FEATURES

- » High performance product with low RC time constant
- » Long lifetimes with over 500,000 duty cycles
- » Rated capacitance of 3F
- » Compliant with RoHS and REACH requirements

** Image is not to scale*

SPECIFICATIONS

Electrical		ESHSR-0003C0-002R7
Rated Voltage (V_R) at 65°C		**2.7VDC**
Rated Voltage (V_R) at 85°C		2.3VDC
Surge Voltage[1]		2.85VDC
Rated Capacitance[2]		**3F**
Capacitance Tolerance	Max.	-10% / +20%
	Avg.[4]	-5% / +5%
DC-ESR[3]	Max.	55mΩ
	Avg.[4]	40mΩ
Max. Leakage Current[5]		0.005mA
Maximum Continuous Current	at ΔT = 15°C	2.0A
	at ΔT = 40°C	3.3A
Maximum Peak Current, Non-repetitive[6]	at 65°C	3.4A
	at 85°C	2.9A
Max. Stored Energy (E_{max}) at V_R[7]	at 65°C	3.0mWh
	at 85°C	2.2mWh
Usable Specific Power[7]	at 65°C	10.6kW/kg
	at 85°C	7.7kW/kg
Impedance Match / Specific Power[7]	at 65°C	22.1kW/kg
	at 85°C	16.0kW/kg
Max. Gravimetric Specific Energy[7]		2.0Wh/kg

Temperature	
Operating Temperature Range	-40 ~ 65°C (up to 85°C with de-rated voltage) (ΔCAP<5% and ΔESR<300% of initial value measured at 25°C, with linear voltage de-rating to 2.3V @ 85°C)
Storage Temperature Range	-40 ~ 70°C (storage without charge)

Life		
Endurance[8,9]	at 65°C, 2.7V	1,500 hours
	at 85°C, 2.3V	1,000 hours
Room Temperature (at V_R and 25°C)[8]	10 years	
Cycle Life (at 25°C)[8]	500,000 cycles (Cycled from V_R to $1/2V_R$ using 100mA/F const. current with 10sec rest between charge and discharge steps)	
Shelf Life	2 years (Stored without charge at or under 70°C and under 40% RH)	

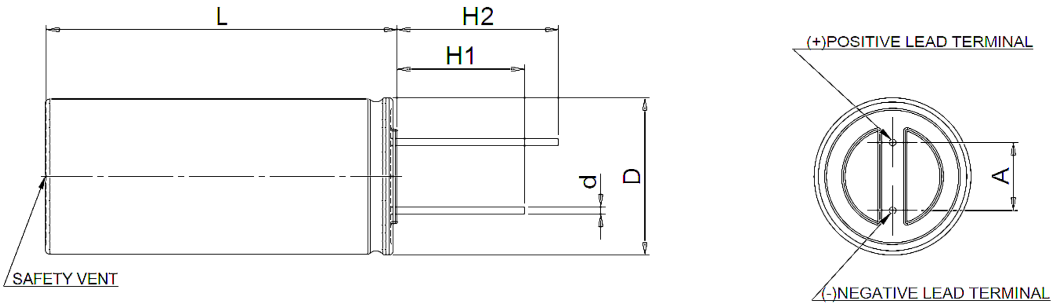
Safety & Certification	
RoHS	Compliant
REACH	Compliant
UL	Complies to 810A, Certificate No.: BBBG2.MH46340

THERMAL

Characteristics	ESHSR-0003C0-002R7
Typical Thermal Resistance, R_{th} (Housing)	67°C/W
Typical Thermal Capacitance, C_{th}	1.3J/°C
Cont. Current to ΔT = 15°C	2.0A
Cont. Current to ΔT = 40°C	3.3A

PHYSICAL

Drawing



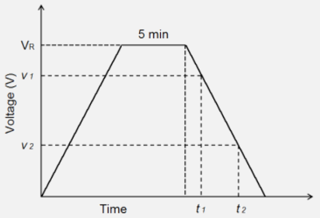
See Note on Mounting[10]

Dimensions	ESHSR-0003C0-002R7
D (+0.5)	8 mm
L (+1.5)	20 mm
H1 (Min.)	15 mm
H2 (Min.)	19 mm
d (±0.05)	0.6 mm
A (±0.5)	3.5 mm
Nominal Weight	1.5 g

NOTE

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

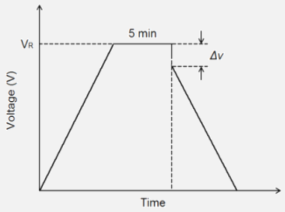
2. Rated Capacitance
   > Constant current charge with 10mA/F to V_R
   > Constant voltage charge at V_R for 5min
   > Constant current discharge with 10mA/F to 0.1V



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

Where 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);
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 72hours 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.

$$I_{Max.}\ (A) = \frac{½V_R}{\Delta t\ /\ C + R_d}$$

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 **<u>should not</u>** be used in normal operation and is only provided as a reference value.

