

電動工具、短時間后備電源模組

Power Tools & Short-term UPS Module

各種小型EDLC模組: 電壓從5.0V到28V, 容量從1.5F到500F, 單體數目為2~16個(串聯), 提供主動/被動電壓均衡電路。廣泛應用於消費類電子產品、便攜式電動工具、短時UPS、UPS、DVR、電訊、汽車及其輔助系統、交通、可再生能源、工業自動化等眾多行業, 滿足客戶不同的儲能和功率要求, 特別適合於取代12V電池的應用。

Various small EDLC modules: Voltage from 5.0V to 28V, capacitance from 1.5F to 500F, the number of cells from 2 to 16 (series connection) with active/passive voltage balancing circuit. These EDLC modules can be widely used in consumer electronics, portable power tools, short-term UPS, UPS, DVR, telecommunications, automotive and auxiliary systems, transportation, renewable energy, industrial automation and many other areas to meet customer's energy storage and power output requirements, particularly suitable for 12V-battery replacement in all applications

產品特性 Product Features

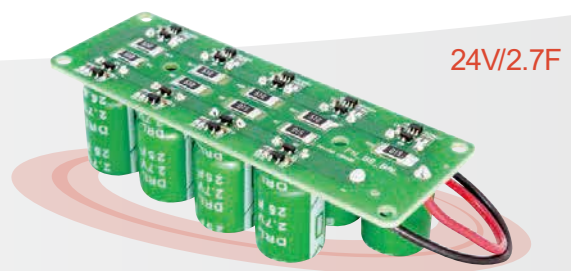
- 超低內阻、高功率
Ultra-low internal resistance and high output power
- 超過500,000次充放電, 使用壽命長達10年
Over 500,000 charge and discharge cycles with service life over 10 years
- 單體間電壓均衡
Voltage balancing between individual cells
- 根據需要, 可提供過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature upon request
- 高效的充放電性能
High efficiency in charge and discharge
- 工作溫度範圍廣 (-40°C~+60°C或 -25°C~+70°C)
Wide range of operating temperature (-40°C~+60°C or -25°C~+70°C)
- 性價比優異
Excellent cost-effectiveness
- 模組結構堅固和緊湊、設計輕巧、緊密、全密封及防濺
Solid and compact mechanical design, lightweight, rugged, fully sealed and splash-prevention

帶充電板後備電源模組
UPS Module with charging board



尺寸 Dimension: 220*90*91.5mm

後備電源模組
UPS Module



尺寸 Dimension: 103*37*32mm

我們還為客戶定制非標準的各種不同電壓和容量等級要求的EDLC模組/系統及其配套充放電電源, 提供如路軌交通運輸系統、大型起重設備、大型動力叉車等的啟動及能量回收, 智能電網UPS/DVR、通訊、軍工, 以及數碼應用、電動工具、電動自行車、電動摩托車、HEV/EV等系統解決方案。

We can also make a variety of customized non-standard EDLC modules and systems as well as associated charger to meet different voltage and capacity requirements, providing total solutions with BMS/QMS for applications in the areas of Start and Braking Energy Regeneration Systems for urban railway transportation systems, heavy lifting equipment, large power forklift as well as UPS/DVR for telecommunications, military and digital applications, power tools, E-Bike, E-Motor, HEV/EV and other applications

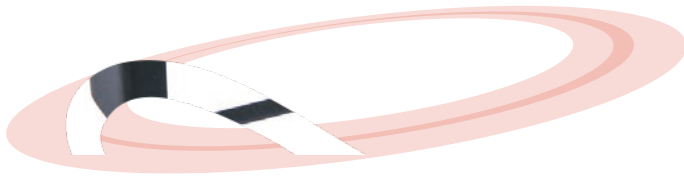
車載錄影系統后備電源模組 Car DVR UPS Module

作為汽車黑匣子的后備電源, 確保汽車行駛、運行中與安全有關數據的可靠記錄。此模組擁有體積小, 超長使用壽命及免維護等優點, 為綠色環保產品。

As back-up power to vehicle black box, this EDLC module ensure reliable safety-related data records during vehicles running. The module has the advantage of small size, long service life, maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻
Ultra-low internal resistance
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure,
fully enclosed and splash-prevention



尺寸 Dimension: 118* 32* 49mm

模組基本特性 Basic Characteristics of Module

產品編碼 P/N :	MOAA0100512550106DC
額定電壓 Rated Voltage :	12.5V
額定容量 Rated Capacitance :	10F
浪涌電壓 Surge Voltage :	13.5V
漏電流 Leakage Current :	≤0.2mA
直流內阻 DC ESR:	≤160mΩ
最大充/放電電流 Max. Charge/Discharge Current :	12.5A
標準充/放電電流 Standard Charge/Discharge Current :	0.5A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	-25°C~+70°C
尺寸 Dimension :	118* 32* 49mm
防護等級 Class of Protection :	IP54
重量 Weight :	~0.25kgs

電動汽車輔助動力模組

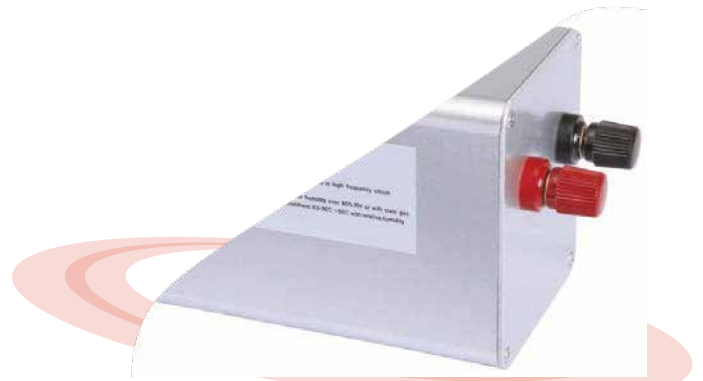
EV Auto Start Module

作為通用汽車啟動或后備電源, 可廣泛應用於汽車、工業、電力、電訊、可再生能源等領域。此模組擁有體積小, 超長使用壽命及免維護等優點, 為綠色環保產品。

As general module for auto start or backup power supply, it can be widely used in Automotive, Industrial, Power Electricity, Telecommunications, Renewable Energy and other areas. The module has the advantage of small size, long service life, maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 模組結構堅固和緊湊、緊密、全密封及防濺
Solid and compact mechanical design, rugged, fully sealed and splash-prevention



尺寸 Dimension: 163*90*100mm

模組基本特性 Basic Characteristics of Module

產品編碼 P/N :	MOAC0100601560666BC
額定電壓 Rated Voltage :	15V
額定容量 Rated Capacitance :	66F
浪涌電壓 Surge Voltage :	16.2V
漏電流 Leakage Current :	≤4mA
直流內阻 DCESR:	≤40mΩ
最大充/放電電流 Max. Charge/Discharge Current :	50A
標準充/放電電流 Standard Charge/Discharge Current :	4A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	-25°C~+70°C
尺寸 Dimension :	163*90*100mm
防護等級 Class of Protection :	IP54
重量 Weight :	~1.1kgs

電動自行車/電動摩托車模組 E-Bike/E-Motor EDLC Module

此模組應用於電動自行車，提供制動能量回收，改善電動自行車起動，加速和爬坡等方面性能，此外，此模組也大大改善了電動自行車在低溫工作時效能。另模組結構緊密、堅固，並具有防濺功能。
This EDLC Module is applied for E-Bike braking energy regeneration, providing instantaneous peak power for the E-Bike's starting, accelerating and climbing. Besides, it can significantly improve the E-Bike's low temperature operation performance. The mechanical structure of the module is rugged, compact and with splash-prevention.

