
CAP-XX



Introduction to CAP-XX

May, 2009

- Export-driven supercapacitor manufacturer founded in 1997
- Listed on the London Stock Exchange (AIM) in 2006
- World leader in the design & development of thin, prismatic, high power supercapacitors (ultracapacitors)
- Provide a high power energy storage solution in portable & other space-constrained electronic devices
- Unique technology & powerful IP, built on in-house R&D
- Millions of devices sold to global, brand name customers
- Applications in many high growth markets





HQ in Sydney, Australia

(R&D, Applications Engineering & Sales)

Product & manufacturing development in Australia

Volume manufacturing by PTA in Malaysia

Global licensing partnership with Murata in Japan

Global market coverage via local sales reps

- Headquarters
- Manufacturing
- R&D
- Sales

- CAP-XX has the only organic EDLC available today in a thin, flat & small prismatic package
- Targeted patent strategy, global reach, 19 families
 - Patents cover materials, processes & applications
 - Earliest key patent offers protection to 2021. Others last longer
- Trade secrets across materials, manufacturing processes & device assembly
- Key materials processing is retained in-house
- Long-standing relationships with partners & suppliers
- IP licensed to Murata in 2008

- Product development & small-scale plant in Sydney
- Volume manufacturing facility in Penang (PTA)
- License agreement with Murata in Japan
 - Murata will manufacture & sell CAP-XX supercapacitors for camera phones & other applications
 - CAP-XX & Murata will jointly develop the next generation of supercapacitor products (e.g., SMT devices)



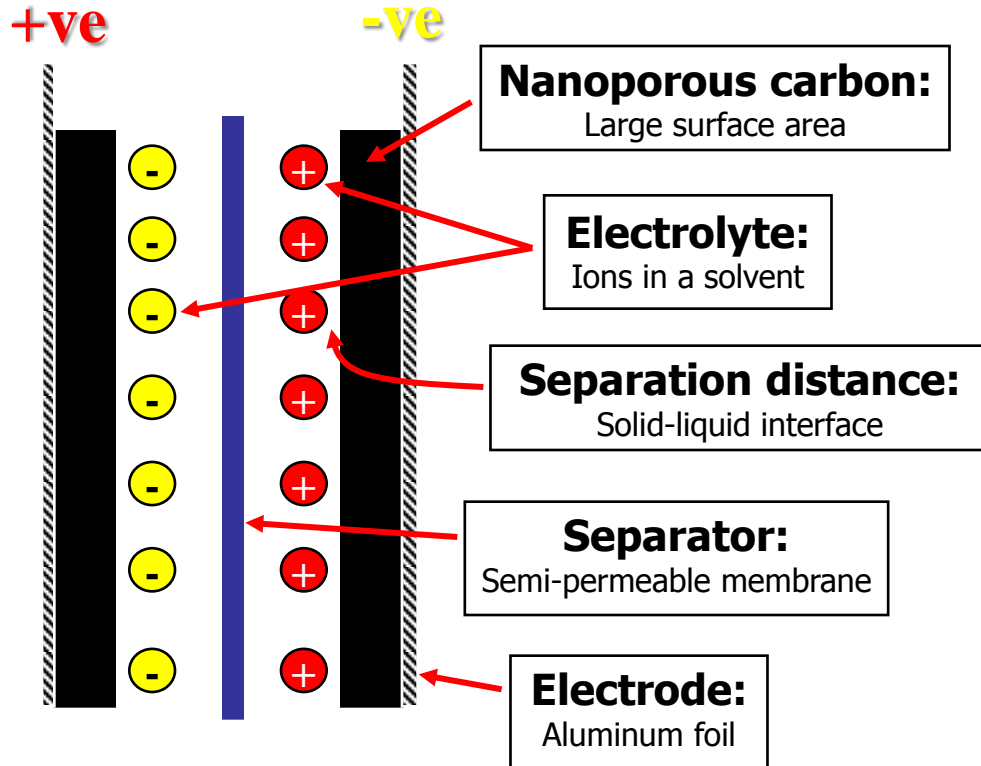
Technology Overview

A supercapacitor is an energy storage device which utilizes high surface area carbon to deliver much higher energy density than conventional capacitors

