Customer's Name：	File. Nº： Version ： A/1 Date ： 03/05/2016

Type ： Energy storage battery

Name ： 16S32P （26650 ）

Model ： MC-5KWH(48V/100AH)

Customer Approval		
Checked By/Date	**Approved By/Date**	**Company Stamp**

MASTERBATTERY （）		
Prepared By/Date	**Checked By/Date**	**Approved By/Date**

Address: Dehesa Vieja nº2 nave 16
Madrid Spain

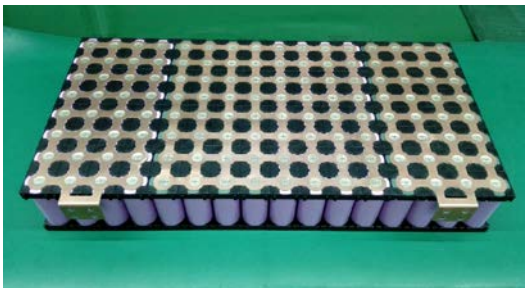
Website)：www.masterbattery.es

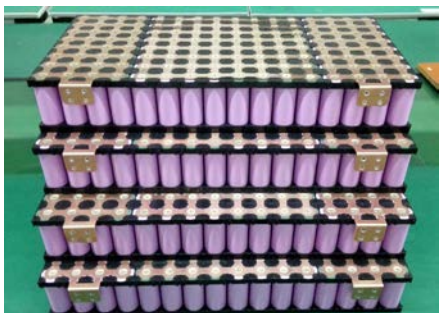
Amendment Records				
Edition	**Description**	**Prepared by**	**Approved by**	**Date**
A/0	**First Edition**			**2016-4-18**

Product Summary

1.Production description

- Name： Energy storage battery
- Mode： 16S/32P/51.2V/100Ah
- Cell ： 26650/3.2Ah/3.2V
- Shelf period ： 1 YEAR
- Structure Drawing： (mm)





Charing input /Discharge output : 175A Anderson

Size：L*W*H） 335*376*560mm

1、Scope and standard

1.1 Scope

This specification is applied to Energy storage battery manufactured by Masterbattery

1.2 Standard

This product complies with National Standard GB/T18287-2000 “Cell Phone Lithium-ion Battery General Specifications”.

GB/T 18287-2000

— **Specification**

NO	Items	Parameter	Remarks
2.1	Rated Capacity	100Ah	Discharge:0.2C cut-off voltage:37.5V
2.2	Energy	5120Wh	
2.3	Nominal Voltage	51.2V	
2.4	Open Voltage	51.2V~56V	
2.6	Internal Impedance	≤30mΩ	AC 1KHz after standard charge AC 1KHz
2.7	Charge voltage	57.6±0.2V	CC/CV
2.8	Standard charge current	20A	
2.9	Max charge current	50A	
2.10	Standard discharge current	20A	
2.11	Max discharge current	100A	
2.12	Discharge cut-off voltage	40V	
2.13	Operating Temperature	0~+45℃	Charge
		-10~+60℃	Discharge

2.14	Storage Temperature	0℃～+45℃	Less than 1 month
		15℃～+35℃	Less than 6 months
2.14	Weight	55kg	

3.Battery configuration

NO	Item	Criteria	Remarks
3.1	Cell	26650/3000mAh/3.2V	LiFePo4
3.2	PCM	LARGE	
3.3	（Sheet metal）	335*376*560mm	

4.Battery Performance Test

4.1 Appearance

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt. The structure and dimensions see attached drawing of the battery.

4.2 Test Equipment

(1) Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with accuracy no less than 0.01mm.

0.01mm

(2) Voltmeter

Class with national standard or more sensitive class with inner impedance not less than 10 KΩ/V.

(3) Ammeter

Class with national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

(4) Impedance Meter

Impedance shall be measured by a AC impedance method (AC 1kHz LCR meter).

4.3 Standard Test Condition

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of 15~35℃ and relative humidity of 45~75%.

4.4 Standard Charge

0.2C=20A Full charge condition: Constant current 20C, Constant voltage 57.6V for 8 hours in all at20±5℃.

