

Name: Lithium-Polymer Rechargeable Battery Model: AKYGA 1770-140mAh

SPEC: 3.7V / 140mAh



#### 1. Scope

This specification describes the Product Specification of chargeable Polymer Lithium-Ion Battery produced by AKYGA BATTERY.



### 2.Cell Pack specification

No.	Item	Parameters		meters
1	Cell model	1770		
2	Minimum capacity  0.2C discharge current	140mAh		
3	Typical capacity 0.2C discharge current	142mAh		1770
4	Nominal voltage	3.7V		+ 3.7V 140mAh -
5	Shipment voltage	3.9V-4.0V		YY/MM
6	Shipment SOC Status	65%~85%		
7	Charge ending voltage	4.2V		
8	Discharge ending voltage	3.00V		
9	Maximum Pack dimension	D1 : 17.2mm, H1: 7.1mm		
10	Protection IC			
11	Over current protection			
12	Short current protection			
13	Battery Impedance ( V= <b>3.9-4.0V</b> )	≤300mΩ		
14	Maximum Battery weight	3.1g		
		142mA, 1.0C		15℃≤T≤45℃
15	Max charge current	71mA, 0.5C		0°C≤T<15°C
		142mA, 1.0C		15°C≤T≤60°C
16	Max discharge current	71mA, 0.5C		0°C≤T<15°C
		29mA, 0.2C		-20°C≤T<0°C
17	Operating temperature	Charge : 0-45°C	/	Discharge : -20-60°C
18	Cycle life	25±3℃  After 500cycles charge/discharge, Battery can recover 80% of its initial capacity		
19	Storage Method	Within 6months		C~+35°C , RH : 65±20% very capacity >90%
19		Within 1 year		C~+30°C , RH : 65±20% very capacity >85%
20	Power Consumption	0.08mV/h ( within one yea	ır —	)
21	Other	TBD		



1 Nominal capacity is measures by the discharge at 0.2C to 3.0V end voltage after fully charges according to specification at 23±2°C

2 Discharged at high rate and high temperature (>45°C) frequently, Battery life will be shorten.

#### 2.1 Battery Label



MMYY: Month/Year



2.2 Cell Pack drawing



2.3 Schematic diagram of Battery packaging

**TBD** 



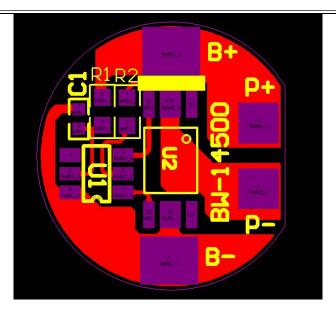
### **3.Protection Circuit Characteristics** (at 25 °C)--This specification item is option.

#### 3. 1Electrical Characteristic

Item	Symbol	Content	Criterion
Over charge Protection	V <sub>DET1</sub>	Over charge detection voltage	4.28±0.03V
	tV <sub>DET1</sub>	Over charge detection delay time	960ms~1400ms
Over discharge	$V_{\mathrm{DET2}}$	Over discharge detection voltage	3.0±0.1V
protection	$tV_{DET2}$	Over discharge detection delay time	80ms~208ms
	V <sub>DET3</sub>	Over current detection voltage	6.5±9.5mv
Over current protection	$I_{DP}$	Over current detection current	MIN:1. A MAX:3.0A
	tV <sub>DET3</sub>	Detection delay time	7.2ms~11ms
		Release condition	Cut load
		Detection condition	Exterior short circuit
Short protection	$T_{SHORT}$	Detection delay time	450us(MAX)
		Release condition	Cut short circuit
Interior resistance	R <sub>DS</sub>	Main loop electrify resistance(V <sub>C</sub> =3.9V)	B− P− R <sub>DS</sub> ≤ 65m Ω
Current consumption	$I_{DD}$	Current consume in normal operation	MIN: 0.3 µ A MAX: 6.0 µ A