與48V/10Ah蓄電池配套使用- 64V/1F
Connected with 48V/10Ah rechargeable battery

與48V/20Ah蓄電池配套使用 - 40V/10F
Connected with 48V/20Ah rechargeable battery



尺寸 Dimension: 160* 84* 76mm



尺寸 Dimension: 238* 115* 103mm

模組基本特性 Basic Characteristics of Module

產品編碼 PN:	MPAM0102464850016DP	MPBI0201604060106DU
額定電壓 Rated Voltage:	64V	40V
額定容量 Rated Capacitance:	1F	10F
浪涌電壓 Surge Voltage:	67V	44V
漏電流 Leakage Current:	≤10mA	≤10mA
直流內阻 DC ESR:	≤450mΩ	≤180mΩ
最大充/放電電流 Max. Charge/Discharge Current:	15A	32A
標準充/放電電流 Standard Charge/Discharge Current:	0.27A	1.8A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C	-40°C~+60°C
尺寸 Dimension:	160* 84* 76mm	238* 115* 103mm
防護等級 Class of Protection:	IP54	IP54
重量 Weight:	~1kgs	~2.4kgs

電動跑車起動輔助模組

EV Auto Power Accelerator Module

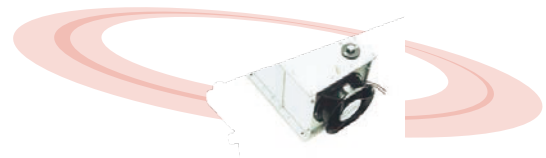
此模組使用於電動汽車，蓄電池和超級電容配合使用為電動汽車提供動力驅動能源。採用蓄電池和超級電容器的驅動形式能充分達到調整電動汽車的運行峰值功率，增加蓄電池壽命；發揮電動汽車啟動、加速情況下超級電容器快速充放電的能力，滿足驅動電機瞬間大功率的要求，同時對蓄電池起到補償保護作用。在制動情況下制動回饋時，超級電容器吸收峰值功率，使驅動電機電能能夠被超級電容快速充電儲能，減少了車輛的能耗，延長了電動車的續航里程。

This module is used in electric vehicles, and provides energy for EV with batteries. The EV can easily acquire peak power value due to the super capacitor module's high power density. The lifetime of batteries is extended. Because the super capacitor can be very fast charged or discharged, the EV can start or accelerate in short time. At the same time, the batteries are protected and compensated. When the EV braking, the super capacitor modules absorb large feedback current, the energy is resorted and reused, the range of EV is extended.

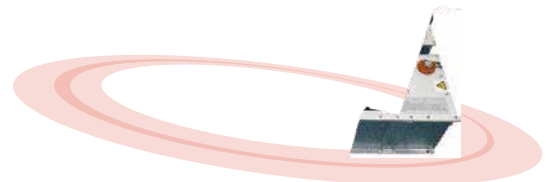
產品特性 Product Features

113V/83F

- 超低內阻、超高功率 ($\geq 200\text{kW}$)
Ultra-low internal resistance and super high power ($\geq 200\text{kW}$)
- 超過1,000,000次充放電
Over 1,000,000 charge and discharge cycles
- 集成超級電容管理系統 (CMS)
Integrated super-capacitor management system (CMS)
- 單體間電壓均衡
Voltage balancing between individual cells
- 模組可積木式連接
Using discrete system structure
- CAN輸出接口
CAN output interface
- 模組結構堅固、緊湊、採用風扇對流散熱
Solid and compact mechanical structure with cooling fan



尺寸 Dimension: 966* 227* 256mm



尺寸 Dimension: 966* 700* 256mm

模組基本特性 Basic Characteristics of Module

產品編碼 P/N:	MPAP0104211360836EM
額定電壓 Rated Voltage:	113V
額定容量 Rated Capacitance:	83F
浪涌電壓 Surge Voltage:	117V
漏電流 Leakage Current:	$\leq 10\text{mA}$
直流內阻 DCESR:	$\leq 20\text{m}\Omega$
最大充/放電電流 Max. Charge/Discharge Current:	700A
標準充/放電電流 Standard Charge/Discharge Current:	37A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	$-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$
尺寸 Dimension:	966* 227* 256mm
防護等級 Class of Protection:	IP32
重量 Weight:	$\sim 50\text{kgs}$

發電機啟動電源模組 Engine Starting Module

用作發電機的啟動電源, 工作溫度範圍寬 (-40°C~+60°C), 使用壽命可長達10年和超過50萬次的充放電循環。由於此模組無需維護, 綠色環保, 是鉛酸電池的理想替代品。

Used as a generator starting power supply, with wide operating temperature range (-40°C~+60°C). The service life of this EDLC module is up to 10 years with more than 500,000 charge and discharge cycles. As a maintenance-free, environmental friendly green product, it is the ideal alternative to the lead-acid rechargeable battery.

產品特性 Product Features

- ◆ 超低內阻、大功率, 滿電時可支持30次2000KVA發電機啟動
Ultra-low internal resistance, high power, over 30 start-ups of 2000KVA generator start at full charge
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension : 349* 133* 218mm

模組基本特性 Basic Characteristics of Module

產品編碼 PN :	MPAK0101002763006BC
額定電壓 Rated Voltage :	27V
額定容量 Rated Capacitance :	300F
浪涌電壓 Surge Voltage :	28V
漏電流 Leakage Current :	≤20mA
直流內阻 DCESR:	≤5mΩ
最大充/放電電流 Max. Charge/Discharge Current :	650A
標準充/放電電流 Standard Charge/Discharge Current :	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	-40°C~+60°C
尺寸 Dimension :	349* 133* 218mm
防護等級 Class of Protection :	IP65
重量 Weight :	~10kgs

發電機啟動電源模組 Engine Starting Module

用作發電機的啟動電源, 工作溫度範圍寬 (-40°C~+60°C), 使用壽命可長達10年和超過50萬次的充放電循環。由於此模組無需維護, 綠色環保, 是鉛酸電池的理想替代品。

Used as a generator starting power supply, with wide operating temperature range (-40°C~+60°C). The service life of this EDLC module is up to 10 years with more than 500,000 charge and discharge cycles. As a maintenance-free, environmental friendly green product, it is the ideal alternative to the lead-acid rechargeable battery.

產品特性 Product Features

- ◆ 超低內阻、大功率, 滿電時可支持30次2000KVA發電機啟動
Ultra-low internal resistance, high power, over 30 start-ups of 2000KVA generator start at full charge
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension: 423*98*232mm

模組基本特性 Basic Characteristics of Module

產品編碼 P/N :	MPBK0100616254506BC
額定電壓 Rated Voltage :	16V
額定容量 Rated Capacitance :	450F
浪涌電壓 Surge Voltage :	17V
漏電流 Leakage Current :	≤6mA
直流內阻 DC ESR:	≤5mΩ
最大充/放電電流 Max. Charge/Discharge Current :	500A
標準充/放電電流 Standard Charge/Discharge Current :	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	-40°C~+60°C
尺寸 Dimension :	423*98*232mm
防護等級 Class of Protection :	IP54
重量 Weight :	~7kgs

發電機啟動電源模組 Engine Starting Module

用作發電機的啟動電源, 工作溫度範圍寬 (-40°C~+60°C), 使用壽命可長達10年和超過50萬次的充放電循環。由於此模組無需維護, 綠色環保, 是鉛酸電池的理想替代品。

Used as a generator starting power supply, with wide operating temperature range (-40°C~+60°C). The service life of this EDLC module is up to 10 years with more than 500,000 charge and discharge cycles. As a maintenance-free, environmental friendly green product, it is the ideal alternative to the lead-acid rechargeable battery.

