



Customer:

Li-ion Polymer Battery Specification

Model: HPL402323-2C-190mAh

Checked & Approved by	Prepared by	Date

History of revisions					
Edition	Prepared by	Approved by	Date	Modify reasons	Modify content

Client Confirmation	
Date	



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1.Scope

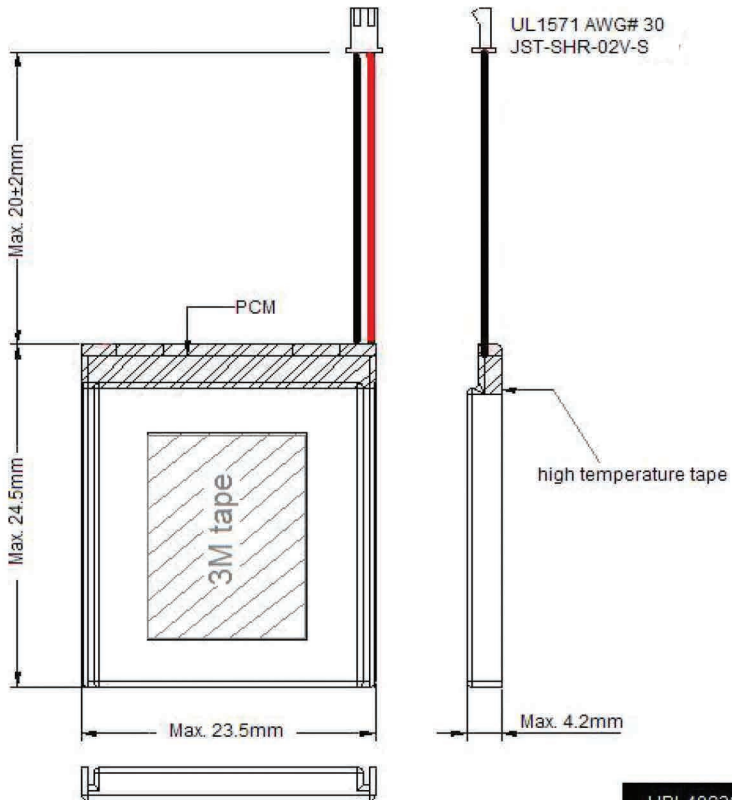
This specification is applied to HPL402323-190mAh battery.

2.Product Configuration

No.	Item	Criteria
1	Li-ion Polymer Cell	HPL402323-2C-190mAh 3.7V
2	PCM	MOS:8205, IC: G3J
3	Wire & Connector	UL1571 AWG 30, 20 ± 2 mm with JST-SHR-02V-S
4	3M Tape	3M double-side adhesive tape, dimension: $20 \times 10 \times 0.2$ mm

3.Product Dimension

3.1Pack Dimension



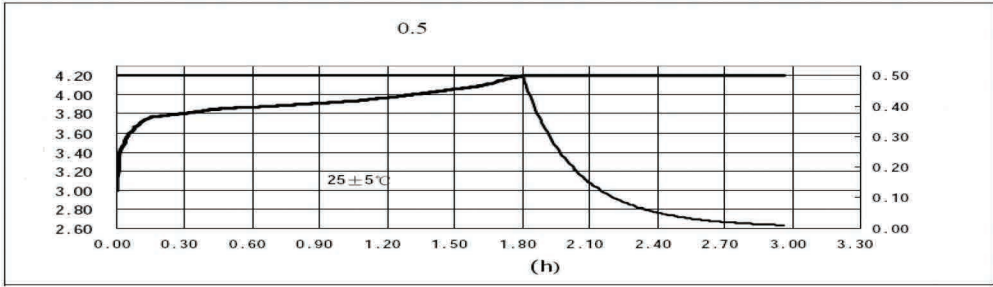
- HPL402323-2C
3.7V 190mAh
+ "Date Code"

