

APPROVE SHEET

For

Lithium ion polymer rechargeable battery

Customer : _____

Cell's model name : HA055275

Assembly : _____

Date : 2008/01/28

REVISED : 0

Customer approval

Comment :

Customer's signature/ Date :

Approved	Checked	Prepared

Title	Specification of Lithium Ion Polymer Battery	Page	0/9
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REVISION AND UPDATES

REVISED	DESCRIPTION	Date

File No	HA055275		
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Title	Specification of Lithium Ion Polymer Battery	Page	1/9
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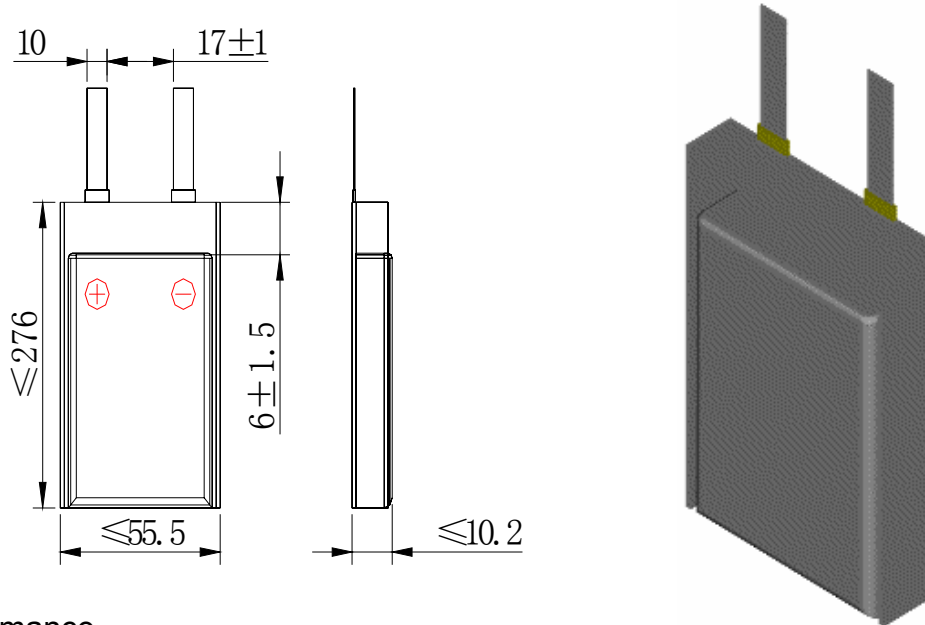
Title	Specification of Lithium Ion Polymer Battery	page	2/9
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1. Battery Type and Model

1.1 Battery Type : Batteryspace.com Lithium Ion Polymer Battery

1.2 Battery Model : HA055275

1.3 Battery Outer Dimension Tolerance +/- 0.5 mm: $\leq 10.2(T) \times \leq 55.5(W) \times \leq 276(L)$ mm



2. Performance

Item	Specification	Remark※
2.1 Nominal Capacity	21Ah	0.2C discharge
2.2 Nominal Voltage	3.7V	
2.3 End Voltage	2.75V	
2.4 Charging Current (Max.)	1.0C(=21A)	Ambient temperature 0~+45°C
2.5 Charging Voltage	4.2±0.03V	
2.6 Charging Time (Max.)	2~3.0 hours	
2.7 Discharging Current (Max. ,2C)	42A	Ambient temperature -20~+60°C
2.8 Internal Resistance	<15mΩ	@ 1KHz
2.9 Weight	≤406.9g	Battery only
2.10 Temperature range for storage	less than 1 month	-20~+60°C
	less than 3 month	-20~+45°C
	less than 1 year	-20~+20°C

※ (1).Percentage of recoverable capacity

$$= (\text{discharging time after storage} / \text{discharging time Initial}) \times 100\%$$

(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°C.

File No.	HA055275
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Title	Specification of Lithium Ion Polymer Battery		page	3/9
3. Electrical Characteristics				
Item	Test Method		Criterion	
3.1 Fully Charge	Supply 0.5C(=10.5A)constant current until battery voltage reaches 4.2V, then supply a decreasing current endlessly. Charging time is 2~3 hours.		Ambient temperature 0 ~+40℃	
3.2 Capacity	(1)Within 1 hour after fully charged, discharge at 0.2C (=4.2A) continuously down to end voltage 2.75V. (2)Within 1 hour after fully charged, discharge at 0.5C(=10.5A)continuously down to end voltage 2.75V.		more than 300 min (100%) more than 114 min (95%)	
3.3 Cycle Life	(1)A battery unit shall be repeated 500 charge/discharge cycles, charged at CC-CV (0.2C =4.2A to 4.20 V) for 4~5 hours, discharged at10.5A to 2.75V end voltage, After 500 cycles, discharging time is estimated as specified in paragraph 3.2(2)		more than 42 min (70%)	
3.4 Temperature	(1)Within 1 hour after fully charged at 20℃ , a battery unit is stored at -20℃ . Discharge time is estimated by discharging at 0.5C (=10.5A) continuously down to 2.75V end voltage. (2)Within 1 hour after fully charged at 20℃ , a battery unit is stored at 60℃ . Discharge time is estimated by discharging at 0.5C (=10.5A) continuously down to 2.75V end voltage.		more than 72 min (60%) more than 102 min (85%)	
3.5 Full Charged State Storage	(1)After fully charged, stored for 10days at 60℃ and rested at room temperature for 1 hour. Discharge time is estimated by discharging at 0.5C (=10.5A) continuously down to 2.75V end voltage. (2)Then next discharge time is estimated as specified in paragraph 3.2(2).		more than 84 min (70%) more than 96 min (80%)	
File No.	HA055275			

