



## Specification Approval Sheet

Name : Lithium ion Battery

Model : 31003

SPEC : 7.4V, 2200mAh, 18650

Approved By	Checkup	Make

Customer Confirmation	Signature	Date
	Company Name :	
	Stamp :	

436 Kato Terrace, Fremont, CA 94539 U.S.A.

Tel: 510.687.0388 Fax: 510.687-0328

[www.TenergyBattery.com](http://www.TenergyBattery.com)



**TABLE OF CONTENTS**

**General Description -----p.3**

**1. Electrical Characteristics -----p.3**

**2. Characteristic Curves -----p.3**

**3. Physical Characteristics -----p.4**

**4. Notes -----p.5**

**5. PCB Specifications -----p.6**

**6. Safety Characteristics -----p.6**

**7. Warranty Period & Product Liability -----p.7**

**8. Battery Usage Warnings & Cautions -----p.7**



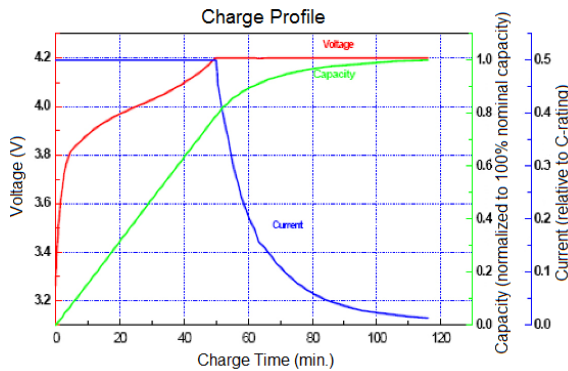
**GENERAL DESCRIPTION**

Item Number:	31003
Chemistry:	Lithium Ion (Lithium Cobalt)
Battery Model:	2S 18650

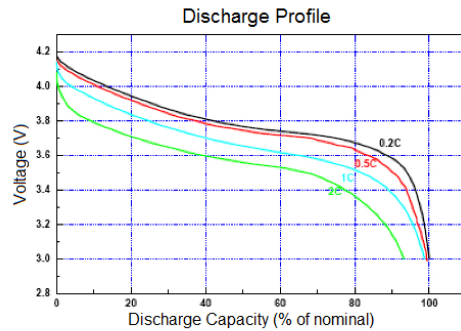
**1. ELECTRICAL CHARACTERISTICS**

Nominal Capacity (@ 0.2C Discharge Current)	2200 mAh
Nominal Voltage	7.4 V
Charge Cutoff Voltage	8.4 V
Discharge Cutoff Voltage	6.0 V
Maximum Charge Current	1C
Maximum Discharge Current	2C
Total Internal Impedance (Max. @1KHz)	≤ 220mΩ (with PTC and PCB)
Charge Current (Using CC/CV Charging Method)	Standard = 0.5C
	Rapid = 1C
Cycle Life	≈ 300 (Charge/Discharge)

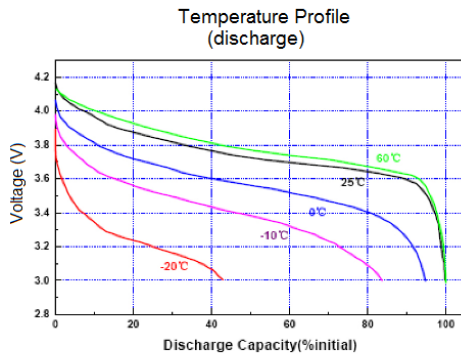
**2. CHARACTERISTIC CURVES<sup>1</sup>**



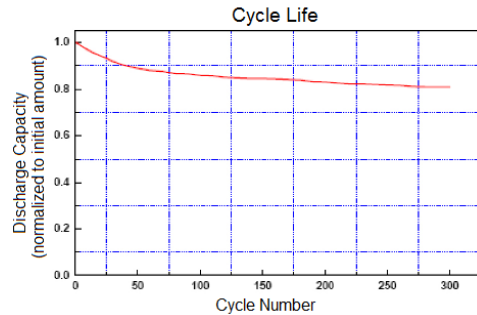
Charge: CC/CV 0.5C mA, 4.2V, 20mA cutoff at room temperature.



Discharge: 3.0V cutoff at room temperature.



Charge: CC/CV 0.5C mA, 4.2V, 20mA cutoff.  
Discharge: 3.0V cutoff



Charge: CC/CV 0.5C mA, 4.2V, 20mA cutoff.  
Discharge: CC 0.5C mA, 3.0V cutoff.  
(at room temperature)

<sup>1</sup>Curves represent individual LiCo chemistry cell characteristics.



### 3. PHYSICAL CHARACTERISTICS

Approximate Length	71 mm. (≈ 2.8 in.)	
Approximate Width	37 mm. (≈ 1.5 in.)	
Approximate Depth	21 mm. (≈ 0.83 in.)	
Approximate Weight	115 grams (4 ounces)	
Operating Temperature Range	Charge:	0°C to 45°C (32°F to 113°F)
	Discharge:	-20°C to 60°C (4°F to 140°F)
	Storage:	Within 1 month: -5°C to 35°C (23°F to 95°F)
Within 6 months: 0°C to 35°C (32°F to 95°F)		



#### 4. NOTES

- All measurements performed to determine the electrical parameters in this datasheet were conducted under the following conditions:
  - Ambient Temperature = 25°C ± 5°C
  - Relative Humidity = between 65% ± 20%
  - Using Standard Charging current (0.2C)
  - Discharge cycle started 30 minutes (rest period) after completion of charge cycle.
- Charge and discharge cycles are noted using the parameter “C” which refers to the capacity rating of the mentioned battery with units of 1/hrs. Hence, the charge or discharge current is a fraction or multiple of the capacity of the battery, in units of milliamps. The following table gives examples to demonstrate this:

For example if a battery has a rated capacity of 1300mAh:

Charge/Discharge Current Rating	Equivalent Charge/Discharge Current (mA)
0.2C	260
1.0C	1300
2.0C	2600

- Charging is performed using a constant-current/constant-voltage (CC/CV) charging method. This charging method, generally, has two main stages:
  - Stage 1: Charge with constant current specified by battery datasheet. This is performed until the battery voltage reaches the fully charged cutoff voltage, also mentioned in the datasheet.
  - Stage 2: Once the maximum cutoff voltage of the battery has reached, charge with constant voltage. The current should slowly decrease as charging continues. Once the charging current has dropped to ≤ 5% (ideally ≤ 1%) of the initial current value the battery is fully charged.

#### Storage:

Normal (Short Term) Storage: 28 days after fully charging cell (using standard charging method and values), and stored at 25°C ±5°C, residual capacity ≥ 90% of nominal capacity rating.

Long Term Storage: 12 months after charging cell to half of rated capacity (using standard charging method and values), stored at 25°C ±5°C, and humidity of 65% ±20%, discharge time is ≥ 4 hours.

#### Transportation:

UN38.3 certified



**5. PCB SPECIFICATIONS**

Parameter	Minimum	Typical	Maximum	Units
Overcharge Detection Voltage Threshold*	4.20	4.25	4.30	V
Overcharge Release Voltage Threshold*	3.95	4.05	4.15	V
Over-Discharge Detection Voltage Threshold*	2.35	2.40	2.45	V
Over-Discharge Release Voltage Threshold*	2.95	3.00	3.05	V
Rated Operational Current		4		A
Over-Current Detection Threshold	6.0	7.5	9.0	A
Over-Current Detection Delay	8.0	12.0	16.0	msec.
Over-Current Protection Release Condition	Cut The Load			
Short Circuit Protection	Implemented/Active			
Short Circuit Protection Release Condition	Cut The Load			
PCB Internal Resistance (from "P+" to "P-")		60		mΩ
Supply Current		4.0	10.0	μA

\*Note: Individual cell values.

**6. SAFETY CHARACTERISTICS (UN compatible)**

Each of the tests in this section was conducted with a battery fully charged using standard charging cycle parameters. Tests performed at room temperature unless otherwise specified.

Test	Testing Details	Test Results
Short Circuit	The battery is shorted by connecting the negative and positive terminals to each other using a copper wire with resistance of < 0.05Ω.	No fire. No explosion.
Impact Test	Cell is placed on a hard surface and is hit by a 10Kg hammer that freefalls from a height of 1 meter.	No fire. No explosion.
Overcharge	Charge cell with constant current of 3C until the voltage reaches 10.0Volts. Then charge at constant voltage of 10.0V until current reaches ≤ 0.01C.	No fire. No explosion.
Thermal Shock	Raise cell temperature at a rate of 5C ±2C per minute until a temperature of 150C ±2C is reached. Maintain this temperature for 10 minutes.	No fire. No explosion.
Drop Test	Cell is dropped twice from a height of 1 meter onto a hard surface. This is performed to all faces of the cell.	No fire. No explosion.



## 7. WARRANTY PERIOD & PRODUCT LIABILITY

Warranty period of this product is 6 months from the manufacturing date code. Tenergy is NOT responsible for the failures caused by mishandling the battery against the instructions in this datasheet. Specifications and data are subject to change without notice. Contact Tenergy for the latest information.

## 8. BATTERY USAGE WARNINGS & CAUTIONS

To prevent the possibility of battery leakage, excessive heat damage, fire or explosion, please observe the following precautions:

### **WARNINGS!**

- Do NOT immerse the battery in water or other liquids. Keep or store the battery in a cool and dry place/environment.
- Do NOT use or store the battery near any source of heat.
- Use a charger that is clearly specified to be compatible for charging the battery and has appropriate charging protection (voltage, current, temperature)
- Do NOT install the battery in reverse polarity.
- Do NOT connect the battery to an electrical outlet or other incompatible power source.
- Do NOT discard the battery in fire.
- Do NOT short circuit the battery. Do NOT connect the positive and negative terminals to each other with metallic object(s) or other conductive material(s).
- Do NOT transport or store the battery together with metal objects, such as hairpins, necklaces, or any other conductive object or material.
- Do NOT strike, crush, puncture, disassemble, or throw the battery.
- Do NOT directly solder the battery or battery terminals. Do NOT pierce the battery.
- Lithium batteries should be used only with proper voltage, current, and temperature protection circuitry and protection.

### **CAUTIONS!**

- Do NOT use or leave the battery in a high temperature environment (for example, under direct sunlight or in a vehicle in hot weather). Failure to take this precaution can lead to overheating of battery and/or fire or explosion. Also, performance of battery will degrade and lifetime will be reduced.
- Do NOT use battery in a location where there is high static-electricity or magnetic fields, otherwise safety devices may be damaged which cannot be visible.
- If the battery leaks and the electrolyte get into the eyes, do NOT rub eyes. Instead, rinse and wash eyes with clean water, and immediately seek medical attention.
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging, or storage, immediately remove it from the device or battery charger and stop using it.
- In case the battery terminals are dirty, clean the terminals with a dry cloth before use. Otherwise, poor performance may occur due to the poor connection with the instrument or device.
- Be aware that discarded batteries may cause fire or explosion. Therefore, apply a non-conductive tape to the battery terminals to insulate them before discarding.