

Customer Approval Sheet

Application				
Model No.				NUE PACK LIPO 3.7V 1170mAh 1S1P 504050
Part Number				NUE11SJJ5040501X17A
CPN				
Issued By	Checked By	Approved By	Customer Confirmation	
BT	VN	JZ		

2.0 Scope

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

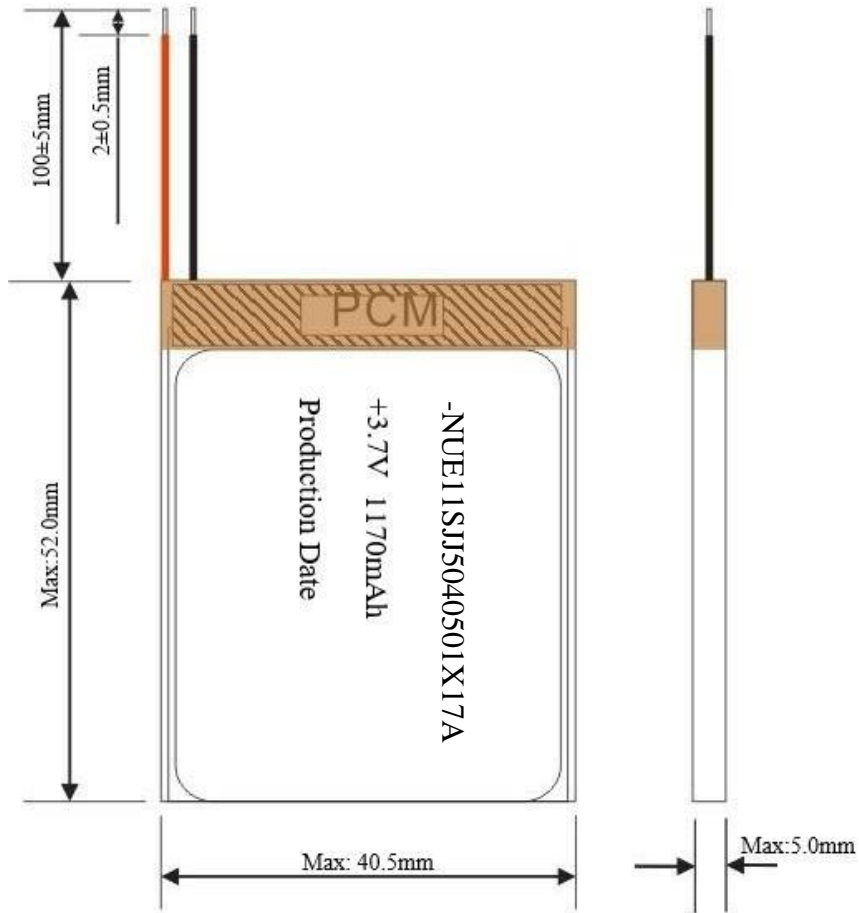
Reference standard

GB/T 18287-2013 IEC/EN61960 UL1642

3.0 Basic Product Information

Items	Parameter	
Battery model	504050	
Design scheme	S-8261ABMMD-G3MT2x+PE6968	
Nominal voltage	3.7V	
Minimum capacity	1170mAh(0.2C discharge)	
Typical capacity	1200mAh(0.2C discharge)	
Charging voltage	4.20V	
Discharging cut-off voltage	3.0V	
Standard charging	0.2C /4.20V	
Max charging	1.0C /4.20V	
Standard discharging	0.2C/3.0V	
Max discharging	1.0C/3.0V	
Weight	Appr: 20.9g	
Shipment voltage	≥3.85V	
Battery pack impedance	≤200mΩ	
Operating temperature	Charging: 0°C ~ 45°C	
	Discharging: -20°C ~55°C	
Storage (At 50% SOC and specified temp, recoverable capacity in % vs time.)	-10°C~25°C	(12 months, ≥85%)
	-10°C ~45°C	(6 months, ≥85%)
	-10°C~55°C	(1 month, ≥90%)
	20±5°C is the recommended storage temperature	
Visual Inspection	There should not be any remarkable scratches, cracks, bolts, cauterization, deformations, swelling , leakage and so on on the surface of the cell.	