#### 3.2 PCB Pad description



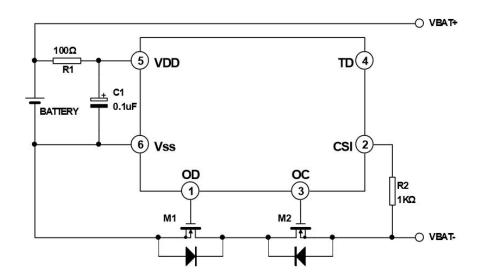




#### 3.3 PARTS LIST

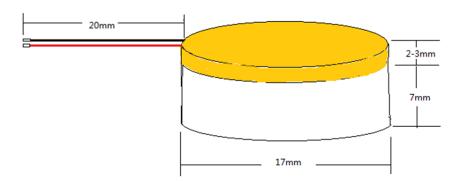
1	IC	U1	G3J/S0T-23-6	1	
2	MOSFET	U2	8205A/TSSOP-8	1	
3		R1	$100\Omega \pm 5\%/0603$	1	
4		R2	$1 \text{K} \Omega \pm 5 \% / 0603$	1	
5		C1	0. 1 μ F/±20%/0603/50V	1	
6		PCB	BW-14500	1	

#### 3.4 Application Circuit



### 4.Pack Drawing

4.1 Soft pack drawing (Product Outer Dimension: Diameter=17mm, Height=10mm.)





### 4.2BOM of Product

	Item	Model	Specification	Remarks
1	lead wire	32#( UL1571)	Line length: 20±3mm 2P(Red and black)	1
2	PCM	Li-ion single cell PCM	Over Voltage Protect: 4.28±0.03V Over Discharge Protect: 2.4±0.1V	1
3	Tape	Kapton	See figure	
4	Cell	1770	140mAh	1

### **5.Environmental characteristics**

No.	Test item	Test Method	Pass Criteria
1	Charged Storage Characteristics	Battery is fully charged by standard charge process. Battery idle at 25±3°C for 28days.  At 25±3°C, Battery is discharged Battery by 0.2C until 3.0V.	Discharge time≥4.25hrs



### 6 . Safety Test (n=1)

Battery can meet several international safety standards. Below is part of safety tests which are referred to international standard.

No.	Test item	Test Method	Criteria
1	Constant Humidity and Temperature test	Battery is fully charged by standard charge process. Then ,Battery is put into chamber with constant humidity $(90\sim95\%)$ and temperature $(40\pm2^{\circ}\text{C})$ for 48hrs. After test, Battery idle for 2hrs at $25\pm3^{\circ}\text{C}$ and discharge by 0.2C to 3.0V.	After test, Battery can discharge ≥3hrs No fire, No leakage, No explosion
2	Overcharge Test	Battery is fully charged by standard charge process.  Then, the Battery is charged by 3.0C rate constant current and voltage to 4.6V for 7hrs.	No fire, No explosion
3	Over discharge Test	At 25±3°C, Battery is discharged by 0.2C until 3.0V. And then Battery is connected the load with $30\Omega$ to discharge for 7hours.	No fire, No leakage, No explosion



4	Short test	Battery is fully charged by standard charge process. Then, Battery anode and cathode connected to $<\!100\text{m}$ $\Omega$ load for 1hour.	
5	Projectile Test	Battery is fully charged by standard charge process.  Battery is placed on the screen which is to be constructed by steel wire mesh. The screen is mounted above the burner. And eight-sided covered wire cage is to be placed over the Battery.  Battery is to be heated and remain on the screen until it explodes or has been ignited or burned out.	No part of an exploding Battery shall penetrate the wire screen.
6	Drop Test	Battery is fully charged by standard charge process.  Battery is free fall from a height of 1m on the cement floor, from X-axis, Y-axis positive and negative direction.  Each direction is free fall 1 time.	No deformation,  No fire, No explosion, No leakage



7	Crush test	Battery is fully charged by standard charge process.  The Battery is to be crushed with its longitudinal axis parallel to the surfaces of crushing apparatus.  The surfaces are to be bought in contact with Battery and the crushing is to be continued until an applied force of 13±1kN is reached. Once the maximum force has been obtained, it is to be released.	No fire, No explosion
8	Shock test	Battery is fully charged by standard charge process.  Battery is secured to the testing machine by means of a rigid mount which will support all mounting surfaces of the Battery. The Battery is subjected to a total of two shocks of equal magnitude. The shocks are to be applied in each of two mutually perpendicular directions. For each shock the Battery is accelerated in such a manner that during the initial 3ms the minimum average acceleration is 75g. The peak acceleration shall be between 125 g and 175 g. Battery is tested at 20±5°C	No fire, No explosion ,



#### 7 . Performance and Test Criteria

#### 7.1 Standard Test Criteria

If test criteria is not defined, test should be done under the below standard test criteria.