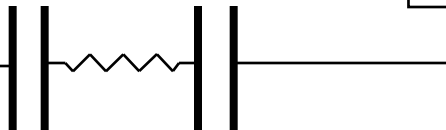
Basic Theory:
 Capacitance is proportional to the surface area of the carbon, divided by the charge separation distance ($C \propto A / d$)

As area (A) \uparrow , and charge distance (d) \downarrow
 capacitance (C) $\uparrow\uparrow\uparrow\uparrow$

$C = I * dt / dV$
 $ESR = dV / I$
Charge stored: $Q = CV$



Basic Electrical Model:
 Electric Double Layer Capacitor (EDLC)



Capacitor



- Low Energy (stores a small amount of energy as static electricity)
- Very High Power (releases it very quickly)

Supercapacitor



- Moderate Energy (stores a medium amount of energy as static electricity)
- High Power (releases it quickly)

Battery

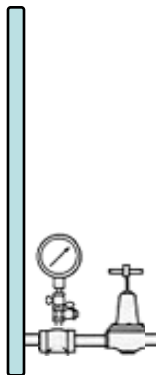


- High Energy (stores a large amount of energy as a chemical reaction)
- Low Power (releases it slowly)

The water tank analogy

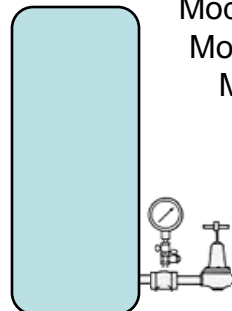
Capacitor:

High pressure
Small volume
Large tap



Supercap:

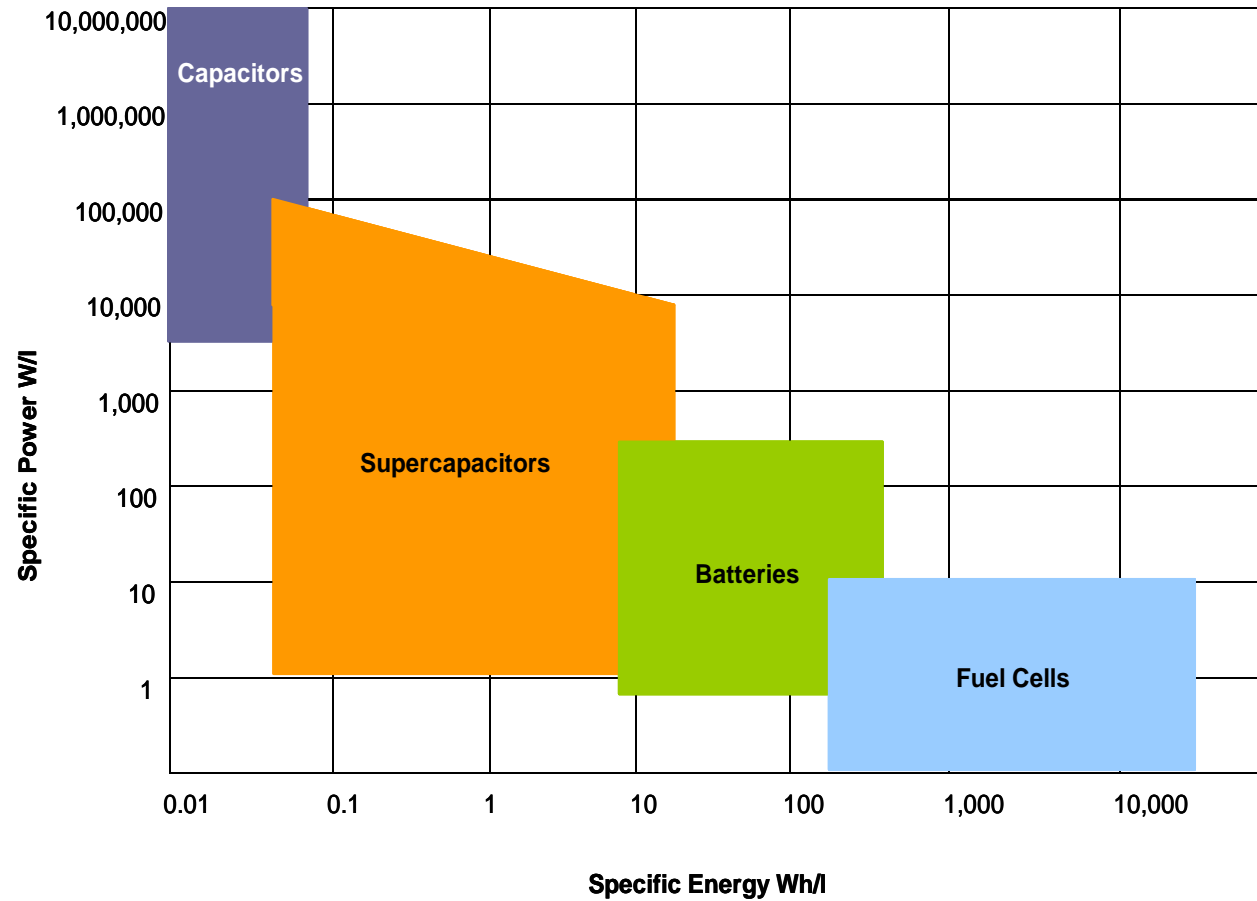
Moderate pressure
Moderate volume
Moderate tap



