Li-ion Battery Specification

Model：26650 Battery pack
Capacity：20000mAh
Voltage：7.2V
Assembly: 2S4P+PCM+cable

1 Scope

This specification applies to the mentioned battery manufactured by General Electronics Battery Co., Ltd.

2 Product Specifications

1).Battery configuration

Model：7.2V/20000mAh

Cell: 26650 3.6V 5000mAh

Assembly Style: 2S4P+PCM +Cable（AWG22, length 100±5mm）

Pack size: 55*68*120mm

Table 1 pack

No.	Item	General Parameter		Remark
1	Nominal Capacity	Nominal Capacity	20000mAh	Standard discharge（0.2C） after standard charge
		Minimum Capacity	19000mAh	
2	Nominal Voltage	7.2V		
3	Voltage at end of Discharge	6.0V		Discharge Cut-off Voltage
4	Maximum Charging Voltage	8.6 ±0.03 V		
5	Internal Impedance	≤70mΩ		Internal impedance measured at AC 1KHz after 50% charge. The measure must use the new batteries within one week after shipment and cycled no more that 5 times.
6	Standard Charge	Constant Current: 0.2C; Constant Voltage: 8.4V; Cut-off Current: 0.02C		Charging time：Approx 5.0h
7	Standard Discharge	Constant Current: 0.2C ; Cut-off Voltage: 6.0V		
8	Fast Charge	Constant Current: 0.5C; Constant Voltage: 8.4V; Cut-off Current: 0.02C		Charging time：Approx 2.5h
9	Fast Discharge	Constant Current 1C end Voltage 6.0V		
10	Maximum Continuous Charge Current	4A		
11	Maximum Continuous Discharge Current	5A		
12	Operation Temperature Range	Charge：0~45℃		60±25%R.H. Bare Cell
		Discharge：-10~60℃		

13	Storage Temperature Range	Less than 1 year：-20~25℃	60 ± 25%R.H. at the shipment state.
		Less than 3 months：-20~40℃	
14	Weight	Approx：800g	
15	Cell Dimension Size	Height：65+0.1 −0.1mm	Pack size: 55*68*120mm
		Diameter：26+0.3 −0.05. mm	

Table 2 PCM specification

No	Device	Items	Requirements
1	Charger	Charge termination voltage	8.400±0.049V
2	Protective Circuitry (For reference only)	Overcharge detection voltage	8.55±0.025V
3		Overcharge release voltage	8.35±0.050V
4		Discharge termination voltage	6.00±0.10V
5		Over discharge detection voltage	4.6±0.08V
6		Over discharge release voltage	4.8±0.10V
7		Over discharge detection value	2.7±0.2A

3. Performance and Test Conditions

3.1 Standard Test Conditions

Tests should be conducted with new batteries within one week after shipment from our factory and the cell should not be cycled more than five times before the tests. Unless otherwise specified, test and measurement shall be done under temperature of 20±5℃ and relative humidity of 45~48%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30℃ and humidity 45-85%R.H.

3.2 Measuring Instrument or Apparatus

Dimension Measuring Instrument

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

3.3 Standard Charge/Discharge

Standard charge：Test procedure and its criteria are referred as follows：

Charging shall consist of charging at a 0.2C constant current rate until the battery reaches 8.4V. The battery shall then be charged at constant voltage 0f 4.2 volts while tapering the charge current Charging shall be terminated when the charging current has tapered to 0.02 C. Charge time： Approx 5.0h. The cell shall demonstrate no permanent degradation when charged between 0℃ and 45℃.

3.4 Standard Discharge

Batteries shall be discharged at a constant current of 0.2C to 2.5volts at 20℃±5℃.

If no otherwise specified, the rest time between Charge and Discharge amount to 10 min.

3.5 Appearance

There shall be no such defect as flaw, crack, stains, rust, leakage, deformation, which may

adversely affect commercial value of battery.

3.6 Initial Performance Test

Table 2

Item	Testing Method and Conditions	Requirements
(1)Open-circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	No less than: 7.4V
(2) Internal impedance	Internal resistance measured at AC 1KHz after 50% charged.	Less than: 44mΩ
(3)Minimal Rated Capacity	The capacity on 0.2 C discharge till the voltage tapering to6.0V shall be measured after rested for 10mins then finish standard charge.	Discharge Capacity

3.7 Temperature Dependence of discharge capacity

Cells shall be charged in accordance with 3.3.1 and discharged at 0.5 C_5A to 6.0 volts. Expect to be discharged at temperatures in accordance with Table 3. 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℃ and the percentage shall be calculated. Each cell shall meet or exceed the requirements of Table 3.

