

**Lithium-ion Battery Pack
Specification**

Model: PCLI18650-3S-LG

ZEUS CONFIDENTIAL

Amendment History

Rev	Description	Date	Name
Pre 1.0	Initial Draft	2/12/2018	Kevin Oh
Pre 1.1		3/18/2018	Kevin Oh
A.1		5/3/2018	Kevin Oh

Customer Approval

Company/Customer Name	Department	Date	Signature

- **For Air Shipments** A 30% state of charge (SOC) limit on secondary lithium-ion cells and batteries, including Section II cells and batteries, will now apply. This does not apply to batteries packed with or contained in equipment (Effective April1, 2016).
- Lithium cells/battery packs must be charged within 45 days of receipt to avoid over discharge.
- Shipping lithium materials must be done through a licensed shipper with appropriate packaging & labeling to meet current regulations.

These amendments are detailed in a lithium battery update document found on the International Air Transport Association (IATA) website: <http://www.iata.org/whatwedo/cargo/dgr/Documents/lithium-battery-update.pdf>

191 Covington Drive, Bloomingdale, IL 60108
Phone: 630-295-6800 Fax: 630-295-6801
Toll Free: 877-469-4255

1. Scope

This product specification applies to rechargeable Lithium-ion battery supplied by Zeus Battery Products.

2. Description and Model

Model: PCL18650-3S-LG

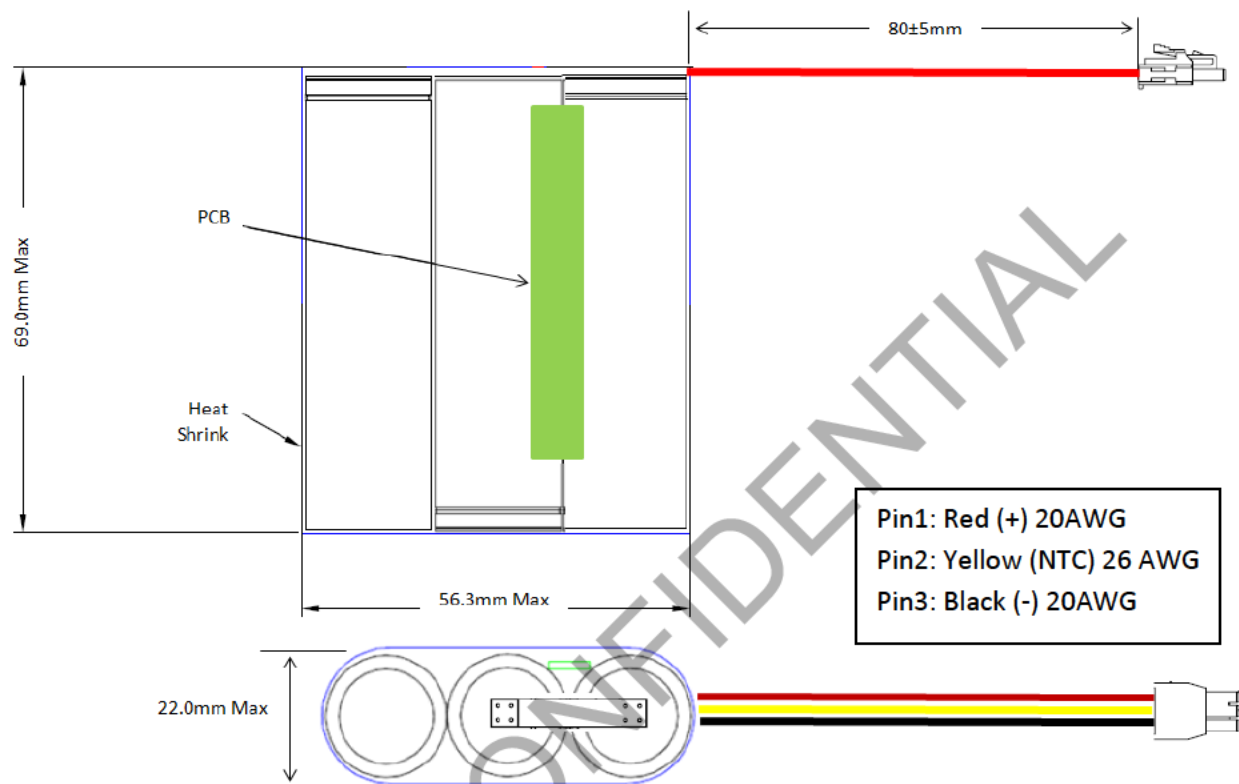
Description: 11.1V 3200mAh (35.52Wh)

