Specification Approval Sheet

Customer Name: _____

CustomerModel: NUE LIPO 3.7V 180mAh 1S1P 472023 0.6Wh

ProductModel: NUE11SJJ472023X180MA

Prepared by	Checked by	Approved by
ZX	JH	ZJ

Revision History

Revision	Date	Mark	Modified content	Approved by
REL.0	2020/8/13	/	Release	ZJ

1. Scope

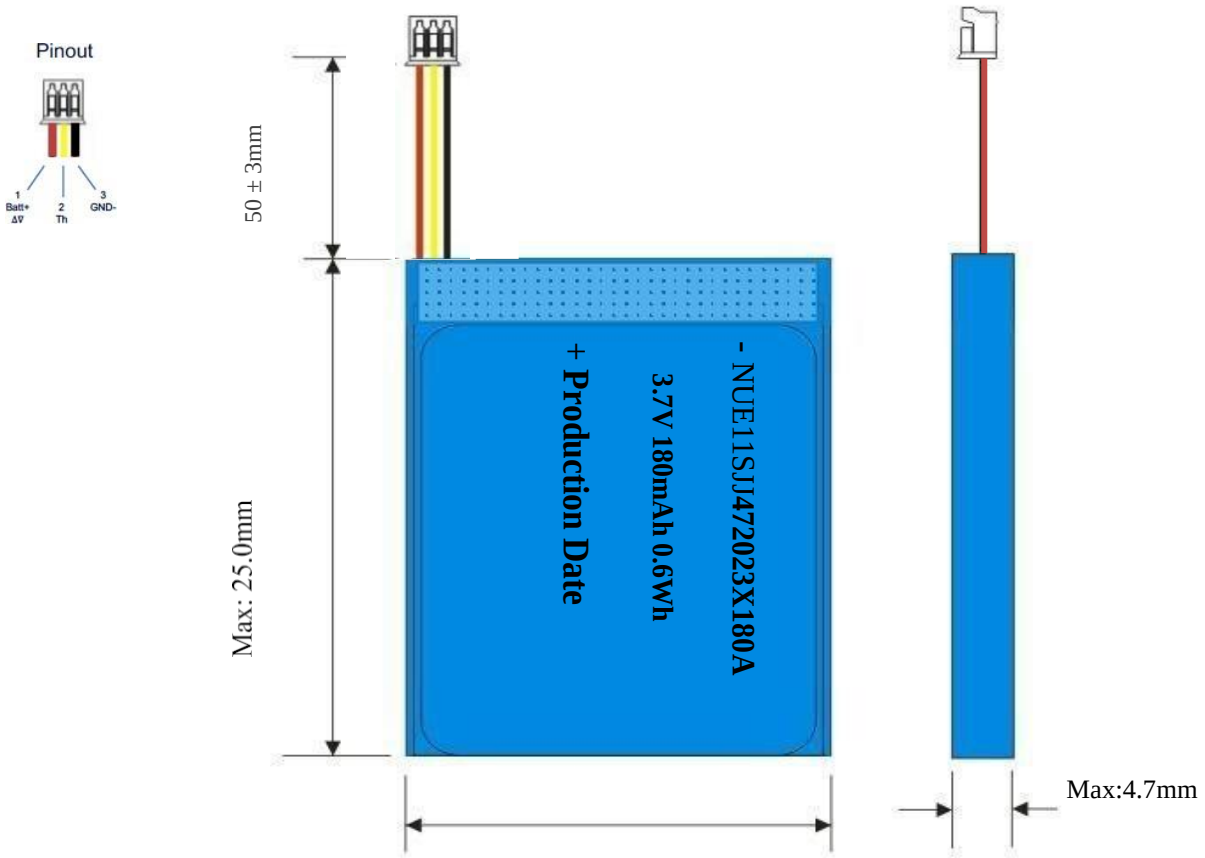
The specification shall be applied to Lithium-ion Polymer (LIP) rechargeable battery pack, which is manufactured by NuEnergy Storage Technologies.

