



GREEN-CAP

(Electric Double Layer Capacitors)



Green-Cap. business group



An energy storage device with rapid Charge & discharge characteristics and semi-permanent cycle life. Supply of eco-friendly products in single-cell and module.

Applications: Renewable energy (Wind power, Solar power), Hybrid cars, Improvement of energy efficiency, ESS (Energy storage device) etc

Hybrid Cap. business group (Conductive Polymer Hybrid Aluminum Electrolytic Capacitors)



Electrolyte consists of electrolyte and conductive polymer, enabling high voltage and miniaturization compared to solid electric capacitors

Applications : Automotive, IT, etc

Aluminum Electrolytic Cap. business group (Aluminum Electrolytic Capacitors)



Main business group supplying customers worldwide with continuous customer satisfaction and quality improvement

Applications : DISPLAY & AV, Household Appliances, Watt hour meter, LED, Automotive, Elevator, Subway, Uninterruptible power supply, etc

SMD Cap. Business group (Surface Mount Aluminum Electrolytic Capacitors)



Surface mount type products with the same characteristics (capacitance & voltage) as electrolytic capacitors, but reducing product size by 30% or more

Applications : Automotive, Display, LED, AV, IT, etc

Principle of Green-Cap

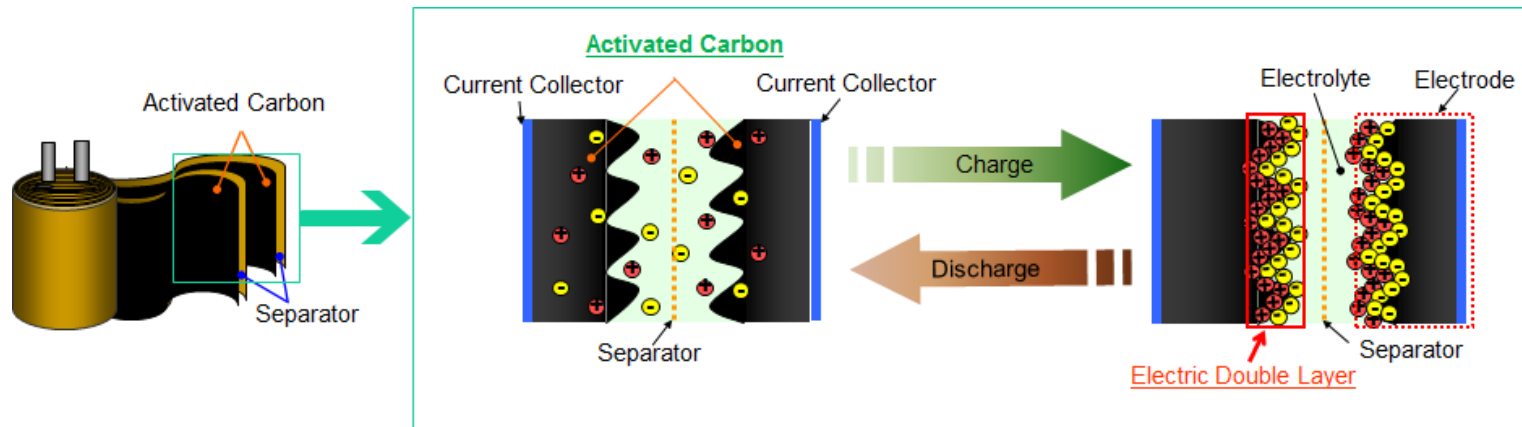
Green-Cap stores electrical energy using the electric double layer that is created at the interface between the electrode surface and the electrolyte.

Eco-friendly product

The eco-friendly charcoal electrode expands the surface area per unit area to deliver high energy density compared to the Capacitor.

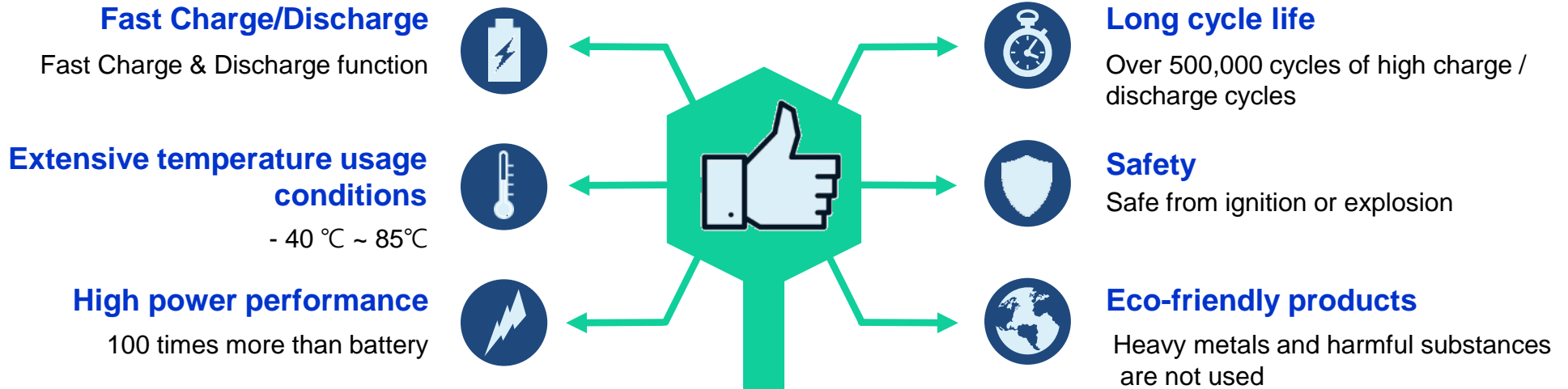
Fast/unlimited charge and discharge, Long-life product

Green-Cap has feature that is not electrochemical reaction, whereby rapid electrical charge and discharge is possible and have longer life cycle.