4.Product Specification

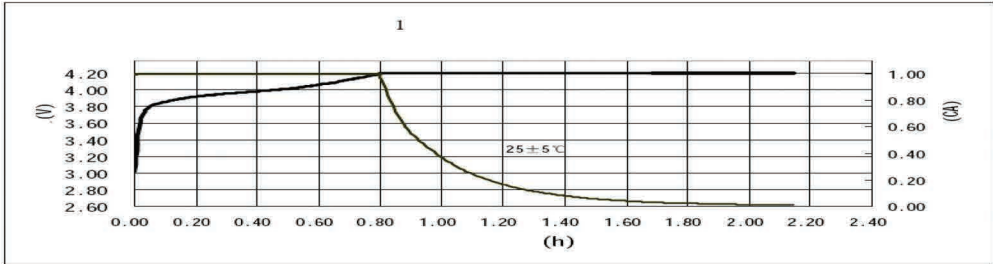
4.1 Specification Table 1

No.	Item	Rated Performance		Remark
1	Rated Capacity	Typical	190mAh	Discharge at 0.2C ₅ A after standard charge fully.
		Minimum	190mAh	
2	Nominal Voltage	3.7V		Mean operation voltage during standard discharge.
3	Voltage at end of Discharge	3.0V		Discharge cut-off voltage.
4	Charging Voltage	4.2±0.03V		
5	AC (1KHz) Impedance New Cell Max.(mΩ)	≤250mΩ		
6	Standard Charge	Constant Current 0.5C ₅ A Constant Voltage 4.2V 0.01 C ₅ A cut-off		Charge time: Approx 4.0h.
7	Standard Discharge	Constant current 0.2 C ₅ A end voltage 3.0V		Discharge time: Approx 6.0h.
8	Fast Charge	Constant Current 1C ₅ A Constant Voltage 4.2V 0.01 C ₅ A cut-off		Charge time: Approx 2.5h.
9	Fast Discharge	Constant current 2C ₅ A end voltage 3.0V		
10	Maximum Continuous Charge Current	1.0C ₅ A		
11	Maximum Continuous Discharge Current	2.0C ₅ A		
12	Operation Temperature Range	Charge: 0~45℃		60±25%RH.
		Discharge: -20~60℃		
13	Storage Temperature Range	Less than 1 year: -20~25℃		60±25%RH.
		Less than 3 months: -20~40℃		
		1 Week: -20~60℃		
14	Storage Humidity Range	60±25%RH.		
15	Weight	Approx: 4.5 g		Whole product
16	Product Dimension	Thickness: Max. 4.2mm		Initial dimension
		Width: Max.23.5mm		
		Length:Max.24.5mm		

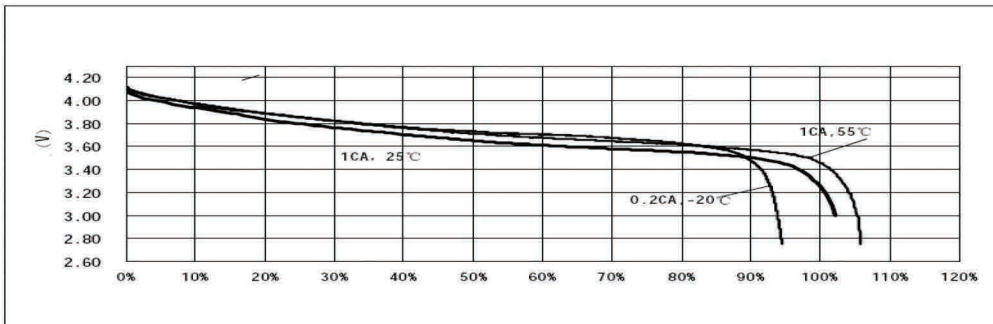
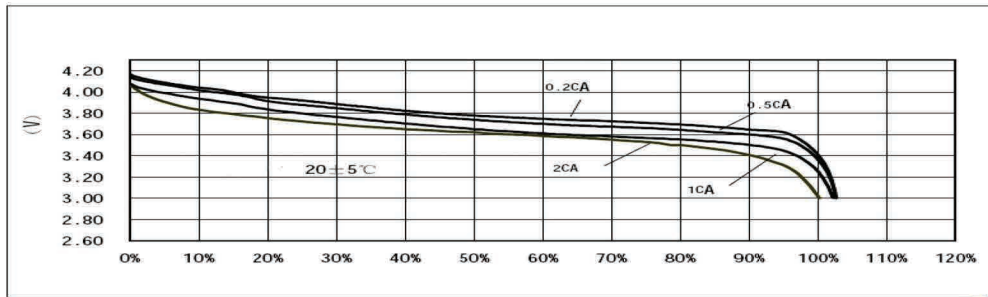
4.2 Characteristic Curves



