DATASHEET

GY12R760138S308C SUPERCAPACITOR

Revision 1.1 Feb 2020

Electrical Specifications

Single Cell Supercapacitor

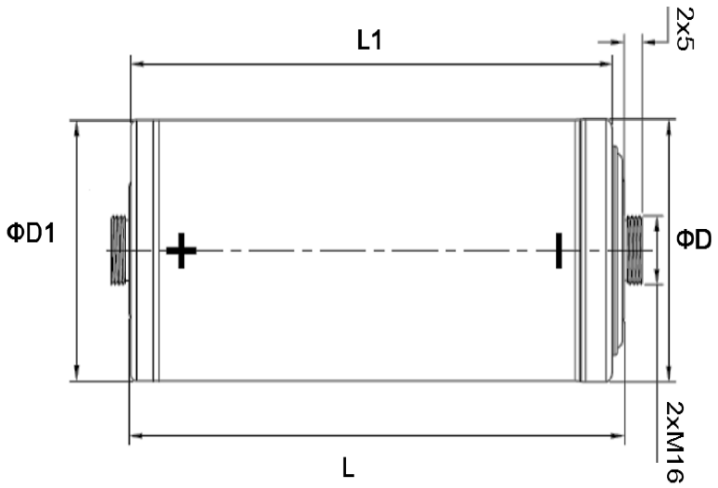
Technical Parameters

Item	Specification	Unit
Rated Voltage	2.70	V
Surge Voltage	2.85	V
Nominal Capacitance	3000	F
Capacitance Tolerance	-10 to +30	%
Operating Temperature Range	- 40 to +65	°C
Maximum Equivalent Series Resistance (ESR)	0.22	mΩ
ESR_{DC}	0.25	mΩ
Maximum Leakage Current (120hrs)	5	mA
Maximum Operating Current ($\Delta T = 40°C$)	210	A
Peak Current (Discharge from V → V/2 in 1 sec allowing for $I.ESR_{DC}$ voltage drop).	2314	A
Maximum Storage Energy	3.04	Wh
Energy Density	6.08	Wh/Kg
Power Density (as per IEC 62391-2)	6998	W/Kg
Weight	500	gm

Product dimension

All units in millimetre

ΦD(+1.0)	60.5
ΦD1(+0.5)	60.0
L(±2.0)	138.0
L1(±1.0)	135.0



Measurement of DC Capacitance

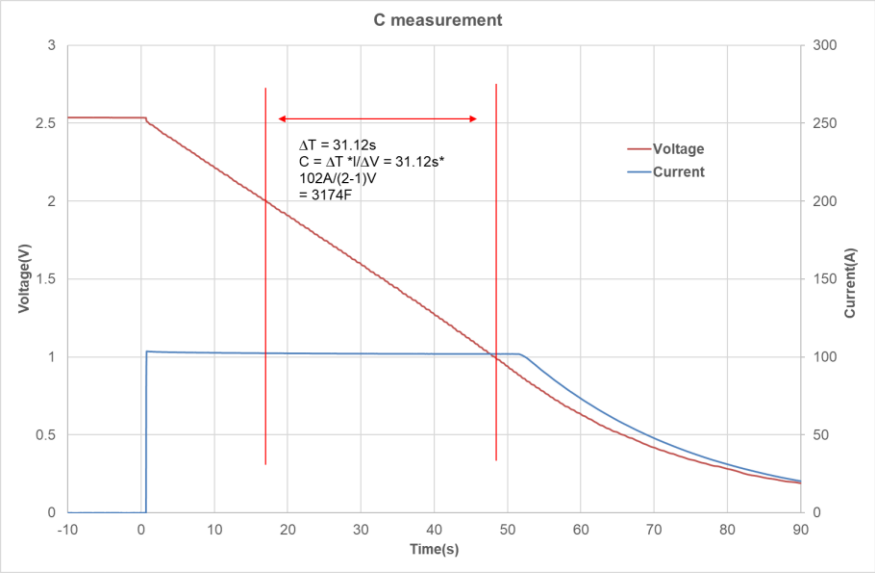


Fig 1: Measurement of DC Capacitance for a GY12R760138S308C

Fig 1 shows the measurement of DC capacitance by drawing a constant 100A current from a fully charged supercapacitor and measuring the time taken to discharge from 2V to 1V. In this case, C = 100A x 31.12s /1V = 3174F, which is well within the 3000F -10% to +30% tolerance for a GY12R760138S308C cell.