3. Nominal Specifications

No.	Item	Specification	Remark
1	Nominal Capacity	3200mAh	@ 0.2C discharge, room temperature
2	Nominal Voltage	11.10V	3.7V/cell. Pack configuration: 3S1P
3	Charge Voltage	12.60V	4.20V/cell
4	Standard Charge current	1.00A	
5	Max. continuous charge current	2.00A	
6	Max. discharge current	6.00	<10sec
7	Discharge cut-off Voltage	7.80V	2.6V/cell
8	Internal resistance	≤280mΩ	
9	Weight	Approx. 0.18Kg	
10	Operating temperature	Charge: 0 ~ 45°C Discharge: -20 ~ 55°C	
11	Storage temperature	1 yr: -10 ~ 25°C 6 months: 25 ~ 45°C 1 month: 45 ~ 55°C	Recommended 25+/-5°C at 50% SOC
12	Cycle Life	≥500 cycles	@ 0.2C discharge, room temperature

***Note on Air transport: Lithium ion cells and batteries must be offered for transport at a state of charge (SOC) not exceeding 30% of their rated design capacity**

4. Battery Dimension



191 Covington Drive, Bloomington, IL 60108
Phone: 630-295-6800 Fax: 630-295-6801
Toll Free: 877-469-4255

5. Protection Parameters

Item	Content	Criterion
Over charge protection	Over charge detection voltage	4.25+/-0.025V
	Detection delay time	1.5sec Max.
	Release voltage	4.15+/-0.05V
Over discharge protection	Over discharge detection voltage	2.75+/-0.08V
	Detection delay time	115-173ms
	Release voltage	3.0+/-0.10
Over current protection	Over current detection voltage	100+/- 30mV
	Detection current	10+/-3A
	Detection delay time	50.0ms Max
	Release condition	Cut load
Short circuit protection	Detection condition	External short circuit
	Detection delay time	600us
	Release condition	Remove short circuit
Internal resistance	Main loop resistance	Vc=4.2V; RDS≤70mΩ
Current consumption	Consumption under normal operation	20uA Max.
Over discharge release function	Non-Latch	-----

7. Standard Test Conditions

7.1 Environmental Conditions

Unless otherwise specified, all tests stated in this specification are conducted at 25±5°C and 60±20% humidity.

7.2 Measuring Equipment

1) Ammeter and Voltmeter

Standard class specified in the national standard or more sensitive class

2) Slide caliper

The slide caliper should have 0.01mm accuracy.

3) Impedance meter

An impedance meter with 1kHz AC should be used.

8. Environmental Tests

No	Items	Test Method and Condition	Criteria
1	Free fall test	The battery is to be fully charged in accordance with standard charge condition, then drop the battery three times from a height of 1.0 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations.	No Fire,
2	Vibration test	After standard, install battery on the vibration table; adjust the equipment according to the following vibration and amplitude frequency. From X,Y,Z three directions in 10Hz~55Hz sweep vibration to sweep for 30mins with the sweep frequency speed rate at 1oct/min. Vibration frequency: 10Hz~30 Hz(single amplitude) Displacement amplitude(single): 0.38mm; Amplitude frequency: 30Hz~55 Hz(single amplitude) Displacement amplitude (single): 0.19mm	No explosion, No leakage, No fire
3	Shock Test	Fix the battery through the fixture from the three perpendicular X,Y,Z axes respectively to the vibration table, then following the requests below to adjust the acceleration, pulse duration time for crash test: Pulse peak acceleration: 100m/s ² , Collision frequency per min: 40~80 Pulse duration time: 16mins collision Frequency: 1000±10	No explosion, No fire

4	Shock test	The fully charged battery is to be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of the cell or battery. The battery is subjected to a total of three shocks of equal magnitude. The shocks are applied in each of three mutually perpendicular directions. At least one of them shall be perpendicular to a flat face. For each shock the cell or battery is accelerated in such a manner that during the initial 3 milliseconds the minimum average acceleration is 75gn. The peak acceleration shall be between 125gn and 175gn. Cells or batteries are tested in an ambient temperature of 20~25°C	No explosion, No leakage, No fire
---	------------	--	-----------------------------------

9. Battery Handling Warning and Precautions

The battery contains flammable materials such as organic solvents. Mishandling the battery may cause fire, smoke, or an explosion and the battery's functionality will be seriously damaged. Protection circuitry must be designed into the application device to protect the battery. Please read and check the following prohibited actions

(1) Immersion

Do not immerse the battery in liquid such as water, beverages, or other fluids. Exposure to liquid may damage the battery or the battery pack (including protection circuit). As a result, the battery may generate heat, smoke, catch fire, or explode.

