Supercapacitors Light Up the Night Scene for LED Flash Camera Phones

Today's standard battery-powered LED flash camera phones struggle to generate enough flash power for low light conditions. Adding a thin supercapacitor can power multiple high-current LEDs to produce a flash that can take clear pictures in low light, without compromising slim handset design. The same supercap can also offload other peak power demands from the camera-phone battery to improve talk time, battery life and audio quality.

Camera phones are continually improving with more megapixels, better lenses, image-processing software and anti-handshake features. The area that lags behind is the power and energy of the flash for taking pictures in low-light conditions, such as in restaurants, bars or other places where people socialize.

The key to taking clear pictures is to produce enough Light Energy from the flash during image-capture time. To calculate Light Energy, one would sum the light power, or the intensity of the flash (measured in lux) over the duration of the flash exposure time (secs): light power (lux) x flash exposure time (secs) = Light Energy (lux.secs). Ten to fifteen lux.secs of Light Energy is said to be ideal for high-resolution pictures.

CAP-XX Limited based in Sydney, Australia recently compared camera-phone flash solutions – xenon tubes, standard LEDs powered by a phone battery, and high-current LEDs powered by a supercapacitor – for their ability to provide the Light Energy that camera phones of 2-megapixels or more need to take digital-still-camera-quality pictures in low light. The technical study compared light power and energy, shutter requirements, ease of design-in, safety and size of the solutions.

CAP-XX specialises in thin-form supercapacitors which drive peak-power events – wireless voice and data, music audio, GPS, video and mobile TV – then recharge from a battery.

Since high-current LEDs need up to 400% more power than a phone battery can provide to achieve full light intensity, the company saw an opportunity to apply its technology in camera-phone LED flash units. In the CAP-XX BriteFlash™ LED flash power architecture, supercapacitors deliver the pulse power (more than 1A) needed to drive high-current LEDs. The phone battery is only needed to recharge the supercapacitor for 2 seconds between flashes.

Xenon flash:

As an alternative to LEDs, some camera-phone designers have used xenon flash tubes driven by electrolytic storage capacitors. Xenon flashes deliver excellent light power, over a very short flash exposure time, which is ideal for capturing fast-moving action shots in low light. However, xenon tubes require large electrolytic storage capacitors which are bulky to fit a slim handset, cause safety concerns due to the high voltages involved, take a long time to recharge between flashes (8 seconds in the Sony Ericsson K800 tested), and cannot be used for other power management needs within the phone.

Camera-phones tested:

Representing xenon flash were three different camera phones with different sized electrolytic storage capacitors, including the SonyEricsson K750 with a large external flash accessory and a SonyEricsson K800 with two internal electrolytic capacitors.

A Nokia N73 represented standard battery-powered LED flash.

For CAP-XX's BriteFlash™ LED flash power solution, CAP-XX retrofitted a Nokia N73 with its thin dual-cell supercapacitor to drive four high-power Luxeon® Flash LEDs at very high current (1A each) during the flash pulse. The supercapacitor delivers 15 watts of pulse power to the LEDs, compared to a battery which can only deliver 1 – 2 watts.

(more)

Measurement included several steps. A photo detector measured on-axis illumination while a digital storage oscilloscope captured light power over time at distances of 1 and 2 meters from the source. The areas under the power curves were integrated to measure the Light Energy at the detector as a function of time.

Study results:

Tests showed that the Light Energy delivered by the BriteFlash™ LEDs exceeded that of the xenon flashes.

From 2 meters away, the BriteFlash™ 4-LED flash was the only case that achieved a Light Energy above the recommended 10 lux.sec (10.8) for high-resolution pictures. The SonyEricsson K750 delivered the best performance of the three xenon flashes with a Light Energy of 9.5 lux.sec, but achieved this only with its large external flash accessory. The Nokia N73 with its standard battery-powered LED flash delivered Light Energy of only 0.43 lux.sec.

Beyond the Light-Energy tests, CAP-XX points to other perks of supercapacitors. Occupying less than 2mm, a thin supercapacitor easily fits in a slim mobile handset. By comparison, the total volume of the xenon solution in the SonyEricsson K800, including its electrolytic storage capacitor, is approximately 3.8cm^3. A supercapacitor also has low voltage (5V compared to the 330V-electrolytic storage capacitor necessary for xenon), takes only 2 seconds to recharge between flashes, and can offload peak power demands from the battery to improve talk time, battery life and audio quality.

Xenon, which delivers very high peak light power over a very short flash exposure time, is superior for taking action shots for those who attempt such shots in low-light conditions. However, blurring caused by hand-shaking in the BriteFlash™ approach over its longer exposure time can be corrected with image-processing software.

CAP-XX has gained an endorsement from Danny Yu, VP Business Development at LED-supplier Philips Lumileds, who claims, “BriteFlash™ maximizes performance from our Luxeon® Flash LEDs so that cell phone users get superior image quality.”

For more information on the CAP-XX study: http://www.cap-xx.com/news/Press_Release_Comparing_Light_Energy_from_Xenon_vs_LEDs_in_Camera_Phones.pdf

For more information visit http://www.cap-xx.com or email sales@cap-xx.com.

# # #