產品特性 Product Features

- ◆ 超低內阻、大功率, 滿電時可支持30次2000KVA發電機啟動
Ultra-low internal resistance, high power, over 30 start-ups of 2000KVA generator start at full charge
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension : 416*68*142mm

模組基本特性 Basic Characteristics of Module

產品編碼 PN :	MFAI0100601662006BC
額定電壓 Rated Voltage :	16V
額定容量 Rated Capacitance :	200F
浪涌電壓 Surge Voltage :	16.8V
漏電流 Leakage Current :	≤6mA
直流內阻 DCESR:	≤5mΩ
最大充/放電電流 Max. Charge/Discharge Current :	270A
標準充/放電電流 Standard Charge/Discharge Current :	13A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	-40°C~+60°C
尺寸 Dimension :	416*68*142mm
防護等級 Class of Protection :	IP54
重量 Weight :	~4kgs

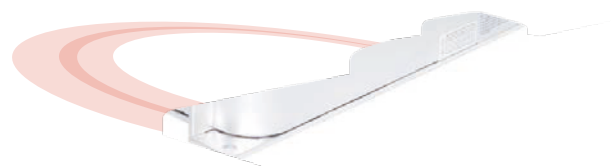
混合動力汽車/電動汽車輔助動力模組 HEV/EV Module

新能源汽車, 包括電動車、混合動力電動車和增程序混合動力電動車, 用於制動能量的回收與反饋, 回收制動能量, 為車輛啟動、加速、爬坡提供瞬時峰值功率, 降低油耗, 減低廢氣排放污染, 改善動力和低溫啟動性能。模組結構緊密、堅固及防濺。

This EDLC module is applied for new energy vehicles including EV/HEV and PHEV for the regeneration of braking energy, providing instantaneous peak power for the vehicle's starting, accelerating and climbing so as to lower fuel consumption and reduce exhaust pollution, significantly improving power and low temperature performance. The mechanical structure of the module is rugged, compact and with splash-prevention.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 超過1,000,000次充放電
Over 1,000,000 charge and discharge cycles
- ◆ 集成超級電容器管理系統 (CMS)
Integrated super-capacitor management system (CMS)
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ RS或CAN輸出及過電壓和溫度監控信號輸出
RS or CAN output of monitoring signal for over-voltage and temperature
- ◆ 符合中華人民共和國汽車行業標準“車用超級電容器”標準編號QC/T 741-2006
Compliance with QC/T 741-2006 “Ultracapacitors for Vehicles” testing standard



尺寸 Dimension: 416* 191* 193mm

附測試報告於32頁: 檢驗依據QC/T741-2006 (車用超級電容器檢測標準)

Test report endorsed on P.32: Tested by QC/T-741-2006 (China Bus Testing Center)

模組基本特性 Basic Characteristics of Module

產品編碼 P/N:	MFAK0101848651666BC
額定電壓 Rated Voltage:	48V
額定容量 Rated Capacitance:	166F
浪涌電壓 Surge Voltage:	50.4V
漏電流 Leakage Current:	≤10mA
直流內阻 DC ESR:	≤6.3mΩ
最大充/放電電流 Max. Charge/Discharge Current:	650A
標準充/放電電流 Standard Charge/Discharge Current:	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C
尺寸 Dimension:	416* 191* 193mm
防護等級 Class of Protection:	IP65
重量 Weight:	~16kgs

風能變槳后備電源模組

UPS Module for Wind Turbine Blade Pitch Control

高壓變槳 High Voltage System 97V/9.7F

風力發電變槳系統后備電源，當需要為風力發電機組變槳時，控制系統發出指令，使EDLC UPS放電，驅動變槳系統工作。此模組擁有體積小，超長使用壽命及免維護等優點，為綠色環保產品。

As the backup power supply for wind power pitch system, when the need for Wind Turbine Blade Pitch Control arises, per instructions of the control system, the EDLC UPS will discharge to drive pitch system work. The module has the advantage of small size, long service life, maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension: 290* 114* 270mm

模組基本特性 Basic Characteristics of Module

產品編碼 PN:	MPBB0103609760975DC
額定電壓 Rated Voltage:	97V
額定容量 Rated Capacitance:	9.7F
浪涌電壓 Surge Voltage:	100.8V
漏電流 Leakage Current:	≤40mA
直流內阻 DCESR:	≤120mΩ
最大充/放電電流 Max. Charge/Discharge Current:	76A
標準充/放電電流 Standard Charge/Discharge Current:	3.8A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C
尺寸 Dimension:	290* 114* 270mm
防護等級 Class of Protection:	IP20
重量 Weight:	~8kgs

風能變槳后備電源模組

UPS Module for Wind Turbine Blade Pitch Control

高壓變槳 High Voltage System 16V/58F

風力發電變槳系統后備電源，當需要為風力發電機組變槳時，控制系統發出指令，使EDLC UPS放電，驅動變槳系統工作。此模組擁有體積小，超長使用壽命及免維護等優點，為綠色環保產品。

As the backup power supply for wind power pitch system, when the need for Wind Turbine Blade Pitch Control arises, per instructions of the control system, the EDLC UPS will discharge to drive pitch system work. The module has the advantage of small size, long service life, maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension: 259* 46* 85mm

模組基本特性 Basic Characteristics of Module

產品編碼 P/N:	MFBB0100601660586EC
額定電壓 Rated Voltage:	16V
額定容量 Rated Capacitance:	58F
浪涌電壓 Surge Voltage:	17V
漏電流 Leakage Current:	≤3mA
直流內阻 DC ESR:	≤20mΩ
最大充/放電電流 Max. Charge/Discharge Current:	75A
標準充/放電電流 Standard Charge/Discharge Current:	3.8A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C
尺寸 Dimension:	259* 46* 85mm
防護等級 Class of Protection:	IP54
重量 Weight:	~0.8kgs

風能變槳后備電源模組

UPS Module for Wind Turbine Blade Pitch Control

低壓變槳 Low Voltage System 16V/500F

風力發電變槳系統后備電源，當需要為風力發電機組變槳時，控制系統發出指令，使EDLC UPS放電，驅動變槳系統工作。此模組擁有體積小，超長使用壽命及免維護等優點，為綠色環保產品。

As the backup power supply for wind power pitch system, when the need for Wind Turbine Blade Pitch Control arises, per instructions of the control system, the EDLC UPS will discharge to drive pitch system work. The module has the advantage of small size, long service life, maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension: 416* 68* 173mm

模組基本特性 Basic Characteristics of Module

產品編碼 PN:	MPAL0100616255006BC
額定電壓 Rated Voltage:	16V
額定容量 Rated Capacitance:	500F
浪涌電壓 Surge Voltage:	17V
漏電流 Leakage Current:	≤10mA
直流內阻 DCESR:	≤2.4mΩ
最大充/放電電流 Max. Charge/Discharge Current:	650A
標準充/放電電流 Standard Charge/Discharge Current:	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C
尺寸 Dimension:	416* 68* 173mm
防護等級 Class of Protection:	IP65
重量 Weight:	~5.5kgs

風能變槳后備電源模組

UPS Module for Wind Turbine Blade Pitch Control

低壓變槳 Low Voltage System 86V/94F

風力發電變槳系統后備電源，當需要為風力發電機組變槳時，控制系統發出指令，使EDLC UPS放電，驅動變槳系統工作。此模組擁有體積小，超長使用壽命及免維護等優點，為綠色環保產品。

As the backup power supply for wind power pitch system, when the need for Wind Turbine Blade Pitch Control arises, per instructions of the control system, the EDLC UPS will discharge to drive pitch system work. The module has the advantage of small size, long service life, maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension: 515*258*220mm

模組基本特性 Basic Characteristics of Module

產品編碼 P/N:	MFAK0103208660946BC
額定電壓 Rated Voltage:	86V
額定容量 Rated Capacitance:	94F
浪涌電壓 Surge Voltage:	89.6V
漏電流 Leakage Current:	≤10mA
直流內阻 DCESR:	≤13mΩ
最大充/放電電流 Max. Charge/Discharge Current:	650A
標準充/放電電流 Standard Charge/Discharge Current:	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C
尺寸 Dimension:	515*258*220mm
防護等級 Class of Protection:	IP65
重量 Weight:	~26kgs

風能/重工業應用儲能模組系統

Energy Storage System for Wind Power/Heavy Industry

作為各種風力發電設施的輔助儲能系統, 可顯著改善微網電能質量, 提供微網系統無功支持; 輸出功率大, 支持高電壓 ($\geq 500V$) 大電流 ($\sim 1000A$) 工作情況, 超長使用壽命及免維護。可依不同電壓或容量需求進行積木式組合使用。

As auxiliary energy storage system for a variety of wind power generation facilities, this system can significantly improve power quality and provide reactive power support in Micro Smart Grid; high power output to support high voltage ($\geq 500V$), high current ($\sim 1000A$) working conditions, extremely long life time and maintenance-free. It can be used as building blocks for complex module system to meet different voltage or capacity needs.

