

## 3V 310F Supercapacitor Cells

- 3V DC output
- 310F Capacitance
- High cycle life of 1 million cycles
- Very high power density
- Radial terminals for PCB mounting



### ELECTRICAL SPECIFICATIONS

TYPE	C33S-3R0-0310
Rated Voltage $V_R$	3.0 V
Surge Voltage $V_S^1$	3.1 V
Rated Capacitance $C^2$	310 F
Capacitance Tolerance <sup>3</sup>	-0%/+20%
ESR <sup>2</sup>	≤1.6 mΩ
Leakage Current $I_L^4$	<1.2 mA
Self-discharge Rate <sup>5</sup>	<20 %
Constant Current $I_{MCC}(\Delta T = 15^\circ C)^6$	27 A
Max Current $I_{Max}^7$	311 A
Short Current $I_S^8$	1.9 kA
Stored Energy $E^9$	0.39 Wh
Energy Density $E_d^{10}$	6.2 Wh/kg
Usable Power Density $P_d^{11}$	10.7 kW/kg
Matched Impedance Power $P_{dMax}^{12}$	22.3 kW/kg

### THERMAL CHARACTERISTICS

Type	C33S-3R0-0310
Working Temperature	-40 ~ 65°C
Storage Temperature <sup>13</sup>	-40 ~ 70°C
Thermal Resistance $R_{Th}^{14}$	12.7 K/W
Thermal Capacitance $C_{th}^{15}$	60 J/K

### SAFETY & ENVIRONMENTAL SPECIFICATIONS

TYPE	C33S-3R0-0310
Safety	RoHS, REACH and UL810A
Vibration	ISO16750 Table 12 IEC 60068-2-64 (Table A.5/A.6)
Shock	IEC 60068-2-27

### LIFETIME CHARACTERISTICS

TYPE	C33S-3R0-0310
DC Life at High Temperature <sup>16</sup>	1500 hours
DC Life at RT <sup>17</sup>	10 years
Cycle Life <sup>18</sup>	1'000'000 cycles
Shelf Life <sup>19</sup>	4 years

### PHYSICAL PARAMETERS

TYPE	C33S-3R0-0310
Mass M	63 g
Terminals(leads) <sup>20</sup>	Solderable
Dimensions <sup>21</sup> Height	62.9 mm
Diameter	33 mm



**NOTES:**

TYPE		C33S-3R0-0310
<p>1. Surge voltage VS: Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.</p> <p>2. Rated capacity C: the rated capacity test method is as shown in Figure 1. The test current is 100 C multiple current, i.e. 0.1 A / F. if the calculated test current is greater than 100 A, 100 A is used.</p>	<p>21. Dimensions: C33S-3R0-0310</p>	
<p>3. Capacitance tolerance: Typical capacity is 105% of rated capacity.</p> <p>4. Leakage current measurement procedure: 1) Charge the capacitor to the VR with a constant current (0.1 A/F, if the calculated current is &gt;100A, then apply 100A). 2) Hold the voltage at VR for 72h. 3) The current to maintain VR after 72 h is the leakage current.</p> <p>5. Self-discharge rate measurement procedure: 1) Charge the capacitor to VR with a constant current (0.1 A/F, if the calculated current &gt;100A, then apply 100A). 2) Hold the voltage at VR for 3h. 3) Floating for 72h. 4) Measure the voltage after 72 h.</p> <p>6. Max constant working current: <math>I_{MCC} = \sqrt{\Delta T / (ESR * R_{Th})}</math> the working current of the supercapacitor in static air depends on the natural convection heat dissipation of the shell and the Joule heat balance.</p> <p>7. Max current: <math>I_{Max} = 0.5C * VR (\Delta t + ESR * C)</math>, discharge from VR to VR / 2 in 1 second.</p> <p>8. Short current: <math>I_s = VR / ESR</math> Each parameter adopts SI system unit or its conversion unit, This current can't be used as working current.</p> <p>9. Stored energy: <math>E = 0.5C * V^2 / 3600</math>.</p> <p>10. Energy density: <math>E_d = E / M</math></p> <p>11. Usable power density: <math>P_d = 0.12V_R^2 / (ESR * M)</math>.</p> <p>12. Impedance match power density: <math>P_{dMax} = 0.25V_R^2 / (ESR * M)</math></p> <p>13. Storage temperature: discharged state (cell voltage &lt; 0.2 V).</p> <p>14. Thermal resistance: <math>R_{Th} = 1 / (h * A)</math>, where h=10 W/(m<sup>2</sup>*K), A=surface area.</p> <p>15. Thermal capacitance: For the whole capacitor.</p> <p>16. DC Life at High Temperature: Under the maximum working temperature of the supercapacitor (65 °C), it is constant at its rated voltage for 1500h, the capacity is kept above 80% of the rated capacity under normal temperature, and the internal resistance is below 200% of the rated internal resistance.</p> <p>17. DC Life at RT: keep the supercapacitor at its rated voltage. The life criterion is that the capacity is kept above 80% of the rated capacity, and the internal resistance is below 200% of the rated internal resistance.</p> <p>18. Cycle life: Charge and discharged the capacitor in the range between VR and VR / 2. 5 seconds waiting period between charge and discharge. The constant test current is 0.1 A/F (if the calculated current &gt;100A, then apply 100A).</p> <p>19. Storage life: within the storage temperature range, keep the discharge state, no load (cell voltage &lt; 0.2 V).</p> <p>20. Leading end: Tinned terminal, can weld PCB board.</p>	<p>22. Standard marking</p> <p>23. Name of manufacturer, part number, serial number</p> <p>Rated voltage and capacitance, negative and positive terminals, warning marking</p> <p>Stored energy in watt-hours.</p> <p>24. Mounting recommendations:</p> <p>25. Provide sufficient distance between cells to meet the insulation strength. Keep enough space around the explosion-proof tank and keep the top clean and avoid mechanical damage.</p> <p>26. Recommended wave soldering profile for printed circuit assembly with use of lead-free alloy.</p>	<p>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</p> <p>Solder: Lead-free (Sn96.5/Ag 3.0/Cu0.5) liquidus point 217°C</p> <p>Recommended Flux Kester 979T</p> <p>Ramp Up Rate: 3°-5° C/sec. Max</p> <p>Preheat: 140° to 155° C 2°-3° C/sec on top of board</p> <p>Ramp to peak temp: 200°C/sec</p> <p>Peak Temp: 265°C for 1.5 to 5 sec. Max</p> <p>Cool Down Rate: 3°C-5°C /sec. Max</p> <p>Max Conveyor Speed: 40-50 cm/min</p>
	<p>27. The contents of this document are subject to change without notice. GMCC accepts no liability for the accuracy or credibility of the values and information contained in this document.</p>	