Reference standards: GB/T 18287-2013, IEC/EN61960, UL1642

2. Product information

Items	Parameter	
Battery model	472023	
Design scheme	DW01B-G +FH8205+10KNTC	
Nominal voltage	3.7V	
Minimum capacity	180mAh(0.2C discharge)	
Typical capacity	190mAh(0.2C discharge)	
Charging voltage	4.2V	
Discharging cut-off voltage	3.0V	
Standard charging	0.2 /4.2V	
Max charging	1.0C /4.2V	
Standard discharging	0.2C/3.0V	
Max discharging	1.0C/3.0V	
Weight	Appr：3.5g	
Shipment voltage	3.90±0.05V	
Battery pack impedance	≤320mΩ	
Max charge current	0C~10°C; 0.2Cmax	
	10°C~20°C; 0.5Cmax	
	20°C~45°C; 1.0Cmax	
Max discharge current	-20°C~0°C; 0.2Cmax	
	0°C~25°C; 0.5Cmax	
	25°C~60°C; 1.0Cmax	
Operating temperature	Charging: 0°C ~ 45°C	
	Discharging: -20°C ~60°C	
Storage (At 50%-60% SOC and specified temp, recoverable capacity in % vs time.)	-10℃~25℃	(12 months, ≥85%)
	-10℃ ~45℃	(6 months, ≥85%)
	-10℃~55℃	(1 month,≥90%)
	20±5℃ is the recommended storage temperature	
Visual Inspection	There should not be any remarkable scratches, cracks, cauterizations, deformations, swelling, or leakage on the surface of the cell.	

3. Battery Outline Drawing



BOM (Bill of materials)				
NO.	Material Name	Specification	Qty	Remark
1	Cell	472023/180mAh/3.7V	1	RoHS
2	Connector	Molex 078172-003P		
3	Protection board	PCB1438T	1	RoHS
4	Wire	Red Wire UL1330(#30P+)	1	RoHS
		Black Wire UL1330(#30(P-)	1	RoHS
		Yellow Wire UL1330#30(NTC)	1	RoHS

4. Electrical characteristics

No.	Items	Test Method	Criteria
1	Standard Charge	Charging the cell initially with constant current at 0.2C and then with constant voltage at 4.2V till charge current declines to 0.02C.	N.A
2	Minimal Capacity	The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.2C with 3.0V cut-off voltage after the standard charge.	≥180mAh
3	Charge/Discharge Cycle	The capacity on 0.2C discharge shall be measured after 500 cycles of 0.2C charge and discharge at 23±2℃.	Capacity≥80%
4	Retention Capability	After full charging, storing the battery 28 days with 20 ± 5°C condition, and then staying 1 hours with discharge current of 0.2C till 3.0V cut-off voltage.	Capacity≥85%

※ **Typical capacity**

The capacity means the average discharge capacity of the cell, which is measured with discharge current of 0.2C with 3.0V cut-off voltage after the standard charge at 23±2℃environment temperature, unit: mAh.

5. Condition adapting characteristics

No.	Items	Test Method	Criteria 标
1	Constant temperature and Humidity	After standard charging, put cell into the box that the temperature is 40±2℃and the humidity ranges between 90～95% for 48hours, then put it at 23±2℃for 2 hours, then discharge with current of 0.2C to the cut-off voltage.	No distortion, no rust, no leakage, no venting, no rupture, no fire, no explosion, the discharge time is not less than 3hrs.
2	High Temperature Performance Test	After full charging, put the cell into box with high temperature of 55℃±2℃ for 2h, then dischargewith current of 1.0C to thecut-off voltage.	No distortion, no rupture, no fire, no smoke or leakage Discharge time≥51min
3	Low Temperature	After full charging, put the cell into box with low temperature of -10±2℃ for 16~24h, then discharge with current of 0.2C to the cut-off voltage.	No distortion, no rupture, no fire, smoke or leakage Discharge time ≥ 3h

6. Cell safety performance

No.	Items	Test Method	Criteria
1	Cell Overcharge	After discharge to limit voltage, charged at constant current of 3C and constant voltage of 4.6V, while voltage reaches to the max, if charging continued over 7 hours or temperature is 20% less than the top, close the test.	No explosion and no fire.
2	External Short-circuit Test	Cell terminals are short-circuited to discharged state less than 0.1V or longer time with a resistance of 50mΩ or less. Tests are to be conducted at room temperature.	No explosion and no fire.
3	Over-Discharge Test	Cell is discharged at a current of 1C rate for 2.5 hours. (If current stops by safety or passive circuit on the battery, test is finished.).	No explosion and no fire.
4	Crush Test	Crush between two flat plates. Applied force is about 13kN.	No explosion and no fire.
5	Impact Test	Impact between bar (15.8mm diameter) and 9.1Kg falling material (at a height of 6.1cm). 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 1.2meter onto a thickness of 20mm board, dropped once in the positive and negative directions of three mutually perpendicular X, Y, Z axes.	No leakage, no smoke, no fire, no explosion.
7	Vibration Test	Fixed the fully charged cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 0.8mm. The cell shall be vibrated for 90 ~100 minutes per axis of XYZ axes.	No explosion, no fire, no leakage.
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℃ per minute to a temperature of 130±2℃, remain for 30minutes at that temperature.	No explosion and no fire.

