

LITHIUM-ION POLYMER BATTERY SPECIFICATION

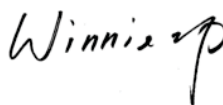
PL601033/170mAh
(With PCM)

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Lithium-ion polymer battery PL601033/170mAh

1、Scope:

This specification is applies to describe the related Battery product in this Specification and the Battery/cell supplied by CHUNG PAK (GUANGDONG) BATTERY INDUSTRIAL CO.,LTD.

2、Cell Model: PL601033/170mAh

3、Cell Specification

No.	Items	Specifications	Remark
1	Nominal Capacity	170mAh	0.2C discharge
2	Minimum Capacity	170mAh	
3	Nominal Voltage	3.8V	Mean Operation Voltage
4	Delivery voltage	3.8V-4.0V	Within 10 days from Factory
5	Charge cut-off Voltage	4.35V	By standard charge method
6	Discharge cut-off voltage	3.0V	By standard discharge method
7	Standard charging method	0.2C constant current charge to 4.35V, 4.35V constant voltage continue charging till current decline to $\leq 0.02C$, charge time:6.5h(Ref)	/
8	Standard discharging method	0.2C constant current discharge to 3.0V	/
9	Cell Internal Impedance	$\leq 420m\Omega$	Internal resistance measured at AC 1KHZ after 50% charge
10	Max continuous charge current	0.5C	Standard charge, charge time:2.5h(Ref)
11	Max continuous discharge current	0. 5C	For continuous discharge mod
12	Instantaneous discharge current	2C	Last within 3s
13	Weight(Approx.)	3.4g	With PCM

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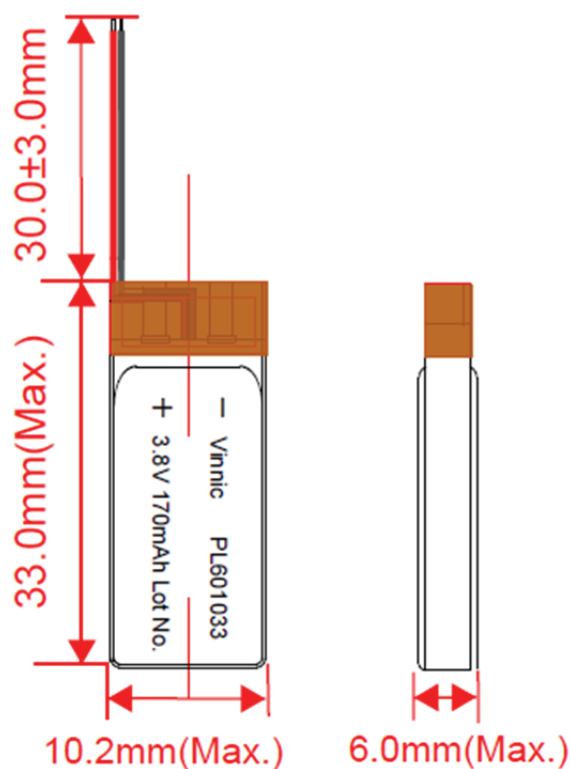
4、Cell Specification (continuous)

No.	Items	Specifications			Remark
13	Operation temperature and relative humidity range	Charge	0~45℃ 60±25%R.H.		Charge at a very low temperature such as blew 10℃,will be get a lower capacity and reduce cycle life of the battery.
		Discharge	-10~55℃ 50±25%R.H.		
14	Storage temperature for a long time	25±5℃ 60±25%R.H.			Do not storage exceed half year. Must charge once when storage for half year. Must charge the battery which with protect circuit when storage for three months.
15	Discharge performance at different temperature	-10℃	50%		0.2C CC to 4.35V, and CV to 0.02C cut off at 25±2℃, standby 2hrs separately at different temperature, then perform 0.2C discharge to 3.0V(-10℃ discharge 2.75V), Ratio(%) in different temperature is the discharge capacity at relative temperature over capacity at 25℃.
		0℃	80%		
		25℃	100%		
		55℃	95%		
16	The reversible capacity at different temperature	30℃-45℃	3 months	80%	Charging by standard charging method to 50%-60% of the nominal capacity, then storage at different temperature and time, testing the reversible capacity
		-20℃-30℃	1 year	70%	