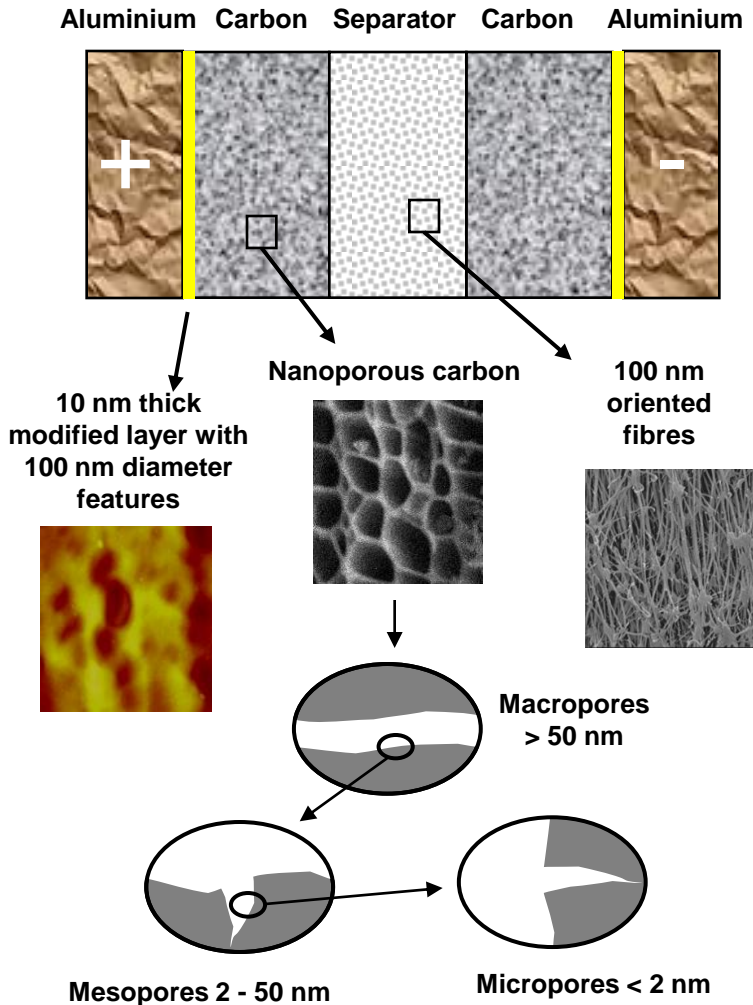
Battery:

Low pressure
Large volume
Small tap





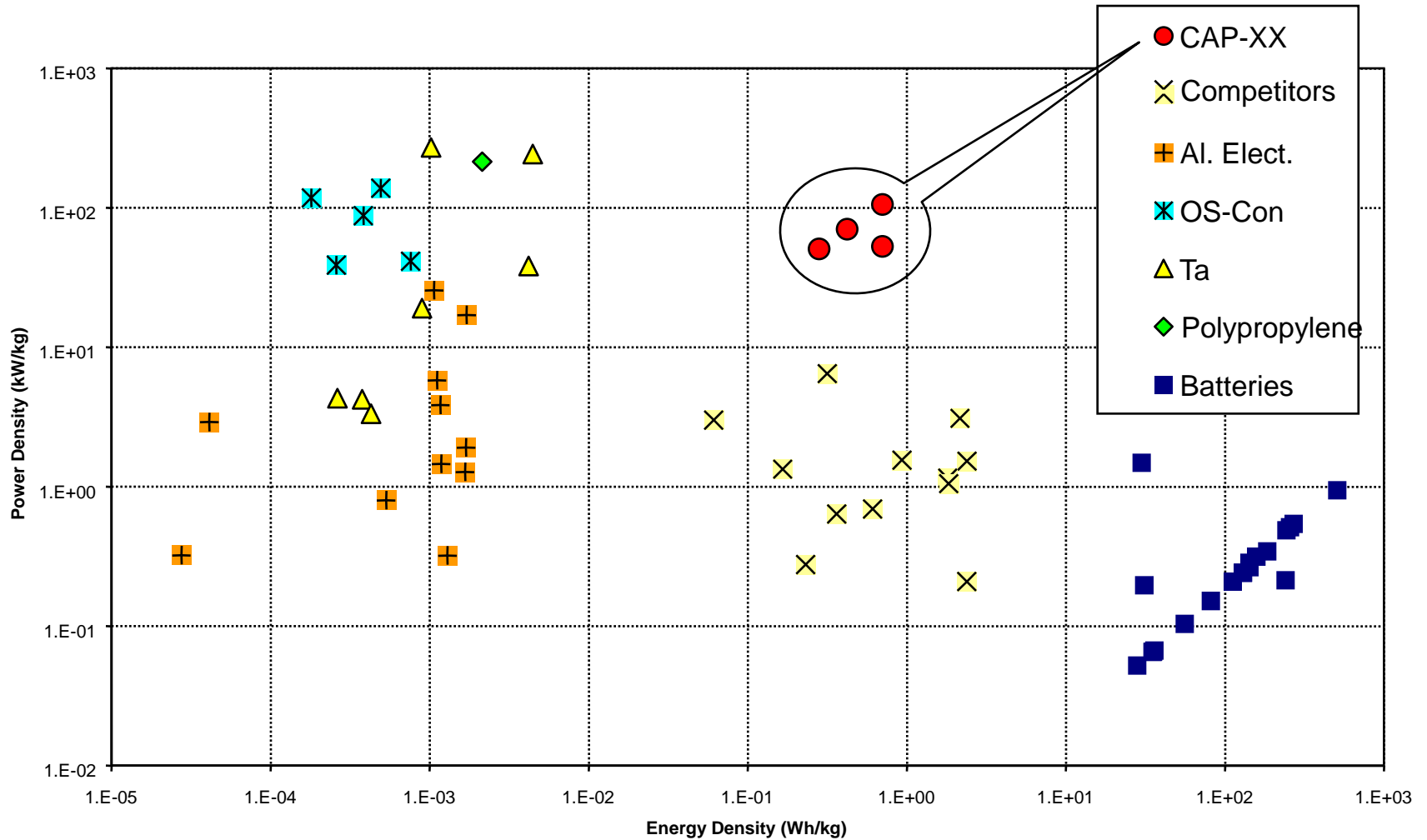
Product Overview



Nano-structured materials increase the energy (capacitance) & decrease the impedance (ESR) of CAP-XX supercapacitors



giving CAP-XX world-leading power density (low ESR) & very high energy density (capacitance) in a thin, flat & small package



