

Product Datasheet

60mm \varnothing Ultracapacitors – weldable type

- Rated voltage 3VDC
- 1500F up to 3000F capacitance
- Ultra-low ESR, especially 'P' type cell
- High cycle life of 1 million cycles
- Excellent DC life performance
- Laser-weldable posts
- Very high energy and power density



ELECTRICAL SPECIFICATIONS

Type	C60W-3R0-1500	C60W-3R0-2000	C60W-3R0-3000	C60W-3P0-3000
Rated Voltage V_R	3.00 V	3.00 V	3.00 V	3.00 V
Surge Voltage V_S^1	3.10 V	3.10 V	3.10 V	3.10 V
Rated Capacitance C^2	1500 F	2000 F	3000 F	3000 F
Capacitance Tolerance 3	0% / +20%	0% / +20%	0% / +20%	0% / +20%
ESR 2 (DC)	<0.45 m Ω	<0.34 m Ω	<0.23 m Ω	<0.14 m Ω
ESR 2 (AC, 1 kHz)	<0.39 m Ω	<0.3m Ω	<0.2 m Ω	<0.12 m Ω
Leakage Current I_L^4	<7 mA	<8 mA	<12 mA	<12 mA
Self-discharge Rate 5	<20%	<20%	<20%	<20%
Constant Current ($\Delta T = 15^\circ C$) 6	85 A	105 A	145 A	185 A
Max Current I_{Max}^7	1.3 kA	1.8 kA	2.8 kA	3.2 kA
Short Current I_S^8	6.7 kA	8.8 kA	13 kA	21.4 kA
Stored Energy E^9	1.9 Wh	2.5 Wh	3.75 Wh	3.75 Wh
Energy Density E_d^{10}	6.6 Wh/kg	7.3 Wh/kg	7.8 Wh/kg	7.7 Wh/kg
Usable Power Density P_d^{11}	8.4 kW/kg	9.3 kW/kg	9.8 kW/kg	15.8 kW/kg
Matched Impedance Power Density P_{dMax}^{12} , 10 Hz ESR	17.5 kW/kg	19.3 kW/kg	20.5 kW/kg	32.9 kW/kg
Matched Impedance Power Density P_{dMax}^{12} , 1 kHz ESR	20.2 kW/kg	21.9 kW/kg	23.5 kW/kg	38.3 kW/kg

THERMAL CHARACTERISTICS

Type	C60W-3R0-1500	C60W-3R0-2000	C60W-3R0-3000	C60W-3P0-3000
Working Temperature	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C
Storage Temperature 13	-40 ~ 70°C	-40 ~ 70°C	-40 ~ 70°C	-40 ~ 70°C
Thermal Resistance R_{Th}^{14}	4.6 K/W	4.0 K/W	3.1 K/W	3.1 K/W
Thermal Capacitance C_{Th}^{15}	330 J/K	409 J/K	575 J/K	584 J/K

LIFETIME CHARACTERISTICS

Type	C60W-3R0-1500	C60W-3R0-2000	C60W-3R0-3000	C60W-3P0-3000
DC Life at High Temperature 16	1500 hours	1500 hours	1500 hours	1500 hours
DC Life at RT 17	10 years	10 years	10 years	10 years
Cycle Life 18	1'000'000 cycles	1'000'000 cycles	1'000'000 cycles	1'000'000 cycles
Shelf Life 19	4 years	4 years	4 years	4 years

SAFETY & ENVIRONMENTAL SPECIFICATIONS

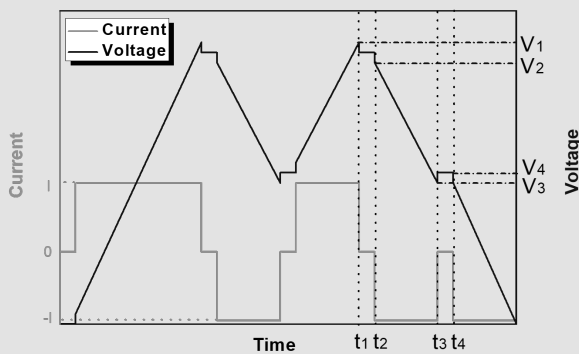
Type	C60W-3R0-1500	C60W-3R0-2000	C60W-3R0-3000	C60W-3P0-3000
Safety	RoHS, REACH and UL810	RoHS, REACH and UL810	RoHS, REACH and UL810	RoHS, REACH and UL810
Vibration	IEC 60068-2-64	IEC 60068-2-64	IEC 60068-2-64	IEC 60068-2-64
Shock	IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27

PHYSICAL PARAMETERS

Type	C60W-3R0-1500	C60W-3R0-2000	C60W-3R0-3000	C60W-3P0-3000
Mass M	285 g	342 g	478 g	489 g
Terminals	Weldable ²⁰	Weldable ²⁰	Weldable ²⁰	Weldable ²⁰
Dimensions ²¹	Height L	85 mm	102 mm	138 mm
	Diameter	60 mm	60 mm	60 mm

NOTES:

- Surge voltage V_S : Absolut maximum voltage, non-repetitive. The duration must not exceed 1 second.
- Capacitance C: The test current is 0.075 A/F, if the calculated current is >100A, then apply 100A.