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5. Dimension and PCM Specification

a) Dimension Drawing

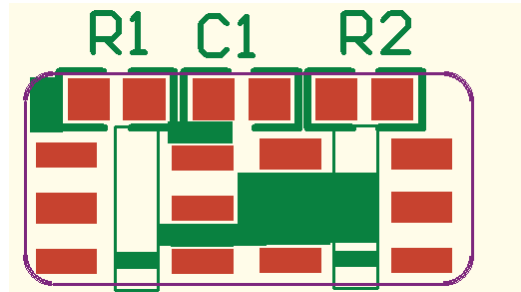


b) Parts List

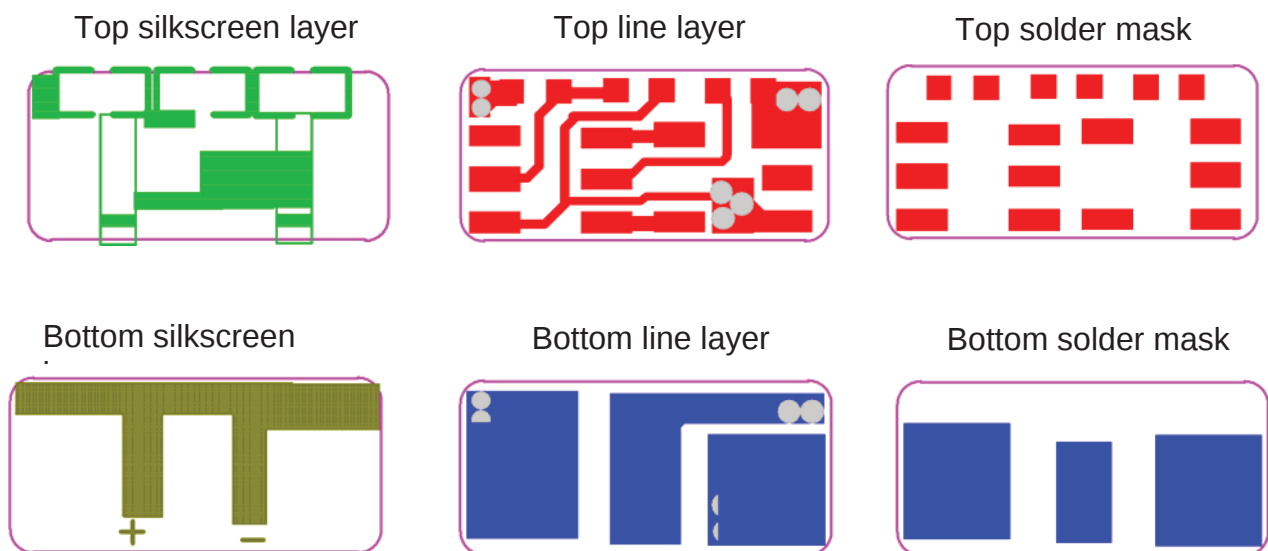
No.	Part Name	Description	Quantity
1	Cell	PL601033/170mAh	1
2	Wire	Black wire and Red wire: UL1571 30#	1
3	PCM	JXK-HHX-0838	1

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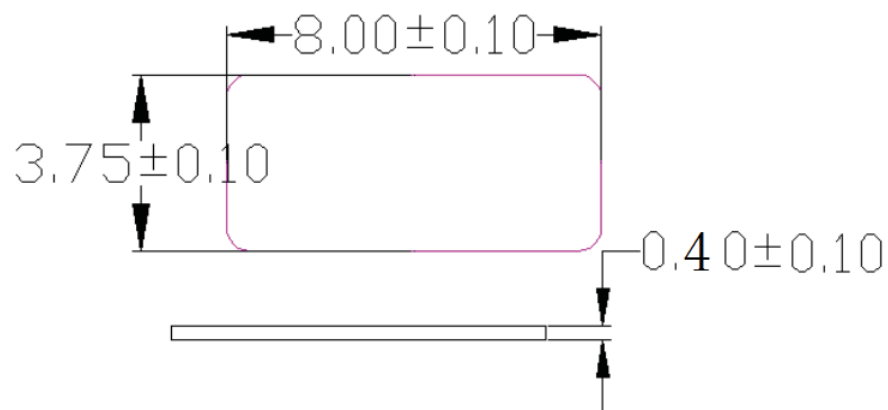
c) Pad Description