(2) High Temperature

Do not use or place the battery near an open flame, heater or high temperature (above 80°C). Subjecting the battery to high temperature may damage the separator and can cause an internal short circuit. This may cause the battery to generate heat, smoke, catch fire, or explode.

(3) Chargers and Charge Conditions

Do not use unauthorized chargers. Only charge the battery within specified conditions (e.g., temperature range, voltage, and current). Use of an unauthorized charger could cause the battery to generate heat, smoke, catch fire, or explode.

(4) Reverse Polarity

Do not attach or insert battery with polarity reversed. A battery has polarity. If the battery does not easily fit into the charger or device, check the battery's orientation. Do not force the battery into the battery compartment. If attached to the device with reversed polarity, the battery may generate heat, smoke, catch fire, or explode.

(5) Direct Connection

Do not connect the battery to an AC outlet or DC automotive plug. The battery requires a specific charger. If the battery is connected directly to a power outlet, the battery may generate heat, smoke, catch fire, or explode.

(6) Use in Other Equipment

Do not use the battery in equipment for which it was not intended.

191 Covington Drive, Bloomingdale, IL 60108
Phone: 630-295-6800 Fax: 630-295-6801
Toll Free: 877-469-4255

If the battery is used in unapproved applications or systems, the battery may become damaged and generate heat, smoke, catch fire, or explode.

(7) Incineration and Heat

Keep the battery away from heat and fire.

Heat will damage the battery and may cause it to generate heat, smoke, catch fire, or explode.

(8) Short-Circuit

Do not apply a short-circuit.

Do not connect the positive (+) and negative (-) terminals with a conductive material. Do not carry or store the battery with any metal objects. If the battery is shorted, the shorting item may overheat and the battery may generate heat, smoke, catch fire, or explode.

(9) Impact

Avoid excessive impact to the battery.

Impact beyond specification may damage the battery. This may cause the battery to leak, generate heat, smoke, catch fire, or explode.

(10) Penetration

Do not penetrate the battery with a nail or strike with a hammer.

If subjected to a hard strike or penetrated by an object, the battery may be damaged or destroyed, thereby causing an internal short-circuit. This may cause the battery to generate heat, smoke, catch fire, or explode.

(11) Soldering

Do not directly solder to the battery.

Soldering directly to the battery could melt the separator or damage the gas release vent or other safety mechanisms. This may cause the battery to generate heat, smoke, catch fire, or explode.

(12) Disassembly

Do not disassemble the battery.

Disassembly or modification of the battery may damage the protection circuit. This may cause the battery to generate heat, smoke, catch fire, or explode.

(13) Charge near High Temperatures

Do not charge the battery near high temperature.

If the battery is charged while exposed to high temperature, the battery's protection circuit may activate and prevent charging, or fail and cause the battery to generate heat, smoke, catch fire, or explode.

(14) Deformation

Do not use the battery with conspicuous damage or deformation.

It causes the generating heat, smoke, rupture or flame.

(15) Reverse Charge and Over discharge

Do not reverse polarity (and terminals).

On charging, the battery is reverse-charged and abnormal chemical reaction occurs. And also, there may be case that unexpected large current flows on discharging, and can generate heat, smoke, rupture or flame.

Additional Precaution

- ◆ The battery should be stored at half charged state in a dry, clean area with good ventilation. If the battery has to be stored for extended period of time (over 3 months), the environmental condition should be 20+/-5°C with 65+/-20% Relative Humidity.
- ◆ Charging current and voltage should be less than maximum charge current specified in the Product Specification. Charging with higher current or voltage than recommended value may damage the battery and lead to poor performance increased safety risk.
- ◆ Do not reverse the polarity of battery pack leads. Reverse charging may cause damage to the battery and lead to degradation of performance and increased safety risk.
- ◆ Parents must explain how to use the system and the battery. Periodic checks must be made to ensure children are using the system and the battery correctly.
- ◆ Always adhere to operating temperature as listed in the Product Specification. Using batteries outside of its operating temperature will lead to reduced performance and increased safety risk.
- ◆ Never short-circuit the battery pack.
- ◆ If electrolytes leak and come into contact with the skin or eyes, flush with fresh water and seek medical attention immediately.
- ◆ Batteries might be damaged during shipping. If abnormal features are present such as damage in a plastic envelop, visible deformation of packaging, or electrolyte odor, the battery shall not be used and placed in a safe well ventilated area away from heat source.

10. Warranty

Products supplied by Zeus Battery Products contain 12 months warranty against manufacturing defects from date of manufacture. Zeus Battery Products shall not be responsible for any accident or damage resulting either from user abuse or misuse.