a 0.5C



b 1C



5. Performance and Test Conditions

5.1 Standard Test Conditions

Test should be conducted with new batteries within one week 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 $20\pm5^{\circ}\text{C}$ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30°C and humidity 25~85%RH.

5.2 Measuring Instrument or Apparatus

5.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

5.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10kΩ/V.

5.2.3 Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

5.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1 kHz LCR meter).

5.3 Standard Charge\Discharge

5.3.1 Standard Charge: Test procedure and its criteria are referred as follows:

$$0.5C_5A = 95\text{mA}$$

Charging shall consist of charging at a 0.5C₅A constant current rate until the cell reaches 4.2V. The cell shall then be charged at constant voltage of 4.2V while tapering the charge current. Charging shall be terminated when the charging current has tapered to 0.01C₅A. Charge time: Approx 4.0 h. The cell shall demonstrate no permanent degradation when charged between 0 °C and 45 °C.

5.3.2 Standard Discharge

$$0.2C_5A = 38\text{mA}$$

Cells shall be discharged at a constant current of 0.2C₅A to 3.0V @ 20°C.

5.4 Appearance

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

5.5 Initial Performance Test

Table 2

Item	Measuring Procedure	Requirements
(1) Open-Circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	$\geq 3.85\text{V}$
(2) AC Impedance Resistance	The Impedance shall be measured in an alternating current method (1kHz LCR meter) after standard charge at $20\pm5^{\circ}\text{C}$.	$\leq 250\text{m}\Omega$
(3) Nominal Capacity	The capacity on 0.2C ₅ A discharge shall be measured after standard charge at $20\pm5^{\circ}\text{C}$.	Discharge Capacity $\geq 190\text{mAh}$

5.6 Temperature Dependence of Capacity (Discharge)

Cells shall be charged per 5.3.1. and discharged @ 0.2C₅A to 3.0V. except to be discharged with

temperature per Table 3 below. Cells shall be stored for 3 hours at the test temperature prior to discharging and then shall be discharged at the test temperature. The capacity of a cell at each temperature shall be compared to the capacity achieved at 23 °C and the percentage shall be calculated. Each cell shall meet or exceed the requirements of Table 3.

Table 3

Discharge Temperature	-20°C	0°C	23°C	60°C
Discharge Capacity (0.2 C _{5A})	50%	80%	100%	100%

5.7 Cycle Life and Leakage-Proof

Table 4

No.	Item	Criteria	Test Conditions
1	Cycle Life (0.5 C _{5A})	Higher than 70% of the Initial Capacities of the Cells	Carry out 500 cycle charging/ Discharging in the below condition. ◆ Charge: 0.5C _{5A} cc to 4.2V; 4.2V cv to 0.05 C _{5A} ◆ Discharge: 0.5 C _{5A} to 3.0V ◆ Rest Time between charge/ discharge:30min. ◆ Temperature:20±5°C
2	Leakage-Proof	No leakage (visual inspection)	After full charge, store at 60±3°C 60±10%RH for 1month.