Measurement of ESR

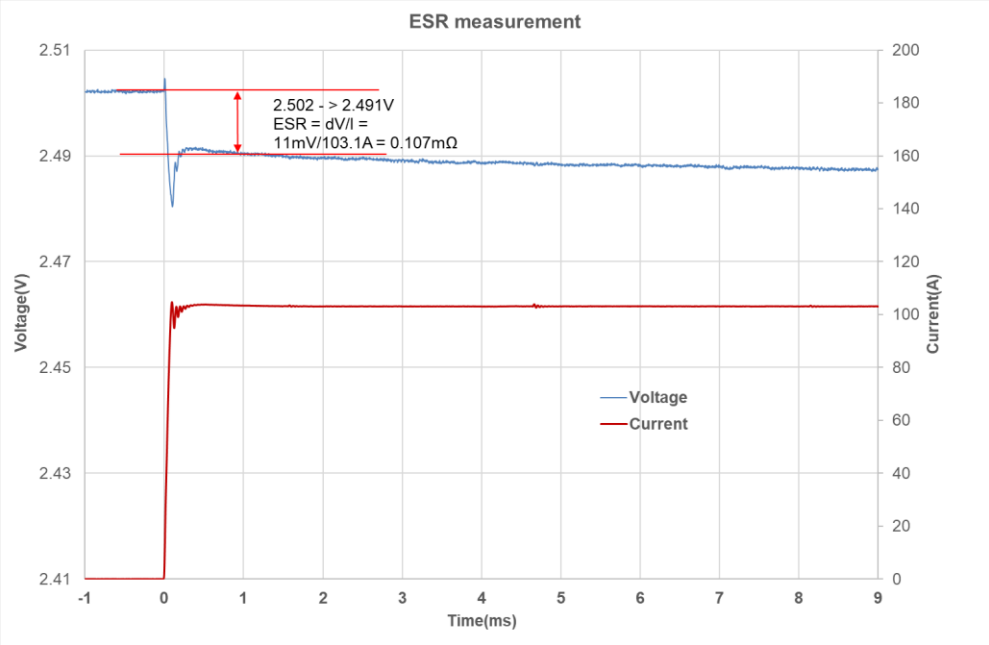


Fig 2: Measurement of ESR for a GY12R760138S308C

Fig 2 shows DC measurement of ESR by applying a step load current to the supercapacitor and measuring the resulting voltage drop. CAP-XX waits for a delay of 1ms after the step current is applied to ensure the voltage and current have settled. In this case the ESR is measured as 11mV/100A = 0.107mΩ.

DC Capacitance variation with temperature

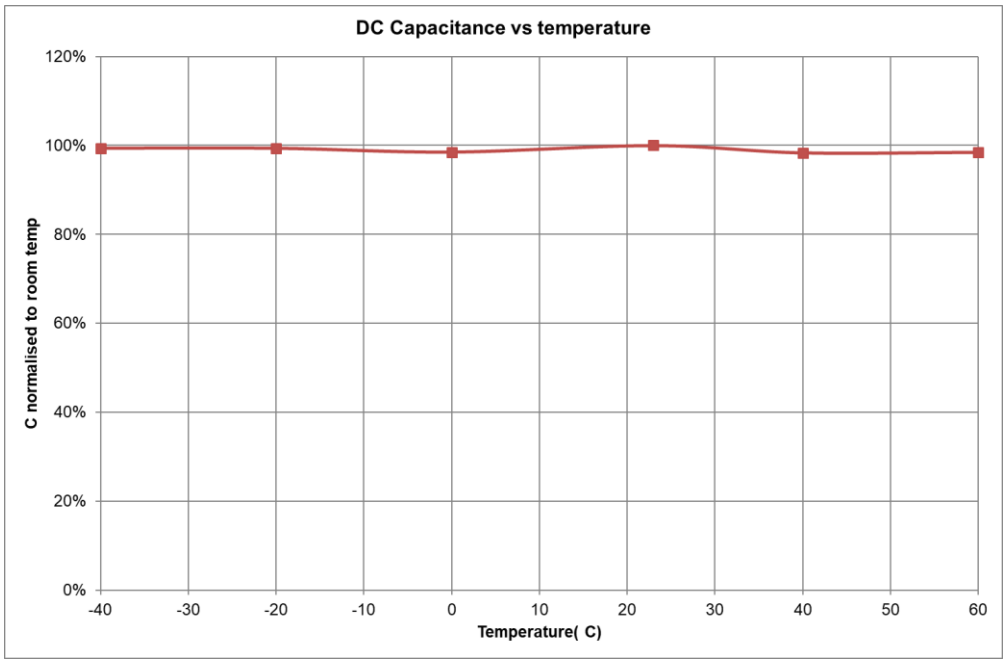


Fig 3: Capacitance change with temperature

Fig 3 shows that DC capacitance is approximately constant with temperature.