4.0 Battery Outline Drawing



BOM (Bill of materials)

NO.	Material Name	Specification	Qty	Remark
1	Cell	504050/1170mAh/3.7V	1	RoHS
2	Protection board	PCB2640-15	1	RoHS
3	Wire	Red Wire UL3302#26	1	RoHS
		Black Wire UL3302#26	1	RoHS

5.0 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.	$\geq 1170\text{mAh}$
3	Charge/Discharge Cycle	The capacity on 0.2C discharge shall be measured after 700 cycles of 0.2C charge and discharge at $23\pm 2^\circ\text{C}$.	Capacity $\geq 80\%$
4	Retention Capability	After full charging, storing the battery 28 days with $20 \pm 5^\circ\text{C}$ condition, and then staying 1 hours with discharge current of 0.2C till 3.0V cut-off voltage.	Capacity $\geq 85\%$

Typical Capacity:

Capacity refers to the average discharge capacity of the cell. This is measured with discharge current of 0.2C with 3.0V cut-off voltage after the standard charge at $23\pm 2^\circ\text{C}$ environment temperature, unit : mAh.

6.0 Condition Adapting Characteristics

No.	Items	Test Method	Criteria
1	Constant temperature and Humidity	After standard charging, put cell into the box that the temperature is $40\pm 2^{\circ}\text{C}$ and the humidity ranges between 90~95% for 48hours, then put it at $23\pm 2^{\circ}\text{C}$ for 2hours, 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 $55^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 2h, then discharge with current of 1.0C to the cut-off voltage.	No distortion, no rupture, no fire, no smoke, or leakage Discharge time $\geq 51\text{min}$
3	Low Temperature Performance Test	After full charging ,put the cell into box with low temperature of $-10\pm 2^{\circ}\text{C}$ 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 $\geq 3\text{h}$

7.0 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, stop 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.

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6	Drop	<p>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.</p>	<p>No leakage, no smoke, no fire, no explosion.</p>
7	Vibration Test	<p>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 ~100minutes per axis of XYZ axes.</p>	<p>No explosion, no fire. no leakage.</p>
8	Heating	<p>After standard charging, put cell in the baking oven and start , the temperature of the oven is to be raised at a rate of $5\pm 2^{\circ}\text{C}$ per minute to a temperature of $130\pm 2^{\circ}\text{C}$, remain for 30minutes at that temperature.</p>	<p>No explosion and no fire.</p>

8.0 Pack Safety Performance

No.	Items	Test Method	Criteria
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 2C5A current.	No fire, no explosion. The electrical properties are normal.
2	Over discharge protection	After the battery is fully charged, discharge at 20±5°C conditions with 0.2C5A until the battery voltage drops to the over discharge voltage, then discharge with a 30Ω resistor for 24 hours.	No fire, no explosion. The electrical properties are normal.
3	Short protection	After standard charging, connect the positive and negative terminals of the cell with copper wire having a maximum resistance load of 0.1 Ω at room temperature, the test is discontinued when the surface temperature lower than 10°C.	The battery shall not rupture, smoke, catch fire, or leakage. Battery Voltage ≥3.6V

9.0 Others

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

100 Testing Requirements

Battery test environment

- Temperature: $23 \pm 2^{\circ}\text{C}$
- Relative humidity: $60 \pm 20\%$ RH
- Atmospheric pressure: 86~106 KPa

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°C
- Impedance instrumentation requirements: Measuring impedance should be sinusoidal alternating (1 KHZ) test

110 Charge/Discharge Definitions

Fully charged definition

- With charging voltage 4.35V, current 0.2C continued to charge the cell, when charging current drops to 0.02C charging is terminated, shall be full charged.