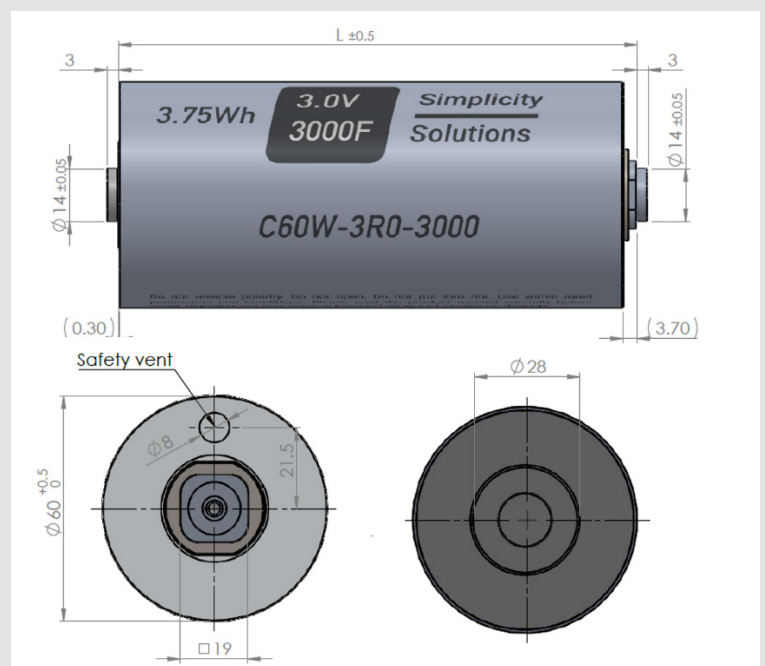
$$V_1 = 2V_3 = V_R$$

$$C = I * (t_3 - t_2) / (V_2 - V_3)$$

$$ESR = (V_4 - V_3) / I$$

- Capacitance tolerance: Typical tolerance is +5%~+10%.
- Leakage current measurement procedure: 1) Charge the capacitor to the V_R with a constant current (0.075 A/F, if the calculated current is >100A, then apply 100A). 2) Hold the voltage at V_R for 72h. 3) The current to maintain V_R after 72 h is the leakage current.
- Self-discharge rate measurement procedure: 1) Charge the capacitor to V_R with a constant current (0.075 A/F, if the calculated current >100A, then apply 100A). 2) Hold the voltage at V_R for 3h. 3) Floating for 72h. 4) Measure the voltage after 72 h.
- Max constant working current: $I_{MCC} = \sqrt{\Delta T / (ESR * R_{Th})}$
- Max current: $I_{Max} = 0.5C * V_R / (\Delta t + ESR * C)$, discharge from V_R to $V_R / 2$ in 1 second.
- Short current: $I_S = V_R / ESR$
- Stored energy: $E = 0.5C * V^2 / 3600$
- Energy density: $E_d = E / M$
- Usable power density: $P_d = (0.12V_R^2 / ESR) / M$
- Matched impedance power density: $P_{dmax} = (0.25V_R^2 / ESR) / M$
- Storage temperature: Storage in discharge state.
- Thermal resistance: $R_{Th} = \Delta T / P$, where $P = ESR * I^2$
- Thermal capacitance is indicated for the whole product.
- DC life at high temperature: Hold the capacitor charged at rated voltage at 65°C for 1500h. The capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.

- DC life at RT: Hold the capacitor charged at rated voltage at room temperature RT, the capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.
- Cycle life: Charge and discharged the capacitor in the range between V_R and $V_R / 2$. 5 seconds waiting period between charge and discharge. The constant test current is 0.075 A/F (if the calculated current >100A, then apply 100A).
- Shelf life: Discharged and no load applied at RT.
- The welding depth should be larger than 0.8 mm
- Dimensions C60W-3R0 3R0 (drawing shows 3000F only):



Standard markings:

- + Name of manufacturer, part number, serial number
- + Rated voltage and capacitance, negative and positive terminals, warning marking
- + Stored energy in watt-hours

Mounting recommendations:

- + Mounting without applying undue mechanical stress on the terminals
- + Provide adequate spacing in between cells to secure required insulation strength
- + Provide clearance around the safety vent and do not position anything above the safety vent that may be damaged in an event of vent rupture

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