

Ultracapacitor, Ultra-condensador, Extrême-condensateur,  
Ultra-Kondensator, 极端的容器, 超コンデンサ

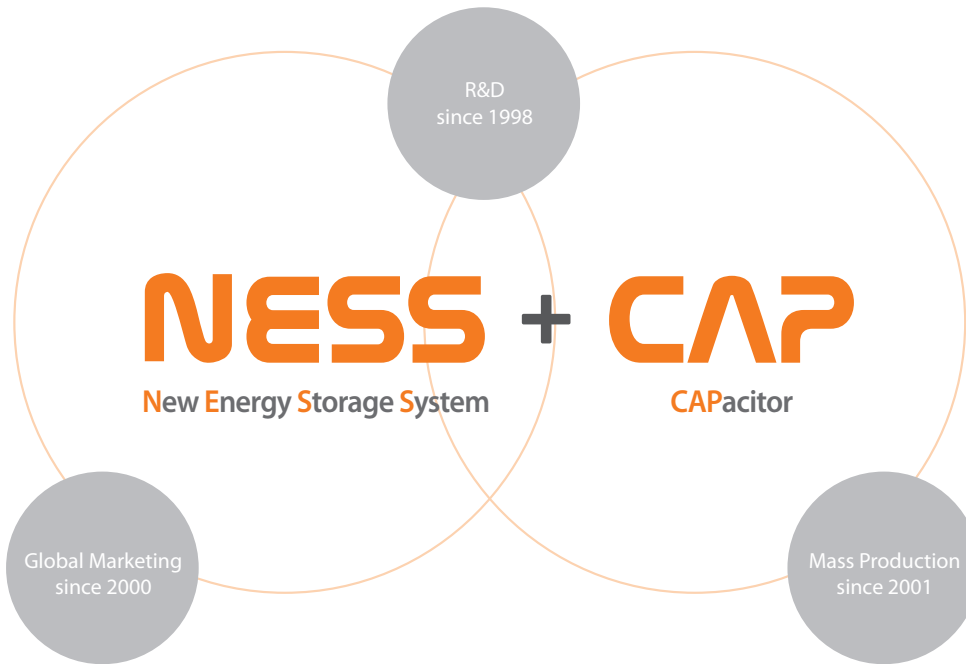
# POWER TO MOVE

The world leader in **ultracapacitor** technology  
with proprietary electrode and manufacturing processes.



# Company

## Origin



## Awards



2010

- Nominated as one of the top 10 companies in Asia Pacific in the Global Cleantech 100 annually held by Cleantech Group LLC

2005

- IEEE Spectrum's "Special Technology Issue Winner Device" in 2005
- Nominated for a primary contractor of "Development of 3V Ultracapacitors and HEV" from Korean government
- Selected as a primary contractor for the research and development of "Freedom Car Project" sponsored by USABC

2002

- KT (Excellent Korean Technology) Mark from the Ministry of Science and Technology of Korea
- Nominated for "Good Company" by KTCGF (Korean Technology Credit Grantee Fund)
- Selected as a primary contractor for "42V System Development Project" conducted by Ministry of Science and Technology of Korea
- Selected as a primary contractor for "Development of Intelligent Transportation System Using Pseudocapacitors" conducted by Ministry of Commerce, Industry and Energy

2000

- IR52 Award from the Minister of Science and Technology of Korea for NESSCAP EDLC (Electric Double Layer Capacitor)
- Power 2000, Chairman's Choice Component Award for EDLC in San Diego