ESR variation with temperature

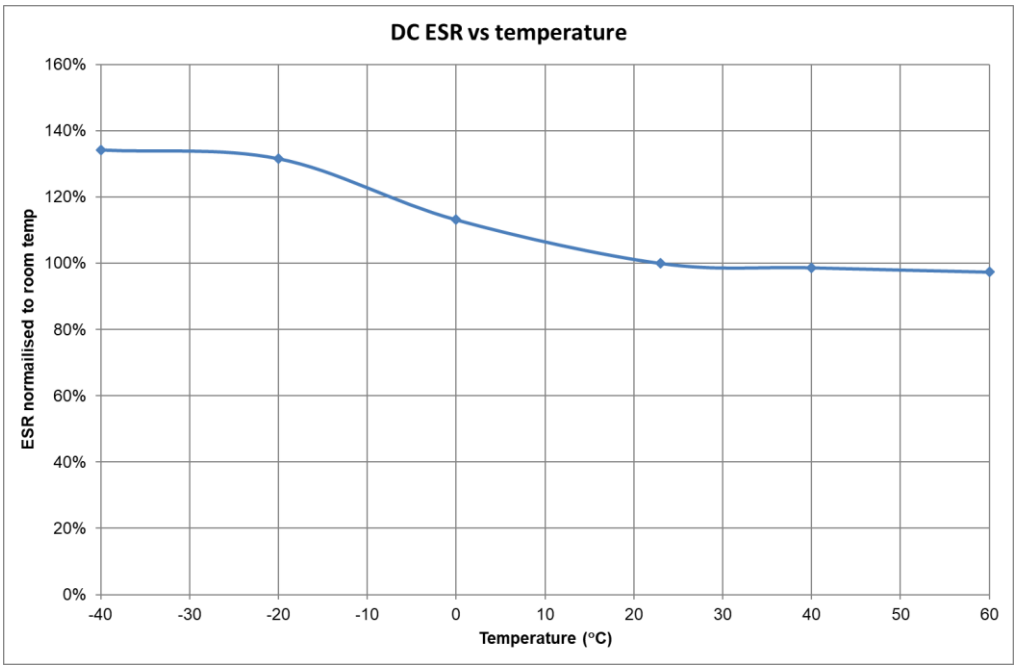


Fig 4: ESR change with temperature

Fig 4 shows that ESR at -40°C is ~1.2x ESR at room temp, and that ESR at 60ºC is ~0.97 x ESR at room temperature.

Leakage Current

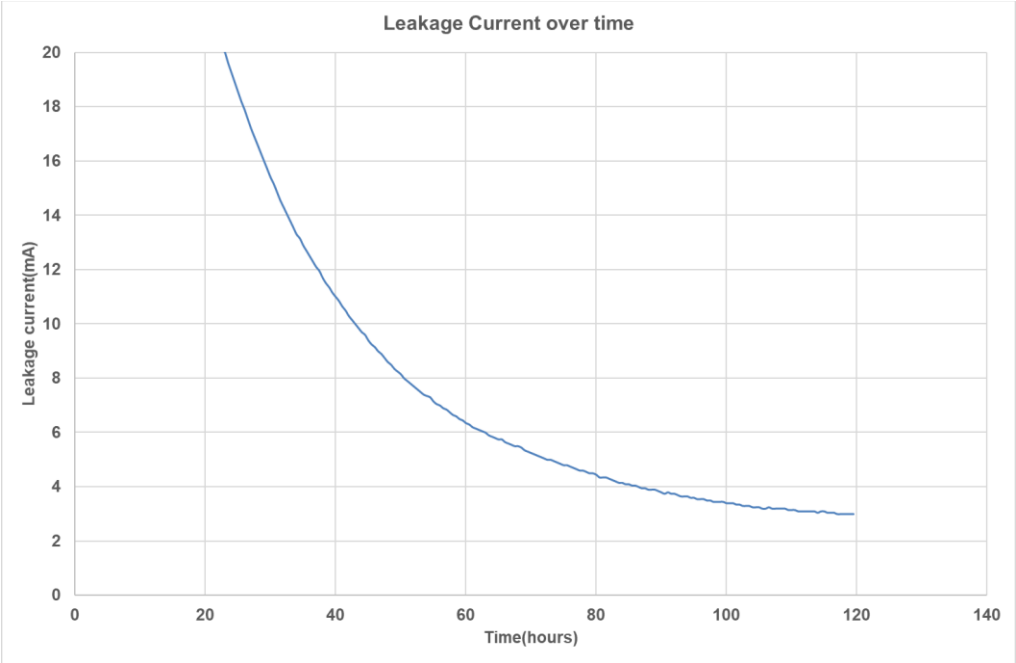


Fig 5: Leakage Current

Fig 5 shows the leakage current for GY12R760138S308C at room temperature. The leakage current decays over time, and the equilibrium value leakage current will be reached after ~120hrs at room temperature. The typical equilibrium leakage current is 3mA at room temperature.