- EDLCs store electrical energy using the electric double layer that is created at the interface between the electrode surface and the electrolyte.
- The electrodes are made of activated carbon, which has a high surface area per unit volume, further increasing the capacitor's energy density.
- EDLC has feature that is not electrochemical reaction, whereby rapid electrical charge and discharge is possible and have longer life cycle.

Green-Cap Major Features



Feature	Green-Cap	Battery
Charge Time	Sec. unit	Hour unit
Temp. Characteristic	- 40 ~ 85 °C	- 20 ~ 60 °C
Energy Density (Wh/kg)	1 ~ 15	20 ~ 100
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200
Charge/Discharge Cycle Life	500,000 ~ 1,000,000	500 ~ 1,000
Environment	Environmentally friendly	Contains harmful substances

Development Road map (EDLC)

Details		2022	2023	2024
EDLC SNAP-IN type	High Voltage	3.2V 65°C 1,500H		3.3V 65°C 1,500H
	High Temperature	2.7V 85°C 2,000H	2.7V 95°C 1,500H	
EDLC Axial type	High Voltage	3.0V 65°C 2,000H	3.2V 65°C 1,500H	3.3V 65°C 1,500H

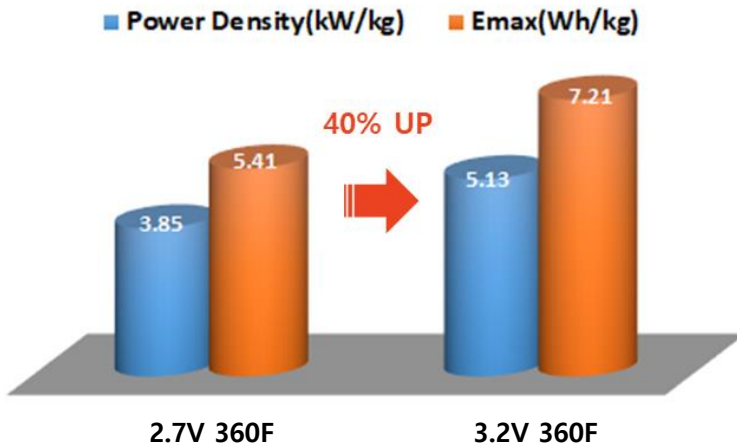
Product in development

Snap-in Type(High Voltage)

Rated Voltage (2.7V → 3.2V)

- Endurance : 3.2V 65°C 1,500hours (World Best)
- The middle size and high capacitance, low resistance
- Charge and discharge efficiency are higher than in batteries

Section	2.7V 360F	3.2V 360F
Rated Voltage(V)	2.7	3.2
Stored Energy(Wh)	0.36	0.51
Power Density(kW/kg)	3.85	5.41
Weight(kg)	0.071	0.071
Dimension(mm)	Ø35x60	Ø35x60
E _{max} (Wh/kg)	5.13	7.21



Applications

- Power Quality Solution(UPS)
- Renewable Energy(Windmill, Photovoltaic & Solar light etc.)
- Customer And industrial electronics
- Medical devices

Advantages of using high voltage cells

- Reducing weight and volume by less cell
- Reducing module resistance by less cell

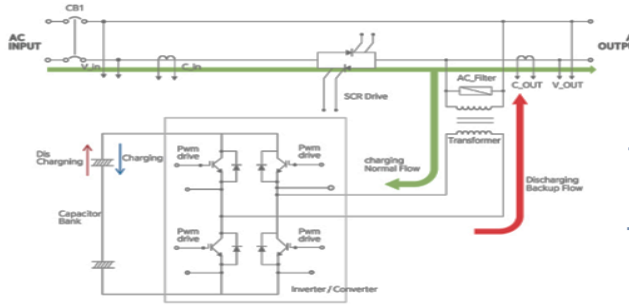
Ex) 48V module Comparison table of each cell

Spec	2.7V 360F	3.2V 360F	Ratio(%)
Total cell qty	18	15	-16.7
Module Voltage(V)	48.6	48	2.6
Module Capacitance(F)	20	24	20
Module ESR(mΩ)	57.6	48.0	-16.7
Module Size(mm)	216x108x60	180x108x60	-
Module Volume(cm ³)	1399.6	1166.4	-16.7
Module Weight(g)	127.8	106.5	-16.7

Applications

Section	Applied Product	Function			
		Peak Power Assist	Power Backup	Energy Regeneration	Battery Replacement
Industrial	UPS / VSP		●		●
	Smart Meter	●	●		
	Escalator / Fork Lift	●		●	
	Elevator				
	AGV				●
Renewable Energy	Wind Power Pitch Control		●		●
Automotive	Subway	●	●	●	
	Tram	●	●	●	
	Diesel locomotive		●		●
	Hybrid Bus	●	●	●	
	Electricity Bike / Golf Cart	●	●	●	
	ISG (Idle Stop & GO)			●	
Medical Appliances	X-Ray	●		●	

Application



- Energy charged in the Green-Cap supplies for prevention of equipment failures

Recommended Product

Product group	Series	Spec.	Advantage
Snap-In 	DB	2.7V 65°C 2000h	Standard
	DK	2.7V 85°C 1500h	Wide Temp.
	DA	3.0V 65°C 1500h	High Volt.
Weldable Threaded 	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module 	DM	65~85°C 1500~2000h	Customized Design

Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Reduces maintenance costs (**30 %** less than battery)
- Maximum instantaneous power characteristics (**100 times** more than battery)