d) PCB wiring scheme



e) PCB Structure Chart



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f) PCM Specification

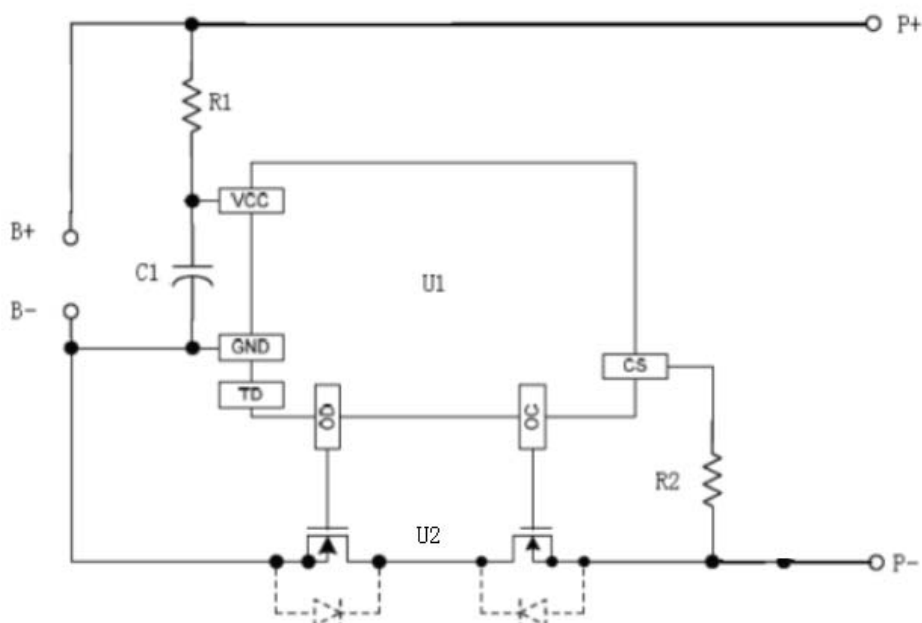
Item	Content	Symbol	Criterion			Unit
			Max.	Type Value	Max.	
Over charge protection	Over charge detection voltage	V_{DET1}	4.325	4.350	4.375	V
	Over charge detection delay time	tV_{DET1}	0.7	1.0	1.3	s
	Over charge release voltage	V_{REL1}	4.100	4.150	4.200	V
Over discharge protection	Over discharge detection voltage	V_{DET2}	2.45	2.500	2.55	V
	Over discharge detection delay time	tV_{DET2}	14.0	20.0	26.0	ms
	Over discharge release voltage	V_{REL2}	2.90	3.00	3.10	V
Over current protection	Over current detection voltage	V_{DET3}	0.185	0.200	0.215	V
	Over current detection current	I_{DP}	2.0	4.0	6.0	A
	Delay of excess discharge-current	tV_{DET3}	8.0	12.0	16.0	ms
Short protection	Protection conditions	T_{SHORT}	230	300	500	μS
	Release condition	/	Cut short circuit or recovering recharge			
Interior resistance	Main loop electrify resistance	R_{DS}	30	45	60	m Ω
Current consumption	Current consume in normal operation	I_{DD}	/	1.5	7.0	μA
Quiescent current	Current consume in sleeping	I_{PWN}	/	/	0.1	μA

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g) PCM Material List

No.	Material Name	Material Code	Part	Qty.	Manufacturer
1	Protection IC	U1	5031E(R5478N102CD)/SOT-23-6	1	RICOH
2	MOSFET	U2	DP8205/SOT-23-6	1	DePuWei
3	Resistance	R1	330Ω±5%/0402	1	GuoJu
4	Resistance	R2	1KΩ±5%/0402	1	GuoJu
5	Capacitance	C1	0.1μF/±20%/16V/0402	1	GuoJu
6	PCB	PCB	JXK0314A-HHX0838R,FR4,8*3.75*0.4mm, Lead-Free HASL, Yellow Oil, White letter, 2 layers, thickness 1.0 OZ, ROHS	1	FSW

h) Typical Circuit Diagram



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6、Battery/Cell performance test Criteria

a) Appearance inspection by visual

There shall be no such defect as flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

b) Environmental test condition

Unless otherwise specified, all test stated in this product specification are conduct at below test condition.

