

Specification Approval Sheet

Product Model: PHD503030CE
Nominal Capacity: 3.7V 430mAh

Prepared	Checked	Approved
Bob Song	Jessica Lee	Arthur Xie
Customer approved		

REVISION HISTORY

Revision	Description	Date	Prepared
V1.0	1st released	2019-05-14	Bob Song
V1.1	Update product model	2019-06-06	Bob Song
V1.2	Add qr code and qr code coding rules	2019-06-22	Bob Song

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1. Scope

The specification shall be applied to Lithium-ion Polymer rechargeable battery pack PHD503030CE 3.7V 430mAh which is manufactured by PHD Energy Inc..

Reference standard:

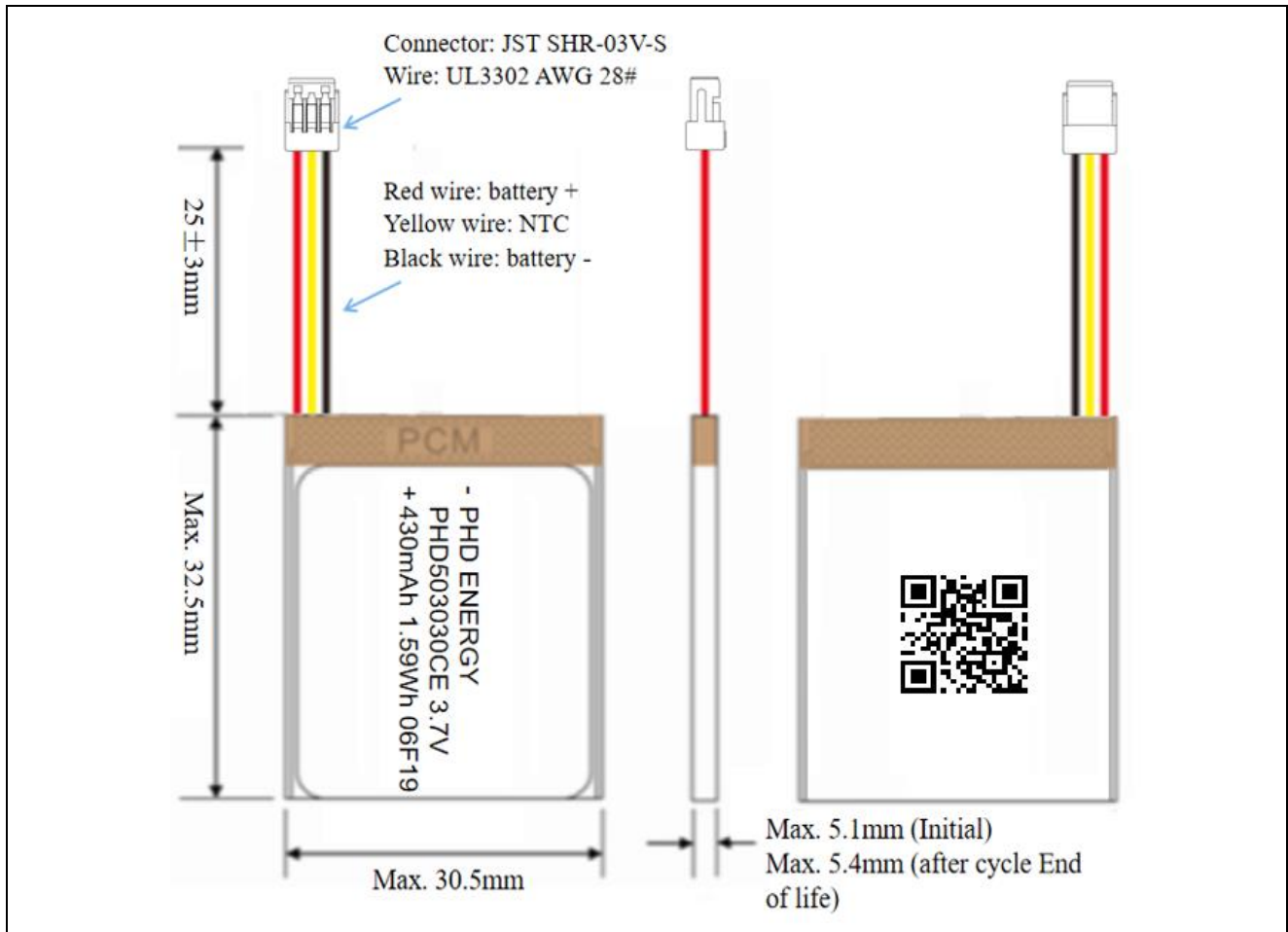
UN38.3, IEC62133, UL1642

Current 503030-3.7V- 430mAh has UL1642

2. Specifications

No.	Item	Characteristics	
1	Cell Model	503030 3.7V 430mAh	
2	Array Model	1S1P	
3	Nominal Capacity (Cell)	Typical	430mAhh (0.2C)
		Minimum	420mAh (0.2C)
4	Nominal Voltage	3.7V	
5	Full Charging Voltage	4.2±0.05V	
6	Full Discharge Voltage	3.0V	
7	Internal Resistance	Cell	≤90mΩ (AC 1kHz after 50% SOC, 25±2°C)
		Pack	≤200mΩ (AC 1kHz after 50% SOC, 25±2°C)
8	End-of-charge Current	0.01C (6mA)	
9	Charging Mode	CC/CV (Constant Current/ Constant Voltage)	
10	Standard Charge Current	0.2C (120mA)	
11	Standard Discharge Current	0.2C (120mA)	
12	Maximum Continuous Charge Current	0~ +15°C (0.2C)	
		+15~ +35°C (1C)	
		+35°C~ +45°C (1C max to 4.1V, then CV to 0.05C min)	
13	Maximum Continuous Discharge Current	-10~ +15°C (0.5C)	
		+15~ +60°C (1C)	
14	Charge Cut-off Voltage	Ref. 9.1	
15	Discharge Cut-off Voltage	Ref. 9.3	
16	Operating Environment	Charge	0~ +45°C
		Discharge	-10~ +60°C
17	Storage Temperature	-20~ +45°C ≤1 month; -20~ +35°C ≤3 months; 0~ +25°C ≤12 months	
18	Weight	About 11.5g	
19	Open Circuit Voltage	≥3.7V	

3. Drawing



4. BOM

No.	Part Name	Description	Quantity
1	Cell	503030 3.7V 430mAh	1
2	Wire	UL3302 28# 25± 3mm; red, yellow and black wires	3
3	PCM	G3J+8205A; 0.6*3.5*26mm FR-4 UL94-V0	1
4	Connector	JST SHR-03V-S (Metal up, red wire on the left, black wire on the right)	1

5. Electrical Characteristics

No.	Items	Test method	Criteria
