THE LEADING MANUFACTURER OF ULTRACAPACITORS AND LITHIUM-ION CAPACITORS

LICAP Technologies Application Note

An Ultracapacitor Energy Source For IoT Remote Sensors

IoT remote sensors for field data collection are delivering new value to enterprises worldwide. Applications for sensors include grid scale power line monitoring, location tracking, real-time utility usage, security, and more. An alternative to costly wiring or primary batteries that need replacing is an autonomous low power energy harvesting and storage source.

Examples of low power generators include piezoelectric, TEG, and solar. Harvesting intermittent energy at low power levels requires a suitable storage medium to both aggregate the generated power and support the peak and continuous power requirements of the load. At these low power levels, ultracapacitors can store days of device run time energy. This coupled with long cycle life and wide operating temperature range (for outdoor applications) make ultracapacitors the superior energy storage solution for these applications.

The TI bq25570 device harvests power in the microwatts to milliwatts range from a variety of DC power sources. This device includes a programmable maximum power point tracking (MPPT) sampling network to optimize, for example, solar generated power for ultracapacitor charging. The device also keeps the ultracapacitor operating within its proper voltage range with factory set under-voltage and user programmable over-voltage levels.

Given the average device power requirement, the following should be considered when determining ultracapacitor sizing to meet run time requirements:

- Power loss due to efficiency of bq25570 DC to DC conversion between the ultracapacitor and device power input.
- Power loss due to ultracapacitor internal equivalent series resistance; more of a factor at low temperatures where ESR increases.
- Ultracapacitor energy storage capacity should be calculated at 125% initial requirement to account for 80% remaining capacity at cell end of life.
- Usable energy storage of ultracapacitors is always calculated with lower voltage cut off at 50% of maximum voltage per cell.
- Ensure solar cells are sized to allow the charger to overcome ultracapacitor leakage current and provide reasonable charge times.

Recommended for this application:

SC0370-300-RSS Specifications

Rated capacitance	370F
Rated voltage	3.0V DC
ESR (DC) – typical	1.8mΩ
Max leakage current	0.3mA
Max cont I (ΔT = 40°C)	34A
Usable Stored energy	0.35Wh
Power density	6923W/kg
Operating temp range	-50°C to +65°C

LICAP Technologies, established in 2016, is a manufacturer of innovative ultracapacitor electrode material, high quality ultracapacitor cells and ultracapacitor modules. Our patented LICAP Activated Dry Electrode manufacturing process was developed in our California R&D laboratories. Dr. Linda Zhong, the leader in modern ultracapacitor electrode design with over forty patents in the US and abroad, is our company President. LICAP Technologies leads the way in ultracapacitor performance.

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