Temperature: 20℃~25℃

Relative Humidity: 60%±25% R.H.

c) Cell Electrical characteristics

No	Items	Test Method and Condition	Criteria	
1	Rated Capacity at 0.2C(Min.)	After standard charge, the capacity shall be measured on 0.2C discharge till the voltage discharge to 3.0V.	≥170mAh	≥100%
2	Cycle Life	Test condition(25±2℃): Step1: 0.2C constant current,4.35V constant voltage charge to 4.35V,continue charging till current decline to ≤0.02C; Step 2: standby 10min; Step3: discharge the cell at 0.2C to 3.0V; Step 4: standby 10min; Step5: repeat step1 to step4 for 300 times. measure the capacity of 1st cycle capacity at 0.2C discharge of operation.	≥80% of initial capacity ≤10.0% the thickness of the rate of change	

d) Mechanical characteristics

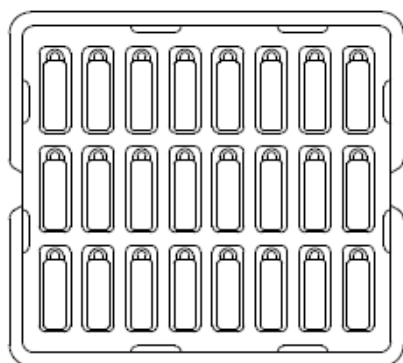
No	Items	Test Method and Condition	Criteria
1	Free fall test	The battery to be fully charged in accordance with standard charge condition, then drop the battery three times from a height of 1m onto a Board. The batteries are dropped so as to obtain impacts in random orientations.	No Fire, No leakage, No Explosion
2	Vibration test	After standard charging, fixed the 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 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.	No Fire, No leakage, No Explosion
3	Crush test	Fully charged the battery in accordance with standard charge condition, the battery is to be crushed between two flat plates. Continuous to applied force on battery of 13kN(17.2Mpa),stopped until a pressure reading of 17.2Mpa is reached on the hydraulic ram.	No Fire, No Explosion
4	Overcharge test	Test method: To charge the standard charged cell with 170mA constant current until cell voltage reaches 4.6V, then be charged at constant voltage of 4.6V while tapering the charge current at 25℃ for 2.5hrs.	No Fire, No Explosion

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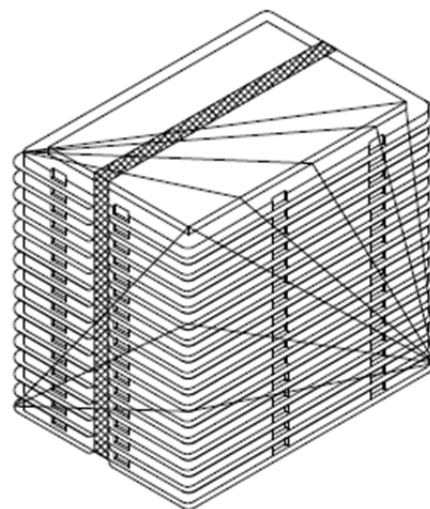
7、Packaging



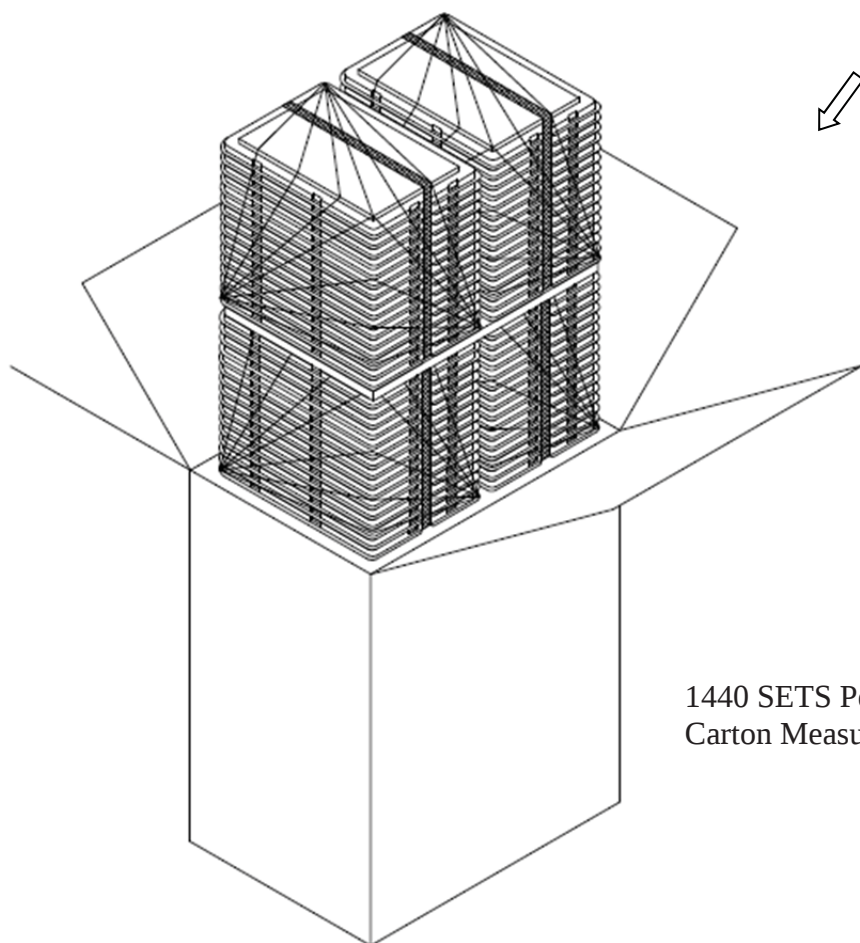
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24 SETS Per Display Tray
Display Tray Measure: 182*164*10.5mm