1	Standard Charge	Charging the battery initially with 0.2C and then with constant voltage at 4.2V till charge current declines to 0.01C.	N.A
2	Standard Discharge	After standard charged, discharging the battery with constant current at 0.2C till the voltage drops to 3.0V.	N.A
3	Initial Capacity	The capacity means the discharge capacity of the battery, which is measured with discharge current of 0.2C with 3.0V after the standard charge.	≥420mAh
4	Cycle Life	At 25±2°C ambient temperature, constant current 0.5C charge to 4.2V, then constant voltage charge to current declines to 0.01C, rest 10min, constant current 0.5C discharge to 3.0V, rest 10min. Repeat above steps.	Capacity ≥80% After 300 cycles
5	Capacity Retention and Capacity Recovery	The cell to be charge in accordance with standard charge condition at 20~25°C, then storage the cell at an ambient temperature 20~25°C for 28 days. Measure the capacity after 28 days with 0.2C at 20~25°C as retention capacity. The cell again after standard charge then at 0.2C discharge capacity as the capacity recovery.	Retention Capacity ≥85%; Capacity Recovery ≥90%

6. Environmental Characteristics

No.	Items	Test method	Criteria
1	Constant Temperature and Humidity	After the Standard Charge, and stored in an ambient temperature of 40±2°C (90~95% RH) for 48h, then placed in room temperature for 2h. After that, check its appearance prior to being discharged to cut-off voltage at a constant current of 0.2C.	No distortion, no rust, no leakage, no venting, no rupture, no fire, no explosion, the discharge time is not less than 3h.
2	High Temperature	Measure the cell initial capacity and initial state, after the standard charge, keep the cell for 4h in 55±2°C, then discharge at 0.2C to 3.0V.	No distortion, no rupture, no fire, no smoke or leakage. Capacity ≥95% (Initial capacity)
3	Low Temperature	Measure the cell initial capacity and initial state, after the standard charge, keep the cell for 4h in -10±2°C, then discharge at 0.2C to 3.0V.	No distortion, no rupture, no fire, smoke or leakage. Capacity ≥60% (Initial capacity)

7. Safety Performance

7.1 Standard testing environment:

Temperature: 25±2°C.