RMS Current

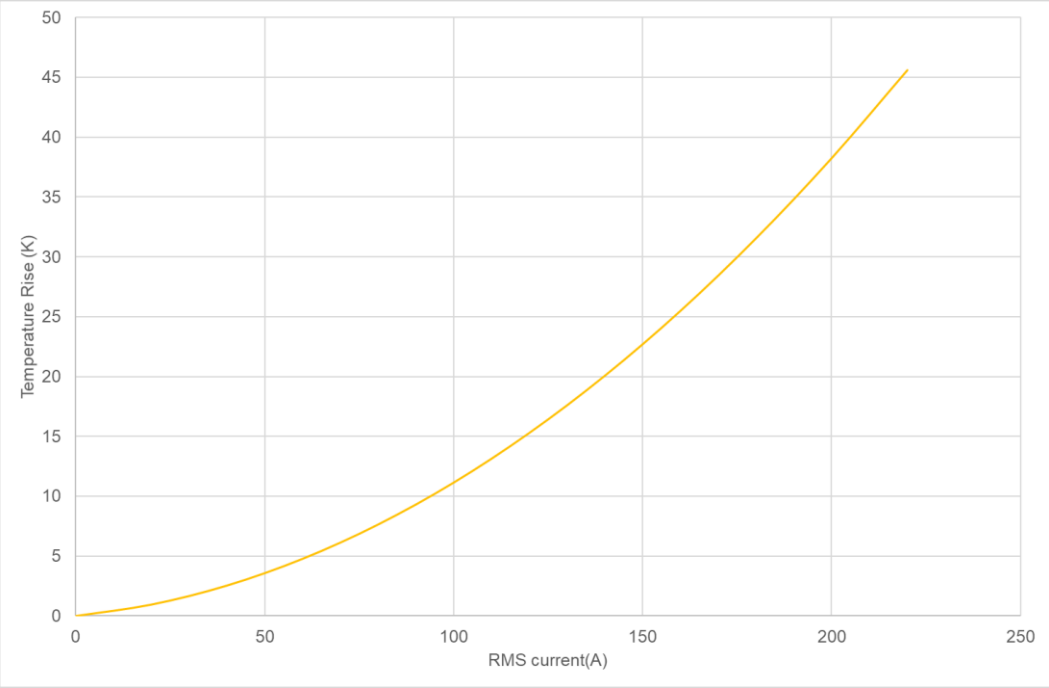


Fig 6: Temperature rise in GY12R760138S308C with RMS current

Continuous current flow into/out of the supercap will cause self-heating, which limits the maximum continuous current the supercapacitor can handle. This is measured by a current square wave with 50% duty cycle, charging the supercapacitor to rated voltage at a constant current, then discharging the supercapacitor to half rated voltage at the same constant current value. For a square wave with 50% duty cycle, the RMS current is the same as the current amplitude. Fig 6 shows the increase in temperature as a function of RMS current. From this, the maximum RMS current in an application can be calculated, for example, if the ambient temperature is 40°C, and the maximum desired temperature for the supercapacitor is 65°C, then the maximum RMS current should be limited to 160A, which causes a 25°C temperature increase.

Lifespan Performance Characteristics

Item		Features
Cycle Life	Test Methods	Capacitors cycles charge and discharge between specified voltage and half rated voltage under constant current at +25°C (500,000 cycles)
	Capacitance Change	« 30% of initial measured value
	Internal Resistance	« 2 times of initial specified value
Lifespan	Shelf Life	After 1000 hours storage at the range of the rated temperature upper limit, without load, the capacitor shall meet the following limits for endurance.
	Endurance	After 1000 hours application of rated voltage at the range of the rated temperature upper limit, the capacitor shall meet the following limits.
	Life Test	After 10 years application at rated voltage, at +25°C, the capacitor shall meet the following limits.
	Capacitance Change	« 30% of initial measured value
	Internal Resistance	« 2 times of initial specified value
Temperature	Test Condition	At -40°C, +25°C, +65°C
	Capacitance Change	« 30% of initial measured value
	Internal Resistance	« 2 times of initial specified value
Damp Heat	Test Methods	Temperature: +40±2°C, humidity: 90~95%RH, after 240 hours storage, the capacitor shall meet the following limits.
	Capacitance Change	« 30% of initial measured value
	Internal Resistance	« 2 times of initial specified value
Self Discharge	Test Condition	At room temperature, charge 8 hours under constant rated voltage, and rest for 24 hours, the voltage shall meet standards.
	Voltage Change	» 80% * VR