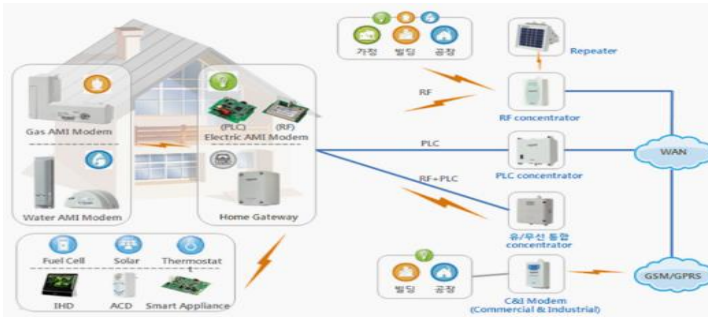
※ The effect is estimated

Application Examples

Module Spec	Structure
125V 2F	DB 2.7V 100F (Ø22×L45) 50EA Series
125V 7.2F	DB 2.7V 360F (Ø35×L60) 50EA Series
16V 1000F	DH 2.7V 3000F (Ø60×L138) 6EA Series X 2EA Parallel

Smart Meter

Application



- High power energy supply required when sending and receiving data
- Smart Grid key components of data communication such as Electrical Meter, Water Meter, Gas Meter, etc.

Recommended Product

Product group	Series	Spec.	Advantage
Radial 	DS	2.7V 65°C 1000h	Standard
	DS	3.0V 65°C 1000h	High Volt.
	DJ	2.5V 85°C 1000h	Wide Temp.
Module 	DM	65~70°C / 1000h	

Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

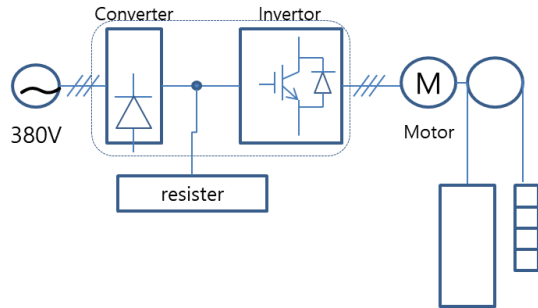
- Reduced maintenance costs (30 % less than battery)
- Maximum instantaneous power characteristics (100 times more than battery)
- Rapid charging characteristics

※ The effect is estimated

Application Examples

Module Spec	Structure
5.4V 1.5F	DS 2.7V 3F (Ø8×L20) 2EA Series
5.4V 2.5F	DS 2.7V 5F (Ø10×L20) 2EA Series
5.4V 5F	DS 2.7V 10F (Ø10×L30) 2EA Series

Application



- Charging regenerative energy with Green-Cap when going down
- Energy saving : Support motor by providing high power energy when going up
- Preventing an accident as emergency power when blackout

Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded 	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module 	DM	65~85°C / 1500~2000h	Customized Design

Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

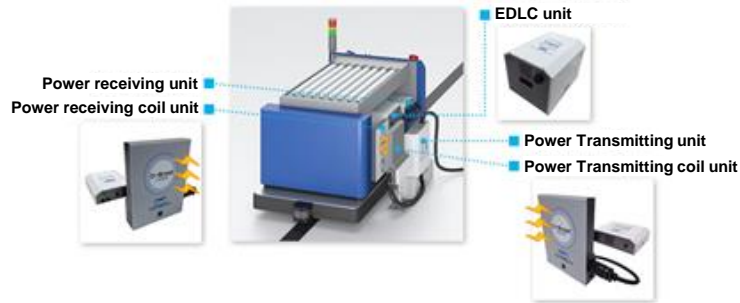
- Reduced maintenance costs (30 % less than battery)
- Maximum instantaneous power characteristics (100 times more than battery)

※ The effect is estimated

Application Examples



Module Spec.	Structure
92V 100F	DH 2.7V 3000F (Ø60×L138) 36EA Series

✓ Application



- Used as main power when driving

✓ Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded 	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module 	DM	65~85°C / 1500~2000h	Customized Design

✓ Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Reduced maintenance costs
Green-Cap one time per 10 years or more
- Excellent low temperature and high temperature characteristics (-40°C~85°C)
- Rapid charging compared to battery

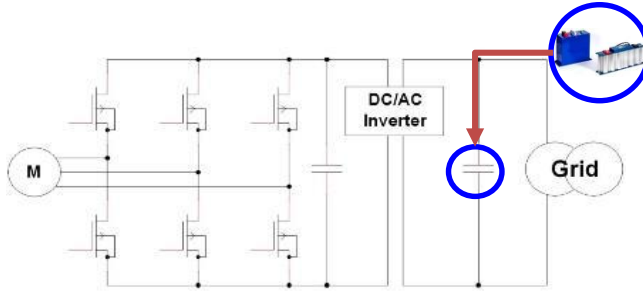
✓ Application Examples

Module spec.	Structure
24V 60F	DB 2.7V 360F (Ø35×L60) 12EA Series X 2EA Parallel
48V 166F	DH 2.7V 3000F (Ø60×L138) 18EA Series

AGV : Automated Guided Vehicles

Wind Power Pitch Control

✓ Application



- Controlling each pitch blade when emergency braking by using excellent power characteristics of Green-Cap after electric back up

✓ Recommended Product

Product group	Series	Spec.	Advantage
Snap-In 	DB	2.7V 65°C 2000h	Standard
	DK	2.7V 85°C 1500h	Wide Temp.
	DA	3.0V 65°C 1500h	High Volt.
Weldable Threaded 	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module 	DM	65~85°C 1500~2000h	Customized Design

✓ Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

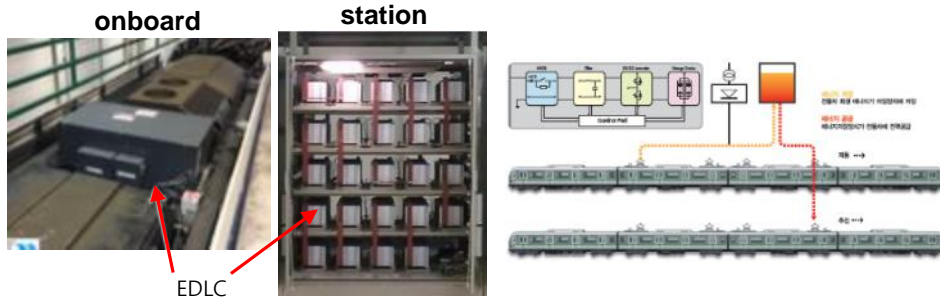
- Reduced maintenance costs (30 % less than battery)
- Maximum instantaneous power characteristics (100 times more than battery)