Relative humidity: 60±25% R.H..

Atmospheric pressure: 86~106KPa. (Unless specially requested)

7.2 Performance tests:

No.	Items	Test method	Criteria
1	Over-charge	After standard charged, the cell shall be charged for 2.5 hours using 10V, 1C power supply.	No explosion and no fire.
2	External Short-circuit	The cell shall be standard charged. The plus and minus terminals of the cell shall be short circuited with a wire having 50mΩ or less resistance, and left for 1 hour.	No explosion and no fire.
3	Over-discharge	The cell shall be standard charged, and discharged with 50Ω resistor load for 24 hours.	No explosion and no fire.
4	Crush Test	Crush between two flat plates. Applied force is about 13 kN.	No explosion and no fire.
5	Impact Test	Impact between bar (15.8mm diameter) and 9.1Kg falling material (at a height of 610mm). Bar is laid across the center of the test sample.	No explosion and no fire.
6	Drop	After standard charging, the cell is to be dropped from a height of 1.0 meter onto a thickness of 20 mm board, dropped once in the positive and negative directions of three mutually perpendicular X, Y, Z axes.	No explosion and no fire.
7	Vibration	Fixed the fully charged cell to vibration table and subjected to vibration cycling that the frequency is 16.7Hz, the excursion of the vibration is 1mm, and left for 1 hour. The cell shall be vibrated for 3h per axis of X, Y, Z axes.	No explosion, no fire, no leakage. Possible to be charged and discharged.
8	Heating	After standard charging, put cell in the baking oven and start , the temperature of the oven is to be raised at a rate of 5± 2°C per minute to a temperature of 130± 2°C, remain for 30 minutes at that temperature.	No explosion and no fire.

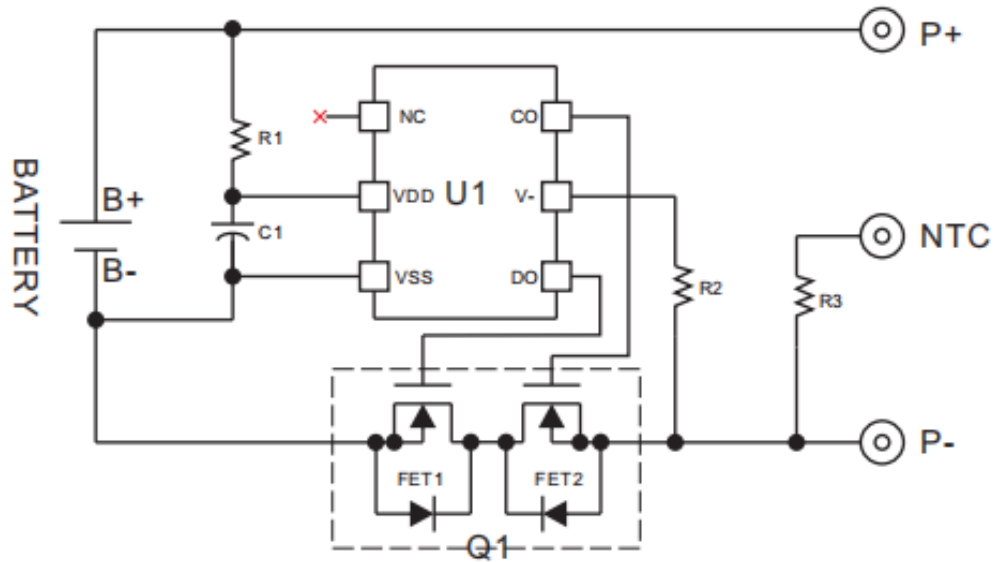
8. PCM BOM

NO.	Details	Model	Unit	Quantity	Symbol
1	PCB	0.6*3.8*25mm FR-4 UL94-V0	pcs	1	
2	IC	S8261ABJMD-G3JT2X SOT23-6	pcs	1	U1
3	MOS	8205A TSSOP-8	pcs	1	Q1
4	Resistance1	470Ω ±5% 0603	pcs	1	R1
5	Resistance2	2KΩ ±5% 0603	pcs	1	R2
6	NTC	10KΩ ±1% B=3435K 0603	pcs	1	R3
7	Capacitance	0.1uF ±10% 25V 0603	pcs	1	C1