360 SETS / Bundle



1440 SETS Per Carton
Carton Measure: 342*196*228mm

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8、Handling of Cells

8.1 Consideration of strength of film package

1) Soft Aluminium foil

Easily damaged by sharp edge parts such as pins and needles, Ni-tabs, so don't strike by those sharp parts.

2) Sealed edge may be damaged by heat above 100°C, bend or fold sealed edge.

8.2 Prohibition short circuit

Never make short circuit cell. It generates very high current which causes heating of the cells and may cause electrolyte leakage, gassing or explosion that are very dangerous.

The LIP tabs may be easily short-circuited by putting them on conductive surface.

Such outer short circuit may lead to heat generation and damage of the cell.

An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

8.3.Mechanical shock

LIP cells have less mechanical endurance than metal-can-cased LIB.

Falling, hitting, bending, etc. may cause degradation of LIP characteristics.

8.4 Handling of tabs

The battery tabs are not so stubborn especially for aluminium tab.

Don't bend tab. Do not bend tabs unnecessarily.

9、Notice for Designing Battery Pack

9.1 Pack toughness

Battery pack should have sufficient strength and the LIP cell inside should be protected from mechanical shocks.

9.2 Cell fixing

The LIP cell should be fixed to the battery pack by its large surface area.

No cell movement in the battery pack should be allowed.

9.3 Inside design

No sharp edge components should be inside the pack containing the LIP cell.

9.4 Tab connection

Ultrasonic welding or spot welding is recommended for LIP tab connection method.

Battery pack should be designed that shear force are not applied to the LIP tabs.

If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

- 1) The solder iron should be temperature controlled and ESD safe;
- 2) Soldering temperature should not exceed 350°C;
- 3) Soldering time should not be longer than 3s;
- 4) Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;
- 5) Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 80°C.

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9.5 For mishaps

Battery pack should be designed not to generate heat even when leakage occurs due to mishaps.

- 1) Isolate PCM (Protection Circuit Module) from leaked electrolyte as perfectly as possible.
- 2) Avoid narrow spacing between bare circuit patterns with different voltage.(Including around connector)

LIP battery should not have liquid from electrolyte, but in case If leaked electrolyte touch bare circuit patterns, higher potential terminal material may dissolve and precipitate at the lower potential terminal, and may cause short circuit. The design of the PCM must have this covered.

10、 Notice for Assembling Battery Pack

Shocks, high temperature, or contacts of sharp edge components should not be allowed in battery pack assembling process.

11、 Others

11.1 Cell connection

- 1) Direct soldering of wire leads or devices to the cell is strictly prohibited.
- 2) Lead tabs with pre-soldered wiring shall be spot welded to the cells.

Direct soldering may cause damage of components, such as separator and insulator, by heat generation.

11.2 Prevention of short circuit within a battery pack

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack shall be structured with no short circuit within the battery pack, which may cause generation of smoke or firing.

11.3 Prohibition of disassembly

- 1) Never disassemble the cells.

The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, explosion, or other problems.

- 2) Electrolyte is harmful.

LIP battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

11.4 Prohibition of dumping of cells into fire

Never incinerate nor dispose the cells in fire. These may cause explosion of the cells, which is very dangerous and is prohibited.

11.5 Prohibition of cells immersion into liquid such as water

The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

11.6 Battery cells replacement

The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

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11.7 Prohibition of use of damaged cells

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more.

The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

12、 Period of Warranty

The period of warranty is a year from the date of shipment. CHUNG PAK guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer abuse and misuse.

13、 Storage of the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity. We recommend that batteries be charged about once per half a year to prevent over discharge.

14、 Other The Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

15、 Note

Any other items which are not covered in this specification shall be agreed by both parties.