※ The effect is estimated

✓ Application Examples



Module Spec.	Structure
90V 10F	DB 2.7V 360F (Ø35×L60) 36EA Series
75V 36F	DB 2.7V 360F (Ø35×L60) 30EA Series X 3EA Parallel
16V 500F	DH 2.7V 3000F (Ø60×L138) 6EA Series

✓ Application



- Charging regenerated energy to Green-Cap when braking
- Support engine power when start or acceleration which high power energy is necessary
- In case of subway station installation is for energy storage power converting facility and onboard installation for light rail transit

✓ Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded 	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module 	DM	65~85°C / 1500~2000h	Customized Design

✓ Characteristic

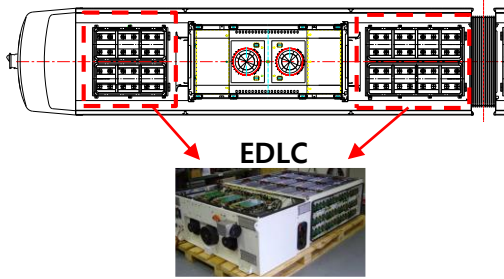
Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Reduced maintenance costs (30 % less than battery)
 - Maximum instantaneous power characteristics (100 times more than battery)
- ※ The effect is estimated

✓ Application Examples



Module Spec.	Structure
48.6V 166.6F	DH 2.7V 3000F (Ø60×L138) 18EA Series
129V 62.5F	DH 2.7V 3000F (Ø60×L138) 48EA Series

✓ Application



- Charging regenerated energy to Green-Cap when braking
- Used as main power when driving
- Onboard installation
- Quick charge at stop

✓ Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded 	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module 	DM	65~85°C / 1500~2000h	Customized Design

✓ Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

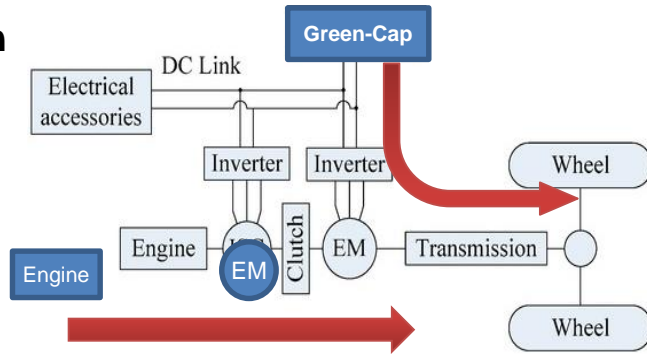
- Reduced maintenance costs
Green-Cap one time per **10 years** or more
- Excellent low temperature and high temperature characteristics (**-40°C~85°C**)
- Rapid charging compared to battery

✓ Application Examples

Module Spec.	Structure
48.6V 166.6F	DH 2.7V 3000F (Ø60×L138) 18EA Series
129V 62.5F	DH 2.7V 3000F (Ø60×L138) 48EA Series

Hybrid bus (HEV BUS)

Application



- Filling recovery energy with Green-Cap when braking
- Run the motor when starting / accelerating to **share the engine load**

Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module	DM	65~85°C 1500~2000h	Customized Design

Characteristic

Parameters	Green-Cap	Battery
Temperature characteristics	-40 ~ 85°C	-20 ~ 60°C
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Excellent low and high temperature characteristics (-40°C~85°C)
- Lower cost of maintaining consumer vehicles (Longer life than lithium battery)

※ The effect is estimated

Application Examples

Module Spec.	Structure
48V 166F	DH 2.7V 3000F (Ø60×L138) 18EA Series
129V 63F	DH 2.7V 3000F (Ø60×L138) 48EA Series


Electric Bike / Golf cart

✓ Application



- Filling recovery energy with Green-Cap when braking
- A starting point where the stored energy needs a high output energy or provides acceleration to assist for output of the battery

✓ Recommended Product

Product group	Series	Spec.	Advantage
Snap-In 	DB	2.7V 65°C 2000h	Standard
	DK	2.7V 85°C 1500h	Wide Temp.
	DA	3.0V 65°C 1500h	High Volt.
Module 	DM	65~85°C / 1500~2000h	Customized Design

✓ Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Improving battery life by 50 %
- Maximum instantaneous characteristics : acceleration and performance improvement
- Environmentally friendly product free from heavy metal waste

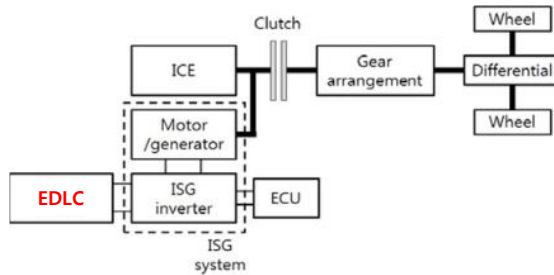
※ The effect is estimated

✓ Application Examples

Module Spec.	Structure
57.5V 8.7F	DB 2.7V 200F (Ø30×L45) 23EA Series
92V 2.5F	DB 2.7V 100F (Ø22x45) 40EA Series

ISG : Idle Stop & Go

Application



- Filling recovery energy with Green-Cap when braking
- 15 V Module for storing renewable energy, 5.4 V Module for starting only

Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module	DM	65~85°C / 1500~2000h	Customized Design



Characteristic

Parameters	Green-Cap	Battery
Total number of charge	-40 ~ 85°C	-20 ~ 60°C
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

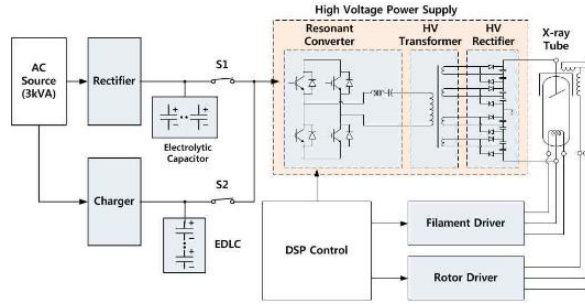
- Excellent low temperature and high temperature characteristics (-40°C~85°C)
- Extended battery life (50 %)
- Improving the supply power to stabilize the power supply and improve the instantaneous failure of the equipment (Audio, Navigation, etc.)

