



Autec Battery Specification for
Lithium-Ion Cylindrical Rechargeable Battery

Part Number: LIR18650-2300

2300mAh Battery

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1. Battery Type and Model

- 1.1 Battery Type : Lithium Ion Battery
- 1.2 Battery Model :LIR18650-2300mAh (nominal 2400)
- 1.3 Outer Dimension:18.2±0.1(Φ) x 65±0.5(H) mm

2. Performance

Item	Specification	Remark※
2.1 Nominal Capacity	2400 mAh	0.2C discharge
	2300mAh	Mini.
2.2 Nominal Voltage	3.7	
2.3 End Voltage	2.75V	
2.4 Charging Current (Std.)	0.2CA(=480mA)	0~+40℃
2.5 Charging Current (Max.)	1.0CA(=2400mA)	0~+40℃
2.6 Charging Voltage	4.2±0.38V	
2.7 Charging Time (Std.)	6~7.0 hours	
2.8 Charging Time (Max.)	2~3.0 hours	
2.9 Discharging Current (Std.)	480 mA	-20~+60℃
2.10 Discharging Current (Max.)	2400 mA	-20~+60℃
2.11 Internal Resistance	<80 mΩ	AC Impedance 1KHz
2.12 Weight	Apro.45g	
2.13 Temperature range for storage	less than 1 month	-20~+60℃
	less than 3 month	-20~+45℃
	less than 1 year	-20~+20℃
		Percentage of recoverable capacity 80%

※ (1).Percentage of recoverable capacity
 =(discharging time after storage / discharging time Initial)×100%

(2).Discharging time is estimated by the discharge at 0.2CA to end voltage 2.75V after fully charged according to specification at approximately 25℃.