4.5 Common Performance

No	Items/	Testing method and determinant standard
1	Charge Performance	The battery can be charged when using the original charger. The standard charge mode :under the temperature of 25±5℃,charge the battery with the current of 0.2C until the voltage reaches up to 57.6V, then charge with constant voltage until the charge current ≤ 0.02C， then stop charging.
2	Discharge Performance	When connecting with load, the battery can supply power. Charge the battery with standard charge mode, then rest for 0.5h, then discharge with 0.2C until the voltage is 40V, and the discharge time is required ≥4.25h
3	Cycle Performance	Under the temperature of 25±5℃, charge the battery with 0.2C, when the voltage reaches up to57.6V charge with constant voltage until the charge current ≤0.02C， then stop charging, rest for 0.5h, then discharge with 0.2C to 40V. Cycle with the above mode, when the continuous discharge time ＜80% stop cycling. The cycle life is required ≥1500times.
4	Charged Storage Characteristics	Charge the battery with 0.2C, then shift to charge with constant voltage until the voltage reaches up to57.6V, when the charge current ≤0.02C stop charging; rest under the temperature of 25±5℃ for 28d then discharge with 0.2C to40V. The discharge time is required ≥4.h.

5	Storage Characteristics	Charge the battery, which is newly manufactured shorter than 3 months, with 0.2C until the capacity reaches to 40~50%, after resting for 12 months under the temperature of 25±5℃ and the humidity of 45～75%, then charge with 0.2C to 57.6V then shift to charge with constant voltage, after full-charge rest for 0.5h, then discharge with 0.2C to 40V. The discharge time is required ≥4h.

4.6 Safety Performance

No	Items	Test method and determinant standard
1	High Temperature Characteristics	Under the temperature of 25±5℃, after charging the battery with 0.2C then put the battery into the constant temperature and humidity oven with 60±2℃ for 2h, then discharge with 0.2C to40V. The discharge time is required ≥4.25h and the battery should no deformation and smoking.
2	Low Temperature Characteristics	Under the temperature of 25±5℃, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with -10±2℃ for 16~24h, then discharge with 0.2C to 40V. The discharge time is required ≥3h and the battery should no deformation and smoking.
3	Overcharge Protection Characteristics	After full-charging the battery with 0.2C and set 2 times of the nominal voltage and current as constant current and voltage supply, then load it to the battery for 8h. It is required the battery should be no leakage, deformation, smoking and explosion during the test processes.

4	Over-discharge Protection Characteristics	Under the temperature of 25±5℃, after discharging the battery with 0.2C to 40V, then connect the load with 30Ω and discharge for 24h. It is required the battery should be no leakage, fire, smoking and explosion during the test processes.
5	Short-circuit Protection Characteristics	Under the temperature of 25±5℃, after full-charging the battery with 0.2C, then make the battery's anode and cathode short-circuit for 1h (the connecting resistance is smaller than 100mΩ), then cut the anode and cathode, after the battery momentary charge by 0.2C current，the voltage should come back to 48V, and there should be no leakage, deformation, smoking and explosion during the test processes.
6	Constant Humidity and Temperature Characteristics	Under the temperature of 25±5℃, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 40±2℃ and 90～95% for 48h, the battery should be no obvious deformation, leakage, rust, smoking and explosion. After testing take out the battery then rest for 2h under the temperature of 25±5℃, discharge with 0.2C to 40V. The discharge time is required ≥3h.

4.7 Rest Period

Unless otherwise defined, 30 min, rest period after charge; 30 min, rest period after discharge.

