

## Product Datasheet

### 60mm $\varnothing$ Ultracapacitors – threaded 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
- Threaded terminals M12
- Very high energy and power density



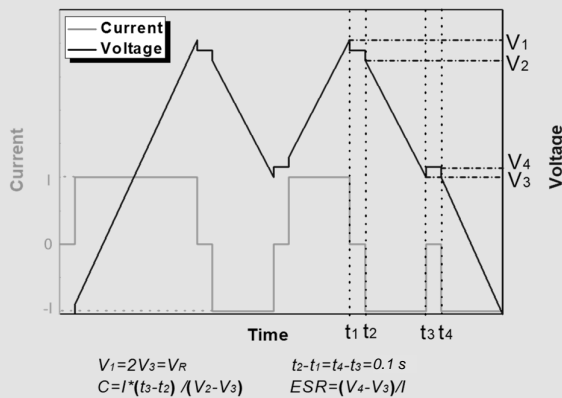
ELECTRICAL SPECIFICATIONS				
Type	C60T-3R0-1500	C60T-3R0-2000	C60T-3R0-3000	C60T-3P0-3000
Rated Voltage $V_R$	3.00 V	3.00 V	3.00 V	3.00 V
Surge Voltage $V_S^1$	3.10 V	3.10 V	3.10 V	3.10 V
Rated Capacitance $C^2$	1500 F	2000 F	3000 F	3000 F
Capacitance Tolerance <sup>3</sup>	-0% / +20%	-0% / +20%	-0% / +20%	0% / +20%
ESR <sup>2</sup> (DC)	<0.45 m $\Omega$	<0.34 m $\Omega$	<0.23 m $\Omega$	<0.14 m $\Omega$
ESR <sup>2</sup> (AC, 1 kHz)	<0.39 m $\Omega$	<0.3m $\Omega$	<0.2 m $\Omega$	<0.12 m $\Omega$
Leakage Current $I_L^4$	<7 mA	<8 mA	<12 mA	<12 mA
Self-discharge Rate <sup>5</sup>	<20%	<20%	<20%	<20%
Constant Current ( $\Delta T = 15^\circ C$ ) <sup>6</sup>	83 A	102 A	130 A	185 A
Max Current $I_{Max}^7$	1.3 kA	1.7 kA	2.4 kA	3.2 kA
Short Current $I_S^8$	6.4 kA	8.3 kA	10.7 kA	21.4 kA
Stored Energy $E^9$	1.8 Wh	2.5 Wh	3.75 Wh	3.75 Wh
Energy Density $E_d^{10}$	6.5 Wh/kg	7.2 Wh/kg	7.7 Wh/kg	7.6 Wh/kg
Usable Power Density $P_d^{11}$	8.3 kW/kg	9.2 kW/kg	9.7 kW/kg	15.6 kW/kg
Matched Impedance Power Density $P_{dMax}^{12}$ , 10 Hz ESR	17.2 kW/kg	19.1 kW/kg	20.2 kW/kg	32.5 kW/kg
Matched Impedance Power Density $P_{dMax}^{12}$ , 1 kHz ESR	19.9 kW/kg	21.6 kW/kg	23.2 kW/kg	37.9 kW/kg
THERMAL CHARACTERISTICS				
Type	C60T-3R0-1500	C60T-3R0-2000	C60T-3R0-3000	C60T-3P0-3000
Working Temperature	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C
Storage Temperature <sup>13</sup>	-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 $C_{Th}^{15}$	335 J/K	414 J/K	580 J/K	589 J/K
LIFETIME CHARACTERISTICS				
Type	C60T-3R0-1500	C60T-3R0-2000	C60T-3R0-3000	C60T-3P0-3000
DC Life at High Temperature <sup>16</sup>	1500 hours	1500 hours	1500 hours	1500 hours
DC Life at RT <sup>17</sup>	10 years	10 years	10 years	10 years
Cycle Life <sup>18</sup>	1'000'000 cycles	1'000'000 cycles	1'000'000 cycles	1'000'000 cycles
Shelf Life <sup>19</sup>	4 years	4 years	4 years	4 years
SAFETY & ENVIRONMENTAL SPECIFICATIONS				
Type	C60T-3R0-1500	C60T-3R0-2000	C60T-3R0-3000	C60T-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	C60T-3R0-1500	C60T-3R0-2000	C60T-3R0-3000	C60T-3P0-3000
Mass M	290 g	347 g	484 g	495 g
Terminals	Threaded <sup>21</sup>	Threaded <sup>21</sup>	Threaded <sup>21</sup>	Threaded <sup>21</sup>
Dimensions <sup>20</sup>	Height L	85 mm	102 mm	138 mm
	Diameter	60 mm	60 mm	60 mm

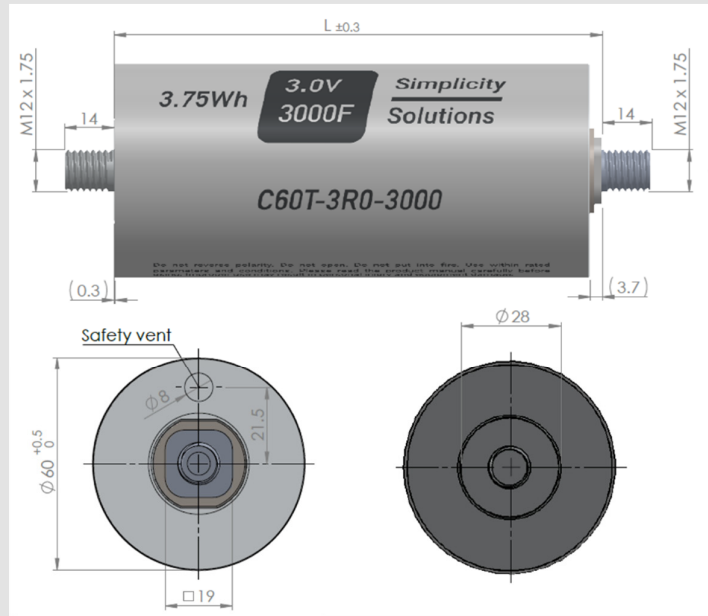
### NOTES:

- Surge voltage  $V_S$ : Absolute 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 +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 at RT.
- 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.
- Dimensions C60T-3R0 (drawing shows 3000F only):



- The maximum torque for threaded terminal is 12 Nm.

#### 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

The contents of this document are subject to change without notice. SECH accepts no liability for the accuracy or credibility of the values and information contained in this document.