Table 3

Discharge Temperature	-20℃	0℃	23℃	60℃
Discharge Capacity(0.5C)	70%	80%	100%	90%

3.8 Cycle Life and Leakage-Proof

Table 4

No.	Item	Criteria	Test Conditions
1	Cycle Life （0.5 C）	Higher than 80% of the Initial Capacities of the Cells	Carry out 500 cycles Charging/Discharging in the below conditions. ◆ Charge: Standard Charge, per 3.3 ◆ Discharge: 0.5Cto 6.0V ◆ Rest Time between charge/discharge:10mins. ◆ Temperature: 20±5℃
2	Leakage-Proof	No leakage (visual inspection)	After full charge with standard charge, store at 60±3℃,60±10%RH for 1 month.

4. Mechanical Characteristics and Safety Test

Table5

No.	Item	Test Method and Condition	Criteria
1	Drop Test	The cell is to be dropped from a height of 1 meter 3 times to concrete ground in 3 directions: x, y, z.	No explosion. No fire. No leakage.
2	Crush	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 10 seconds.	No explosion. No fire

3	Short Circuit	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 50 mΩ. Test is to be conducted at room temperature (20℃±5℃).	No explosion. No fire. The temperature of the surface of the cells are lower than 150℃
4	Short Circuit	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. Test are to be conducted at 55℃±5℃.	No explosion. No fire. The temperature of the surface of the cells are lower than 150℃
5	Impact	A 15.8mm diameter bar is inlayed into the bottom of a 9.1Kg weight. And the weight is to be dropped from a height of 610mm onto a sample battery and then the bar will be across the center of the sample.	No explosion. No fire
6	Over Discharge	Discharge at a current of 0.5C to cut-off voltage. Then reverse charge at a current of 3C for 90mins or to a cut-off voltage of 0.2V.	No explosion. No fire
7	Over Charge	Discharge at a current of 0.5C to cut-off voltage. Then charge at a current of 1C, and the output voltage is not lower than 10V; or charge continuously for 7H but the voltage will not increase.	No explosion. No fire
8	Nail Pricking	Prick through the sample battery with a nail having a diameter of 3mm and remain 10S.	No explosion. No fire

5. Handling of Cells

Avoid short circuit.

Never make short circuit cell. It generates very strong current and causes overheat and electrolyte leakage with poisonous gas. It is very dangerous.

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

Such outer short circuit may lead to overheat and damage.

An appropriate Protective Circuit shall be employed to protect battery pack. when it is in accidental short circuit.

6. Notice for Designing Battery Pack

6.1 Pack Toughness

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

6.2 Cell Fixing

The Li-ion cell should be fixed to the battery pack by its large surface area.

No cell movement in the battery pack should be allowed.

6.3 Inside Design

No sharp edge components should be insides the pack containing the Li-ion cell.

6.4 Tab Connection

Spot welding is recommended for Li-ion tab connection method.

Battery pack should be designed that shear force are not applied to the Li-ion tabs.

If applying manual solder method to connect tab with PCM. The following notices is very important to ensure battery performance：

◆ • The temperature of solder iron should be controlled and ESD safe;

◆ • Soldering temperature should not exceed 350℃;

◆ • Soldering time should not be longer than 3s;

◆ • Soldering times should not exceed 5 times. Keep battery tab cool down before next solder;

◆ • Directly heat cell body is strictly prohibited. Battery may damaged by heat above 100℃.

6.5 For Mishaps

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

1）Isolate PCM (Protection Circuit Module) form leaked electrolyte as perfectly as possible.

2） Avoid narrow spacing between bare circuit patterns with different voltage.(Including around connector)

3）Li-ion 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 covers.

7. Notice for Assembling Battery Pack

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

8. Others

8.1 Cell Connection

1）Direct soldering of wire leads or devices to the cell is strictly prohibited.

2) Lead tabs with pre-soldering may cause damage of components, such as separator and insulator by heat generation.

8.2 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.

8.3 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.

Li-ion 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

8.4 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.

8.5 Battery Replacement

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

8.6 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.

9．Period of Warranty

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

10．Storing 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.

