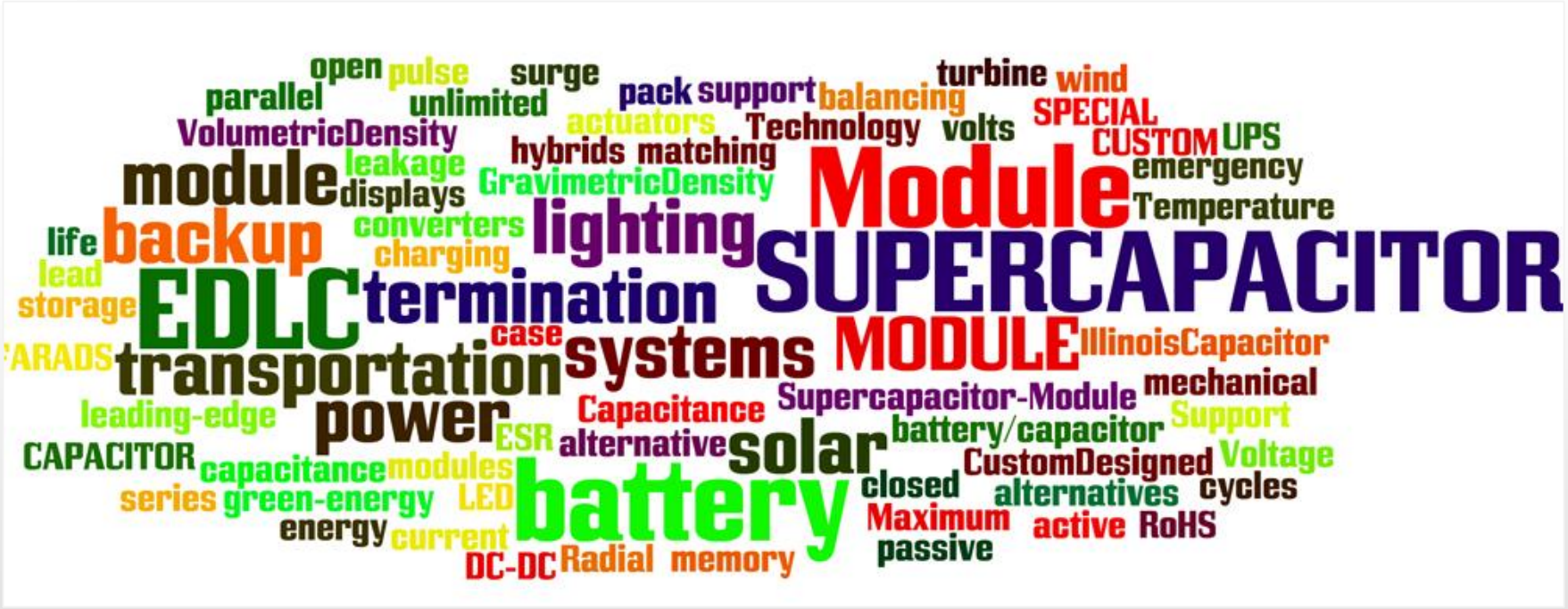
What's so Exciting About Supercapacitor Modules?

A look at some of the latest applications.



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Introduction

Supercacitors are different!

- Whether you call them “supercapacitors,” “ultra-capacitors,” or “EDLC” caps, these devices have max capacities well into the thousands of ***Farads.***
- No dielectric! Supercaps are based on a carbon (nanotube) technology which creates a very large double-layer surface area (as thin as a molecule!) with an extremely small separation between layers.
- When an electrical charge is applied to the nanotube material, a double electric field is generated which acts like a giant dielectric.
- While individual supercaps can have very high capacitance, max voltage ratings are low. This is why there is a need for *supercapactor modules*.

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Quick Look at Supercapacitors

More than a capacitor…different than a battery

- Used with or as alternative to batteries
- Not as volumetrically efficient and more expensive than batteries, but have advantages in specific applications *(Costs are coming down)*
- Can be very quickly charged/discharged many thousands of times
- Used in applications where short bursts of energy are needed
- Capacitances from 1 Farad to hundreds of Farads…or even thousands
- Voltage range: 2.3 to 2.7 for a single cell package

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Quick Look at Supercap Modules

- Modules are primarily intended to provide very high capacity with voltage ratings higher than individual components
- May contain anywhere from two to many identical supercaps
- While standard modules are available, most production applications require some level of customization
- Modules are typically encased in a plastic or metal package, but may sometimes be contained in customer packaging
- Capacitors are configured in active or passive balanced arrays

