

GLOSSARY OF SUPERCAPACITOR TERMS

SUPERCAPACITORS

Supercapacitors also called ultracapacitors or Electric double layer capacitors (EDLC) are capacitors made up of 2 metal plates with a carbon dielectric material and a conductive electrolyte.

CAPACITANCE

A measurement of energy storage in joules. $C = QV$

VOLTAGE

The voltage provided in the specification is the maximum operating voltage for a single capacitor cell or module. The rated voltage is the voltage in which the performance data is measured. It is possible for the capacitors to experience voltages in excess of the rated voltage. The impact is dependent on the time and temperature during this exposure. At no time should the capacitor be subjected to voltages in excess of 10% of the rated voltage.

EQUIVALENT SERIES RESISTANCE (ESR), DC

The sum of all the internal resistances of a capacitor measured in ohms. Expressed mathematically as $ESR = D.F.*X_c$. This measurement is taken after 5 seconds. Since the time constant of the ultracapacitors is approximately 1 second, it takes approximately 5 time constants or 5 seconds to effectively remove 99.7% of the stored energy.

Aluminum Electrolytic Capacitor

INTERNAL RESISTANCE, 100 HZ OR 1 HZ

A measure of the high frequency resistance component and is mainly attributed to contact resistance. Because of the time constant of the ultracapacitors, operation at this frequency is highly inefficient. This measurement is provided because it is simple to measure and correlates easily with the DC resistance.

LIFE

Expected performance change for the supercapacitor if held at rated voltage and 25°C for 10 years.

CYCLE LIFE

Expected performance change after cycling 500K times from rated voltage to half rated voltage. Cycling performed at a duty cycle resulting in no heating of the supercapacitor with the supercapacitor maintained at 25°C.

AMBIENT TEMPERATURE

The temperature of the environment, usually the still air surrounding the supercapacitor.

LEAKAGE CURRENT

Measure of the stray direct current flowing through capacitor after DC voltage is impressed on it. Stable parasitic current expected when capacitor is held indefinitely on charge at the rated voltage. This value is voltage and temperature dependent. Data sheet measurement is at rated voltage and 25°C.

PASSIVE BALANCING

Implies no variation in the voltage regulation as a function of the ultracapacitor condition. The most typical method of passive balancing utilizes resistors. The concept of resistive balancing employs resistors in parallel with the supercapacitors.

ACTIVE BALANCING

For applications with a limited energy source or high level of cycling an active voltage balancing circuit is preferred since it typically draws much lower current in steady state and only requires larger currents when the cell voltage is out of balance. The active circuit forces the voltage at the nodes of series connected cells to stay below a fixed reference voltage.

MAXIMUM OPERATING

Represents the maximum voltage that can be safely implemented by UL810a.

CAPACITANCE

A measure of the energy storage capability of a capacitor at a given voltage usually expressed in farads, microfarads, nanofarads, or picofarads.

CAPACITOR IN PARALLEL

When capacitors are connected in parallel, the total capacitance is the sum of the individual capacitors' capacitances. This also increases ripple-current tolerance.

CAPACITOR IN SERIES

Capacitors connected in series for a higher total voltage rating, although this configuration will have a lower total capacitance than any single one in the circuit. This series circuit offers. The voltage drop across each capacitor is the sum of the total applied voltage.

ELECTROLYTE

A current-conducting solution between the electrodes of a capacitor used to replenish the dielectric in a supercapacitor.



85/85 STRESS TEST RATING

85/85 refers to a component having been subjected to an extended-life stress test at a temperature of 85°C and humidity of 85%. After 1000 to 2000 hours (typical), the parts are examined for signs of corrosion or other indications of potential failure.

FARAD

The basic unit of a measure of a capacitor. A capacitor charged to 1 volt with a charge of 1 coulomb would have a capacitance of 1 farad. 1 microF = .000001 Farads.

OPERATING TEMPERATURE

The temperatures range, usually stated in Celcius, in which a capacitor can operate within rated specifications.

OVERVOLTAGE

A voltage applied to a capacitor that is above its rated operating voltage. In a dielectric withstand test, capacitors are overvoltage-tested (Hi-Pot tested) at 1.5X or 2X its rated voltage.

POLARITY

For manufacturing and consistency purposes the terminals are marked with polarity. It is recommended practice to maintain the polarity although catastrophic failure will not occur if the ultracapacitor is reversed charged for some reason. Reverse polarity will cause accelerated life reduction.

RADIAL

A capacitor in which both leads are connected to one end of the main component. Radial-leaded capacitors are typically mounted vertically to a circuit board.



STORAGE TEMPERATURE

Represents the safe storage temperature without affecting supercapacitor performance when no voltage is applied to the supercapacitor.

TEMPERATURE DERATING

When a capacitor is operated at a lower ambient temperature than rated specifications, its load life can be extended. The amount of improvement can be calculated.

TOLERANCE

The maximum deviation from a nominal capacitance value at specific conditions expressed as a percentage of nominal capacitance.

VOLTAGE

The force or electrical pressure which causes current to flow through a conductor.

WORKING VOLTAGE (WVDC)

The maximum DC voltage applied to a capacitor for continuous operation at maximum rated temperature.