Test Criteria	Parameters
Ambient Temperature	25±3℃
Relative Humidity	65±20%
Atmospheric pressure	86 ~ 106 KPa
Charge	Standard charge process
Discharge	Standard discharge process

### 7.2 Visual Inspection

No crack , no leakage

### 7.3 Measuring Instrument Standard

Instrument	Standard
Instrument to measure dimension	Precision scale : 0.01mm
Voltmeter	Internal impedance < 10kΩ/V
Ammeter	Impedance of ammeter and wires $< 0.01\Omega$
Impedance meter	Impedance is measured by sinusoidal 1kHz AC current



#### 7.4 Standard charge process

Battery is charged by 0.2C constant current at  $25\pm3^{\circ}$ C until 4.2V. Then, Battery is charged by constant voltage until current drop to 0.02C.

#### 7.5 Standard discharge process

Battery is discharged by 0.2C continuous current at 25±3°C until the voltage drop to 3.0V.

#### 7.6 Maximum charge current

Battery is charged by 1.0C constant current at 25±3℃ until 4.2V. Then, Battery is charged by constant voltage at 4.2V until current drop to 0.02C.

#### 7.7 Maximum discharge current

Battery is discharged by 1.0C continuous current at 25±3°C until the voltage drop to 3.0V.

#### 7.8 Initial impedance

Battery is fully charged by standard charge process.

The impedance of fully charged Battery is tested by AC impedance tester at 1kHz. The initial impedance should be  $\leq 300 \text{m}\Omega$ .

#### 7.9 Initial capacity

Battery is fully charged by standard charge process and then Battery is fully discharged by standard discharge process.

The initial capacity is≥140mAh.



### 7.10 Cycle life

Test procedure

Step 1: Battery is charged by 1C constant current at  $25\pm3^{\circ}$ C until 4.2V. Then, Battery is charged by constant voltage at 4.2V until current drop to 0.02C.

Step 2: Wait for 10mins

Step 3: Battery is discharged by 0.5Ccontinuous current at 25±3℃ until the voltage drop to 3.0V.

Step 4: Wait for 10mins

Step 5: Repeat step1 to step 4 until discharge time is less than 80% of initial Battery capacity

Cycle life should be more than or equal to 500cycles.



#### 8. Usage of Battery

**DO NOT** take responsibility if customer **DO NOT** follow the specification and below instruction using the Battery.

To have good performance of Battery, Battery should follow this Battery specification to use and storage. Recommend to charge Battery every 6months using standard charge process.

To use the Battery safe, Battery is prohibited to disassemble, drop, heat, burn, soak, crush, shock, short circuit. Enough insulation inside the customer's end product is required to avoid the short circuit of the Battery. Battery should have enough space to install inside the customer's end product. Please use the maximum dimension of Battery after cycle life to reserve the space.

To protect the Battery, Battery should be installed in the customer's end product with strong mechanical strength.

Any movement of the Battery in the end product should be avoided.

If Battery has any abnormal feature such as Battery cannot be charged and discharge, abnormal heat generate, deformation, smelling of electrolyte or leakage, Battery should be stopped to use immediately. Battery with smelling of electrolyte or leakage should be placed away from fire. Electrolyte is harmful. If electrolyte is contacted the skin or eyes, please flush electrolyte by purified water and consult doctor.

#### 9. Warranty

Garantees the Battery at good condition within <b>12months</b> when Battery is delivered from factory.	Charge
batteries when storage is over 6 months.	



#### 10 . Others

#### 10.1 Prohibition of disassembly

- 1) Never disassemble the Battery The disassembling may generate internal short circuit in the Battery, 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.

#### 10.2 Prohibition of dumping of Battery into fire

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

#### 10.3 Prohibition of use of damaged Battery

The Battery might be damaged during shipping by shock. If any abnormal features of the Battery are found such as damages in a plastic envelop of the Battery, deformation of the Battery package, smelling of an electrolyte, an electrolyte leakage and others, the Battery shall never be used any more. The Battery with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

# 10.4 The following warning language is to be provided with the information packaged with the small Battery and batteries or equipment using them

- Keep batteries out of reach of children to avoid being swallowed, Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion. In case of ingestion of a Battery or Battery, seek medical assistance promptly.
- If children use the Battery, their quardians should explain the proper handling.

10.5 Any other items are not covered in the specification shall be agreed by both parties.