Illinois Capacitor Supercap Modules

- Virtually *any* capacitance and voltage
- Built to meet customer's space and shape limits
- 500,000 charge/discharge cycles or more!
- Durable modular construction
- Open or closed style modules
- Ready-to-go solution…saves design time, cost
- Provide new design options for engineers

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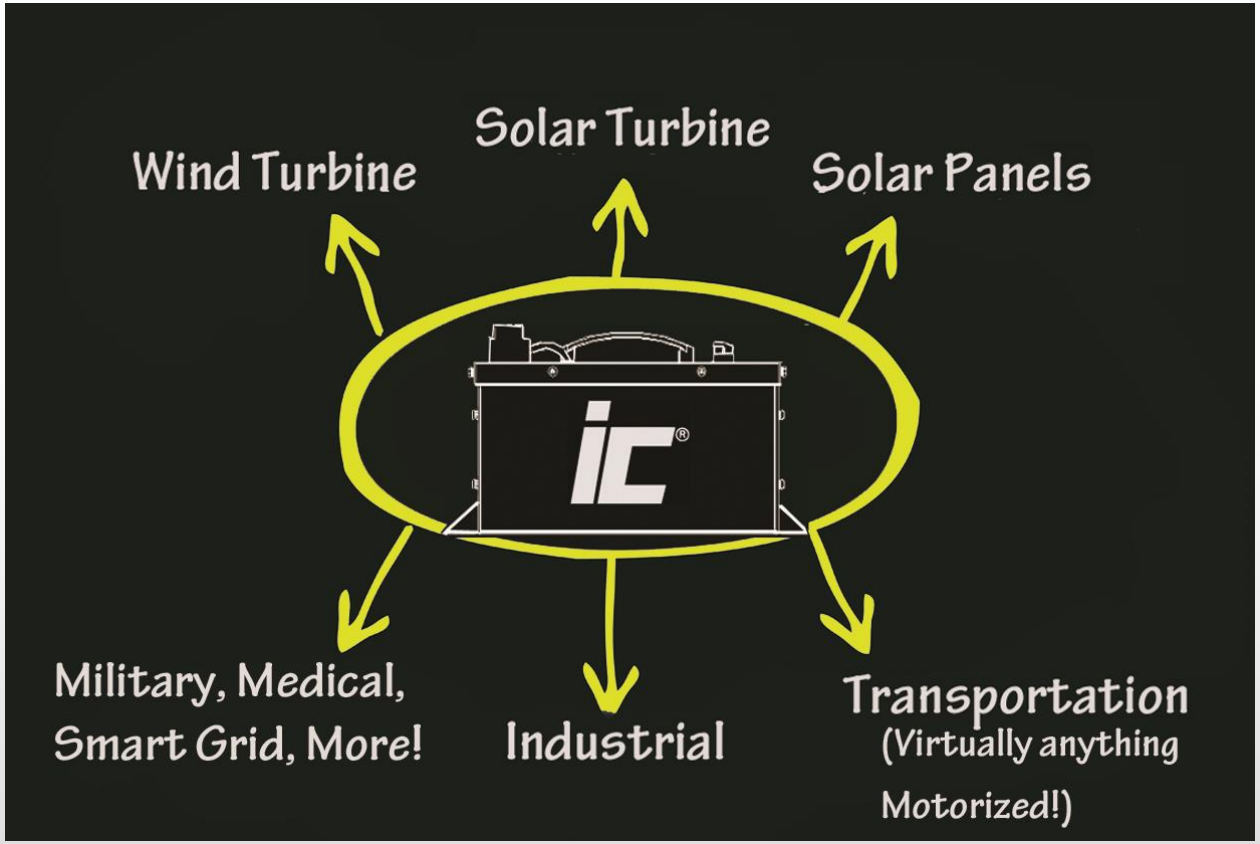
Where are modules being used?

For a growing number of applications, supercap modules are the technology of choice!



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Application Overview

It's easy to remember major application categories. Just think I-T-E-M

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Industrial

- Automation – Including robotics and other factory automation, providing power boosts and backup
- Fork lifts, cranes, electric carts – providing power boosts and backup
- Fuel cell systems
- Regenerative breaking captures energy
- UPS Systems – Faster than conventional UPS

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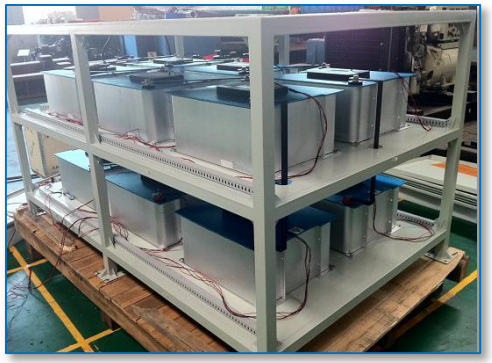
Example…