## History

- 2011** - QC/T 741 for 48V 166F module, certified by China Quality Certification Centre (“CQC”)  
- Listed in TSX Venture Exchange (Stock Symbol: NCE)
- 2010** - Launched 16V, 64V, 86V, series modules and 125V module  
- Second factory established at Dongtan site
- 2009** - Launched 48V series modules  
- I2BF invests in Nesscap Co., Ltd.
- 2008** - Wealthbridge invests in Nesscap Co., Ltd.
- 2007** - ISO/TS 16949/2002, certified by Kiwa INTERNATIONAL CERT Zertifizierung GmbH  
- CE Certification approval from TÜV Rheinland Product Safety GmbH
- 2006** - ISO 14001:2004, certified by Korea International Standards Certification  
- ABB certifies Nesscap as “Approved Supplier”
- 2004** - Factory expansion and relocation to Giheung site
- 2003** - ISO 9001:2000, certified by DAS Certification Ltd  
- Solectria “Super 7” Project - 8000 miles of trouble free hybrid driving with Nesscap ultracapacitor module
- 2002** - Singapore Technologies Kinetics invests in NESS Capacitor Co., Ltd.  
- NESS Capacitor Co., Ltd. renamed to Nesscap Co., Ltd.
- 2001** - New enhanced EDLC product-line introduced at 42 Volt System Conference  
- Japanese company invests in NESS Capacitor and begins marketing of NESS EDLC in Japan  
- Capacitor factory established at Sangal site
- 2000** - NESS EDLC cited for top performance in comparison test at 11th Int’l Seminar on EDLC held at Deerfield  
- NESS Capacitor Co., Ltd. spun off from NESS Corp.  
- First commercial shipment of large-size EDLC to US market
- 1999** - NESS EDLC makes debut appearance at 10th Int’l Seminar on EDLC held at Deerfield Beach, Florida  
- NESS Corporation founded
- 1998** - NESS center officially established at Institute for Advanced Engineering (IAE)  
- Feasibility study of energy storage and display device technology

## Facilities



—• Head Office and Factory - 1



—• Factory - 2

# Ultracapacitor

## Overview



Ultracapacitor, also known as supercapacitor, supercondenser, electric double layer capacitor (EDLC) or pseudocapacitor, is an electric capacitor that has an unusually high energy density when compared to common capacitors, typically on the order of thousands of times greater than a high capacity electrolytic capacitor.

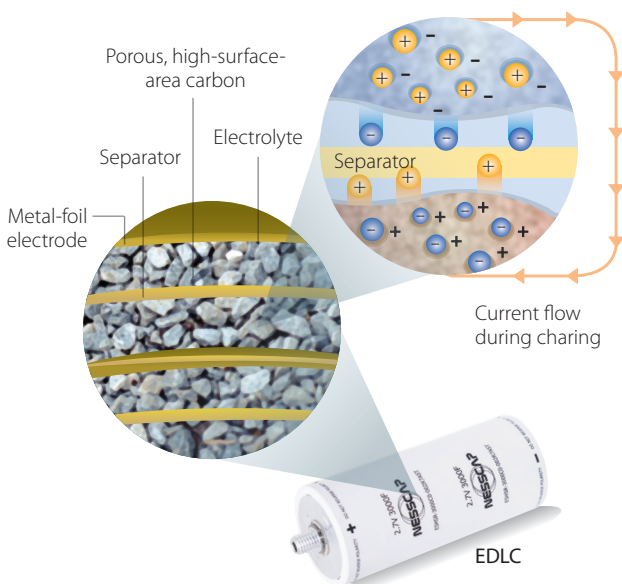
Compared to batteries, ultracapacitors are capable of more than ten times the power and more than thousand times the cycle life. These are two main reasons why engineers choose ultracapacitors over batteries in different applications. Ultracapacitors are proven energy storage devices that can replace conventional capacitors or batteries in many applications that require much more energy than what conventional capacitors are able to provide and that also require higher power outputs that batteries cannot provide.

**Table. Comparison between ultracapacitor and battery**

Parameters	Electrostatic Capacitor	Ultracapacitor	Battery
Discharge Time	$10^{-6} \sim 10^{-3}$ sec	1~30 sec	0.3~3 hrs
Charge Time	$10^{-6} \sim 10^{-3}$ sec	1~30 sec	1~5 hrs
Energy Density (Wh/kg)	< 0.1	1~10	20~100
Power Density (W/kg)	< 10,000	10,000	50~200
Charge / Discharge Efficiency	~ 1.0	~10	0.7~0.85
Cycle Life	Infinite	> 500,000	500~2,000

# NESSCAP

## How it works



The majority of the commercially available ultracapacitor is Electric Double-Layer Capacitor, or EDLC. An EDLC can be viewed as a set of two nonreactive porous carbon electrodes on current collectors, immersed in an electrolyte system with a voltage potential applied across the collectors. In an EDLC cell, the applied potential on the positive electrode attracts the negative ions in the electrolyte, while the same potential at the negative electrode attracts the positive ions. A dielectric separator prevents the two electrodes from creating a short circuit. The amount of energy stored is very large compared to a traditional capacitor due to the enormous surface area that is available on the porous carbon electrodes.

## Nesscap benefit



Nesscap has a holistic and comprehensive understanding of how to make an ultracapacitor, as evident through its long history in innovation and research. Nesscap's product development is based on that understanding of the interrelationship between all the parts that make up an ultracapacitor cell. Significant resources are allocated to focus on the following critical areas in product development:

○ Complete qualification and verification of raw materials and relevant vendors

○ Identification of all required manufacturing process control parameters

○ Optimization of the operational voltage

○ Optimization of electrode formulation to meet market requirements

# Applications

## Market overview

The average market growth rate of ultracapacitor in past 10 years is 25% and most analysts predict growth rate of the market for next 10 years at greater than 30% year over year. Primary area of growth will be in mass customization of power modules and systems for automotive applications, such as micro/mild hybrid vehicle and boardnet stabilization, and green technology applications, such as windmill blade pitch control and smart utility meters. Nesscap's robust ultracapacitors are ideal solutions for these applications.

Nesscap's major markets are in the consumer, industrial and automotive areas. Each of these markets has its own unique requirements and characteristics that must be satisfied. Applications in these markets are listed below.



## Consumer

Applications	Function	Applicable products
Toys	Battery replacement	Small & medium cells Small modules
Portable electronics (PDAs, Hand terminals, other portable gadgets)	Battery replacement Peak pulse power	
Solid-state drive (SSD)	Memory backup	
Wireless audio	Peak pulse power	
Car audio	Peak pulse power	
Power tool	Energy storage system	
Flashlight		

## Industrial



Applications	Function	Applicable products
AMR	Peak pulse power	Small cells Small modules
Robotic systems	Memory backup	Medium & large cells Modules
Windmill pitch control system	Emergency backup power	
Actuator	Emergency backup power	Small & medium cells
Welding machine	Energy storage system Auxiliary power source	Large cells Modules
Crane		
DVR		
Hybrid forklift		
Hybrid excavator		
Trains, trams, subways		

## Automotive



Applications	Function	Applicable products
X-by-wire	Electronically controlled braking (ECB) Electric power steering (EPS)	Medium & large cells Modules
Engine start	Peak power Cold cranking	Large cells Modules
Fuel-cell vehicles	In-rush power supply Load leveling	
Micro/Mild & Full hybrid vehicles	Energy storage system Peak power assist Auxiliary power source	
Heavy duty vehicles		
Transit bus		

## Others



Applications	Function	Applicable products
Solar tile/lighting	Battery replacement Backup power Cold cranking Energy storage system Peak power assist Auxiliary power source	All cells Modules
Medical		
Military		
Others and more		

## EDLC Electric Double Layer Capacitor

### I Small

Capacitance (F)	3 ~ 50
Voltage (V)	2.3 and 2.7
Solvent	Propylene carbonate and acetonitrile
Terminal type	Radial lead
Form factor	Cylindrical
Major application	AMR, Consumer electronics, SSD and more



Nesscap's small-sized EDLC cells range from 3F to 50F in capacitance with operating voltages ranging from 2.3V to 2.7V. These cells can be used in various types of applications which mainly require smaller amounts of capacitance but immediate pulse power, such as, AMR (Automatic Meter Reading), consumer electronics and SSDs (Solid State Drives)

### I Medium

Capacitance (F)	90 ~ 360
Voltage (V)	2.3 and 2.7
Solvent	Propylene carbonate and acetonitrile
Terminal type	Snap in
Form factor	Cylindrical
Major application	Flashlight, Windmill pitch control system, Robotics, DVR (Dynamic Voltage Restorer), Indoor crane and more



Nesscap's medium-sized EDLC cells range from 90F to 360F in capacitance with operating voltages ranging from 2.3V to 2.7V. These 'snap in' type cells offer more durable connectivity & functionality to meet the requirements of industrial applications, such as, windmill pitch control systems, robotics, DVR (Dynamic Voltage Restorer), and indoor cranes. Other applications include power tools and LED flashlights.

### I Large prismatic

Capacitance (F)	600 ~ 5000
Voltage (V)	2.7
Solvent	Acetonitrile
Terminal type	Screw
Form factor	Prismatic
Major application	Tram, Military, Vehicle and more



Nesscap's large-sized prismatic EDLC cells range from 600F to 5000F in capacitance with operating voltage of 2.7V. These cells were originally developed and used for heavy duty motive applications such as tram, military, and other vehicles. These cells provide an optimized structural advantage due their prismatic footprint for integration in space constrained applications.

### I Large cylindrical

Capacitance (F)	650 ~ 3000
Voltage (V)	2.7
Solvent	Acetonitrile
Terminal type	Weldable and Threaded
Form factor	Cylindrical
Major application	Transit bus, Heavy duty vehicle, Hybrid vehicle, Harbor crane and more



Nesscap's large-sized cylindrical EDLC cells range from 650F to 300F in capacitance with operating voltage of 2.7V. These cells were developed to meet market requirements for robustness, compact size, high energy density, and long cycle life. These cells incorporate superior leakage protection and industry lead in shock, rotation and vibration safeguards. These cells are available with threaded or weldable terminals.



## Pseudocapacitor

Capacitance (F)	50 ~ 300
Voltage (V)	2.3
Solvent	Propylene carbonate and acetonitrile
Terminal type	Radial lead and Snap in
Form factor	Cylindrical
Major application	Flashlight, Solar tile and more



Nesscap's small and medium-sized Pseudocapacitor cells range from 50F to 300F in capacitance with operating voltage of 2.3V. This proprietary technology is one of the first commercially available hybrid capacitor products on the market. A Pseudocapacitor will store approximately twice the energy of a typical EDLC of the same size and weight with lower cost per unit of energy. There is a growing and significant opportunity for Pseudocapacitors especially in portable and handheld products.

## Module

Capacitance (F)	1.5 ~ 500
Voltage (V)	5 ~ 125
Solvent	Acetonitrile
Terminal type	Radial lead and screw
Form factor	Various
Major application	AMR, Consumer electronics, Transit bus, Heavy duty vehicle, Tram, Windmill pitch control system and more



Nesscap offers multi-cell modules with operating voltages of 5V, 16V, 48V, 64V, 86V, and 125V, to satisfy higher voltage requirements of many integrated systems. These standardized multi-cell modules can simply be connected in series to meet even higher voltage requirement. 5V modules (composed of two 2.7V 3F cells connected in series) are typically used for AMR and other applications which require small amount of capacitance and mainly used for small pulse power. 16V and higher voltage modules are composed of large cylindrical cells target the automotive and industrial application such as transit bus and heavy duty vehicles.