Fully discharged definition

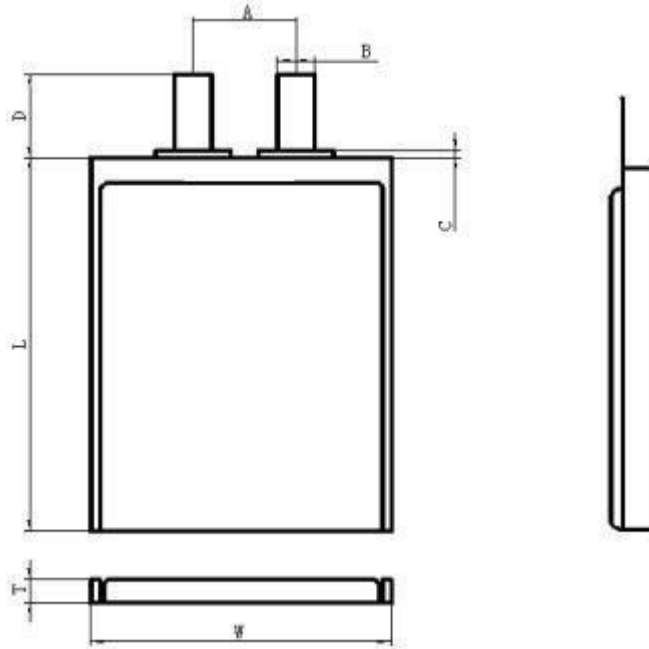
- Standard discharge current 0.2 C for continuous discharge, when the voltage drops to discharge cut-off voltage 3.0V discharge is terminated shall be full discharged.

12.0 Cell

Performance Parameters

No.	Item	Specification	Remark
1	Cell minimum capacity	1170mAh	0.2C discharge
2	Initial impedance	≤60mΩ	1kHz AC Impedance
3	Nominal voltage	3.7V	/
4	Dimensions	T	5.0mm Max Thickness
		W	40.5mm Max Width
		L	50.5mm Max Cell length does not include Tab sealant
		A	18.5±2.0m Distance of tab center
		B	3.0±0.2mm Tab width

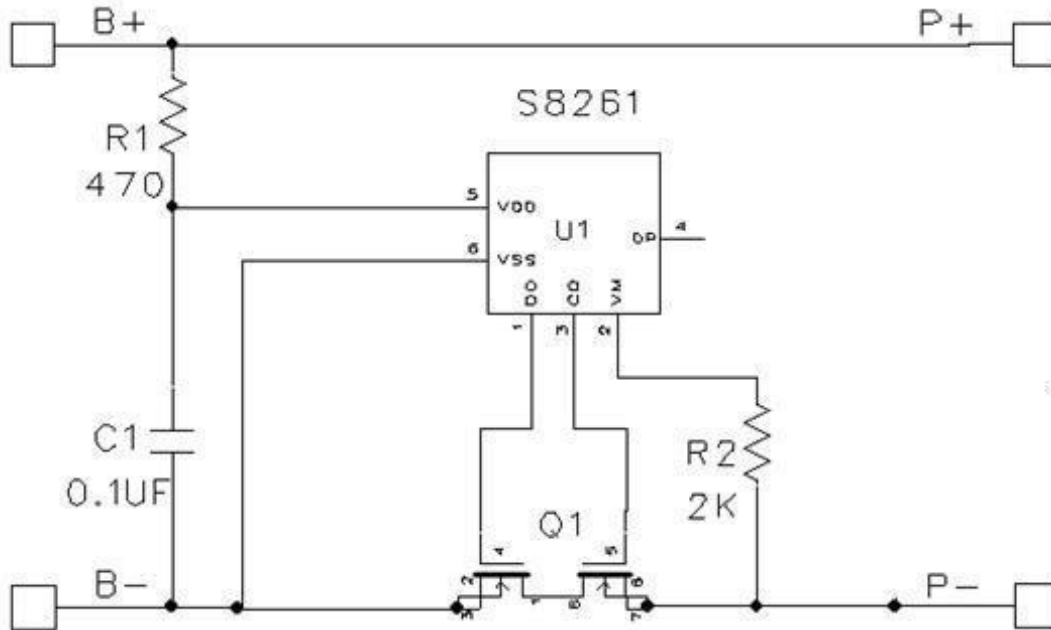
Cell Outline Drawing



13.0 Electrical Protection Features

Item	Symbol	Content	Criteria
Over charge Protection	VDET1	Over charge detection voltage	4.28±0.05V
	TvDET1	Over charge detection delay time	0.96~1.4s
	VREL1	Over charge release voltage	4.08±0.05V
Over discharge protection	VDET2	Over discharge detection voltage	2.8±0.08V
	TvDET2	Over discharge detection delay time	115~173ms
	VREL2	Over discharge release voltage	2.8±0.10V
Over current protection	VDET3	Over current detection voltage	100±10mv
	IDP	Over current detection current	1.5~4.5A
	TvDET3	Detection delay time	7.2~11.0ms
	/	Release condition	Cut load
Short protection	/	Detection condition	Exterior short circuit
	TSHORT	Detection delay time	220~380μs
	/	Release condition	Cut short circuit
Internal resistance	RDS	Main loop electrical resistance	$V_C=4.2V$; $R_{DS} \leq 70m\Omega$
Current consumption	IDD	Current consumption in normal operation	3.0μA Type 7.0μA Max 0V Charging
0V Prohibition/ 0V Allowance		Allowance	/

14.0 Circuit Schematic

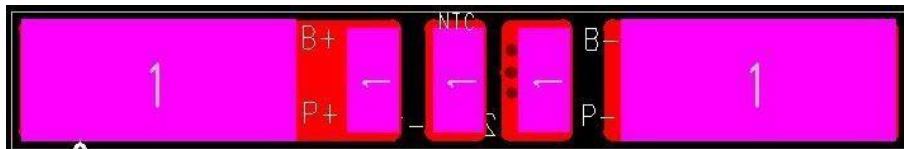


15.0 PCB Part List

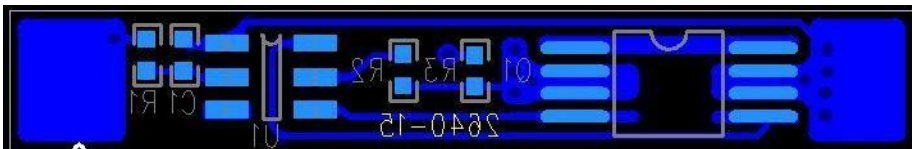
Item	Part Name	Description	QTY	Footprint	Supplier	Remark
1	U1	S-8261ABMMD-G3MT2x	1pcs	S0T-23-6	SEIKO	
2	Q1	PE6968	1pcs	TSSOP-8	SEMIONE	
3	R1	470 ± 5%	1pcs	0402	Any approved vendor	
4	R2	2K ± 5%	1pcs	0402	Any approved vendor	
5	C1	0.1uF ± 10% 25V	1pcs	0402	Any approved vendor	
6	PCB	PCB2640-15		Any approved vendor		

16.0 PCB Layout

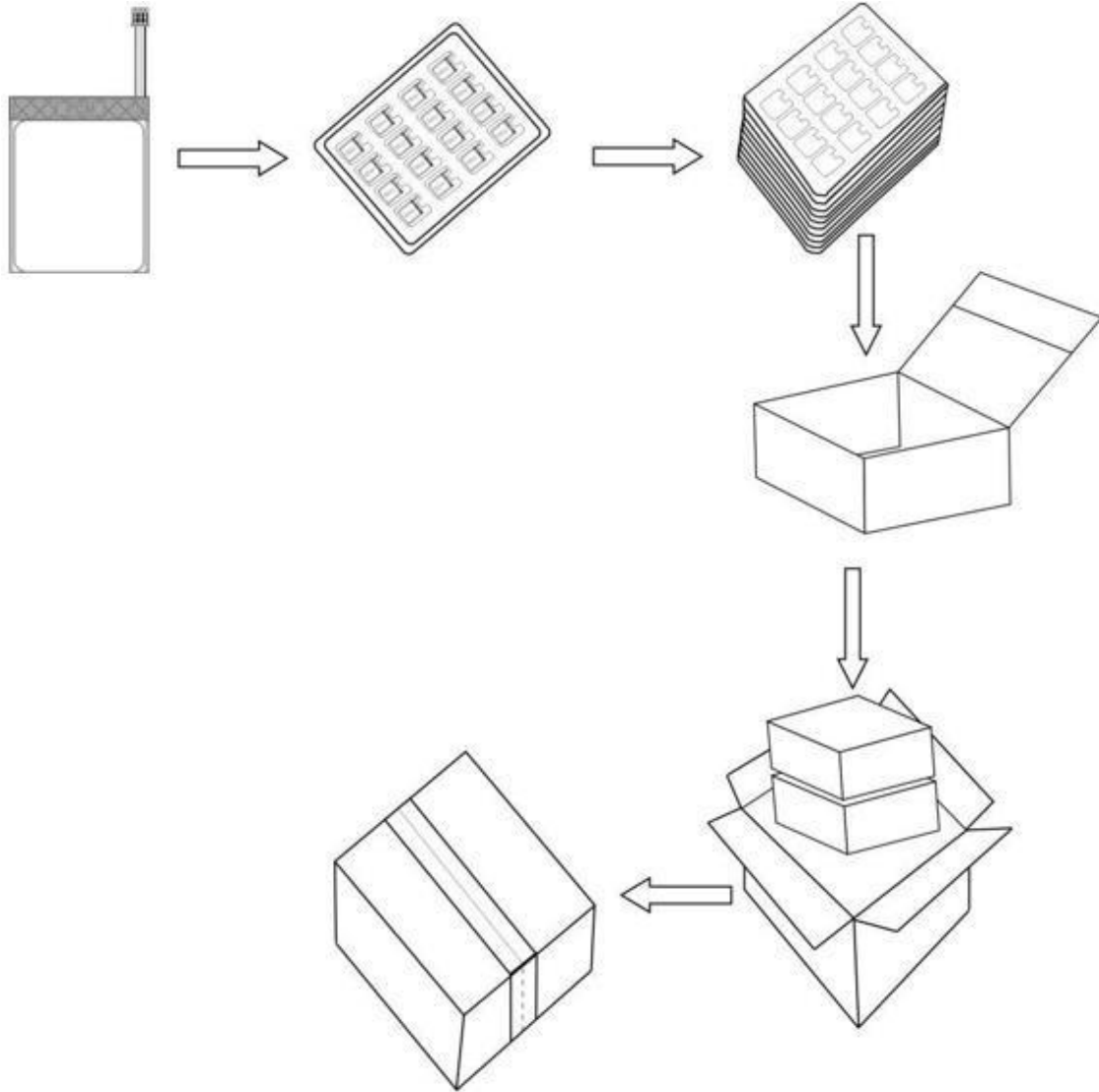
Top Layer



Bottom Layer



17.0 Packaging



18.0 Warranty and Liability

Please be sure to comply with the specifications and follow the precautions when using batteries. If the user fails to follow the specifications for the operation and any incidents are caused, NuEnergy Storage Technologies will not be liable.

NuEnergy offers a limited warranty for 1 year from the date of manufacture.

19.0 Battery Precautions and Safety Instructions

- Please use 0.5C current to charge up 60% capacity after the battery has been stored for more than 3 months.
- Before using the battery, carefully read the instruction manual and battery labels.
- Need to use the original battery charger and should be placed in a dry, ventilated place.
- When not in use for long periods of time, charge the battery to 50% SOC, and store battery separated from charger to prevent any short circuit conditions.
- While in use or during storage, if the battery is found to have a high temperature, leakage, odor, distortion, etc., stop using it immediately and consult with NuE.
- Do not short-circuit the battery's positive and negative leads.
- Keep the battery away from heat, high pressure, and moisture. Do not crush battery.
- Follow all local guidelines regarding proper disposal of batteries.



PRODUCT SPECIFICATION

DATE : 11/16/20
REV. : A0
SHEET : 16 OF 16

Customer Inquiry

If the client 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: _____