Industrial Generator Starting

- Multiple modules are used to start large commercial diesel powered generator
- 12 volt modules



Basic Specifications	
Voltage Range	448V~672V
Working Current	298A~447A
Power	200KW; 15s
Capacitance	27.7F
Dimensions	2.02x1.96x1m

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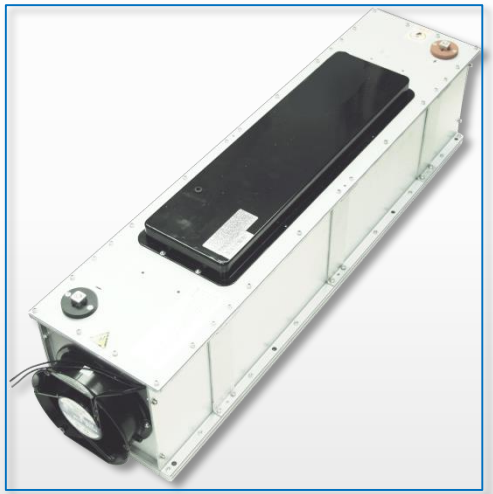
Transportation

- Battery propelled electric vehicles (BEVs)
- Hybrid electric vehicles (HEVs)
- Engine starting – auto, truck, train
- Regenerative breaking/energy capture – trucks, busses, trains
- Fuel cell vehicle support – electric power output smoothing
- Trains – electric power grid stabilization



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Transportation Can Take Many Forms

- 48V Systems for Electric Vehicles
- For fork lift trucks, in plant vehicles, golf carts, etc.
- Provides extra boost of energy to support batteries or fuel cell
- May be used for regenerative braking to capture energy otherwise lost

Basic Specifications	
Voltage	48V
Surge Voltage	50.4V
Max Charge / Discharge Current	810A
Standard Charge / Discharge Current	32.4A
Capacitance	166F
Dimensions	416x212x226mm

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Green Energy

- **Wind turbine** – Prop pitch
- **Solar turbines** – Mirror power
- **Solar Panels** – Storage, smoothing
- **Wave energy converters** – Smoothing, turbine startup power (initiates startup and minimizes starting surge, regenerative breaking of turbines)

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Example…

Wind Turbine Energy Storage Application

- 500,000 charge/discharge cycles
- Overvoltage monitoring
- Ultra low ESR
- High power
- Dual-fan air cooled
- RS or CAN output interface
- Integrated supercapacitor management system

52 F, 129 WVDC, -40 to +60C,
Charge/Discharge current 674 A
Weight: 110 lb.

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More Applications!

- Military – similar needs to those found in other markets, plus any military equipment that is motorized
- Medical – Non-life critical applications, such as support for motor driven diagnostic and patient mobility equipment
- Smart Grid – Power smoothing, backup, energy storage
- Commercial Cooking Equipment

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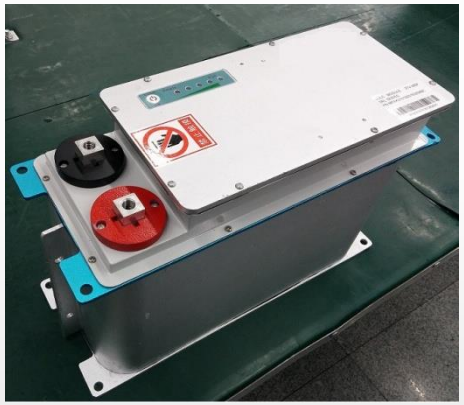
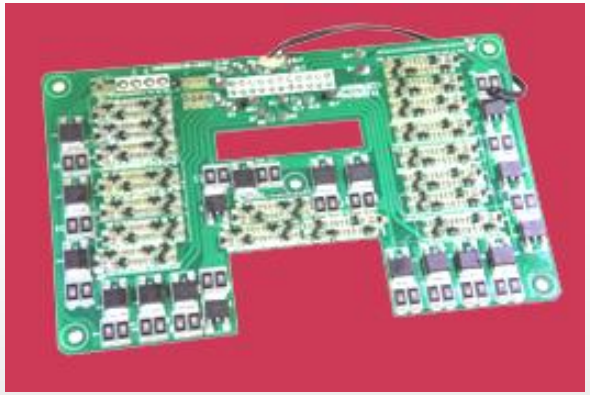
Examples of Custom Modules

- Complete flexibility over electrical and mechanical specifications.