7. Energy & Power
   > Max. Stored Energy at V_R = $\frac{½CV_R^2}{3600}$

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 ± 2°C or 85 ± 2°C
   - Test duration: 1500 (+48/-0) h
   - Applied voltage: V_R ± 0.02V
   - Capacitance and ESR measurement are made at 25°C

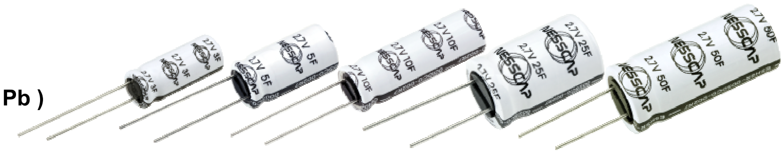
10. Mounting
   > Provide properly spaced holes for mounting according to the cell dimensions as to minimize leads being mechanically stressed.
   > Do not place any copper patterns, including the ground pattern, or through-hole via underneath the cell or on the underside of the PCB (if a double-sided PCB is used) as the electrolyte inside the cell, if it should leak, can corrode, short-circuit, the patterns and/or damage other components nearby. Spacing of 1mm or more should be provided in between the footprint of the cell and the nearest copper pattern.
   > Protective coating of components nearby on the PCB is recommended to reduce the risk of them being damaged in an event of electrolyte leakage.
   > Provide at least 2mm clearance above the safety vent and do not position anything above the safety vent that may be damaged by vent rupture.
   > Place cells on the PCB taking into account that the cells may not be completely hermetic during its lifetime. Electrolyte vapor and gases generated during normal use may escape the package during normal operation.
   > Soldering recommendation for small and medium size cells available on www.nesscap.com under Support > Download.

Nesscap Energy Inc.	**Nesscap Energy Inc.**	**Nesscap Co., Ltd.**	**Nesscap China**	**Nesscap Energy** EASTERN EUROPE	**Nesscap Energy GmbH**
Suite 3800, Royal Bank Plaza, South Tower, 200 Bay Street, P.O. Box 84, Toronto, Ontario, M5J 2Z4	S24040 Camino Del Avion #A118, Monarch Beach, California, 92629	17, Dongtangiheung-ro 681beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do	Room 1608, Block N, Cangson Building, Chegonmiao, Futian District, Shenzhen City, P.R.C	10A, prospect 60-letiya Oktyabrya Moscow, 117036	Beerengarten 4 D-86938 Schondorf
CANADA	USA	REPUBLIC OF KOREA	CHINA	RUSSIA	GERMANY
marketing@nesscap.com				info@nesscap-energy.de	

NESSCAP® Ultracapacitor Products

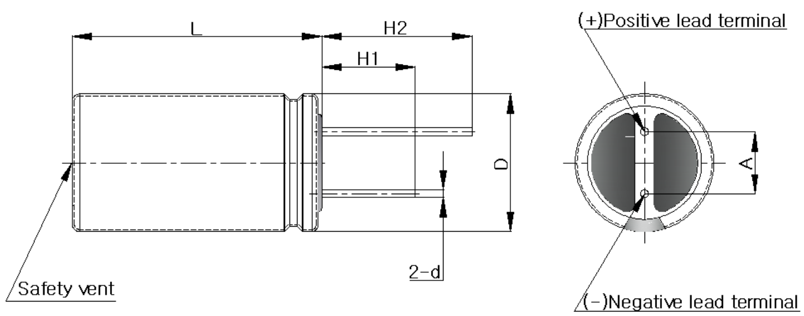
Features

EDLC(Electric Double Layer Capacitor)
Two lead terminals and radial design
Compliant with RoHS requirement (Ex : Cd, Pb)



Dimension

Dimension in mm (not to scale)



Capacitance	Dimension (mm)					
	D (+0.5)	L (+1.5)	H1 (min)	H2 (min)	d (±0.05)	A (±0.5)
3F	8	20	15	19	0.6	3.5
5F	10	20	15	19	0.6	5.0
6F	8	30	15	19	0.6	3.5
10F	10	30	15	19	0.6	5.0
25F	16	25	15	19	0.8	7.5
50F	18	40	15	19	0.8	7.5

Product & Spec.

Rated Capacitance	Internal Resistance (mΩ)		Max. Current (A)	Leakage Current (㎃)	Stored Energy (Wh)	Specific Energy (Wh/kg)	Weight (g)	Part Number
Discharge with constant current at 25℃	AC(1㎑)	DC	1 sec discharge rate to $1/2V_R$	72hours, 25℃	at V_R	Gravimetric		
3F	< 61	< 79	3.3	0.005	0.003	2.00	1.5	ESHSR-0003C0-002R7
5F	< 29	< 38	5.7	0.008	0.005	2.17	2.3	ESHSR-0005C0-002R7
6F	< 26	< 34	6.7	0.017	0.006	2.61	2.3	ESHSR-0006C0-002R7
10F	< 26	< 34	10.1	0.023	0.010	3.13	3.2	ESHSR-0010C0-002R7
25F	< 21	< 27	20.1	0.049	0.025	3.85	6.5	ESHSR-0025C0-002R7
50F	< 14	< 18	35.5	0.073	0.051	4.51	11.3	ESHSR-0050C0-002R7

