
Thermal Monitoring

Maxwell Technologies recommends thermal monitoring during development of new ultracapacitor systems to understand temperature performance and to avoid overheating cells. A new system may present design issues involving temperature that are not well understood. Temperature monitoring will enable such issues to be resolved efficiently and safely.

Modules can be instrumented with two types of thermal sensors as follows:

1. Each ultracapacitor cell should have mounted directly on it a PTC (Positive Temperature Coefficient) thermistor or other device that acts as a thermal switch and opens if an over-temperature condition occurs. The recommended location for this sensor is on the end of the cell near a terminal. The sensors for the module can be wired in series, providing a single signal line that, if open, indicates that one or more of the cells in the module are over operational temperature limits. The module should then be taken off-line to prevent damage or failure. The PTC should be chosen to ensure switching by 60°C. PTC's have a temperature tolerance range and some hysteresis, which should be taken into account when choosing the device switching temperature.
2. Each module should also contain a single analog thermal sensor (RTD, (Resistance Temperature Detector), thermistor, or thermocouple) to provide an actual temperature reading from within the module. This reading will provide an indication of cooling system performance and allow the system to control temperature by adjusting current, duty cycle, or cooling.

As experience is gained with the ultracapacitor system, thermal monitoring requirements may be able to be reduced or eliminated.