※ The effect is estimated

Application Examples

Module Spec.	Structure
5.4V 600F	DH 2.7V 1200F (Ø60×L74) 2EA Series
15V 200F	DH 2.7V 1200F (Ø60×L74) 6EA Series

Application



- Green-Cap's high output power supplies to X-ray generator instantly

Recommended Product

Product group	Series	Spec	Advantage
Snap-In 	DB	2.7V 65°C 2000h	Standard
	DK	2.7V 85°C 1500h	Wide Temp.
	DA	3.0V 65°C 1500h	High Volt.
Module 	DM	65~85°C / 1500~2000h	Customized Design

Characteristic

Parameters	Green-Cap	Battery
Charging time	In seconds	In hours
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Reduced maintenance costs (**30% lower than battery**)
- Excellent momentary maximum output characteristic (**100 times** more than battery)

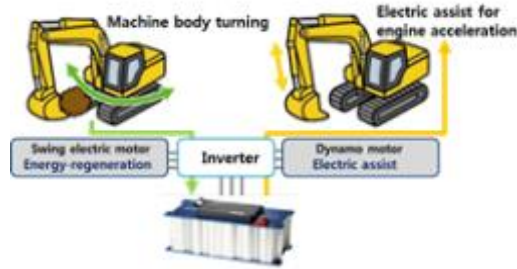
※ The effect is estimated

Application Examples

Module spec.	Structure
450V 2F	DB 2.7V 360F (Ø25×L60) 180EA Series

Hybrid Excavator

✓ Application



- Charge regenerative energy with Green-Cap when turning excavator
- Engine power supply when high power is required

✓ Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module	DM	65~85°C / 1500~2000h	Customized Design



✓ Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

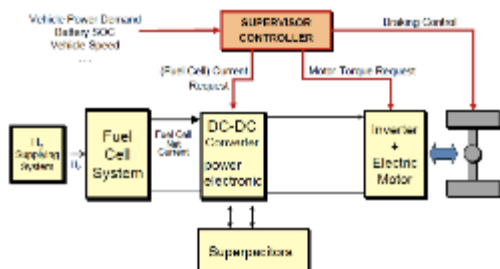
- Excellent low temperature and high temperature characteristics (-40°C~85°C)
- Reduced maintenance costs (30 % less than battery)
- Maximum instantaneous power characteristics (100 times more than battery)

※ The effect is estimated

✓ Application Examples

Module Spec	Structure
32.4V 250F	DH 2.7V 3000F (Ø60×L138) 12EA Series
48.6V 166.6F	DH 2.7V 3000F (Ø60×L138) 18EA Series

Application



- Charge regenerative energy with Green-Cap when lowering lift
- Engine power supply when high power is required

Recommended Product

Product group	Series	Spec.	Advantage
Weldable Threaded	DH	2.7V 65°C 1500h	Standard
	DT	2.5V 85°C 1500h	Wide Temp.
	DV	2.85V 65°C 1500h	High Volt.
Module	DM	65~85°C / 1500~2000h	Customized Design

Characteristic

Parameters	Green-Cap	Battery
Charge/Discharge Cycle Life	> 500,000	500 ~ 1,000
Power Density (W/kg)	10,000 ~ 20,000	50 ~ 200

- Excellent low temperature and high temperature characteristics (-40°C~85°C)
- Reduced maintenance costs (30 % less than battery)
- Maximum instantaneous power characteristics (100 times more than battery)

※ The effect is estimated

Application Examples

Module Spec	Structure
118.8V 50F	DH 2.7V 2000F (Ø60×L102) 44EA Series

Certification



bsi. IATF 16949:2016
Automotive Quality Management

bsi. Certificate of Registration
QUALITY MANAGEMENT SYSTEM - IATF 16949:2016

This is to certify that: **Samwha Electric Co., Ltd.**
3, Bongmyeong-ro, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 28589, Republic of Korea

operates a Quality Management System which complies with the requirements of IATF 16949:2016 for the following scope:
The design and manufacture of aluminum electrolytic capacitors and EDLC(Electric Double Layer Capacitors).

For and on behalf of BSI: *Peter Pu*
Managing Director, NE Asia Region - Peter Pu

BSI Certificate Number: 660453
IATF Number: 0431268
Page: 1 of 2

...making excellence a habit.[™]
Certification Date: 2021-10-25
Latest Issue: 2021-10-25
Expiry Date: 2024-10-24

This certificate was issued electronically and remains the property of BSI and is bound by the conditions of contract. An electronic certificate can be authenticated at www.bsigroup.com/bsi/CertDirectory or telephone +44 20 777 4133. IATF Contracted Office: BSI Assurance (UK Limited), registered in England under number 7903321 at 389 Chiswick High Road, London W6 4AL, UK. BSI Group Name: BSI Services (UK) Limited, 389 Chiswick High Road, London W6 4AL, UK. A Member of the BSI Group of Companies.



