

Product Datasheet

33mm Ø Ultracapacitors

- Rated voltage 3VDC
- 310F capacitance
- Highest power density based on ultra-low ESR
- High cycle life of 1 million cycles
- Hermetically sealed cell
- Most ruggedized cell based on all laser welded design
- Radial terminals for PCB mounting



ELECTRICAL SPECIFICATIONS

Type	C33S-3R0-0310
Rated Voltage V_R	3.00 V
Surge Voltage V_S^1	3.10 V
Rated Capacitance C^2	310 F
Capacitance Tolerance ³	0% / +30%
ESR ² (DC, 10 Hz)	<1.6 mΩ
ESR ² (AC, 1 kHz)	<1.2 mΩ
Leakage Current, typical IL^4	<1.2 mA
Self-discharge Rate, typical ⁵	<20%
Constant Current ($\Delta T = 15^\circ C$) ⁶	29 A
Max Current I_{Max}^7	311 A
Short Current I_S^8	1.875 kA
Stored Energy E^9	0.39 Wh
Energy Density E_d^{10}	6.15 Wh/kg
Usable Power Density P_d^{11}	10.71 kW/kg
Matched Impedance Power Density P_{dMax}^{12} , 10 Hz ESR	22.3 kW/kg
Matched Impedance Power Density P_{dMax}^{12} , 1 kHz ESR	29.8 kW/kg

THERMAL CHARACTERISTICS

Type	C33S-3R0-0310
Working Temperature	-40 ~ 65°C
Storage Temperature ¹³	-40 ~ 55°C
Thermal Resistance R_{Th}^{14}	10.9 K/W
Thermal Capacitance C_{Th}^{15}	60 J/K

LIFETIME CHARACTERISTICS

Type	C33S-3R0-0310
DC Life at High Temperature, 3V and 65°C ¹⁶	1000 hours
DC Life at RT ¹⁷	10 years
Cycle Life ¹⁸	1'000'000 cycles
Shelf Life ¹⁹	4 years

SAFETY & ENVIRONMENTAL SPECIFICATIONS

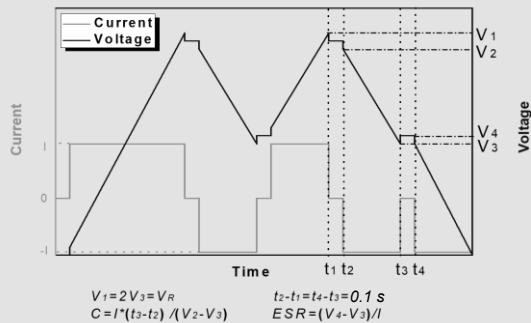
Type	C33S-3R0-0310
Safety	RoHS, REACH and UL810A
Vibration	IEC 60068-2-64 Category 1 (table A.5/ A.6)
Shock	IEC 60068-2-27, 100g 6ms

PHYSICAL PARAMETERS

Type	C33S-3R0-0310
Mass, typical M	63 g
Terminals (leads)	Solderable ²¹
Dimensions ²⁰ Height	68.8 mm
Diameter	33 mm

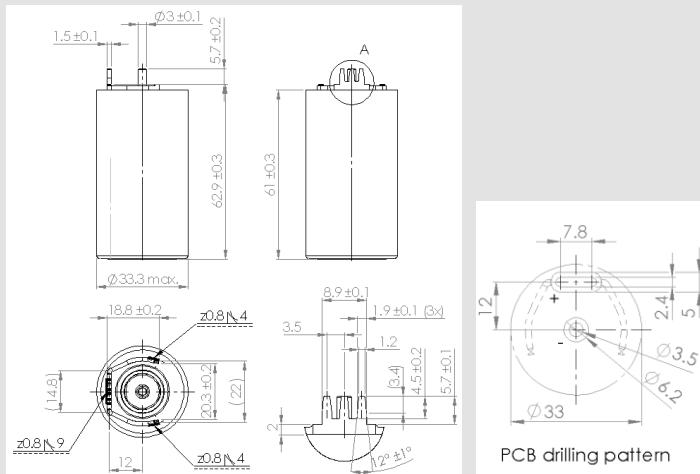
NOTES:

- Surge voltage V_S : Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.
- Capacitance C: The test current is 0.1 A/F, if the calculated current is $>100\text{A}$, then apply 100A.
- Dimensions, potential indication, recommended PCB drilling pattern:



3. Capacitance tolerance: Initially $+10\% \sim +30\%$.
4. Leakage current measurement procedure: 1) Charge the capacitor to the V_R with a constant current (0.1 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 (0.1 A/F, if the calculated current $>100A$, then apply 100A). 2) Hold the voltage at V_R for 8h. 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: $I_5 = V_R / ESR$
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
14. Thermal resistance: $R_{Th} = \Delta T / P$, where $P = ESR * I^2$
15. Thermal capacitance: For the whole capacitor
16. DC life at high temperature: Hold the capacitor charged at specified voltage and temperature. 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 0.1 A/F (if the calculated current $>100A$, then apply 100A).
19. Shelf life: Discharged and no load applied at RT

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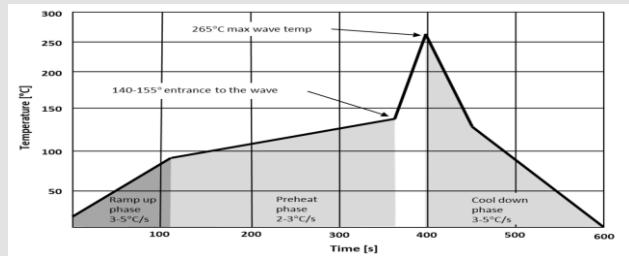
Standard markings:

- + Name of manufacturer, part number, serial number
- + Rated voltage and capacitance, positive terminals, warning markings
- + 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 next to the safety vent that may be damaged in an event of vent rupture

21. Recommended wave soldering profile for printed circuit assembly with use of lead-free alloy:



Total soldering process time from room temperature to peak temperature 265°C and cool down is 10 minutes max. The time to reach the required temperatures depends on the design of the application and on the power of pre-heating section of the soldering machine. All temperatures are measured on the cell leads on top of the PCB. Recommended thickness for PCB = 2.4 to 3.2 mm. Conformal coating is recommended.

Solder: Lead-free (Sn96.5/Ag 3.0/Cu0.5) liquidus point 217°C
 Recommended Flux: Kester 979T
 Ramp Up Rate: 3°-5° C/sec. Max
 Preheat: 140° to 155° C 2°-3° C/sec on top of board
 Temperature entrance into wave: 140° to 155° C on top of board
 Ramp to peak temp: 200°C/sec
 Peak Temp: 265°C for 1.5 to 5 sec. Max
 Cool Down Rate: 3°C-5°C /sec. Max
 Conveyor Speed: 40-50 cm/min