# Product Datasheet

## 60mm ∅ Ultracapacitors – threaded type

- Rated voltage 3VDC
- 3200F capacitance
- Ultra-low ESR,
- High cycle life of 1 million cycles
- Excellent DC life performance
- Threaded terminals M12
- Very high energy and power density


| ELECTRICAL SPECIFICATIONS | |
|---|---|
| **Type** | **C60T-3R0-3200** |
| Rated Voltage $V_R$ | 3.00 V |
| Surge Voltage $V_S$[1] | 3.10 V |
| Rated Capacitance C[2] | 3200 F |
| Capacitance Tolerance[3] | -0% / +20% |
| ESR[2] (DC) | <0.23 mΩ |
| ESR[2] (AC, 1 kHz) | <0.2 mΩ |
| Leakage Current IL[4] | <12 mA |
| Self-discharge Rate[5] | <20% |
| Constant Current (ΔT = 15°C)[6] | 145 A |
| Max Current $I_{Max}$[7] | 2.9 kA |
| Short Current $I_S$[8] | 13 kA |
| Stored Energy E[9] | 4 Wh |
| Energy Density $E_d$[10] | 7.84 Wh/kg |
| Usable Power Density $P_d$[11] | 9.2 kW/kg |
| Matched Impedance Power Density $P_{dMax}$[12], 10 Hz ESR | 19.2 kW/kg |
| Matched Impedance Power Density $P_{dMax}$[12], 1 kHz ESR | 22.1 kW/kg |

| THERMAL CHARACTERISTICS | |
|---|---|
| **Type** | **C60T-3R0-3200** |
| Working Temperature | -40 ~ 65°C |
| Storage Temperature[13] | -40 ~ 70°C |
| Thermal Resistance $R_{Th}$[14] | 3.1 K/W |
| Thermal Capacitance $C_{Th}$[15] | 580 J/K |

| LIFETIME CHARACTERISTICS | |
|---|---|
| **Type** | **C60T-3R0-3200** |
| DC Life at High Temperature[16] | 1500 hours |
| DC Life at RT[17] | 10 years |
| Cycle Life[18] | 1'000'000 cycles |
| Shelf Life[19] | 4 years |

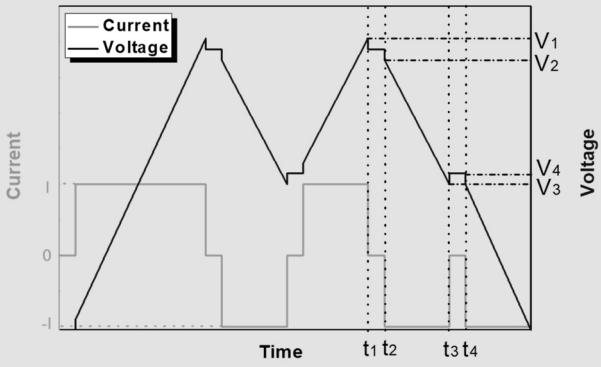
| SAFETY & ENVIRONMENTAL SPECIFICATIONS | |
|---|---|
| **Type** | **C60T-3R0-3200** |
| Safety | RoHS, REACH and UL810 |
| Vibration | ISO 16750-3 Table 12 |
| Shock | IEC 60068-2-27 18x 100g 6ms |

## PHYSICAL PARAMETERS

| Type | | C60T-3R0-3200 |
|---|---|---|
| Mass M | | 510 g |
| Terminals | | Threaded[21] |
| Dimensions[20] | Height L | 138 mm |
| | Diameter | 60 mm |

## NOTES:

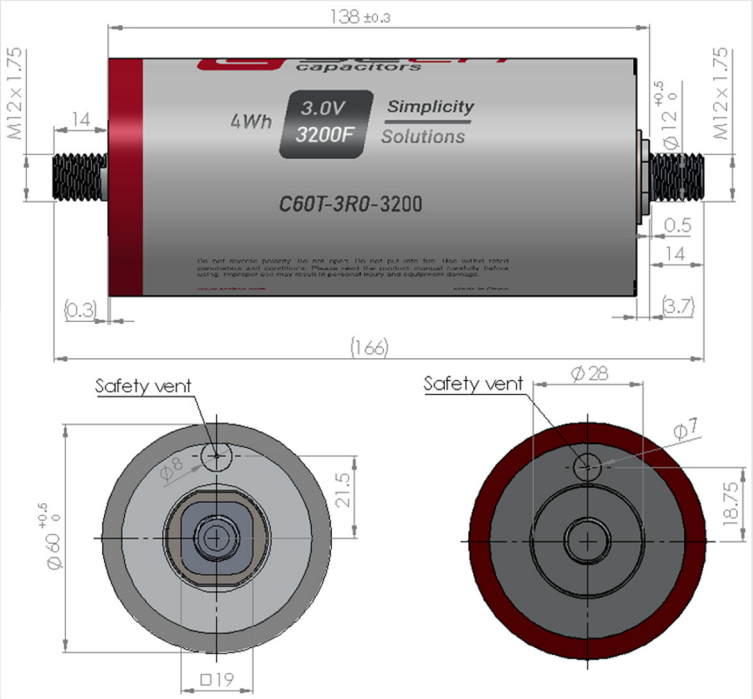
1. Surge voltage $V_S$: Absolut maximum voltage, non-repetitive. The duration must not exceed 1 second.
2. Capacitance C: The test current is 0.075 A/F, if the calculated current is >100A, then apply 100A.




$V_1=2V_3=V_R$ $\quad t_2-t_1=t_4-t_3=0.1$ s

$C=I*(t_3-t_2)\ /(V_2-V_3)$ $\quad ESR=(V_4-V_3)/I$

3. Capacitance tolerance: Typical tolerance is +5%~+10%.
4. 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.
5. 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.
6. Max constant working current: $I_{MCC} = \sqrt{\Delta T/(ESR * R_{Th})}$
7. Max current: $I_{Max} = 0.5C * V_R/(\Delta t + ESR * C)$ , discharge from $V_R$ to $V_R$ /2 in 1 second.
8. Short current: $I_S = V_R/ESR$
9. Stored energy: $E = 0.5C * V^2/3600$
10. Energy density: $E_d = E/M$
11. Usable power density: $P_d = (0.12V_R^2/ESR)/M$
12. Matched impedance power density: $P_{dMax} = (0.25V_R^2/ESR)/M$
13. Storage temperature: Storage in discharge state at RT.
14. Thermal resistance: $R_{Th} = \Delta T/P$, where P = ESR * $I^2$
15. Thermal capacitance is indicated for the whole product.
16. 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.
17. 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.
18. 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).
19. Shelf life: Discharged and no load applied at RT.
20. Dimensions:




21. 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