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3. Electrical Characteristics			
Item	Test Method	Criterion	
3.1 Fully Charge	(1)Standard Charge: Supply 0.2C (=0.48) A constant current until battery voltage reaches 4.2V, then supply a decreasing current endlessly. Charging time is 6~7 hours. (2)Quick Charge: Supply 1.0C (=2.4) A constant current until battery voltage reaches 4.2V, then supply a decreasing current endlessly. Charging time is 2~3 hours.		
3.2 Capacity	(1)Within 1 hour after fully charged, discharge at 0.2C (=0.48) A continuously down to end voltage 2.75V. (2)Within 1 hour after fully charged, discharge at 1.0C (=2.4) A continuously down to end voltage 2.75V.	more than 300 min	more than 54 min
3.3 Cycle Life	(1)A battery unit shall be repeated 500 charge/discharge cycles, charged at CC-CV (0.48A-4.20 V) for 6~ 7 hours, discharged at 2.4 A to 2.75V end voltage, After 500 cycles, discharging time is estimated as specified in paragraph 3.2(2)	more than 32 min	
3.4 Temperature	(1)Within 1 hour after fully charged at 20°C, a battery unit is stored at 0°C. Discharge time is estimated by discharging at 0.5C (=1.2) A continuously down to 2.75V end voltage. (2)Within 1 hour after fully charged at 20°C, a battery unit is stored at 60°C. Discharge time is estimated by discharging at 0.5C (=1.2) A continuously down to 2.75V end voltage.	more than 70 min	more than 100 min
3.5 Full Charged State Storage	(1)After fully charged, stored for 10days at 60 °C and rested at room temperature for 1 hour. Discharge time is estimated by discharging at 0.5C (=1.2) A continuously down to 2.75V end voltage. (2)Then next discharge time is estimated as specified in paragraph 3.2(2).	more than 70 min	more than 45 min
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3.6 Full Discharged State Storage	(1)After fully charged, stored for 10 days at 60°C and rested at room temperature for 1hour. Discharge time is estimated by discharging at 0.5C (=1.2) A continuously down to 2.75V end voltage. (2)Then next discharge time is estimated as specified in paragraph 3.2(2). (3)After fully charged, discharge as specified in paragraph 3.2(2), then store for 10 days at 60°C and rest at room temperature for 1hour. Discharging time is estimated as specified in paragraph 3.2(2).		more than 60 min	
4. Safety Performance				
Item	Test Method		Criterion	
4.2 High Temperature Storage	After fully charged, store for 10 days at 60 °C .		No rupture, fire or smoke	
4.2 Leak Test	After fully charged, store for 10 days at 60°C and at humidity 70±20% .		No leakage of liquid electrolyte apparently	
4.3 Drop-Test	The battery is dropped 3 times for three-dimensional face of the battery (total of 9 times dropping) from a height of 76cm on the hard wooden board.		There shall be no abnormal performance and structure or excessive deformation.	
4.4 Vibration Test	Vibrate for 60 minutes to any direction with amplitude 4mm and frequency 16.7Hz.		There shall be no abnormal performance and structure or excessive deformation.	
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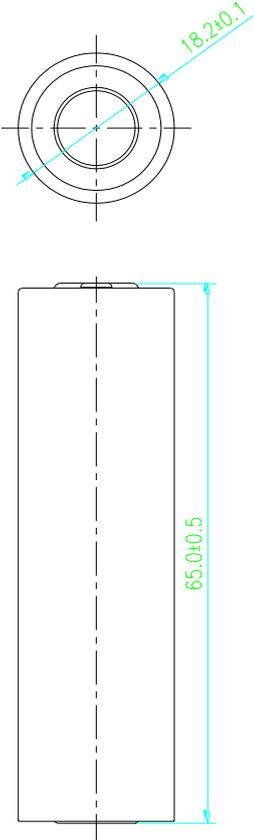
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<p>5. Appearance There shall be no practical damage such as conspicuous liquid leakage, flaw, rust, dirt, and deformation.</p> <p>6. Cell condition at the shipment About 20~50% charged state.</p> <p>7. Protection Circuit Characteristics (at 25°C)</p> <table border="1" data-bbox="173 622 1358 887"> <thead> <tr> <th data-bbox="173 622 632 663">Item</th> <th data-bbox="632 622 1358 663">Test Condition and Criterion</th> </tr> </thead> <tbody> <tr> <td data-bbox="173 663 632 810">(1)Over Charge Protection</td> <td data-bbox="632 663 1358 810">The battery is charged by power supply which voltage limit 15V. When the voltage of any of the cells becomes higher than 4.28±0.11V, charging turns off.</td> </tr> <tr> <td data-bbox="173 810 632 887">(2)Over Discharge Protection</td> <td data-bbox="632 810 1358 887">When the voltage of any of the cells becomes lower than 2.30±0.05V, discharging turns off.</td> </tr> </tbody> </table> <p>8. Pre-charging Method</p> <p>(1) It's possible that the battery voltage decreases about 0V by the storage. If that battery is rapid-charged, there is much possibility that the temperature of the FET is growing highly. The charger must have the pre-charge system in consideration of the drop of battery voltage.</p> <p>(2) Pre-charge current of charger is approximately 0.1C (=0.24) A. When the battery voltage becomes 3.0V, standard charge start. If the battery voltage never reach to 3.0V in specified of the time clock, charging turns off.</p> <p>(3) Standard charge method is 0.1C (0.24) A~4.20V (Constant current-constant voltage). Charging turns off when the specified condition of time clock, current, or O.C.V. is satisfied.</p>					Item	Test Condition and Criterion	(1)Over Charge Protection	The battery is charged by power supply which voltage limit 15V. When the voltage of any of the cells becomes higher than 4.28±0.11V, charging turns off.	(2)Over Discharge Protection	When the voltage of any of the cells becomes lower than 2.30±0.05V, discharging turns off.
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<p>9. Safety Instruction</p> <p>The battery pack includes the flammable objects such as the organic solvent. If the handling is missed, there will be possibility that the battery rupture, Flames or hot, or it will cause the deterioration or damage of battery. Please observe the following prohibitive matters. And the protection Device the equipment for fear that the trouble would affect the battery by the Abnormality of equipment. In addition the following matters as “Prohibition Points on Handle” in the instruction manual of the equipment.</p> <div data-bbox="252 593 657 768" style="border: 1px solid black; text-align: center; padding: 10px; margin: 20px 0;"> <p>! Danger</p> </div> <ol style="list-style-type: none"> 1. Disassemble and Reconstruction <i>“Do not disassemble or reconstruct battery”</i> The battery has safety function and protection circuit to avoid the danger. If they have serious damage, it will cause the generating, smoke, rupture or flaming. 2. Short-circuit <i>“Do not short-circuit battery”</i> Do not connect the + and – terminals with metals (such as wire). Do not carry or store the battery with metal objects (such as wire, chain, necklet or hairpins). If the battery is short-circuited, excessive large current will flow and then the generating, smoke, rupture or flaming will occur. And also, it causes generating of metals. 3. Use nearby Heated Place <i>“Do not use or leave battery nearby fire, stove or heated place(more than 80 °C)”</i> In case that separator made of polymer is melted by high temperature, the internal short-circuit occurs in individual cells and then it causes the generating, smoke, rupture or flaming. In addition, do not use the battery under the heated pace (more than 80°C) for same reason. 4. Immersion <i>“Do not immerse the battery in water or sea water, or get it wet”</i> If the protection circuit included in the battery is broken, the battery will be charged at extreme current or voltage and the abnormal chemical reaction occurs in it. And then it causes the generating, smoke, rupture or flaming. 5. Charge nearby heated place <i>“Do not charge battery nearby the fire or under the blazing sun”</i> If the protection circuit to avoid the danger works under high temperature or it is broken, the battery will be charged at abnormal current (or voltage) and abnormal chemical reaction will occur. It causes the generating, smoke, rupture or flaming. 			
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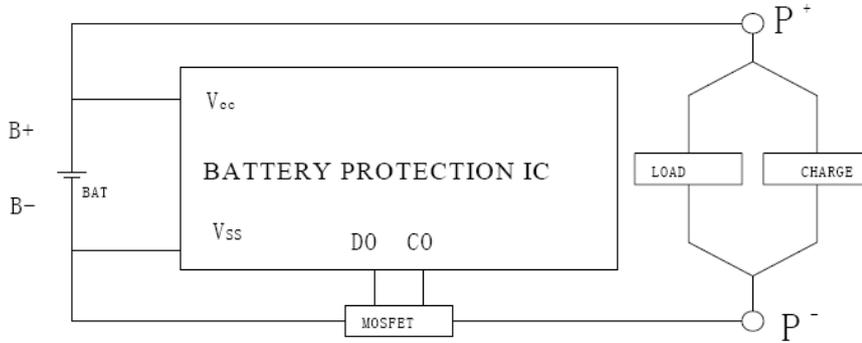
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<p>6. Charger and Charge Condition <i>“Do use the specified charger and observe charging requirement”</i> If the battery is charged with unspecified condition (under high temperature over the regulated value, excessive high voltage or current over regulated value, or remodeled charger). There are cases that it will be overcharged or the abnormal chemical reaction will occur in cells. It causes the generating, smoke, rupture or flaming.</p> <p>7. Penetration <i>“Do not drive a nail into the battery. Strike it by hammer, or tread it”</i> As the battery might be broken or deformed and then it will be short-circuited, It causes the generating, smoke, rupture, or flaming.</p> <p>8. Impact <i>“Do not give battery impact or fling it”</i> If the protection circuit assembled in the battery is broken, the battery will be Charged at abnormal voltage or current and abnormal chemical reaction will occur. It causes the generating, smoke, rupture or flaming.</p> <p>9. Deformation <i>“Do not use the battery with conspicuous damage or deformation”</i> It causes the generating, smoke or flaming.</p> <p>10. Soldering <i>“Do not make the direct soldering on battery”</i> It causes the generating, smoke or flaming.</p> <p>11. Reverse Charge and Overdischarge <i>“Do not make the direct soldering on battery”</i> 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. These cause the generating, smoke, rupture or flaming.</p> <p>12. Reversed Polarity Use <i>“Do not reverse-charge or reverse-connect”</i> The battery has polarity. If the battery is connected to opposite polarity with charger, it will generate smoke, rupture or flaming.</p> <p>13. Connect Battery To the Plug <i>“Do not connect battery to the plug socket or car-cigarette-plug”</i> Added high voltage to the battery, the excessive current will flow in it and then it will cause the generating, smoke, rupture or flaming.</p> <p>14. Inappropriate Use For unspecified Equipment <i>“Do not use battery for unspecified equipment”</i> If the battery is used for unspecified equipment, it will deteriorate its performance and cycle-life. At worst, abnormal current will flow or battery may generate, smoke, rupture or flame.</p> <p>15. Leakage <i>“Do not touch a leaked battery directly”</i> In case the leaked electrolyte gets into eyes, wash them with fresh water as soon as possible without rubbing eyes. And then, see a doctor immediately. If leave damaged eyes undone, it will cause eye-trouble.</p>			