7. Battery safety performance

1	Overcharge protection	After battery charge finished, then charge the battery for 8 hours with a power which can provide 2 times more than nominal voltage and 2C$_5$A current.	No fire, no explosion. The electrical properties of normal.
2	Over-discharge protection	After the battery is fully charged, discharge at 20±5℃ conditions with 0.2C$_5$A until the battery voltage dropsto the over discharge voltage, then discharge with a 30Ω resister for 24 hours.	No fire, no explosion. The electrical properties of normal.
3	Short protection	After standard charging, connect the positive and negative terminals of the cell with copper wire havinga maximum resistance load of 0.1 Ω at room temperature, the test is discontinued when the surface temperature lower than 10℃.	The battery shall no rupture, smoke, catch fire, or leakage. Battery Voltage ≥3.6V

8. Others

Any matters that this specification doesn't cover should be conferred between the customer and NuE.

9. Testing requirements

9.1 Battery test environment

Temperature：23±2℃

Relative humidity： 60± 20% RH

Atmospheric pressure： 86～106 KPa

9.2 Measuring instrumentation requirements

Voltage instrumentation requirements: Measuring the voltage meter accuracy no less than 0.5 magnitude

Current instrumentation requirements: Measuring the current meter accuracy no less than 0.5 magnitude

Time instrumentation requirements: Measuring the time meter accuracy no less than 0.1%

Temperature instrumentation requirements: Measuring the temperature meter accuracy no less than 0.5 ℃

Impedance instrumentation requirements: Measuring impedance should by sinusoidal alternating (1 KHZ) test

10. Electrical Characteristics

10.1 Battery charge/discharge

10.1.1 Full charged definition

With charging voltage 4.2V, current 0.2C continued to charge the battery pack, when charging current drops to 0.02C charging is terminated, shall be full charged.

10.1.2 Full discharged definition

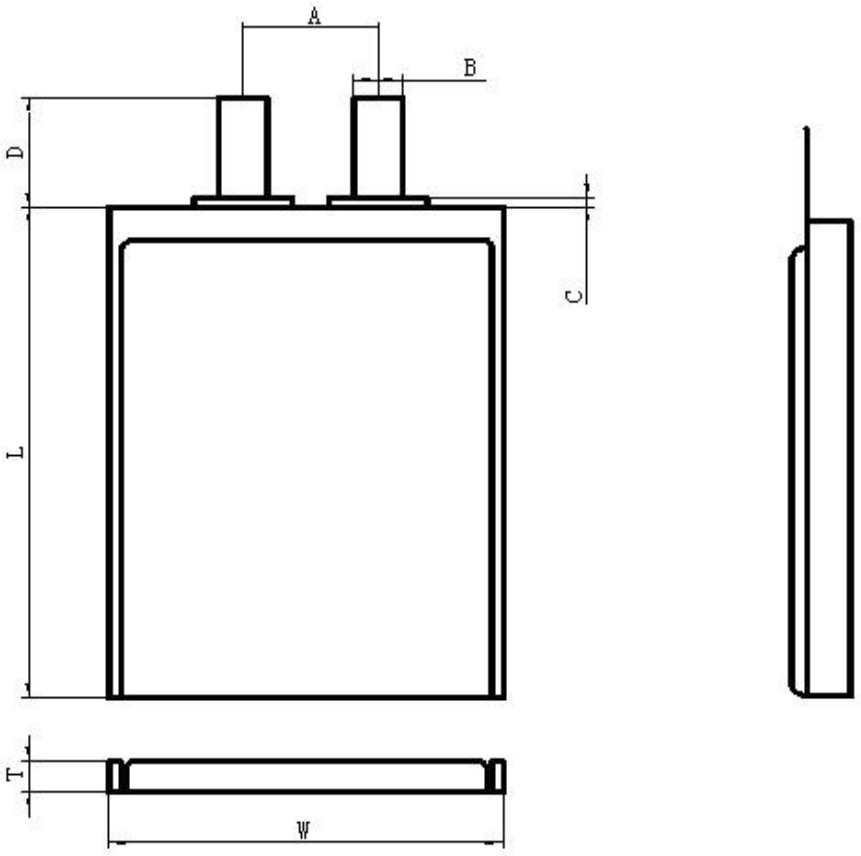
Standard discharge current 0.2 C for continuous discharge, when the voltage drops to discharge cut-off voltage 3.0V discharge is terminated, shall be full discharged.