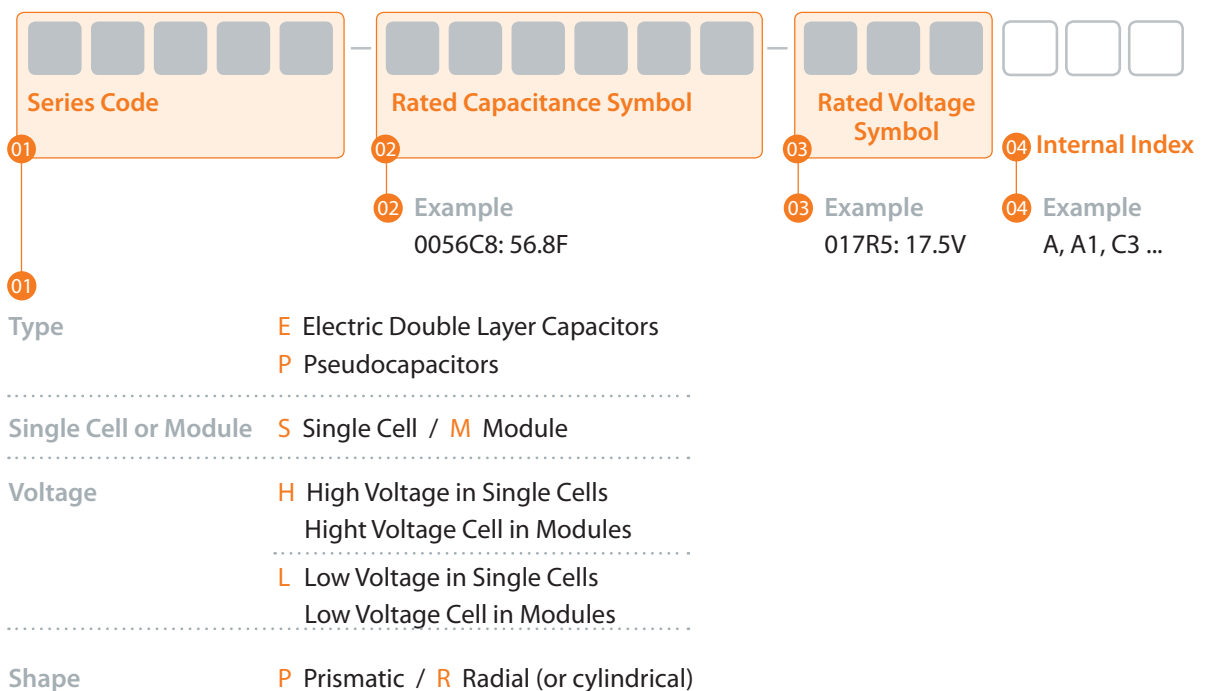
## Overall Product Matrix

Series	Size	Rated Voltage (V, DC)	Rated Capacitance (F)	Max. ESR (mΩ)	Dimension(mm)				Volume (ml)	Weight (g)	Part Number
					AC	D	L	W			
EDLC	Small	2.3	5	<123	10	20			1.6	2.4	ESLSR-0005C0-002R3
		2.3	7	<35	8	30			1.5	2.2	ESLLR-0007C0-002R3
		2.3	10	<70	10	30			2.4	3.6	ESLSR-0010C0-002R3
		2.3	25	<38	16	25			5	7.6	ESLSR-0025C0-002R3
		2.3	60	<23	18	40			10.2	13.5	ESLSR-0060C0-002R3
		2.7	3	<61	8	20			1	1.5	ESHSR-0003C0-002R7
		2.7	5	<29	10	20			1.6	2.3	ESHSR-0005C0-002R7
		2.7	6	<26	8	30			1.5	2.3	ESHSR-0006C0-002R7
		2.7	10	<26	10	30			2.4	3.2	ESHSR-0010C0-002R7
		2.7	25	<21	16	25			5	6.5	ESHSR-0025C0-002R7
	2.7	50	<14	18	40			10.2	11.3	ESHSR-0050C0-002R7	
	Medium	2.3	120	<16	22	45			17.1	23	ESLSR-0120C0-002R3
		2.7	90	<6	22	45			17.1	21.5	ESHLR-0090C0-002R7
		2.7	100	<9	22	45			17.1	21	ESHSR-0100C0-002R7
		2.7	360	<3.2	36	64			65.1	67	ESHSR-0360C0-002R7A
	Large Prismatic	2.7	600	<0.64		90	60	28	151	210	ESHSP-0600C0-002R7
		2.7	1700	<0.50		165	60	28	277	385	ESHSP-1700C0-002R7
		2.7	3500	<0.28		165	60	52	515	685	ESHSP-3500C0-002R7
		2.7	5000	<0.25		165	60	72	713	930	ESHSP-5000C0-002R7
	Large Cylindrical Weldable	2.7	650	<0.50	60.2	51.5			164	205	ESHSR-0650C0-002R7A5
		2.7	1200	<0.40	60.2	74			228	280	ESHSR-1200C0-002R7A5
		2.7	1600	<0.34	60.2	85			259	335	ESHSR-1600C0-002R7A5
		2.7	2000	<0.28	60.2	102			307	390	ESHSR-2000C0-002R7A5
		2.7	3000	<0.22	60.2	138			410	530	ESHSR-3000C0-002R7A5
	Large Cylindrical Threaded	2.7	650	<0.50	60.2	52.5			223	210	ESHSR-0650C0-002R7A5T
		2.7	1200	<0.40	60.2	75			288	285	ESHSR-1200C0-002R7A5T
		2.7	1600	<0.34	60.2	86			319	340	ESHSR-1600C0-002R7A5T
		2.7	2000	<0.28	60.2	103			367	395	ESHSR-2000C0-002R7A5T