Gravimetric power density vs energy density

- Thinner, smaller, lighter
 - Light-weight, prismatic, low volume package
 - Single cell, or dual cell modules
- Very high power (low ESR)
 - 100x greater than a battery of the same weight
 - Up to 10x greater than competitive supercapacitors
- High energy (high capacitance)
 - 100x greater than a capacitor of the same weight
 - Up to 10x greater than competitive supercapacitors
- Higher cell voltage & operating temperature



**CAP-XX is the only supercapacitor company
delivering this combination of features**

- **Two series**
 - General purpose, G series
 - (4.5V, -40 C to +70 C)
 - High temp, high voltage H series
 - (5.5V, -40 C to +85 C)
- **Four footprints**
 - 20.0 x 15.0mm (“Z”)
 - 20.0 x 18.0mm (“A”)
 - 28.5 x 17.0mm (“W”)
 - 39.0 x 17.0mm (“S”)
- **Two packaging options**
 - Dual cell (4.5V or 5.5V)
 - Single cell (2.3V or 2.75V)
- **Maximum C:**
 - 2.40F/cell (1.20F @ 5.5V)
- **Minimum ESR:**
 - 14mΩ/cell (28mΩ @ 4.5V)



- Certifications achieved
 - ISO 9001
 - Sony Green Partner
- Compliances established
 - Full MSDS available under NDA
 - RoHS & WEEE compliant
 - Lead free, halogen free
 - Sony Ericsson Design for Environment requirements
 - Motorola Restricted Substances list
- Ongoing Approvals
 - Nokia Global Supplier requirements
 - Motorola component approval
 - Samsung CST component approval

Reliability tests to international standards available for:

- Vibration
- Mechanical shock (acceleration)
- Thermal shock
- Temperature cycling
- High temperature
- Low temperature
- Humidity

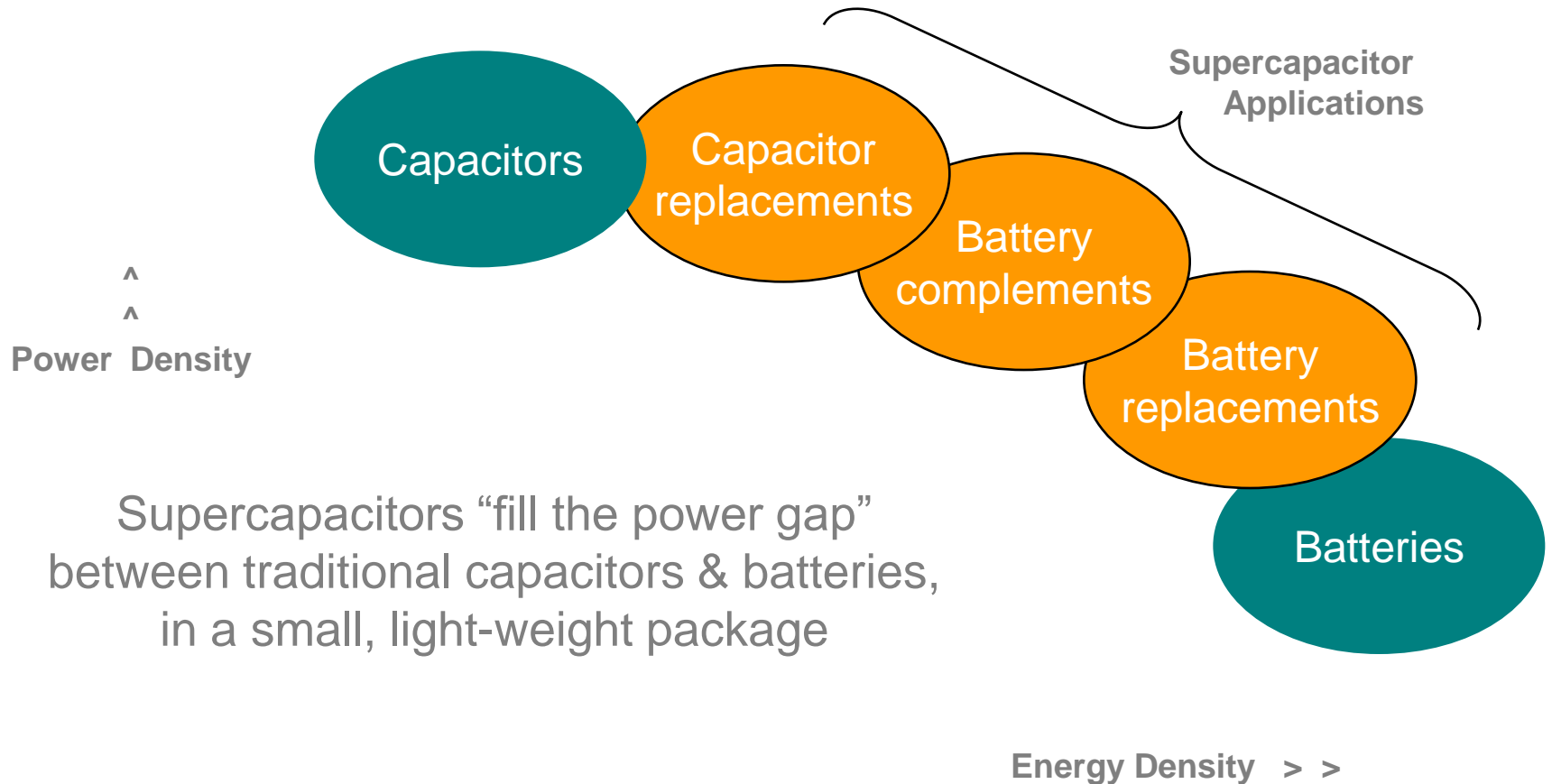
Safety tests to international standards available for:

- Flammability
- Over-heating
- Compression
- Puncture

CAP-XX supercapacitors are completely safe

- Do not burn (no fire risk)
- Do not explode
- Can be over-charged or over-heated with no dangerous outcome
- Self protecting: fails open-circuit if abused

Applications & Benefits



Supercapacitor functions

- **Secure power**

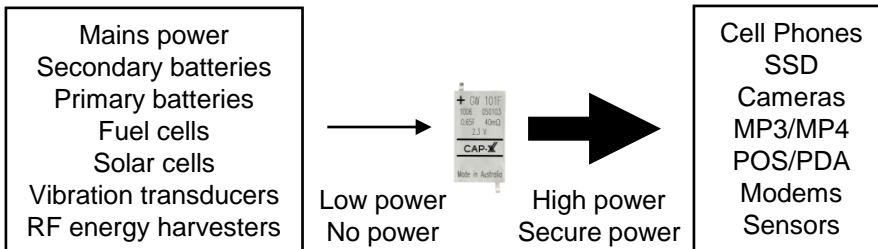
Provides reliable interim power, even if the primary source fails or fluctuates

- **Energy storage**

Stores energy from low power sources, enabling support for high power loads

- **Pulse power**

Supplies peak power to the load while drawing average power from the source



User benefits

- Reduces the size & weight of the battery / power source required
- Improves run-time & battery life, particularly at cold temperatures
- Enables more power-hungry features, being used more often
- Can remove the need for a battery & harvest energy from clean sources
- Protects against accidental power loss or fluctuations/interruptions
- Doesn't need to be replaced like batteries (unlimited discharge cycles)
- Environmentally friendly & safe

- **BritePower™**
 - Secure power solutions for SSDs, ruggedized PDAs, handheld POS terminals, wireless data loggers, condition monitors, location trackers, automated metering, etc.
 - Energy storage & power support solutions for renewable & recaptured energy
 - Pulse power solutions for wireless modems & other high current applications such as LED flash, electronic locks, GPS, etc.
- **BriteFlash™**
 - Driving high power LED flash for high quality images in digital cameras & phones
- **BriteSound™**
 - Peak power support in portable audio