6. PCM Specification




6.1 Using scope: The document applies to Li-ion Battery protection module

6.2 Battery capacity: 190mAh

6.3 Environment request: RoHS

6.4 Function description: Over charge protection, Over discharge protection, Over current protection
Short circuit protection

6.5 Electric features:

IC:	G3J	parameter value			
Protection		25℃			
IC:		General temperature 25℃			
item		Min.	Type value	Max.	Unit
Over charge protection voltage		4.250	4.275	4.300	V
Over charge release voltage		4.150	4.175	4.200	V
Over discharge protection voltage		2.25	2.30	2.35	V
Over discharge release voltage		2.35	2.40	2.45	V
Over current detection voltage		0.085	0.100	0.115	V
Over current protection current		1	2	3	A
Over charge protection delay time		0.96	1.2	1.4	s
Over discharge protection delay time		115	144	173	ms
Over current protection delay time		7.2	9	11	ms
Short protection delay time		150	320	540	us
Current consumption (Operation)		1.0	3.5	7.0	uA
Current consumption (Power down)				0.1	uA
Impedance			60	75	mΩ
Input voltage(B+ to B-)		-0.3		12	V
Max continuous charge current				1.5	A
Max continuous discharge current				1.5	A
Operating temperature		-40		+85	℃
Recommendatory storage condition		Temperature range: -5 ~ +35 ℃ Humidity: 0% ~ 75%RH			
0V battery charge function		Available			
PTC Impedance					mΩ

6.6 Reliability test

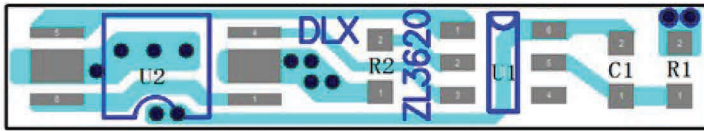
6.6.1 Humidity test: +40±2℃, 90%RH, 48h.

6.6.2 High temp. test: +55±2℃, 2h.

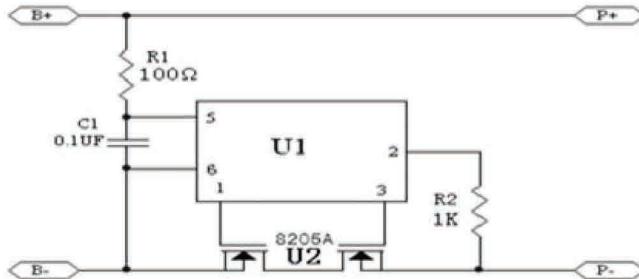
6.6.3 Low temp. test: $-20 \pm 2^{\circ}\text{C}$, 16h

6.6.4 ESD test: normal operation in all parts at $\pm 4\text{KV}$ (contact) $\pm 8\text{KV}$ (air) condition

6.7 Top overlay



6.8 Circuit diagram:



6.9 Parts list:

NO.	Description/vendor/HSF demand	Symbol	Model/Spec.	unit	Q'ty
1	PCB		HYB-2030C2/FR-4/RoHS	PCS	1
2	MOSFET/MT	U2	8205/TSSOP-8	PCS	1
3	YAGEO	R1	SMD100Ω/±5%/0402	PCS	1
4	YAGEO	R2	SMD1KΩ/±5%/0402	PCS	1
5	IC/Seiko	U1	G3J/SOT-23-6	PCS	1
6	YAGEO	C1	SMD0.1μF/ ±20%/0402	PCS	1

7.Security Testing Standard(Single Cell)