Title	Specification of Lithium Ion Polymer Battery		page	4/9
3.6 Full Discharged State Storage	(1) 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 90 min (75%)	
4. Safety Performance				
Item	Test Method		Criterion	
4.1 High Temperature Storage	After fully charged, store for 10 days at 60°C.		No rupture, distend, 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.	
File No	HA055275			

Title	Specification of Lithium Ion Polymer Battery	page	5/9						
<p>5. Appearance There shall be no practical damage such as conspicuous liquid leakage, flaw, rust, dirt, swell, and deformation.</p> <p>6. Cell capacity condition at the shipment About 20~50% charged state.</p> <p>7. Protection Circuit Characteristics (at 25°C)--This specification item is option.</p> <table border="1" data-bbox="172 600 1358 862"> <thead> <tr> <th data-bbox="172 600 632 636">Item</th> <th data-bbox="632 600 1358 636">Test Condition and Criterion</th> </tr> </thead> <tbody> <tr> <td data-bbox="172 636 632 786">(1)Over Charge Protection</td> <td data-bbox="632 636 1358 786">The battery is charged by power supply which voltage limit 15V. When the voltage of any of the cells becomes higher than 4.28±0.03V,charging turns off.</td> </tr> <tr> <td data-bbox="172 786 632 862">(2)Over Discharge Protection</td> <td data-bbox="632 786 1358 862">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(=2.1A). When the battery voltage becomes 2.75V, standard charge start. If the battery voltage never reach to 2.75V in specified of the time clock, charging turns off.</p> <p>(3) Standard charge method is 0.1C(=2.1A)~4.20V(Constant current-constant voltage). Charging turns off when the specified condition of time clock, current, or O.C.V. is satisfied.</p> <p>9.Safety Instruction 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>				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±0.03V,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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File No	HA055275								

Title	Specification of Lithium Ion Polymer Battery	Page	6/9
<div style="border: 1px solid black; padding: 10px; margin-bottom: 20px; text-align: center;"> <h2 style="margin: 0;">10. Danger !</h2> </div> <ol style="list-style-type: none"> <li data-bbox="145 405 1449 555"> <p>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.</p> <li data-bbox="145 555 1449 779"> <p>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.</p> <li data-bbox="145 779 1449 1010"> <p>3. Use nearby Heated Place <i>“Do not use or leave battery nearby fire, stove or heated place(more than 80℃)”</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℃) for same reason.</p> <li data-bbox="145 1010 1449 1205"> <p>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.</p> <li data-bbox="145 1205 1449 1400"> <p>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.</p> <li data-bbox="145 1400 1449 1624"> <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> <li data-bbox="145 1624 1449 1771"> <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> <li data-bbox="145 1771 1449 1966"> <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> 			
File No	HA055275		

Title	Specification of Lithium Ion Polymer Battery	Page	7/9
<p>9. Soldering <i>“Do not make the direct soldering on battery”</i> It causes the generating, smoke or flaming.</p> <p>10. 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 generating, 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>			
File No	HA055275		

Title	Specification of Lithium Ion Polymer Battery	Page	8/9
<div data-bbox="272 266 633 360" style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <h2 style="margin: 0;">11. Warning !</h2> </div> <ol style="list-style-type: none"> <li data-bbox="150 412 1442 629"> <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="150 633 1442 786"> <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="150 790 1442 943"> <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="150 947 1442 1099"> <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="150 1133 1442 1323"> <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="150 1357 1442 1547"> <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> 			
File No	HA055275		

Title	Specification of Lithium Ion Polymer Battery	Page	9/9
<div data-bbox="272 271 636 360" style="border: 1px solid black; padding: 5px; text-align: center;"> <h2 style="margin: 0;">12. Caution !</h2> </div> <ol style="list-style-type: none"> <li data-bbox="150 369 1442 517"> <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="150 521 1442 705"> <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="150 710 1442 902"> <p>3. Charging Temperature Range Charging temperature range is regulated 0°C and 45°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="150 907 1442 981"> <p>4. Manual Please read the manual before using the battery</p> <li data-bbox="150 985 1442 1059"> <p>5. Charging Method Please read the manual of specified charger about charging method.</p> <li data-bbox="150 1064 1442 1182"> <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="150 1187 1442 1335"> <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="150 1339 1442 1458"> <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="150 1462 1442 1581"> <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> 			
File No	HA055275		