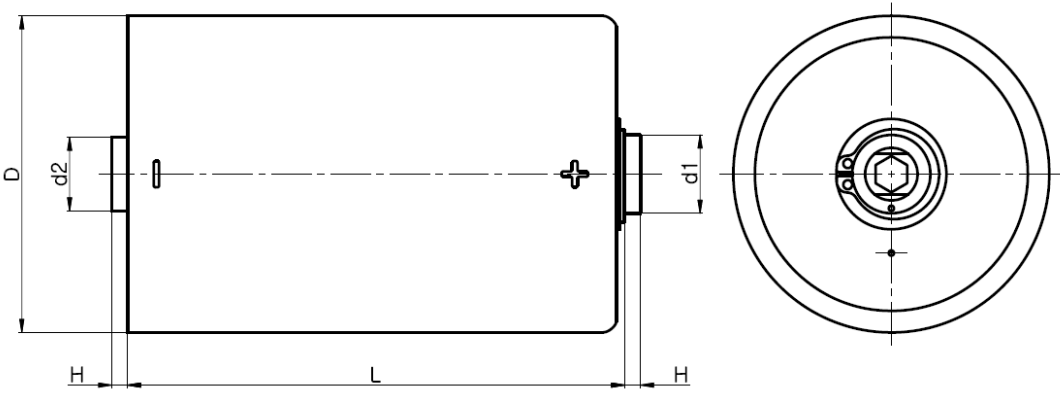
| Safety & Certification | |
|------------------------|--|
| RoHS | Compliant |
| REACH | Compliant |
| UL | Complies to 810A, Certificate No.: BBBG2.MH46340 |

THERMAL

| Characteristics | ESHSR-0650C0-002R7A5 |
|--|----------------------|
| Typical Thermal Resistance, R_{th} (Housing) | 5.3 °C/W |
| Typical Thermal Capacitance, C_{th} | 170 J/°C |
| Cont. Current to $\Delta T = 15^{\circ}C$ | 68 A |
| Cont. Current to $\Delta T = 40^{\circ}C$ | 112 A |

PHYSICAL

Drawing



See Note on Mounting¹⁰

| Dimensions | ESHSR-0650C0-002R7A5 |
|-------------------|----------------------|
| D (± 0.2) | 60.2 mm |
| L (± 0.3) | 51.5 mm |
| H (± 0.125) | 3.0 mm |
| d1 (-0.05) | 14.9 mm |
| d2 (-0.05) | 14.0 mm |
| Nominal Weight | 205 g |

| Shock & Vibration | |
|-------------------------|------------------------|
| Shock Specification | SAE J2464 |
| Vibration Specification | ISO 16750-3 (Table 14) |

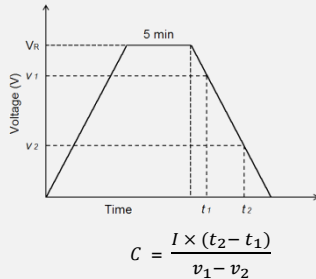
NOTE

1. Surge Voltage

- > Absolute maximum voltage, not repeated and for no longer than 1 second.

2. Rated Capacitance

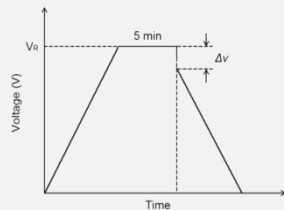
- > Constant current charge with 10mA/F to V_R
- > Constant voltage charge at V_R for 5min
- > Constant current discharge with 10mA/F to 0.1V



Where v_1 is the measurement starting voltage, $0.8 \times V_R$ (V);
 v_2 is the measurement end voltage, $0.4 \times V_R$ (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);
 I is the absolute value of the discharging current (A).

3. ESR (Equivalent Series Resistance)

- > ESR_{DC}
 - Constant current charge to V_R
 - Constant voltage charge at V_R for 5min
 - Constant current discharge to 0.1V



$$R_d = \frac{\Delta v}{I}$$

Where R_d is the ESR_{DC} (Ω);
 Δv is the voltage drop for 10ms (V);
 I is the discharge current (A).

4. Average (or Typical)

- > Percentage spread that may be present in one shipment

5. Leakage Current

- > The capacitor is charged to the rated voltage at 25°C.
- > Leakage current is the current at 72 hours that is required to keep the capacitor charged at the rated voltage

6. Max. Current

- > Current for 1sec discharging from rated voltage to half rated voltage under constant current discharging mode.

$$I_{Max.} (A) = \frac{\frac{1}{2}V_R}{\Delta t / C + R_d}$$

Where Δt is the discharge time (sec) and Δt is 1 sec in this case;
 C is the capacitance (F);
 R_d is the ESR_{DC} (Ω);
 V_R is the rated voltage (V).

- > Max. Current **should not** be used in normal operation and is only provided as a reference value.

7. Energy & Power

- > Max. Stored Energy at $V_R = \frac{\frac{1}{2}CV_R^2}{3600}$

Where C is the capacitance (F);
 V_R is the rated voltage (V).

- > Usable Specific Power, IEC 62391-2 (W/kg) = $\frac{0.12 \cdot V^2}{ESR_{DC} \cdot Mass}$

- > Impedance Match Specific Power (W/kg) = $\frac{0.25 \cdot V^2}{ESR_{DC} \cdot Mass}$

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

8. Lifetime

- > End-of-Life Conditions
 - Capacitance: -30% from rated min. value
 - ESR: +100% from max. ESR value

9. Endurance

- > Conditions
 - Temperature: $65 \pm 2^\circ C$
 - Test duration : 1500 (+48/-0) h
 - Applied voltage: $V_R \pm 0.02V$
 - Capacitance and ESR measurement are made at 25°C

10. Mounting

- > Mounting should be designed in such a way as to not place undue mechanical stress on the terminals
- > Do not exceed the max torque value of 8Nm when assembling threaded type cells.
- > Provide adequate spacing in between cells to ensure required insulation strength for the application.
- > Provide clearance above the safety vent and do not position anything above the safety vent that may be damaged by vent rupture.
- > Welding recommendation for weldable cells available on www.nesscap.com under Support > Download.

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