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Options

- Overvoltage protection
- Over temperature protection – user defined
- Active or passive voltage balancing
- Voltage level indication
- Safety circuits - relays/fuses
- Charging circuit – limits current
- Power booster – very custom
- DC-DC converter (bidirectional)
- Cooling and more!

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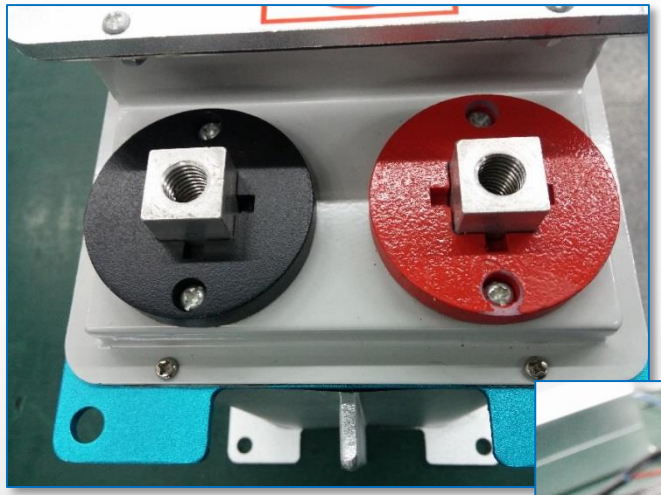
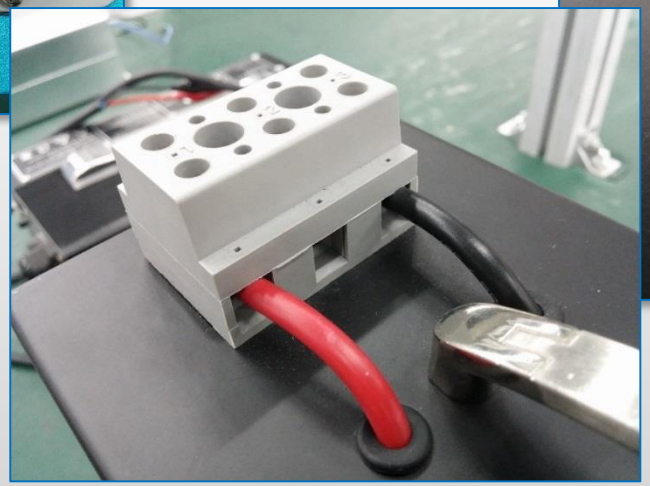
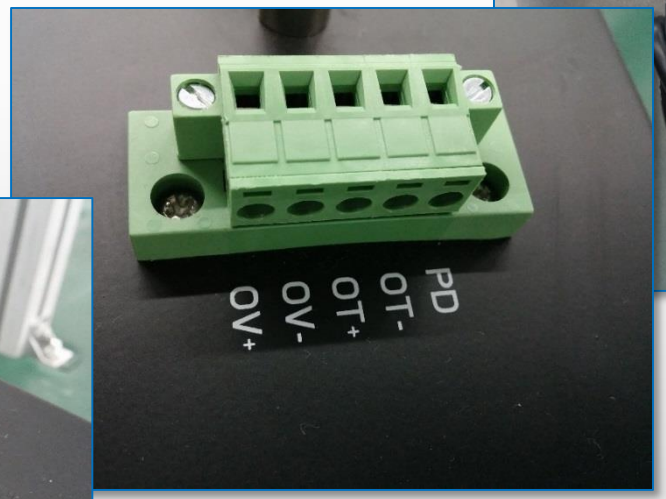
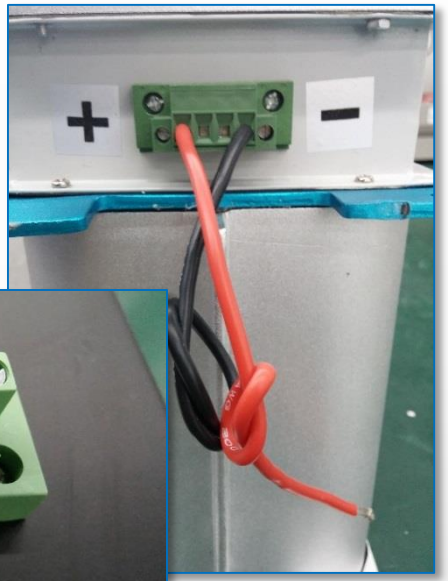
Connector Examples



Many more types are available







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Learn More at IllinoisCapacitor.com

- Website featuring catalog pages in PDF format and individual product specifications
- Technical assistance
- Gateway to Quote & Samples
- Net Components System- inventory locater
- Glossary

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