產品特性 Product Features

- ◆ 超低內阻、超高功率 ($\geq 200kW$)
Ultra-low internal resistance and super high power ($\geq 200kW$)
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 集成超級電容器管理系統 (CMS)
Integrated super-capacitor management system (CMS)
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature
- ◆ RS或CAN輸出接口
RS or CAN output interface
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention



尺寸 Dimension : 644* 465* 285

模組基本特性 Basic Characteristics of Module

產品編碼 PN :	MPAA0104812960626EM
額定電壓 Rated Voltage :	129V
額定容量 Rated Capacitance :	62F
浪涌電壓 Surge Voltage :	134.4V
漏電流 Leakage Current :	$\leq 10mA$
直流內阻 DC ESR:	$\leq 20m\Omega$
最大充/放電電流 Max. Charge/Discharge Current :	640A
標準充/放電電流 Standard Charge/Discharge Current :	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	$-40^{\circ}C \sim +60^{\circ}C$
尺寸 Dimension :	644* 465* 285mm
防護等級 Class of Protection :	IP41
重量 Weight :	$\sim 51kgs$

港口吊機混合動力模組系統

Port Crane Hybrid Power Module System

(6S2P組成680V 27F模組系統：SPAF0200668060276DO)

此模組使用於港口RTG柴油發電機組超級電容儲能系統，當RTG的起升機構下降時，將勢能轉向超級電容系統充電；當RTG工作機構處於大功率狀態運行時，超級電容儲能系統將能量釋放回饋到主電路中，補充發動機的輸出能量，形成燃油-電力的混合動力源，可以節能12%~30%。超級電容儲能系統具有大功率放電能力，超長使用壽命及免維護，安全的優點。可依不同電壓或容量需求進行積木式組合使用。

Use on RTG's power generator energy storage system. EDLC module can absorb and store the energy generated by containers lowering, the regenerated energy will be used when lifting up, in order to load-off the peak power of engine, and make hybridization possible. By implementing this module, usage of energy can be saved up to 12%~30%. It also has the advantages of high output power, long service life and maintenance-free. Moreover, it can be assembled as building blocks for complex module system to meet different voltage and capacity needs.

系統結構 (12個模組 - 6串2並)
System Structure (12 Modules – 6S2P)



113V/83F



尺寸 Dimension : 482* 387* 228mm

模組/系統基本特性 Basic Characteristics of Module/System

產品編碼 PN:	MPAF0104211360836BC	SPAF0200668060276DO
額定電壓 Rated Voltage:	113V	680V
額定容量 Rated Capacitance:	83F	27F
浪涌電壓 Surge Voltage:	117V	705V
漏電流 Leakage Current:	≤10mA	≤20mA
直流內阻 DCESR:	≤18mΩ	≤60mΩ
最大充/放電電流 Max. Charge/Discharge Current:	500A	1000A
標準充/放電電流 Standard Charge/Discharge Current:	38A	76A
工作/儲存溫度範圍 Operating/Storage Temperature Range:	-40°C~+60°C	-40°C~+60°C
尺寸 Dimension:	482* 387* 228mm	2018* 1236* 1328mm
防護等級 Class of Protection:	IP54	IP32
重量 Weight:	~40kgs	~600kgs

背景 Background

在城市中，由於人口和車輛集中，造成城市車輛運行工況的特殊性，特別是對於大城市，車速低、油耗高、排放與噪聲嚴重是其共有問題。對於城市公共汽車，由於城區公共汽車停靠的站點多，站與站之間的距離短。據統計，公共汽車平均站距在1公里左右，每個站點的滯留時間約為1分鐘。城區交通擁擠，行駛時速不高，再加上交通要道紅綠燈多，起步和停車十分頻繁，大部分發動機產生的牽引能量在制動過程中以摩擦生熱的形式消耗掉了。長時間的停車工況，使發動機長時間地處於高耗油率的怠速運轉狀態，不僅消耗燃料，而且排放廢氣污染環境。近年來，汽車怠速啟動起停系統漸趨流行，可有效減低車輛發動機排放，提高燃油經濟效益。

In the cities, due to the concentration of population and vehicles, the vehicle operating conditions are different. Especially for big cities, serious low speed and high fuel consumption, emissions and noise are problem. For city buses, the distance between two stations is very short. According to statistics, the average distance between two bus stations is about 1 km, the average stop time is around 1 minute. Urban traffic congestion, driving speed is low, combined with traffic lights, starting and stopping frequently, most of energy is lost as heat. The bus wastes oil and pollute the environment due to the long time idling status. Recently, ISS idling stop and start system is becoming popular, and can efficiently reduce vehicle emissions and improve fuel economy.

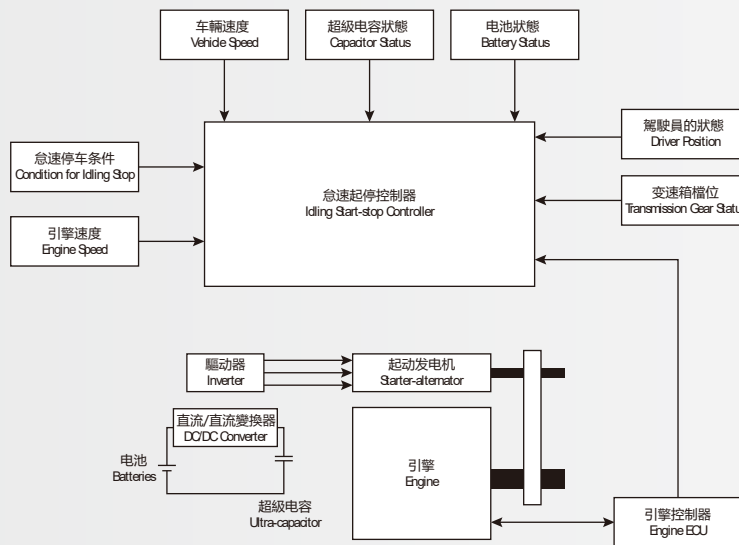
怠速啟動起停系統定義和原理

The definition and principle of idling start-stop system

在車輛因故發生停車情況時，如果此時車輛運行條件允許，為了達到節能與環保的目的，車輛可以自行控制發動機熄火，而後則應能快速響應起動要求，自動起動發動機。

When vehicle is stopping, in order to save oil and protect environment, vehicle can stop engine. When vehicle is needed to run, it can quickly start engine and run.

怠速啟動起停系統的系統框圖
ISS Diagram



通過變換器，蓄電池可將能量傳送給超級電容，並可以通過不同的連接方式帶動不同類型的起動電機。
Through the converter, battery energy can be charged to the super capacitor, and can drive through different connection means of different types of starter motor.