KTLMS
ISO 14001

CERTIFICATE OF ENVIRONMENTAL MANAGEMENT SYSTEMS

SAMWHA ELECTRIC CO., LTD.
3, Bongmyeong-ro, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, Korea

This is to certify that the Environmental Management Systems of this organization has been found to conform to the below Certification Standard by KTLMS

Certificate No: **KRE - 0037**
Certification Standard: **KS I ISO 14001:2015 / ISO 14001:2015**
Certification Scope: The design and manufacture of aluminum electrolytic capacitors and EDLC(Electric Double Layer Capacitors)

Period of Validity: from 09 December 2019 until 08 December 2022
Initial Registration Date: 09 December 1998
Date of Issue: 09 December 2019

President
KTLMS Co., Ltd.
A-1007, Xi-Tower, 67, Saebong-ro, Gwangmyeong-gu, Gyeonggi-do, Korea

KTLMSKTLMASKTLMS

KTLMS has been accredited as a certification body of Environmental Management System from KAS Accreditation Number: KAS-0040
KTLMS is a certification body that has been accredited by the accreditation body. It has been registered in the Registrar Recognition Agreement (RGA) of the International Accreditation Forum(IAF)



MH47765

CERTIFICATE OF COMPLIANCE

Certificate Number: **MH47765-3**
Report Reference: **MH47765-20110223-3**
Issue Date: **2020-JULY-10**

Issued to: **SAM WHA ELECTRIC CO LTD.**
3, Bongmyeong-ro, Heungdeok-gu, Cheongju-si Chungcheongbuk-do 28589 KOREA

This certificate confirms that representative samples of **COMPONENT - CAPACITORS, ELECTROCHEMICAL**
See Next Page(s)

Have been investigated by UL in accordance with the component requirements in the Standard(s) indicated on this Certificate. UL Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for installation in complete equipment submitted for investigation to UL LLC.

Standard(s) for Safety: **Safety for Electrochemical Capacitors, UL 810A**
Additional Information: See the UL Online Certifications Directory at <https://iq.ulinspector.com> for additional information.

This Certificate of Compliance does not provide authorization to apply the UL Recognized Component Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Recognized Component Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Recognized Component Mark on the product.

Samwha
UL LLC
UL is an authorized and participating licensee of UL Mark Certified as provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact your local UL Customer Service Representative at <https://www.ul.com>

CERTIFICATE OF COMPLIANCE

Certificate Number: **MH47765-3**
Report Reference: **MH47765-20110223-3**
Issue Date: **2020-JULY-10**

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Models/Product: **Component- Electric Double Layer (Electrochemical) Capacitors, EDLC(DB) and EDLC(DA) series.**

Model numbers: EDLC(DB)2 5v100F A, EDLC(DB)2 5v100F B, EDLC(DB)2 5v120F A, EDLC(DB)2 5v120F B, EDLC(DB)2 5v150F, EDLC(DB)2 5v200F, EDLC(DB)2 5v220F, EDLC(DB)2 5v300F, EDLC(DB)2 5v350F, EDLC(DB)2 5v360F, EDLC(DB)2 5v370F, EDLC(DB)2 5v400F A, EDLC(DB)2 5v400F B, EDLC(DB)2 5v400F C, EDLC(DB)2 5v430F, EDLC(DB)2 5v480F A, EDLC(DB)2 5v480F B, EDLC(DB)2 5v480F C, EDLC(DB)2 5v500F A, EDLC(DB)2 5v500F B, EDLC(DB)2 5v500F C, EDLC(DB)2 5v600F A, EDLC(DB)2 5v600F B, EDLC(DB)2 5v600F C, EDLC(DB)2 7v100F A, EDLC(DB)2 7v100F B, EDLC(DB)2 7v120F A, EDLC(DB)2 7v120F B, EDLC(DB)2 7v150F, EDLC(DB)2 7v200F, EDLC(DB)2 7v220F, EDLC(DB)2 7v300F, EDLC(DB)2 7v350F, EDLC(DB)2 7v360F, EDLC(DB)2 7v370F, EDLC(DB)2 7v380F, EDLC(DB)2 7v400F A, EDLC(DB)2 7v400F B, EDLC(DB)2 7v430F, EDLC(DB)2 7v450F A, EDLC(DB)2 7v450F B, EDLC(DB)2 7v450F C, EDLC(DB)2 7v460F A, EDLC(DB)2 7v480F B, EDLC(DB)2 7v480F C, EDLC(DB)2 7v500F A, EDLC(DB)2 7v500F B, EDLC(DA)3 0v120F A, EDLC(DA)3 0v120F B, EDLC(DA)3 0v120F C, EDLC(DA)3 0v150F, EDLC(DA)3 0v200F, EDLC(DA)3 0v220F, EDLC(DA)3 0v300F, EDLC(DA)3 0v350F, EDLC(DA)3 0v360F, EDLC(DA)3 0v370F, EDLC(DA)3 0v380F, EDLC(DA)3 0v400F A, EDLC(DA)3 0v400F B, EDLC(DA)3 0v430F, EDLC(DA)3 0v450F A, EDLC(DA)3 0v450F B, EDLC(DA)3 0v450F C, EDLC(DA)3 0v460F A, EDLC(DA)3 0v480F B, EDLC(DA)3 0v480F C, EDLC(DA)3 0v500F A, EDLC(DA)3 0v500F B, EDLC(DA)3 0v500F C, EDLC(DA)3 0v600F A, EDLC(DA)3 0v600F B, EDLC(DA)3 0v600F C, EDLC(DA)3 0v600F D.

Following EDLC(DB) and EDLC(DA) prefix, each capacitor model identifies the voltage and capacitance.