11. Cell

11.1 Performance parameters

No	Description		Parameter	Remark
1	Cell minimum capacity		180mAh	0.2C discharge
2	Initial impedance		≤60mΩ	1kHzAC Impedance
3	Nominal voltage		3.7V	/
4	Dimensions	T	4.7mm Max	Thickness
		W	20.5mm Max	Width
		L	23.0mm Max	Celllength（notincludeTabsealant）
		A	20.0±2.0mm	Distance of tab center
		B	3.0±0.2mm	Tab width

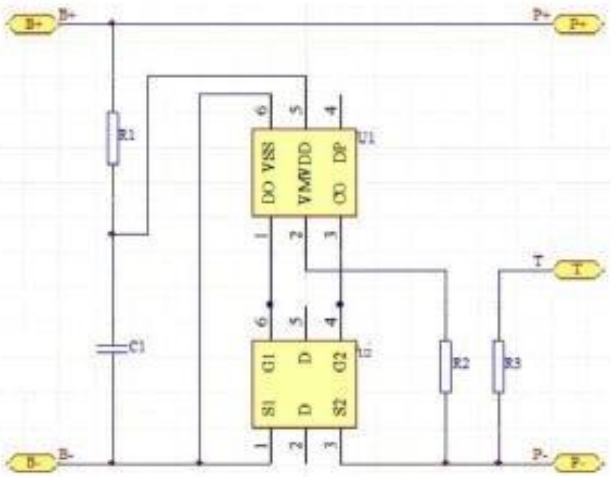
11.2 Cell outline drawing



12. Electric Protect Features

Item	Syol	Content	Criterion
Over charge Protection	V_{DET1}	Over charge detection voltage	4.30V±0.05V
	tV_{DET1}	Over charge detection delay time	200mS（MAX）
	V_{REL1}	Over charge release voltage	4.10V±0.1V
Over discharge protection	V_{DET2}	Over discharge detection voltage	2.40V±0.1V
	tV_{DET2}	Over discharge detection delay time	100ms（MAX）
	V_{REL2}	Over discharge release voltage	3.0±0.10V
Over current protection	V_{DET3}	Over current detection voltage	150mV±30mV
	I_{DP}	Over current detection current	MIN：2.0A MAX：4.5A
	tV_{DET3}	Detection delay time	20ms（MAX）
		Release condition	Cut load
Short protection		Detection condition	Exterior short circuit
	T_{SHORT}	Detection delay time	0.5ms（MAX）
		Release condition	Cut short circuit
Interior resistance	R_{DS}	Main loop electrify resistance	B -P- RDS≤70mΩ
Current consumption	I_{DD}	Current consume in normal operation	MIN: 0.3μA MAX: 10.0μA
0V Prohibition /allowance		allowance	

13. Electrical Schematic Diagram

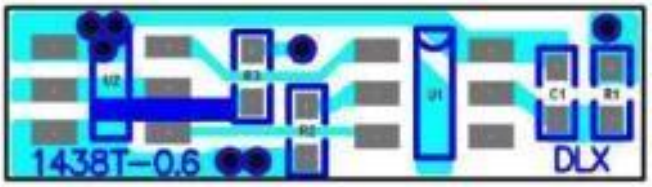


14. PCBA BOM

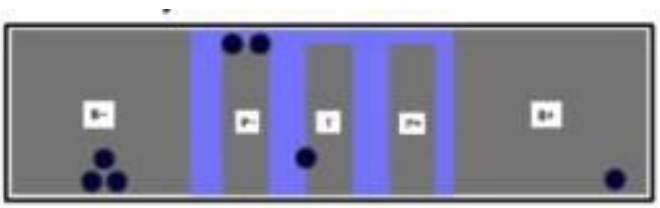
Item	Part Name	Description	QTY	Footprint	Supplier	Remark
1	U1	DW01B-G	1pcs	SOT-23-6	FS	
2	U2	8205A	1pcs	TSSOP-8	XFH	
3	R3	10KΩ ±1% B=3435±1%	1pcs	0402	Any approved vendor	
4	PCB	PCB1438T	/		Any approved vendor	B+ B- Nickel