怠速啟動起停系統模組 EDLC Module for Idling Start-stop System (ISS)



尺寸 Dimension : 372*67*193mm

汽車能量包
Car Energy Pack

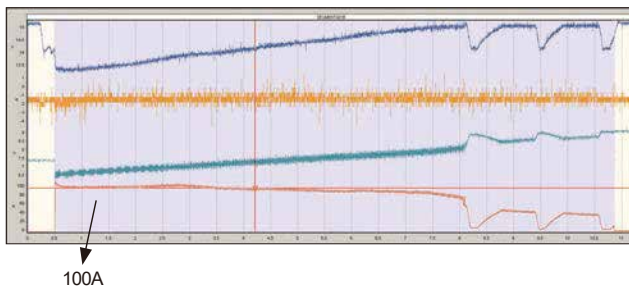


尺寸 Dimension : 458*246*68mm

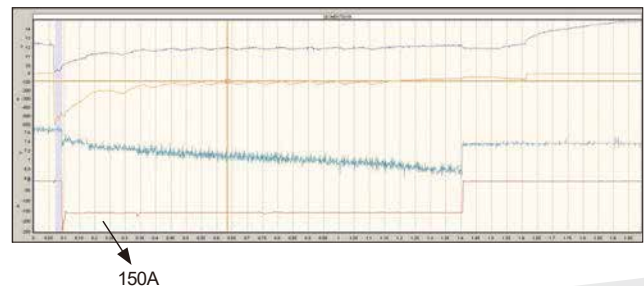
怠速啟動起停系統包含超級電容儲能模組, DC/DC轉換器, 控制裝置。主要功能是剎車時回收能量, 啟動時做啟動電源, 達到環保節能目的。

Idling start-stop system contains super capacitor energy storage module, DC/DC converter, control device. The main function is to store braking energy, provide power for starter, and achieve environmental protection and energy saving.

充電電流曲線圖
Charging current chart



放電電流曲線圖
Discharging current chart



模組基本特性 Basic Characteristics of Module

產品編碼 P/N :	MFAA0100513555006BC
額定電壓 Rated Voltage :	13.5V
額定容量 Rated Capacitance :	500F
浪涌電壓 Surge Voltage :	14V
漏電流 Leakage Current :	≤8mA
直流內阻 DC ESR:	≤4mΩ
最大充/放電電流 Max. Charge/Discharge Current :	450A
允許輸入電壓範圍 Input Voltage Range :	12V~16V
放電電壓 Output Voltage :	16V
工作/儲存溫度範圍 Operating/Storage Temperature Range :	-40°C~+60°C
輸出接口 Communication Interface :	CAN output interface
尺寸 Dimension :	372*67*193mm
防護等級 Class of Protection :	IP54
重量 Weight :	~7kgs

軌道交通能量回收系統

Energy Regeneration System for Rail Transportation

作為軌道交通車輛如地鐵、輕軌、動車、高鐵，以及大型機械等的能量回收系統，用於制動能量的回收與反饋，實現節能減排；為車輛啟動提供瞬時峰值功率，改善動力性能；輸出功率大，支持高電壓（ $\geq 680V$ ）、大電流（ $\sim 880A$ ）工作情況，超長使用壽命及免維護等優點，為綠色環保產品。

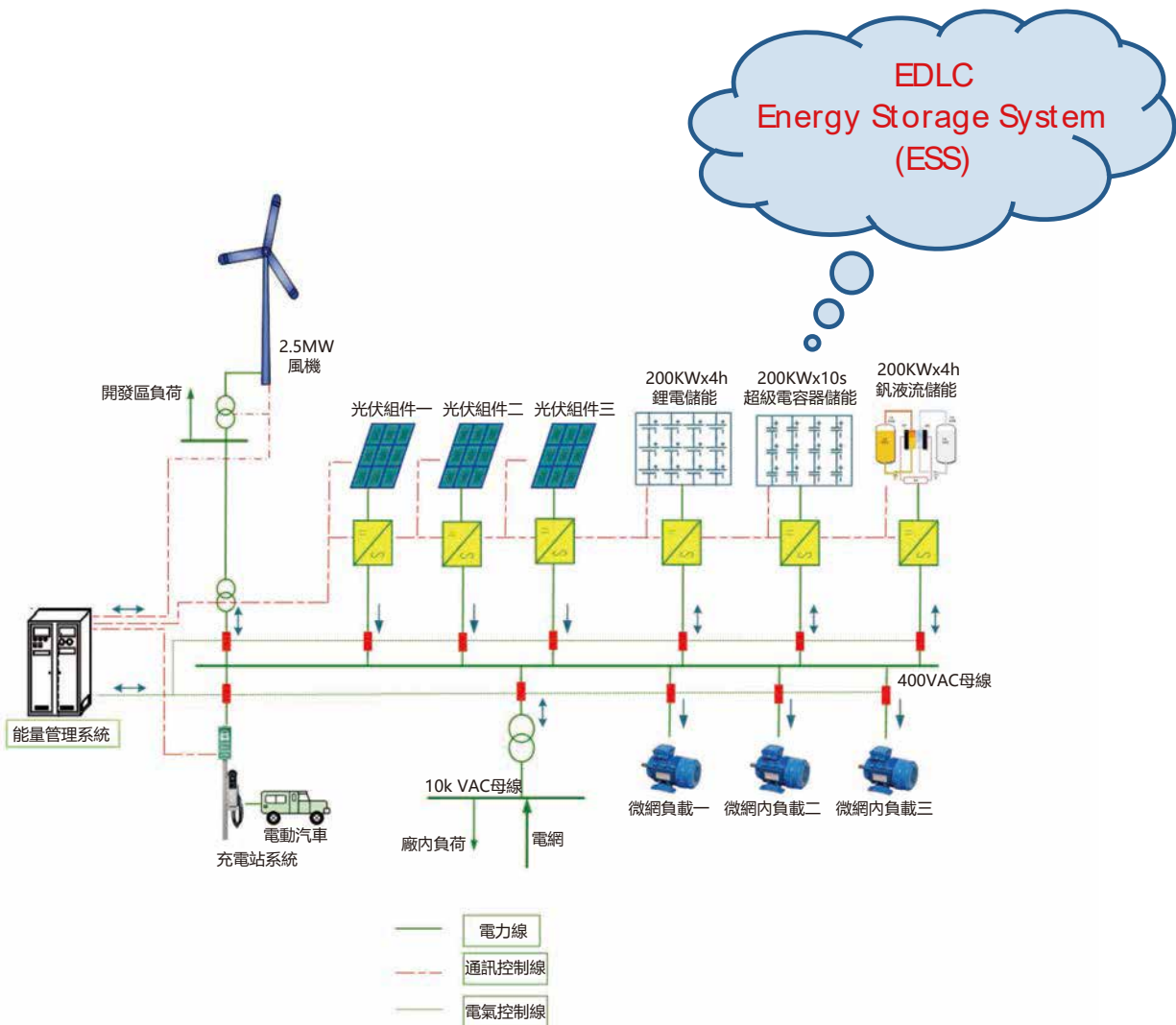
This EDLC system can be used for braking energy capture in rail transit vehicles, such as subway, light rail, EMU (Electric Multiple Units), high-speed rail and large machinery to capture braking energy for energy saving and emission reduction. It will provide instantaneous peak power for the vehicle's starting performance. With super high output power, it supports high voltage ($\geq 680V$) and high current ($\sim 880A$) working conditions. Besides, it has the benefit of long service life with maintenance-free and therefore it is an environmental friendly product.