Samwha
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● Sales office ● Factory & Sales office



Green-Cap Product Line-up

Series	Rated Voltage	Capacitance (F)	ESR, 1KHz (mΩ)	ESR, DC (mΩ)	Max. Continuous Current(A)		Max. Peak Current	Max. Stored Energy (Wh)	Specific Energy (Wh/kg)	Dimension (mm)			Weight (kg)
					ΔT=15°C	ΔT=40°C				L	W	H	
DM (Module)	5.4	1.5	120	180	0.2	0.33	3.2	0.006	1.79	22.0	8.5	16.5	0.0034
	5.4	2.5	100	140	0.33	0.55	5.0	0.010	2.03	22.0	10.5	21.0	0.005
	5.4	5.0	60	100	0.65	1.09	9.0	0.020	2.89	32.0	10.5	21.0	0.007
	15	66.6	23.0	27.4	12	20	191.0	2.08	2.60	247	46	76	0.8
	16.2	200	2.5	3.6	84	140	941.8	7.29	1.78	418	68	113	4.1
	16.2	266.6	2.2	3.2	90	150	1165.4	9.72	2.11	418	68	124	4.6
	16.2	333.3	1.8	2.5	100	167	1472.7	12.15	2.38	418	68	141	5.1
	16.2	500	1.4	2.0	120	200	2025.0	18.23	3.04	418	68	177	6
	48.6	66.6	7.6	10.8	84	140	941.8	21.87	2.19	418	191	113	10
	48.6	88.8	6.5	9.7	90	150	1165.4	29.16	2.54	418	191	124	11.5
	48.6	111.1	5.4	7.6	100	167	1472.7	36.45	2.92	418	191	141	12.5
	48.6	166.6	4.3	6.0	120	200	2025.0	54.68	3.65	418	191	177	15
	90	10	138.2	164.2	12	20	170.3	11.25	1.41	290	110	268	8

Green-Cap Product Line-up

Series	Rated Voltage	Capacitance (F)	ESR, 1KHz (mΩ)	ESR, DC (mΩ)	LC (72hr) (mA Max.)	Specific Energy		Specific Power		Weight (g)	Volume (ml)	Dimension (mm)		
						(Wh/kg)	(Wh/L)	(W/kg)	(W/L)			D	L	
DS (Radial)	2.5	3	120	260	0.007	1.63	2.60	1,803	2,885	1.6	1.0	8	20	
		5	70	150	0.010	1.97	2.71	2,273	3,125	2.2	1.6	10	20	
		10	55	100	0.020	2.48	3.62	2,143	3,125	3.5	2.4	10	30	
		25	35	65	0.020	2.89	4.34	1,538	2,308	7.5	5.0	16	25	
		50	20	30	0.120	3.15	4.26	1,812	2,451	13.8	10.2	18	40	
	2.7	3	50	80	0.007	2.17	3.04	7,811	10,935	1.4	1.0	8	20	
		5	45	60	0.010	2.41	3.16	6,943	9,113	2.1	1.6	10	20	
		10	25	45	0.023	3.49	4.22	6,703	8,100	2.9	2.4	10	30	
		15	20	40	0.030	3.38	4.90	4,860	7,055	4.5	3.1	12.5	25	
		25	15	25	0.045	3.78	5.06	5,223	6,998	6.7	5.0	16	25	
		33	11	20	0.060	3.34	4.13	4,374	5,400	10.0	8.1	18	32	
		50	9	15	0.075	4.40	4.96	5,071	5,718	11.5	10.2	18	40	
	3.0	100	8	13	0.180	4.82	5.92	3,204	3,935	21.0	17.1	22	45	
		3	60	105	0.010	2.34	3.75	6,429	10,286	1.6	1.0	8	20	
		5	50	90	0.015	2.84	3.91	5,455	7,500	2.2	1.6	10	20	
		10	30	45	0.030	3.57	5.21	6,857	10,000	3.5	2.4	10	30	
		15	25	40	0.050	4.17	6.05	6,000	8,710	4.5	3.1	12.5	25	
		25	20	30	0.070	4.17	6.25	4,800	7,200	7.5	5.0	16	25	
			50	10	20	0.150	4.53	6.13	3,913	5,294	13.8	10.2	18	40

Green-Cap Product Line-up

Series	Rated Voltage	Capacitance (F)	ESR, 1KHz (mΩ)	ESR, DC (mΩ)	LC (72hr) (mA)	Max Continuous Current (A)		Max Peak Current(A)	Specific Energy		Weight (g)	Volume (ml)	Dimension (mm)	
						T=15 C	T=40 C		(Wh/kg)	(Wh/L)			D	L
DB (Snap-in)	2.5	100	15.0	35.0	0.25	6.0	10.0	27.7	3.62	5.11	24	17	22	45
		200	10.0	20.0	0.50	8.0	13.0	50.0	4.13	5.43	42	32	30	45
		300	6.0	15.0	0.75	9.5	15.5	68.2	4.20	5.43	62	48	35	50
		360	6.0	12.0	0.90	12.0	19.5	84.6	4.17	5.39	75	58	35	60
		400	6.0	10.0	1.00	13.0	21.0	100.0	4.63	5.99	75	58	35	60
	2.7	100	7.0	9.0	0.27	12.5	20.0	71.1	4.82	5.92	21	17	22	45
		120	7.0	9.0	0.32	12.5	20.0	77.9	5.28	6.80	23	18	22	47
		200	6.0	8.0	0.54	13.0	21.0	103.8	5.33	6.37	38	32	30	45
		300	3.5	5.0	0.81	16.0	26.5	162.0	5.33	6.31	57	48	35	50
		325	1.8	2.0	0.88	30.0	50.0	265.9	4.39	5.67	75	58	35	60
		360	3.0	3.2	0.97	23.0	38.0	225.8	5.13	6.31	71	58	35	60
		400	3.0	3.2	1.08	23.0	38.0	236.8	5.70	7.02	71	58	35	60
		400	2.8	3.0	1.08	25.0	40.0	245.5	5.06	6.48	80	63	35	65
		450	2.8	3.0	1.22	25.0	40.0	258.5	5.18	6.77	88	67	35	70
		500	2.9	3.1	1.35	25.0	40.0	264.7	5.69	7.52	89	67	35	70
		600	3.0	3.2	1.62	25.0	40.0	277.4	6.75	9.02	90	67	35	70
		600	2.8	3.0	1.62	25.0	40.0	289.3	6.08	7.43	100	82	35	85