5、 Storage and Others

5.1 Long Time Storage

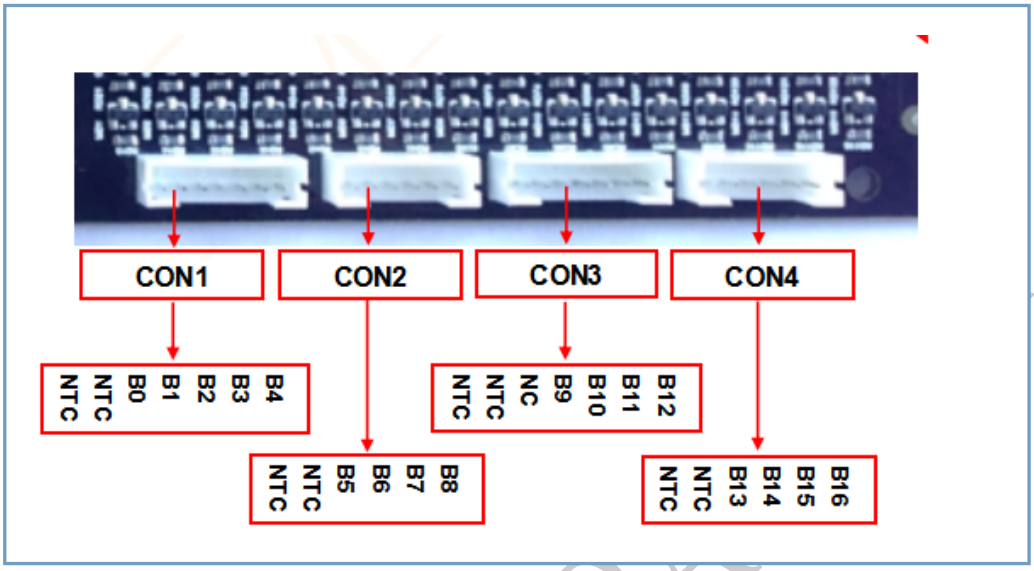
If stored for a long time (exceed three months), the cell should be stored in dry and cooling place. The cell's storage voltage should be 51.2V~56V and the cell is to be stored in a condition as appendix No. 4

5.2 Others

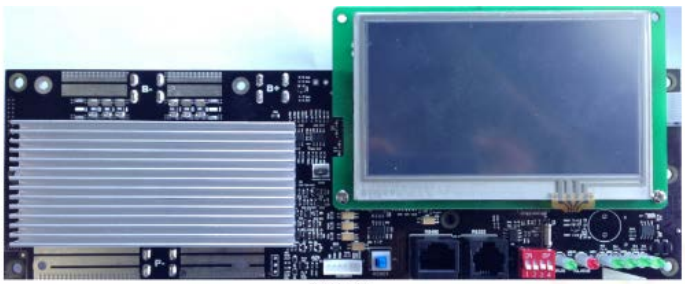
Any matters that this specification does not cover should be conferred between the customer and LARGE.

6、Protection Circuit

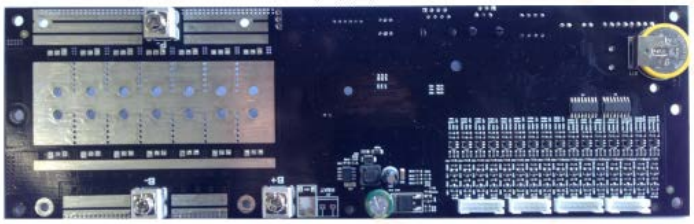
6.1.The wiring diagram



6.3 PCB Layout Drawing PCB



正面图



6.3 specification

详细项目 Details		Min.	Typ.	Max	Error	Unit
电池类型 Battery Gas			3.2V			
电池组组合方式 Battery Link			16			S
充电电压 Input Charging Voltage			57.6			V
充电电流 Input Charging Current			≤50			A
放电电压 Output Discharging Voltage			51.2			V
持续工作电流 Continuous Output Discharging Current			≤100			A
工作环境 Ambient Condition	工作温度 Operating Temperature	-20	25	60		℃
	工作湿度 Humidity (No Water-Drop)	0%		90 %		RH
存储环境 Storage Condition	存储温度 Temperature	-40		85		℃
	存储湿度 Humidity (No Water-Drop)	0%		90 %		RH

保护参数（单节电芯） Protection Parameters (for Individual Cell)									
过充保护电压 Over-Charge Voltage Protection (OVP)					3.9			±25mV	V
过充恢复电压 Over-Charge Voltage Protection Release (OVPR)					3.65			±25mV	V
过放保护电压 Over-Discharge Voltage Protection (UVP)					2.0			±50mV	V
过放恢复电压 Over-Discharge Voltage Protection Release (UVPR)					2.3			±50mV	V
放电过流保护 Over-Current Discharge Protection (OCDP)					120A		延时	1000mS	
放电保护恢复方式 Over-Current Discharge Protection Release	断开负载 Release load								
短路保护 Short circuit current protection	有 Enable								
短路保护延时 Short circuit current protection delay time					100		400	±100	uS
短路保护恢复方式 Short circuit protection Release	断开负载 Release load								
温度保护	高温	65	外置	±5℃	低温	-30	外置	±5℃	℃
智能均衡（智能动态均衡），均衡结果: balance (result: voltage difference)	<20mV								
自耗电	≤1000								uA
休眠时的自耗电	≤100								uA
深度休眠自耗电	≤1								uA
主回路通态电阻（MOS-R_{DS}） Main loop electrify resistance	≤30								mΩ

— Manner of packing

Preface

This document of 'Handling Precautions and Guideline LI Rechargeable Batteries' shall be applied to the battery cells manufactured by Masterbattery.