Rated Voltage,V_R	2.7 V	
Surge Voltage	2.85 V	
Capacitance Tolerance	-10% / +20%	
Operating Temperature Range	-40 ~ 65 °C	∣ΔC∣<5% and ΔESR < 0.5 times of initially measured value at 25°C, respectively
Storage Temperature Range	-40 ~ 70 °C	
Life Time at RT(1)	10 years	(1) ∣ΔC∣ < 30% and ΔESR < 1 times of initially specified value, respectively and LC < specified value (2) Cycle : between rated voltage and half rated voltage under constant current at 25°C
Cycle Life (25°C)(1)(2)	500,000 cycles	

※ Life time is provisional value

Nesscap Co., Ltd.
(446-901) 750-8, Gomae-dong, Giheung-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-289-0721 Fax: +82-31-286-6767 e-mail: marketing@nesscap.com
www.nesscap.com

ISO 9001, ISO 14001, TS 16949

MAXWELL ULTRACAPACITORS: ENABLING ENERGY’S FUTURE

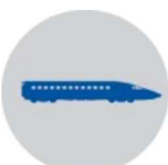
A rapidly emerging and increasingly applied technology, ultracapacitors are capable of storing and discharging energy very quickly and effectively. Due to their many benefits, ultracapacitors are currently being utilized in thousands of different applications, and considered in an equally diverse range of future applications. Ultracapacitors complement a primary energy source which cannot repeatedly provide quick bursts of power, such as an internal combustion engine, fuel cell or battery. The future horizon looks brilliant for ultracapacitors, which already rank as a powerful alternative energy resource.

Where Ultracapacitors Work

Harvest power
from regenerative braking
systems and release power
to help hybrid buses
accelerate.

Reliably crank semi-trucks in cold weather or when batteries are drained from repetitive starting or in-cab electric loads.

Provide cranking power and voltage stabilization in start/stop systems, backup and peak power for key automotive applications – and serve as energy storage in regenerative braking systems.



Capture energy from regenerative braking systems and release power to assist in train acceleration, and used for vehicle power where overhead wiring systems are not available.

Open aircraft doors in the event of power failures.

Used in blade pitch systems and to help increase reliability and stability to the energy grid.

Capture energy and provide burst power to assist in lifting operations.

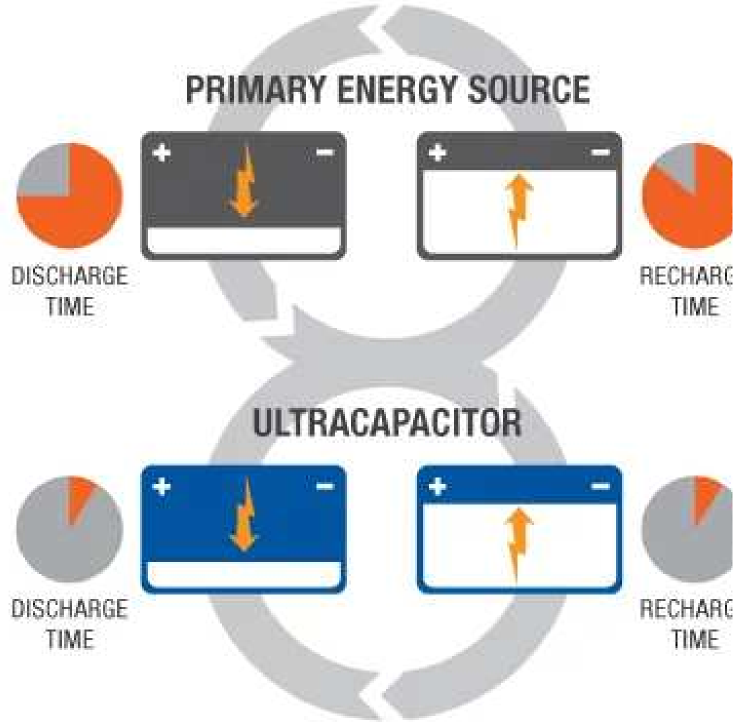
Provide energy to data centers between power failures and initiation of backup power systems, such as diesel generators or fuel cells.

Provide energy storage for firming the output of renewable installations and increasing grid stability.

How Ultracapacitors Work

PRIMARY ENERGY SOURCES like internal combustion engines, fuel cells and batteries work well as a continuous source of low power. However, they cannot efficiently handle peak power demands or recapture energy in today's applications because they discharge and recharge slowly.

ULTRACAPACITORS deliver quick bursts of energy during peak power demands, then quickly store energy and capture excess power that is otherwise lost. They efficiently complement a primary energy source in today's applications because they discharge and recharge quickly.



Contact Us

Contact us using the form below to request more information or to find out how ultracapacitors can work for your application.