2.7		3000	<0.22	60.2	139			470	535	ESHSR-3000C0-002R7A5T	
Pseudocapacitor	Small	2.3	50	<24	16	25			5	7.6	PSHLR-0050C0-002R3
		2.3	120	<18	18	40			10.2	15	PSHLR-0120C0-002R3
	Medium	2.3	220	<14	22	45			17.1	23	PSHLR-0220C0-002R3
		2.3	300	<12	22	45			19	25.2	PSHLR-0300C0-002R3
Module	Standard	5	1.5	<110	9.5	23	17.5			3.4	EMHSR-0001C5-005R0
		5	2.5	<53	12	23	21.5			5	EMHSR-0002C5-005R0
		16	108	<3.6		422	73	68.5	2.11L	4.0kg	EMHSR-0108C0-016R05
		16	200	<2.9		422	73	91	2.80L	4.4kg	EMHSR-0200C0-016R05

Series	Size	Rated Voltage (V, DC)	Rated Capacitance (F)	Max. ESR (mΩ)	Dimension(mm)				Volume (ml)	Weight (g)	Part Number
					AC	D	L	W			
Module	Standard	16	266	<2.5		422	73	102	3.14L	4.9kg	EMHSR-0266C0-016R0S
		16	333	<2.0		422	73	119	3.66L	5.4kg	EMHSR-0333C0-016R0S
		16	500	<1.6		422	73	155	4.77L	6.3kg	EMHSR-0500C0-016R0S
		16	108	<3.6		227	136	70	2.77L	3.0kg	EMHSR-0108C0-016R0V
		48	36	<10.8		430	200	68.5	5.89L	8.0kg	EMHSR-0036C0-048R0S
		48	66	<8.6		430	200	91	7.82L	10.1kg	EMHSR-0066C0-048R0S
		48	88	<7.3		430	200	102	8.77L	11.6kg	EMHSR-0088C0-048R0S
		48	111	<6.0		430	200	119	10.23L	13.1kg	EMHSR-0111C0-048R0S
		48	166	<4.8		430	200	155	13.33L	16.9kg	EMHSR-0166C0-048R0S
		64	83	<8.1		420	297	121	15.09L	15.0kg	EMHSR-0083C0-064R0S
		64	125	<6.4		420	297	157	19.58L	19.0kg	EMHSR-0125C0-064R0S
		86	62	<10.8		542	297	123	19.79L	21.0kg	EMHSR-0062C0-086R0S
		86	93	<8.4		542	297	159	25.59L	26.0kg	EMHSR-0093C0-086R0S
		125	62	<12.7		715	426	246	74.92L	57.0kg	EMHSR-0062C0-125R0S

\* If there is no module you want on the list, please contact us at [marketing@nesscap.com](mailto:marketing@nesscap.com) or 82-31-289-0721~6.

## Part Number System





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