Green-Cap Product Line-up

Series	Rated Voltage	Capacitance (F)	ESR, 1KHz (mΩ)	ESR, DC (mΩ)	LC (72hr) (mA)	Max Continuous Current (A)		Max Peak Current(A)	Specific Energy		Weight (g)	Volume (ml)	Dimension (mm)	
						T=15 C	T=40 C		(Wh/kg)	(Wh/L)			D	L
DA (Snap-in)	3.0	100	7.0	9.0	0.30	12.5	20.0	79	5.95	7.31	21	17	22	45
		200	6.0	8.0	0.60	13.0	21.0	115	6.58	7.86	38	32	30	45
		300	3.5	5.0	0.90	16.0	26.5	180	6.58	7.80	57	48	35	50
		360	3.2	3.8	1.08	23.0	38.0	228	6.43	7.80	70	58	35	60
		380	3.0	3.2	1.00	25.0	40.0	257	6.60	8.23	72	58	35	60
		430	2.8	3.0	1.00	25.0	40.0	282	6.72	8.59	80	63	35	65
		480	2.8	3.0	1.00	25.0	40.0	295	6.82	8.91	88	67	35	70
DK (Snap-in)	2.7	100	8.0	10.0	0.27	12.0	19.0	68	4.82	5.92	21	17	22	45
		200	7.0	9.0	0.54	12.5	20.0	96	5.33	6.37	38	32	30	45
		300	3.5	5.0	0.81	16.5	27.0	162	5.33	6.31	57	48	35	50
		360	3.2	3.8	0.97	21.5	35.0	205	5.13	6.31	71	58	35	60
		400	3.2	3.8	1.08	21.5	35.0	214	5.70	7.02	71	58	35	60

Green-Cap Product Line-up

Series	Rated Voltage	Capacitance (F)	ESR, 1KHz (mΩ)	ESR, DC (mΩ)	LC (72hr) (mA)	Max Continuous Current (A)		Max Peak Current(A)	Specific Energy		Weight (g)	Volume (ml)	Dimension (mm)	
						T=15 C	T=40 C		(Wh/kg)	(Wh/L)			D	L
DH (Axial)	2.7	1200	0.30	0.33	2.7	98	159	1160	4.26	5.73	300	212	60.4	74
		1600	0.25	0.28	3.0	115	188	1492	4.98	6.65	340	244	60.4	85
		2000	0.24	0.27	4.0	126	206	1753	5.26	6.93	400	292	60.4	102
		3000	0.20	0.23	5.0	150	245	2396	5.96	7.68	525	395	60.4	138
		3400	0.25	0.28	9.2	130	210	2351	6.68	8.71	530	395	60.4	138
DV (Axial)	2.85	1200	0.33	0.36	3.4	94	153	1194	4.51	6.38	300	212	60.4	74
		1600	0.28	0.31	4.6	109	178	1524	5.31	7.41	340	244	60.4	85
		2000	0.27	0.30	5.7	120	195	1781	5.64	7.72	400	292	60.4	102
		3000	0.20	0.23	7.0	150	245	2530	6.45	8.56	525	395	60.4	138
		3400	0.20	0.23	8.0	150	245	2175	7.24	9.70	530	395	60.4	138
	3.0	3000	0.20	0.23	7.0	150	245	2663	7.01	9.48	535	395	60.4	138
DT (Axial)	2.5	1200	0.30	0.33	2.7	98	159	1074	3.47	4.91	300	212	60.4	74
		1600	0.25	0.28	3.0	115	188	1381	4.08	5.70	340	244	60.4	85
		2000	0.24	0.27	4.0	126	206	1623	4.34	5.94	400	292	60.4	102
		3000	0.20	0.23	5.0	150	245	2219	4.96	6.59	525	395	60.4	138

Information Request Form

Customer : ★ Essential Records

★Application		Function		
★Rated Voltage(V)				
★Operation Voltage Range	Vmax		Vmin	
★discharge	Current(A) or Power(W)			
	Time(sec)			
Surge Voltage(V)		Holding Time(sec)		
Max. Current(A) or Max. Power(KW)				
Max. Leakage Current(A)				
Self Discharge(V)		Condition (hours)		
Cycle Period (charge discharge)	/day or /week			
Usable Energy (KJ)				
★Normal Operating Temperature(°C)				
Dimension(L X W X H, mm)				
★Circuit	Balance	Passive	Active	Passive+Active
	Monitoring	Over Voltage	Over TEMP.	Over Voltage, TEMP
	monitoring signal of a status	Normal	HIGH	LOW
		abnormal	HIGH	LOW
Other requirements				

Customer : ★ Essential Records

★Application	Windmill	Function	Pitch control system	
★Rated Voltage(V)	90V			
★Operation Voltage Range	Vmax	90V	Vmin 45V	
★discharge	Current(A) or Power(W)	20A		
	Time(sec)	30sec		
Surge Voltage(V)	95V	Holding Time(sec)	3sec	
Max. Current(A) or Max. Power(KW)				
Max. Leakage Current(A)				
Self Discharge(V)		Condition (hours)		
Cycle Period (charge discharge)	10 /day or /week			
Usable Energy (KJ)	40.5KJ			
★Normal Operating Temperature(°C)	-30°C ~50°C			
Dimension(L X W X H, mm)				
★Circuit	Balance	Passive	Active	Passive+Active
	Monitoring	Over Voltage	Over TEMP.	Over Voltage, TEMP
	monitoring signal of a status	Normal	HIGH	LOW
		abnormal	HIGH	LOW
Other requirements				

THANK
YOU