Application	Segment	Design Benefits	Selection Criteria	Product
BritePower™ Secure Power	<ul style="list-style-type: none"> • Solid State Drives • Industrial Handhelds (Ruggedized PDAs, POS & Scanners) • M2M (AMR, Condition Monitors, Trackers & Security Systems) 	<ul style="list-style-type: none"> • Graceful shutdown / volatile cache protection • “Last Gasp” transmissions • Drop test protection / input smoothing of transients • Low voltage protection • Secure position at “off” 	<ul style="list-style-type: none"> • High capacitance for longer hold-up times • High temp. & voltage • Thin, flat, small, light • Unlimited charge / discharge cycle life • Long life 	<ul style="list-style-type: none"> • GS208 / HS208 • GW203 / HW203
BritePower™ Energy Storage	<ul style="list-style-type: none"> • Energy Harvesters • M2M (AMR, Condition Monitors, Location Trackers, Toll Tags) 	<ul style="list-style-type: none"> • Enables use of low power, clean / renewable energy sources (solar, vibration) • Removes the need for a battery • Smooths fluctuating input power & delivers load peaks 	<ul style="list-style-type: none"> • Sufficient C & low ESR to drive sensors/RF • High temp. & voltage • Thin, flat, small, light • Unlimited charge / discharge cycle life • Long life 	<ul style="list-style-type: none"> • HS203 • HW209 • HZ202
BritePower™ Pulse Power	<ul style="list-style-type: none"> • Wireless Modems • M2M (AMR, Condition Monitors, Location Trackers, Toll Tags & Security Systems) • Electronic Locks • Industrial Handhelds (Ruggedized PDAs, POS & Scanners) 	<ul style="list-style-type: none"> • Load leveling of peaks • Reduced size, weight & power required from battery or other current-limited power supply: Enables use of eg, USB ports & “button cell” batteries • Longer run-time & battery life, especially at cold temp. 	<ul style="list-style-type: none"> • Low ESR to minimize voltage droop • Sufficient C to minimize voltage droop • Thin, flat, small, light • Long life • Some apps benefit from high temp. & voltage 	<ul style="list-style-type: none"> • GS203 / HS203 • HW209 / GW209 • GZ215 • HZ202

Application	Segment	Design Benefits	Selection Criteria	Product
BriteFlash™ Pulse Power	<ul style="list-style-type: none"> • Camera Phones • Digital Still Cameras • Digital Video Cameras • Security Cameras • Flash modules for industrial PDAs 	<ul style="list-style-type: none"> • High brightness LED flash (equivalent light to xenon) • Smaller, lighter & more robust • No separate torch needed • Enables optimal white balance, AF and AE setting • Covers all shutter options • Reduces size & weight of battery required • Supports a multitude of other high power functions • Enables low temperature operation • Extends battery life 	<ul style="list-style-type: none"> • High capacitance & low ESR to support high currents & long pulses • High voltage rating • Thin, flat, small, light • Flexible packaging: <ul style="list-style-type: none"> ➢ stacked cells, or ➢ side-by-side for ultra-thin designs • Long life 	<ul style="list-style-type: none"> • HS206 • HW203 • HA230

Application	Segment	Design Benefits	Selection Criteria	Product
BriteSound™ Pulse Power	<ul style="list-style-type: none"> • Portable Media Players (MP3 / MP4) • Music Phones • Accessory Speakers • Headphones 	<ul style="list-style-type: none"> • Boosts peak music power • Louder & clearer audio in current-limited devices (battery-powered or USB) • Removes transients from the power supply - no interference & cleaner sound 	<ul style="list-style-type: none"> • High voltage rating • Thin, flat, small, light • Flexible packaging: <ul style="list-style-type: none"> ➤ stacked cells, or ➤ side-by-side for ultra-thin designs • Sufficient C & low ESR to drive Power Amp • Long life 	<ul style="list-style-type: none"> • HS206 • HW203 • HA230



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