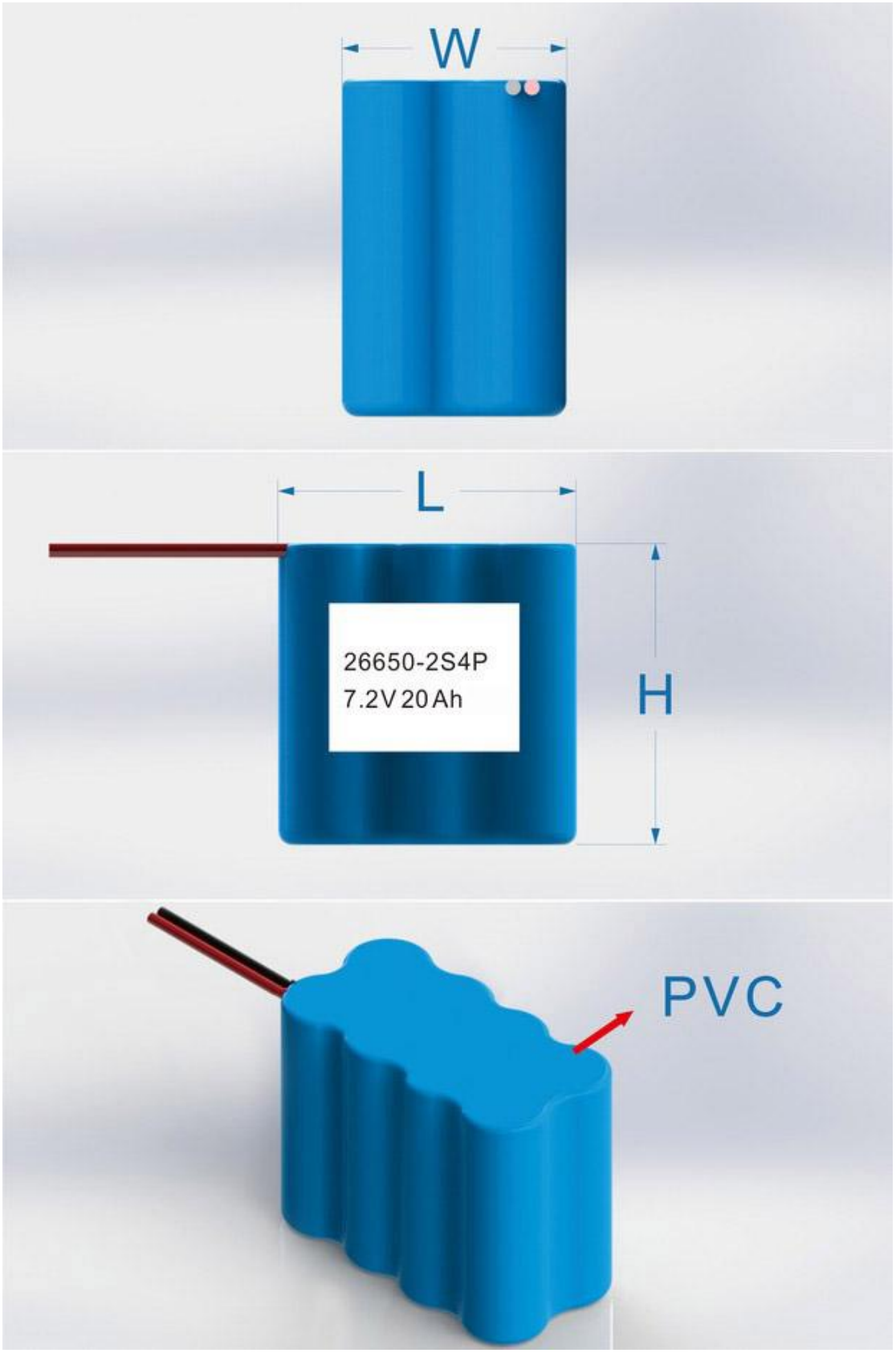
11．Other The Chemical Reaction

Because batteries utilize a chemical reaction, battery performance would lower as time goes by even if batteries stored for a long period of time without being used. In addition, if the various usage conditions such as charge, 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 speciation shall be agreed by both parties.

Battery pack dimensions with unit in mm



Item	Description	Dimension (mm)
H	Height	65~68
W	Width	52~55
L	Length	115~120
D	Lead wire length	100
Lead wire model : AWG 22 #		