Item	Battery Condition	Test Method	Requirements
Crush	Fresh, Full charged	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 30min.	No explosion, No fire
Short Circuit 20°C	Fresh, Full charged	Each test sample battery, in turn, is to be short-circuited by connecting the (+) and (-) terminals of the battery with a Cu wire having a maximum resistance load of 0.1Ω.Tests are to be conducted at room temperature(20±2°C).	No explosion, No fire, The Temperature of the surface of the cells are lower than 150°C
Short Circuit 60°C	Fresh, Full charged	Each test sample battery, in turn, is to be short-circuited by connecting the (+) and (-) terminals of the battery with a Cu wire having a maximum resistance load of 0.1Ω.Tests are to be conducted at temperature(60±2°C).	No explosion, No fire, The temperature of the surface of the cells are lower than 150°C
Impact	Fresh, Full charged	A 56mm diameter bar is inlayed into the bottom of a 10kg weight. And the weight is to be dropped from a height of 1m onto a sample battery and then the bar will be across the center of the sample.	No explosion, No fire
Forced Discharge	Fresh, Full charged	Discharge at a current of 1C ₅ mA for 2.5h.	No explosion, No fire
Nail Pricking (3mm)	Fresh, Full charged	Prick through the sample battery with a nail having a diameter of 3mm and remain 2h.	No explosion, No fire

8. Storage and Transportation

8.1 Storage:

8.1.1 The Li-ion battery pack should be stored in a cool, dry and well-ventilated area, and should be far from the fire and the high temperature.

8.1.2 The battery should store in the product specification book stipulation temperature range, the best storage temp. is 0 to 25°C. The best humidity is 60±25%.

8.2 Transportation:

8.2.1 Do not mix the battery products with other cargos.

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

8.2.3 Do not over 7 layers staking and upside-down.

8.2.4 The highest temperature in transportation is lower than 65°C.

8.2.5 The battery is UN38.3 certified

*UN38.3 number: 16PNS06099 02001 (Fifth edition)

*Identification and Classification Report for Air Transport of Goods: PEKSZ20170714010ZF0001

*Identification and Classification Report for SEA Transport of Goods: PEKSZHY20170714007

*MSDS Report number:17PNS06099 04001

*Drop Test Report number:17PNS06099 05001

9. Use Attentions:

To ensure proper use of the battery please read the manual carefully before using it.

9.1 Handling:

9.1.1 Do not expose to, dispose of the battery in fire.

9.1.2 Do not put the battery in a charger or equipment with wrong terminals connected.

9.1.3 Avoid shorting the battery

9.1.4 Avoid excessive physical shock or vibration.

9.1.5 Do not disassemble or deform the battery.

9.1.6 Do not immerse in water.

9.1.7 Do not use the battery mixed with other different make, type, or model batteries.

9.1.8 Keep out of the reach of children.

9.2 Charge:

9.2.1 Battery must be charged in appropriate charger only.

9.2.2 Never use a modified or damaged charger.

9.2.3 Do not leave battery in charger over 24 hours.

9.2.4 Charging current: Can not surpass the biggest charging current which in this specification book stipulated.

9.2.5 Charging voltage: Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage.

9.2.6 Charge temperature: The battery must carry on the charge in the ambient temperature scope which this specification book stipulated.

9.2.7 Uses the constant electric current and the constant voltage way charge, the prohibition reverse charges. If the battery positive and cathode meet instead, it can damage the battery.

9.2.8 The battery must be stored after charged, and should be charged and discharged once every 3 months.

9.3 Discharge:

9.3.1 The discharging current does not have to surpass this specification book stipulation the biggest discharging current, the oversized electric current electric discharge can cause the battery capacity

play to reduce and to cause the battery heat.

9.3.2 Electric discharge temperature: The battery discharge must carry on in the ambient temperature scope which this specification book stipulated.

9.3.3 Over-discharges: After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity.

9.4 Disposal:

Regulations vary for different countries. Dispose of in accordance with local regulations.

10. Period of Warranty

There is a twelve-month warranty for our export batteries from the date of shipment. If the problem happened during the warranty period, we are responsible to replace the defective ones according to the accurate analysis results. However, we won't take any responsibility if the problem is caused by the battery-related applications and related products.

11. Others

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.

12. Note:

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