Product Datasheet

33mm ∅ Ultracapacitors

- Rated voltage 3VDC
- 310F capacitance
- AEC-Q200, Rev. E qualified
- Highest power density based on ultra-low ESR
- Hermetically sealed cell
- Most ruggedized cell due to laser welded design
- Radial terminals for PCB mounting
- Long life with multimillion cycles

ELECTRICAL SPECIFICATIONS		
Type	**C33S-3R0-0310**	**C33S-3P0-0330**
Rated Voltage V_R	3.00 V	3.00 V
Surge Voltage V_S[1]	3.10 V	3.10 V
Rated Capacitance C[2]	310 F	330 F
Capacitance Tolerance[3]	0% / +30%	0% / +30%
ESR[2] (DC, 10 Hz)	<1.6 mΩ	<1.0 mΩ
ESR[2] (AC, 1 kHz)	<1.2 mΩ	<0.8 mΩ
Leakage Current, typical IL[4]	<1.2 mA	<1.6 mA
Self-discharge Rate, typical[5]	<20%	<20%
Constant Current (ΔT = 15°C)[6]	29 A	34 A
Max Current I_{Max}[7]	311 A	372 A
Short Current I_S[8]	1.875 kA	3 kA
Stored Energy E[9]	0.39 Wh	0.41 Wh
Energy Density E_d[10]	6.15 Wh/kg	6.3 Wh/kg
Usable Power Density P_d[11]	10.71 kW/kg	16.6 kW/kg
Matched Impedance Power Density P_{dMax}[12], 10 Hz ESR	22.3 kW/kg	34.6 kW/kg
Matched Impedance Power Density P_{dMax}[12], 1 kHz ESR	29.8 kW/kg	43.3 kW/kg

THERMAL CHARACTERISTICS		
Type	**C33S-3R0-0310**	**C33S-3P0-0330**
Working Temperature	-40 ~ 65°C	
Storage Temperature[13]	-40 ~ 55°C	
Thermal Resistance R_{Th}[14]	10.9 K/W	12.6 K/W
Thermal Capacitance C_{Th}[15]	60 J/K	65.8 K/W

LIFETIME CHARACTERISTICS		
Type	**C33S-3R0-0310**	**C33S-3P0-0330**
DC Life 3V and 65°C[16]	1500 hours	
DC Life at RT[17]	10 years	
Cycle Life[18]	Multimillion cycles	
Shelf Life[19]	4 years	

SAFETY & ENVIRONMENTAL SPECIFICATIONS		
Type	**C33S-3R0-0310**	**C33S-3P0-0330**
Safety	RoHS, REACH, UL810A, AEC-Q200[20]	
Vibration	IEC 60068-2-64 Category 1 (table A.5/ A.6)	
Shock	IEC 60068-2-27, 100g 6ms	

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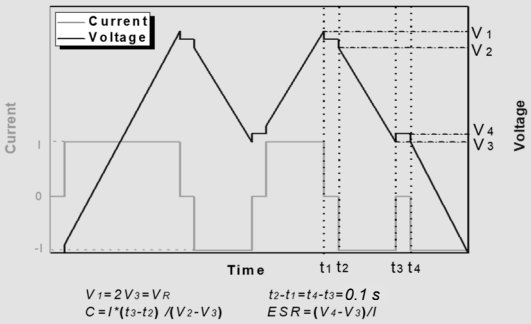
PHYSICAL PARAMETERS

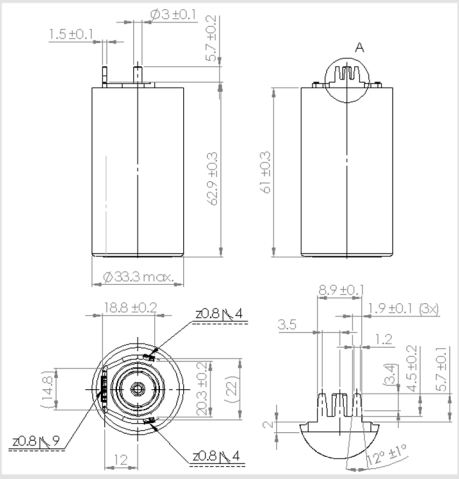
Type	C33S-3R0-0310	C33S-3P0-0330
Mass, typical M	63 g	65 g
Terminals (leads)	Solderable[22]	
Dimensions[21] Height	62.9 mm (68.8 mm with terminals)	
Diameter	33 mm	

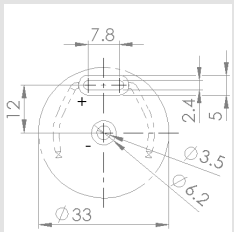
NOTES:

1. Surge voltage V_S: Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.
2. Capacitance C: The test current is 0.1 A/F, if the calculated current is >100A, then apply 100A.



3. Capacitance tolerance: Initially +10%~+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: $I_S = V_R/ESR$
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
14. Thermal resistance: $R_{Th} = \Delta T/P$, where P = ESR * I²
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: The number of cycles depends on the charging and discharging characteristics
19. Shelf life: Discharged and no load applied at RT
20. AEC-Q200, Rev. E qualified, high temperature test (85°C) performed at 2.5V
21. Dimensions, potential indication, recommended PCB drilling pattern:

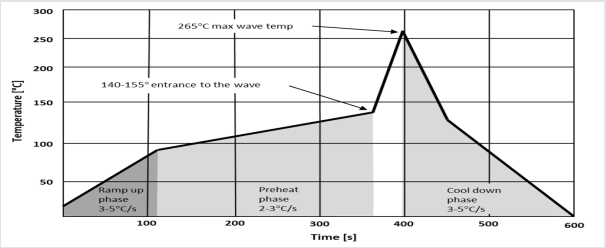




Standard markings:
+ Name of manufacturer, part number, serial number
+ Rated voltage and capacitance, positive terminals, warning marking
+ Stored energy in watt-hours

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 next to the safety vent that may be damaged in an event of vent rupture

22. 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

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