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<div data-bbox="252 282 756 421" style="border: 1px solid black; padding: 10px; margin: 0 auto; width: fit-content;"> <p style="font-size: 24px; margin: 0;">! Warning</p> </div> <ol style="list-style-type: none"> <li data-bbox="146 510 1455 734"> <p>1. Mixed Use <i>“Do not use Lithium ion battery in mixture”</i> Do not use Lithium ion battery with the primary batteries or secondary batteries whose capacity kind or maker is different, if do that, the battery will be discharged or charged excessively in use. And it may cause the generating, smoke, rupture or flaming because of the abnormal chemical reaction in cells.</p> <li data-bbox="146 734 1455 891"> <p>2. Ingestion <i>“Keep the battery away from babies”</i> Keep the little battery out of the reach of babies in order to avoid troubles by swallowing. In case of swallowing the battery, see a doctor immediately.</p> <li data-bbox="146 891 1455 1048"> <p>3. Charging Time <i>“Do not continue to charge battery over specified time”</i> If the battery is not finished charging over regulated time, let it stop charging. There is possibility that the battery might generate, smoke, rupture or flame.</p> <li data-bbox="146 1048 1455 1205"> <p>4. Store <i>“Do not get into a microwave or a high pressure container”</i> It causes the generating, smoke, rapture or flaming because of a sudden heat or damage of sealing condition of battery.</p> <li data-bbox="146 1205 1455 1429"> <p>5. Leakage <i>“Do not use a leaked battery nearby fire”</i> If the liquid leaks from the battery (or the battery gives out bad smell), let the battery leave from flammable objects immediately. Unless do that, the electrolyte leaked from battery will catch fire and it will cause the smoke, flaming or rupture of it.</p> <li data-bbox="146 1429 1455 1653"> <p>6. Rust, Changing color and Deformation <i>“Do not use an abnormal battery”</i> In case the battery has bad smell, it generates, its color changes or it is warped in using (includes charging and storage), let it take out from equipment or charger and do not use it. If an abnormal battery is used, it wilt generate, smoke, rupture or flame.</p> 			
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<div data-bbox="252 282 756 456" style="border: 1px solid black; padding: 20px; margin: 0 auto; width: fit-content;"> <p>! Caution</p> </div> <ol style="list-style-type: none"> <li data-bbox="146 546 1455 696"> <p>1. Use under strong sunshine Do not use or leave the battery under the blazing sun (or heated car by sunshine). The battery may smoke, heat or flame. And also, it might cause the deterioration of battery's characteristics or cycle life.</p> <li data-bbox="146 696 1455 887"> <p>2. Static Electricity The battery has the protection circuit to avoid the danger. Do not use nearby the place where generates static electricity (more than 100V) which gives damage to the protection circuit. If protection circuit were broken, the battery would generate, smoke, rupture or flame.</p> <li data-bbox="146 887 1455 1077"> <p>3. Charging Temperature Range Charging temperature range is regulated 0°C and 40°C. Do not charge the battery out of recommended temperature range. Charging out of recommended range might cause the generating or serious damage of battery. And also, it might cause the deterioration of battery's characteristics and cycle life.</p> <li data-bbox="146 1077 1455 1160"> <p>4. Manual Please read the manual before using the battery</p> <li data-bbox="146 1160 1455 1243"> <p>5. Charging Method Please read the manual of specified charger about charging method.</p> <li data-bbox="146 1243 1455 1361"> <p>6. First time use When the battery has rust, bad smell or something abnormal at first-time-using, do not use the equipment and go to bring the battery to the shop which it was bought.</p> <li data-bbox="146 1361 1455 1512"> <p>7. Used by children In case younger children use the battery, their parents teach how to use batteries according to the manual with care. And also, when children are using the batteries, pay attention to use it according to that or not.</p> <li data-bbox="146 1512 1455 1630"> <p>8. Keep Battery away from children Keep the battery out of the reach of younger children. And also, using the battery, pay attention to be taken out it from the charger or equipment by little children.</p> <li data-bbox="146 1630 1455 1749"> <p>9. Leakage If the skin or cloth is smeared with liquid from the battery, wash with fresh water. It may cause the skin inflammation.</p> 			
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<p>10. Consultation If there's any problem about the battery, contact the following</p> <p>11. Appearance</p> <div style="text-align: center;">  </div>			
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Schematic diagram



5.4.1 Wiring diagram