產品特性 Product Features

- ◆ 超低內阻、超高功率
Ultra-low internal resistance and super high power
- ◆ 耐高溫
High temperature resistant
- ◆ 超過500,000次充放電
Over 500,000 charge and discharge cycles
- ◆ 集成超級電容器管理系統 (CMS)
Integrated super-capacitor management system (CMS)
- ◆ 單體間電壓均衡
Voltage balancing between individual cells
- ◆ 過電壓和溫度監控信號輸出
Output of monitoring signal for over-voltage and temperature
- ◆ RS或CAN輸出接口
RS or CAN output interface
- ◆ 模組結構堅固和緊湊、全密封及防濺
Solid and compact mechanical structure, fully enclosed and splash-prevention

模組系統基本特性 Basic Characteristics of Module System

產品編碼 P/N :	SPAL0102411570695DM
額定電壓 Rated Voltage :	1150V
額定容量 Rated Capacitance :	6.9F
浪涌電壓 Surge Voltage :	1200V
漏電流 Leakage Current :	$\leq 20mA$
直流內阻 DC ESR:	$\leq 160m\Omega$
最大充/放電電流 Max. Charge/Discharge Current :	650A
標準充/放電電流 Standard Charge/Discharge Current :	32A
工作/儲存溫度範圍 Operating/Storage Temperature Range :	$-25^{\circ}C \sim +60^{\circ}C$
尺寸 Dimension :	1400* 600* 800mm
防護等級 Class of Protection :	IP31
重量 Weight :	$\sim 400kgs$



作為風力發電設施的輔助儲能系統，超級電容器儲能系統的主要功能定位於並網狀態下的快速功率波動抑制，孤網狀態下的運行電壓頻率輔助控制，即在微網監控作用下，通過快速的充放電，抑制風機、光伏系統引起的功率波動，以達到平穩功率輸出的目的；在微網孤島運行時，通過微網監控系統的調度，協助鋰電池、鈦液流電池等能量型儲能系統，輔助進行微網的電壓、頻率調節任務。

When the Micro Smart Grid is running in the islanding mode, the EDLC will function as an assistant to those energy storage system, such as Lithium Batteries, Vanadium Redox Flow Batteries and etc. to adjust the voltage and frequency of the Micro Smart Grid.

超級電容器儲能系統可顯著改善微網電能質量，提供微網系統無功支持；輸出功率大，支持高電壓 ($\geq 500V$)、大電流 ($\sim 1000A$) 工況；超長使用壽命，免維護。可依不同電壓或容量需求進行積木式組合使用。

This EDLC module can significantly improve the power quality of the Micro Smart Grid and provide reactive power compensation support at the same time. Featuring a high power density output, it can support high voltage ($\geq 500V$) and large current ($\sim 1000A$). Advantage with an extremely long service life and maintenance-free characteristics. Moreover, it can be assembled as building blocks for complex module system to meet different voltage and capacity needs.

儲能系統模組 EDLC Module for Energy Storage System (ESS)

模組
Module



系統
Integrated System



CMS 監控系統
CMS Capacitor Management System



系統特性 System Features

- 超低內阻、超高功率(≥200KW)
Ultra-low internal resistance and super high power (≥200KW)
- 超過1,000,000次循環壽命
Over 1,000,000 charge and discharge cycles
- 集成超級電容管理系統
Integrated Ultra-capacitor Management System (CMS)
- 單體間電壓均衡
Voltage balancing between individual cells
- 過電壓、過電流和溫度監控、保護
With monitoring and alarm signal for over-voltage, over-current and temperature
- CAN總線或RS485通訊
RS485 or CAN interface

超級電容器儲能系統主要參數 EDLC Energy Storage System Parameters

系統功率 System Output :	200KW
系統工作時間 System Working Time :	10S
額定容量 Rated Capacitance :	31F
額定電壓 Rated Voltage :	518V
浪湧電壓 Surge Voltage :	537V
最大工作電流 Max. Operating Current :	1000A
工作溫度範圍 Operating Temperature Range :	-40~+60°C
機架防護等級 IP Degree :	IP22
機架尺寸 Case size :	1200* 900* 2200mm

超級電容器管理系統 Capacitor Management System (CMS)

本系統採用了離散式系統結構，由一個中央控制模塊（主控模塊）和16個檢測模塊組成。

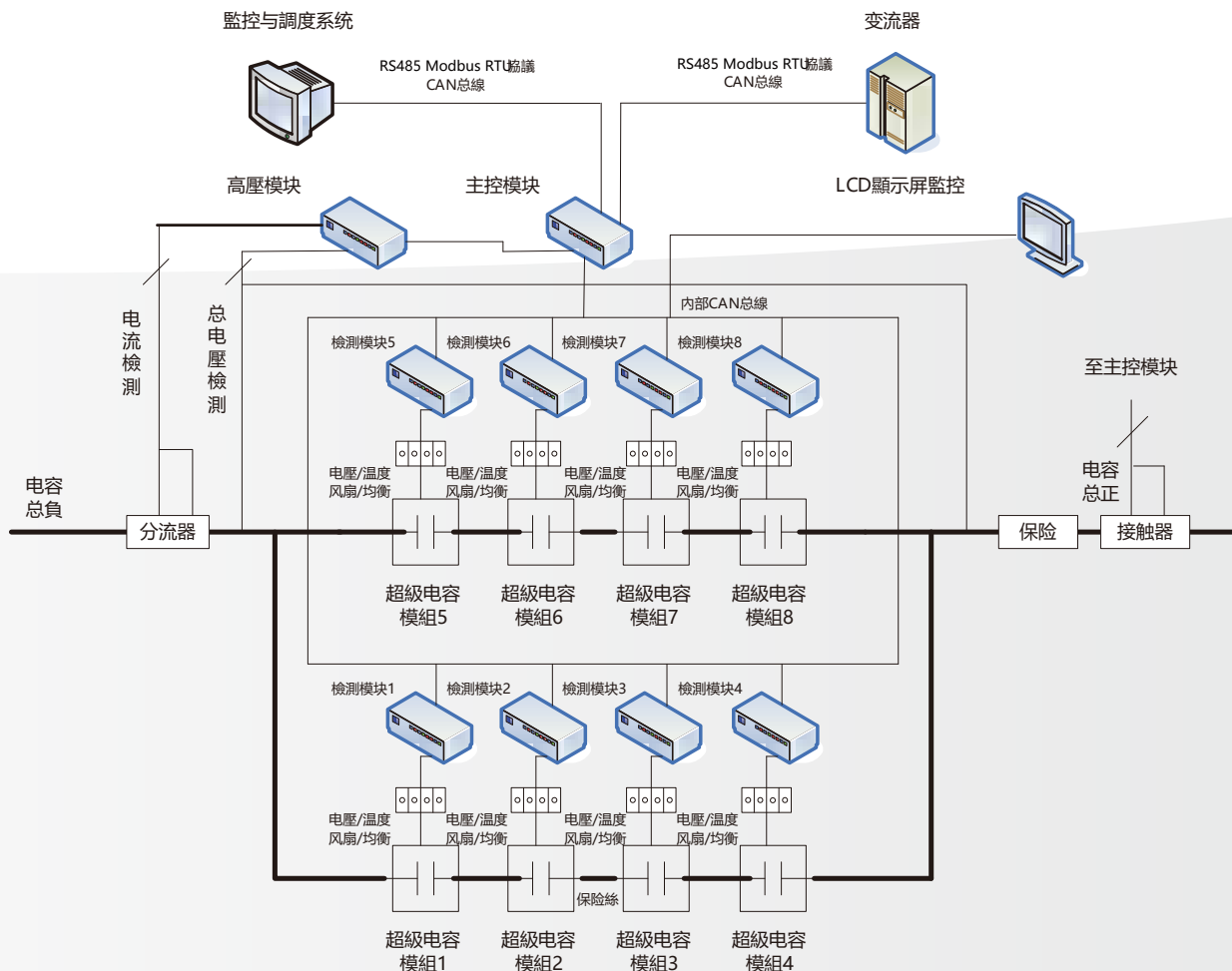
This system is using discrete system structure, built up by one central control module (main module) and 16 monitoring modules

主控模塊的功能是收集檢測模塊的數據，並對數據進行集中分析和處理，判斷當前的故障（過壓，欠壓，過流，過溫），進行系統的預警和報警，必要時切斷電容模組的輸出。同時，主控模塊還完成超級電容器儲能系統工作電流的測量。

The main function of the main module is gathering the data captured from those monitoring modules, and it will analyze and manage the data. It will judge the problems (over voltage, leak of voltage, over current, over heat and etc.), and send out precaution and caution alarm according to the problem occurs, it will even stop the output of module in an emergency case. Meanwhile, the main module will also measure the working current of EDLC storage system.