Note (1) ：

The customer is requested to contact Dongguan Large Electronics Co., Ltd in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

Note (2) ：

Masterbattery will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

Note (3)：

Masterbattery will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.

1、Charging

1.1 Charging current

Charging current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to cell electrical， mechanical, and safety performance and could lead to heat generation or leakage.

1.2 Charging voltage

Charging shall be done by voltage less than that specified in the Product Specification (57.6V/battery). Charging beyond 58.4V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition.

It is very dangerous that charging with higher voltage than maximum voltage may cause damage to the cell electrical,

mechanical safety performance and could lead to heat generation or leakage.

1.3 Charging temperature

The cell shall be charged within 0℃~40℃ range in the Product Specification.

1.4 Prohibition of reverse charging

Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Simultaneously, the reverse charging may cause damaging to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

2、Discharging

2.1 Discharging current

The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharging capacity significantly or cause over-heat.

2.2 Discharging temperature

The cell shall be discharged within -10℃~60℃ range specified in the Product Specification.

2.3 Over-discharging

It should be noted that the cell would be at an over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the cell shall be charged periodically to maintain between 51.2V~56V.

Over-discharging may causes loss of cell performance, characteristics, or battery functions

3. Protection Circuit Module

The cell/battery pack shall be with a PCM that can protect cell/battery pack properly. PCM shall have functions of (1) overcharging prevention, (2) over-discharging prevention, (3) over current prevention to maintain safety and Prevent significant deterioration of cell performance. The over current can occur by external short circuit

3.1 overcharging protection:

Overcharging protection function shall stop charging if any one of the cells of the battery pack reaches 3.9±0.025V.

3.2 over-discharging protection:

Over-discharging prevention function shall work to avoid further drop in cell voltage of 2.00±0.05V
Or less per cell in any cell of the battery pack. It is recommended that the dissipation current of PCM
Shall be minimized to 0.5uA or less with the over-discharging prevention, the protection function shall monitor each bank of the battery pack and control the current all the time

4、Storage 贮存

The battery shall be storied within 0℃~ 45℃ range environmental condition.

If the battery has to be storied for a long time (Over 3 months), the environmental condition should be:
Temperature: 20±5℃, Humidity: 65±20％RH

The voltage for a long time storage shall be 51.2V~56V range.

5、Handling Instructions

Read and observe the following warnings and precautions to ensure correct and safe use of Li-ion polymer batteries.

Date of Minimum Durability: one year after shipment in the standard storage condition. The ambient temperature is 20±5℃, the humidity is 45% to 75%, and the pressure is 86kPa to 106kPa.

Charge the battery to about 50% SOC each six months during storage.

Danger!

— Do not immerse the battery in water or allow it to get wet.

— Do not use or store the battery near sources of heat such as a fire or heater.

— Do not use any chargers other than those recommended.

— Do not reverse the positive (+) and negative (-) terminals.

— Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.

— Do not put the battery into a fire or apply direct heat to it.

— Do not short-circuit the battery by connecting wires or other metal objects to the positive (+) and negative (-) terminals.

— Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.

— Do not strike, throw or subject the battery to sever physical shock.

— Do not directly solder the battery terminals.

— Do not attempt to disassemble or modify the battery in any way.

— Do not place the battery in a microwave oven or pressurized container.

— Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries of different Capacity type or brand.

— Do not use the battery if it gives off an odor, generates heat, becomes discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.

Caution!

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.

Use the battery only under the following environmental conditions. Failure to do so can result in reduced performance or a shorten service life. Recharging the battery outside of these temperatures can cause the battery to overheat, explode or catch fire.

Operating environment:

When charging the battery: 0℃～45℃

When discharging the battery: -10℃～60℃

When stored up to 30 days: 0℃～45℃

When stored up to 90 days: 15℃～35℃

6.Amendment of this Specification

This specification is subject to change with prior notice.

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