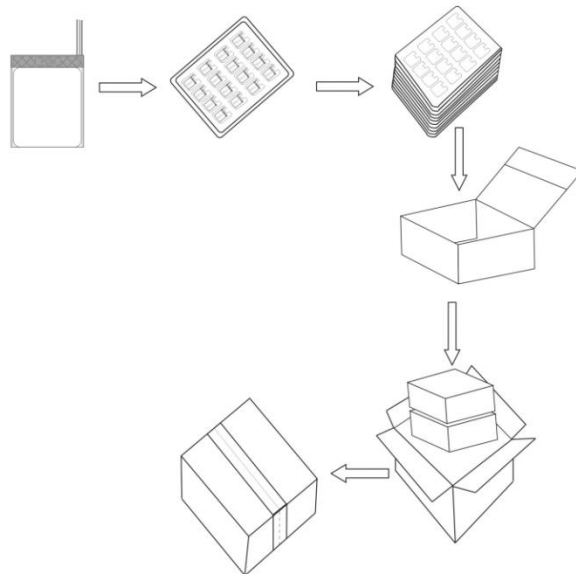
9. PCM Electrical Characteristics

No.	Items	Specification			Unit
		Min.	Type vale	Max.	
1	Over-charging protection voltage	4.26	4.28	4.30	V
2	Over-charging return voltage	4.01	4.08	4.15	V
3	Over-discharge protection voltage	2.95	3.00	3.05	V
4	Over-discharge return voltage	2.95	3.00	3.05	V
5	Over-current detection voltage	0.065	0.08	0.095	V
6	Over-current protection	1.0	/	3.0	A
7	Over-charging protection delay time	0.96	1.2	1.4	S
8	Over-discharge protection delay time	115	144	173	mS
9	Over-current protection delay time	7.2	9	11	mS
10	Internal resistance	/	35	65	mΩ
11	Consume current	/	3.5	7.0	uA
12	Operating temperature	-40	/	+85	°C
13	0V battery charge function	Available			

10. Schematic Diagram Of Battery



11. Package (TBD)



12. Precautions And Safety Instructions

Should be noted in user manual or instruction manual for users to prevent the possibility of the battery from leaking, heating, explosion. With batteries, did not follow the specifications for the operation caused any accidents, PHD Energy Inc. will not accept any responsibility. Please observe the following precautions:

- Don't use and leave the cell near a heat source such as fire or heater.
- Do not use or leave the cell under direct sunlight (or in heated car by sunshine).
- Do not short circuit, over-charge or over-discharge the cell.
- Don't immerse the battery in water. Please set it in cool and dry environment if not in use.
- Don't reverse the positive and negative terminals
- Do not disassemble or modify the cell.
- Do not transport and store the battery together with metal objects that could cause a short such as necklaces, hairpins, coins...etc.
- Do not use the cell with conspicuous damage or deformation.
- Don't connect the cell to an electrical outlet directly.
- If the cell leaks and the electrolyte get into contact with eyes, don't wipe eyes, instead, thoroughly rinse the eyes with clean running water for at least 15 minutes, and immediately seek medical attention.
- Do not use this battery in series or parallel connection with any other chemistries or battery types. Consult with PHD to be sure.
- Keep the battery away from minors.
- Do not directly solder the battery and pierce the battery with a nail or other sharp object.
- Do not strike, throw or trample the battery.
- Do not bend or fold sealing edge, open or deform folding edge and cut the edges off.
- Charge the battery with a recommended charger only. Consult with PHD.
- When disposing of secondary cells, keep cells of different electrochemical systems separate from each other.
- In case the battery terminals are dirty, clean the terminals with a dry cloth before use.
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charger and stop using it.
- Only a qualified technician should only replace this battery. Do not attempt to remove by yourself.
- Be aware discharged batteries may cause fire; tape the terminals to insulate them.
- Do not use under high ESD and EMC conditions. Consult with PHD for design solutions for such environment.
- Battery pack design should prevent damage to battery during transportation and comply with UN38.3 requirements.
- Ultrasonic welding and/or spot welding are recommended for assembly of the cell. For manual soldering, recommended: the temperature of soldering iron to be controlled to ($\leq 350^{\circ}\text{C}$) with ESD protection; soldering tin time $\leq 3\text{s}$; soldering tin less than 2 times and the second soldering is permitted after the cell seal side has cooled to room temperature.