

Product Datasheet

60mm Ø 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 mΩ	<0.34 mΩ	<0.23 mΩ	<0.15 mΩ
ESR ² (AC, 1 kHz)	<0.39 mΩ	<0.3mΩ	<0.2 mΩ	<0.12 mΩ
Leakage Current I_L^4	<7 mA	<8 mA	<12 mA	<12.0 mA
Self-discharge Rate ⁵	<20%	<20%	<20%	<20%
Constant Current ($\Delta T = 15^\circ C$) ⁶	85 A	105 A	145 A	180 A
Max Current I_{Max}^7	1.3 kA	1.8 kA	2.8 kA	3.1 kA
Short Current I_S^8	6.7 kA	8.8 kA	13 kA	20.0 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	14.7 kW/kg
Matched Impedance Power Density P_{dMax}^{12} , 10 Hz ESR	17.5 kW/kg	19.3 kW/kg	20.5 kW/kg	30.7 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

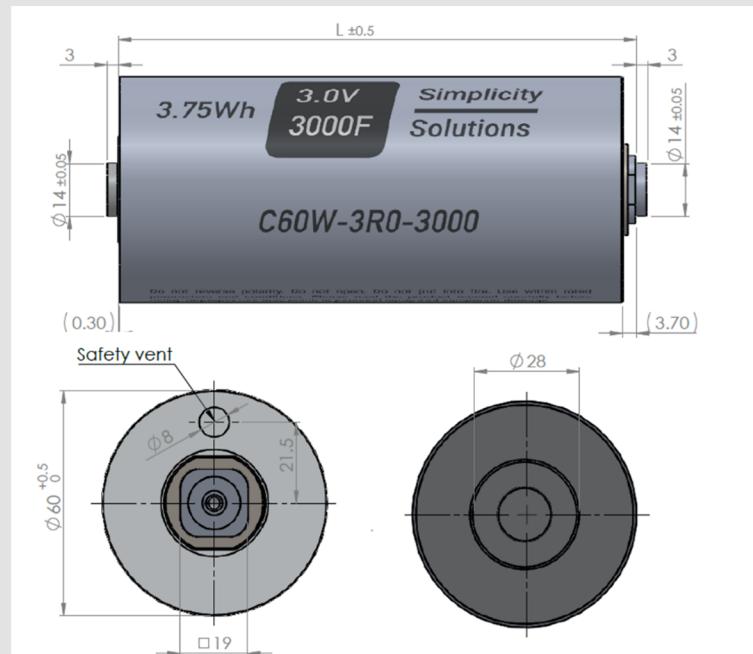
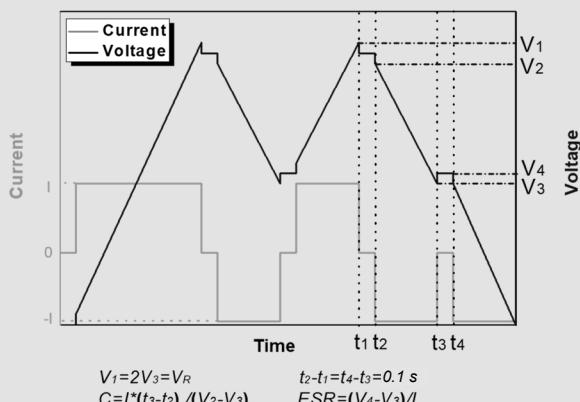
Type	C60W-3R0-1500	C60W-3R0-2000	C60W-3R0-3000	C60W-3P0-3000
Safety	RoHS, REACH and UL810			
Vibration	IEC 60068-2-64	IEC 60068-2-64	IEC 60068-2-64	IEC 60068-2-64
Shock	IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27	IEC 60068-2-27

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	138 mm
Diameter	60 mm	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.
- Capacitance tolerance: Typical tolerance is $\pm 5\% \sim \pm 10\%$.
- 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: $I_5 = V_R / ESR$
- 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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