檢測模塊一般安裝在超級電容器模組箱裡，主要功能是對本箱超級電容器單體電壓和溫度數據的採集，風機控制，並響應中央控制模塊的命令，將超級電容器信息定期返回中央控制模塊。同時，超級電容器管理系統設計了強大的數據通訊功能，可與智能微網中央監控系統、PCS 計算機或LCD屏通訊，實現數據監控和數據存儲。

Monitoring module usually installed inside the EDLC module case, main function is to gather the single EDLC cells' voltage and temperature data, fan controlling. According to main module's order, it will transmit the data to central control module regularly. Moreover, the Capacitor Management System (CMS), with a strong data communicate ability and an intelligence central micro network system, link up with PCS computers and LCD monitors, it makes CMS possible to gather, monitor and store up the data.

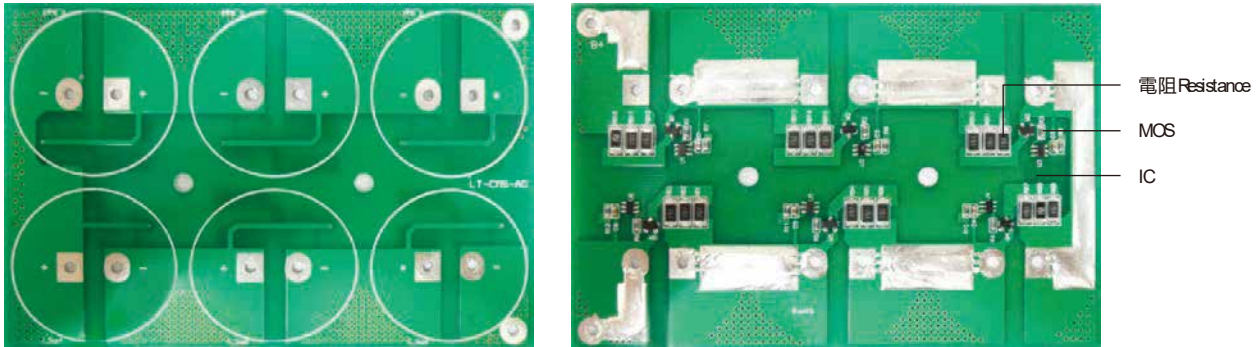


超級電容模組主動式均衡電路描述

EDLC Module Active Voltage Balancing Circuit Description

AMOAC0100601560666BC均衡板 - 15V66F (6S)

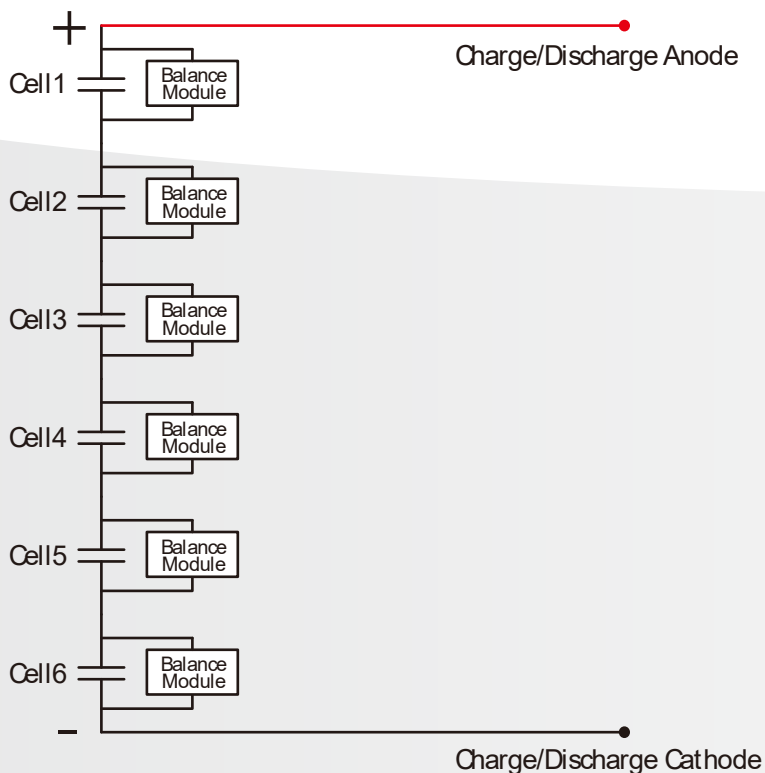
產品外觀 Appearance



均衡功能原理 Balancing Principle

每個電容單體配置一個均衡電路。當電容充電時，某一個或多個電容單體的電壓達到設定的上限電壓后，電容通過均衡電路開始放電。電壓低於設定上限電壓后，停止放電。最終使模組中每個電容的電壓都在設定的上限電壓以內，同時電壓比較接近，既保證了充電時的一致性，又可防止過充。

Each capacitor cell is configured with an Equalizer (a balancing circuit). During charging, active voltage balancing will be triggered to discharge the capacitor of higher voltage when the voltage reaches the balance start voltage; when the voltage falls within the balance start voltage, the discharge stops. The capacitor voltage is set within the maximum voltage to ensure consistency in SOC of each cell, as well as preventing cells from overcharging.



超級電容模組主動式均衡電路描述

EDLC Module Active Voltage Balancing Circuit Description

AMOAC0100601560666BC均衡板 - 15V66F (6S)

單個均衡電路原理圖

Principle of Single Equalizer

當ICU1檢測到電容兩端的電壓低於2.5V時，IC給MOS管M1一個低電平，MOS管不動作，均衡電路處於開路狀態。

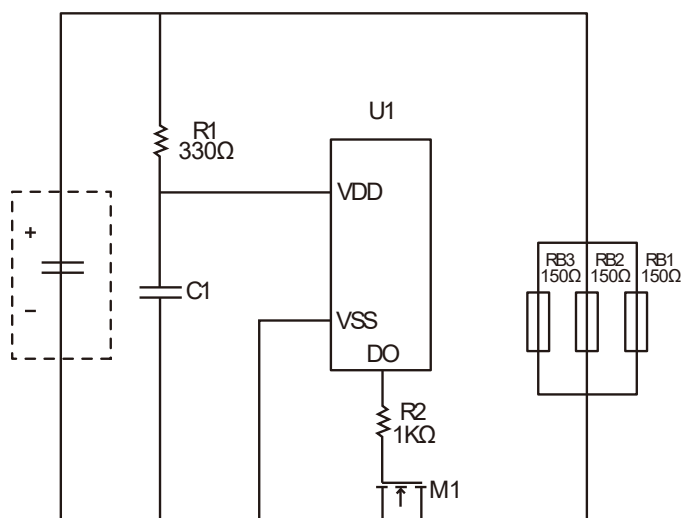
When the IC U1 detects the voltage of the capacitor lower than 2.5V, IC M1 shoots a low level voltage to MOSFET. MOSFET does not act and the equalizer is in Open State.

當ICU1檢測到電容兩端的電壓高於2.5V時，IC給MOS管M1一個高電平，MOS管導通，通過電阻RB1-RB3放電，從而降低電容的電壓。

When the IC U1 detects the voltage of the capacitor higher than 2.5V, IC shoots a high level voltage to MOSFET. MOSFET is connected to reduce the capacitor's voltage via the discharging through the resistor RB1-RB3.

這樣，整體充電時，電壓上升快的電容，通過均衡電路的放電，降低電壓上升幅度；電壓上升慢的電容，可以繼續充電，最終使電容模組中的每個電容都能夠充滿，同時又可防止過充。

Thus, when the EDLC module is charged as a unit, capacitors with rapid voltage increase will be discharged through the Equalizer to slow down the range of voltage increase, while those with slow voltage rise will continue to be charged. As a result, each capacitor within the module will be fully charged as well as preventing overcharging.



主要性能參數 Main Performance Parameters

序號 No.	項目 Item	條件 Condition	參數 Parameter	精度 Accuracy	單位 Unit
1	均衡開啟電壓 Balance Start Voltage	單體電壓 Cell Voltage	$V \geq 2.5$	± 0.05	伏特 V
2	延時 Delay Time	-	1	-	秒 Second
3	均衡關閉電壓 Balance Close Voltage	單體電壓 Cell Voltage	$V < 2.5$	± 0.05	伏特 V
4	延時 Delay Time	-	1	-	秒 Second
5	均衡電流 Balance Current	-	50	± 10	毫安 mA

智能主動均衡系統 Intelligent Active Voltage Balancing System

為了克服傳統的電容管理系統的弊端，提高模組性能、延長模組使用壽命、減小儲能系統的故障率，我司研發出一種用於均衡電池或超級電容組電壓的均衡電路，通過主動平衡超級電容組中的每個電容單體的電荷，從而轉移多余能量的方法來均衡電容單體的電壓，做到主動均衡及無損均衡。從而避免因單體電壓過高而損害電容。

In order to overcome the disadvantages of traditional capacitance management system, improve the module performance, prolong the service life of the module, reduce the failure rate of the energy storage system, we developed the balance circuit for battery or super capacitor, by actively balancing charge of each capacitor in super capacitor group, and transfer surplus energy to balance, active equilibrium and nondestructive equilibrium. The circuit can avoid over voltage damage.

能量轉移式均衡電路是基於開關電容技術設計的。其大致結構如圖1所示，儲能元件組為n個超級電容單體或電池11、12、13..... 1n串聯而成的模組或電池組，電壓主動均衡系統包括：一電壓檢測單元（圖中未標出）和一控制單元（圖中未標出）、n個均衡電路單元21、22、23..... 2n以及一均衡單元3，每個均衡電路單元並聯一個超級電容單體或電池（如圖中的均衡電路單元21與超級電容單體或電池11並聯，均衡電路單元22與超級電容單體或電池12並聯），均衡總單元3分別與每個均衡電路單元11、12、13..... 1n並聯；電壓檢測單元分別與各超級電容單體或電池相連，以檢測各超級電容單體或電池輸出電壓；控制單元分別與各均衡電路單元11、12、13..... 1n相連，以將各超級電容單體或電池11、12、13..... 1n的高於平均電壓的電量分別儲存在各均衡電路單元11、12、13..... 1n中；控制單元還與均衡總單元相連，以將儲存在各均衡電路單元11、12、13..... 1n中的電量轉移至均衡單元3中，再通過均衡單元3對模組或電池組再充電，從而實現模組或電池組中各超級電容單體或電池的電壓均衡。

Energy transfer equalization circuit is designed based on the switched capacitor technology. It's general structure as shown in figure 1, the n super capacitor for energy storage element group monomer or battery 11, 12, 13...1n series of module or battery, voltage active balancing system includes: a voltage detection unit (not shown in the figure) and a control unit (not shown in the figure), n equalization circuit unit 21, 22, 23...2n and a balanced unit 3, each equalization circuit unit or a super capacitor in parallel monomer battery (as shown in figure of the equalization circuit unit 21 or battery and super capacitor monomer 11 in parallel, 22 and ultracapacitors monomer or battery equalization circuit unit 12) in parallel, the equilibrium of the whole unit 3 respectively with each equilibrium circuit unit 11, 12, 13...1n in parallel; Voltage detection unit respectively connected with the super capacitor monomer or battery, in order to detect the ultracapacitors monomer or battery output voltage; the control unit and the equalization circuit unit respectively 11, 12, 13...1n is linked together, to the super capacitor monomer or battery 11, 12, 13...1n is higher than the average voltage of electricity stored in each equalization circuit unit respectively 11, 12, 13...1n; the control unit is connected to the balance of the whole unit to unit will be stored in the equalization circuit 11, 12, 13...1n the power transferred to the equilibrium of unit 3, again through the balanced unit 3 of module or recharging the battery pack, so as to realize module or ultracapacitors monomer in the battery pack or battery voltage balance.

串聯儲能元件組的主動均衡系統

Active balancing system with energy storage elements in serials

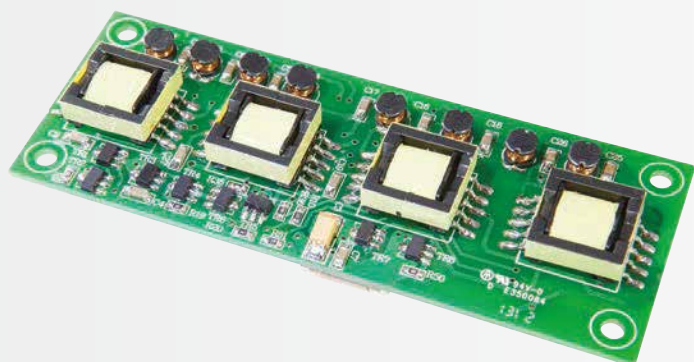
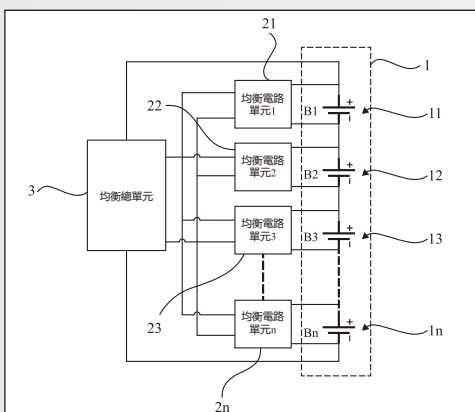
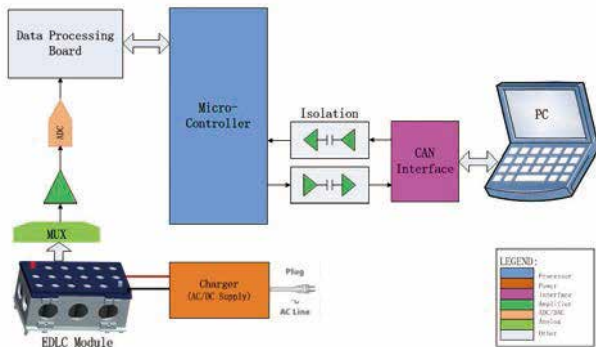


圖1 Figure 1

超級電容配組分選系統 Grouping System for EDLC Cells

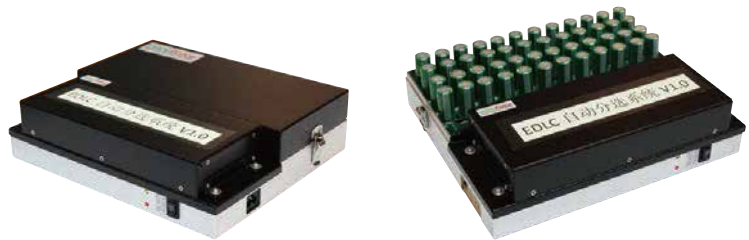
電路基本原理圖
Block Diagram



超級電容單體在進行一級靜態分選之後，超級電容配組分選系統作為二級動態分選，可以提高超級電容單體配組的精準度，提高模組產品的可靠性及穩定性，並提高配組效率。

Grouping system for EDLC cells can act as the secondary level grouping method after the primary static grouping. The super capacitor cells can be grouping during cell charging and discharging which can improve the grouping accuracy and the reliability of the module.

超級電容配組分選系統界面
UI of EDLC Cells Grouping System



超級電容組分選系統規格參數 Grouping System for EDLC Cells Parameters

分選系統的單體電壓範圍 Cell Voltage Range of Grouping System :	1V~2.7V
電容容量範圍 Cell Capacitance Range :	0.1F~5000F
最高分選精度為 Grouping Accuracy :	0.06%
每次最大的分選單體數量 Maximum Grouping Number of Cells :	1,536 PCS
最小的分選時間 Minimum Grouping Time :	1 Second
通信的波特率 Communication Baud Rate :	500kb/s