15. PCBA Layout

Top Layer

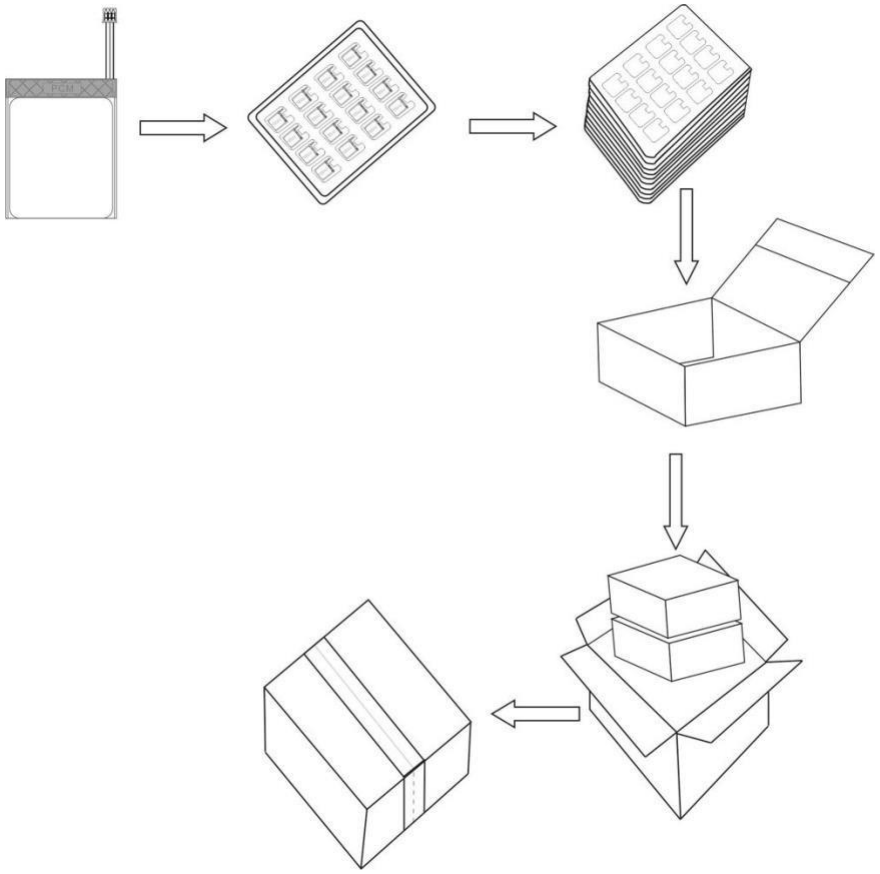


Bottom



16. Package

REV.	MARK	DESCRIPTION	SIGNATURE	DATE
A		FIRST DESIGN RELEASE		



17. Warranty, Maintenance, Battery Precautions and Safety Instructions

NuEnergy offers a 1 year warranty from data of manufacture due to manufacturing defects only. Any customer abuse and misuse will not be covered. Please be sure to comply with the specifications and the following precautions when using the batteries. If operating parameters are outside of the specification and customer does not follow the specifications for the operating conditions, thus caused any accidents, NuE will not accept any responsibility or liability. Before use, carefully read the instruction manual and battery labels on the surface.

Maintenance: If battery is stored for up to 3 months at a time, Please use 0.2C current to charge up to 60% capacity minimum, to prevent degradation and over-discharge conditions. If battery is stored for up to a year, a full charge and discharge cycle must be performed to prevent cell degradation. During storage, battery should be placed in recommended conditions as stated in this document (dry and ventilated area).

In use or during storage, if any battery isfound to be subject to high temperature, leakage, odor, distortion and other anomalies, please stop using it immediately,place in safe place, and report to NuEnergy immediately. Must keep battery away from any heat source, high pressures, and must not be subject to any drop, vibration or hitting of the battery.

Do not short-circuit the battery's positive and negative terminals, and careful not to allow the battery to be subject to any moisture, to avoid danger.

Battery end of life should be immediately removed from the equipment; Please properly handle and recycle spent batteries according to local regulation, and do not put into fire or water.

Customer Inquiry

1. **If clientele wishes to ratify this specification and showpiece, please sign and return this specification to NuE in 1 week.**

2. **The customer is requested to write down your information and contact NuE in advance, if and when the customer needs applications or operating conditions other than those described in this document; NuE could design and build such products according to your special request.**

	Special Request	Criteria
1		
2		
3		
4		
5		
6		

Company Name:

Signature:

Date: