Confidential

File No. UF604462-003

Issue Date: 8/Aug./2013

LITHIUM ION BATTERY SPECIFICATION

BATTERY CLASSIFICATION LITHIUM ION BATTERY

BATTERY TYPE UF604462SW

CLIENT **SCUD (FUJIAN) ELECTRONICS CO., LTD.**

【 The client's agreement 】

Signature:_____

Name in block letters:_____

Date:_____

*"If there is no reply within 30 days after the delivery, this document shall be presumed valid.

Portable Rechargeable Battery Business Division,
SANYO Electric Co.,Ltd.
Automotive & Industrial Systems Company
of Panasonic Group
Technical Service Group No.3
MC Business Development Team

Dft.	
Chk.	
Chk.	
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Contents

1.Subject Model and Drawing No. List

SANYO Model No.	Product Code	Drawing No.
UF604462S-H003A	BJ-F500003AA	UF604462S-H003A01

2.Publication Record

No.	Date	Remark
(0)	6/Feb/'13	Issue (Tentative)
(a)	8/Aug./'13	Issue

3. Safety Instructions

Prohibited Actions

The cell contains flammable objects such as organic solvents. If the battery is mishandled, it may cause fire, smoke or an explosion and the battery's functionality will be seriously damaged. Please read and check the following prohibited actions. Also, please equip a protection in the application so the application troubles don't affect the battery. Additionally, SANYO highly recommends embedding these instructions into the owner's manual.

! Danger

- Immersion

"Do not immerse the battery with liquid such as water, *sea water or soda."*

The battery or the battery pack (including protection circuit) may catch on fire, smoke, explode, or cause heat generation by unexpected electrical load.

- High Temperature

"Do not use or place the battery near fire, a heater or a high temperatures (more than 80℃)."

The battery's polyolefin separator may get damaged from the heat and could cause an internal short circuit. This may cause the battery to catch on fire, smoke, explode, or cause heat generation.

- Charger and Charge Condition

"Do not use unauthorized chargers."

If the battery is charged under unacceptable conditions (For example: usage in restricted temperature ranges, over voltage, or over current with unauthorized chargers) the battery may catch on fire, smoke, explode, or cause heat generation.

- Reverse Polarity

"Do not force a reverse-charge or a reverse-connection."

The battery has correct polarity. If the battery doesn't fit, please check the battery's orientation and do not force into the battery mount. If the battery is forced to set with a different polarity, the battery may catch on fire, smoke, explode, or cause heat generation.

- Direct Connection

"Do not connect the battery with AC plug (outlet) or car plugs."

The battery requires a specific charger. If the battery connects with the outlet directly, the battery may catch on fire, smoke, explode, or cause heat generation.

- Inappropriate Use with Other Equipment

"Do not adapt the battery to unspecified applications. "

If the battery is used for unspecified applications or systems, the battery may get damaged or catch on fire, smoke, explode, or cause heat generation.

- Incineration and Heat

"Please keep the battery away from heat and fire"

The battery materials will get damaged and may catch on fire, smoke, explode, or cause heat generation.

- Short-Circuit

"Do not make a *short-circuit. "*

Do not connect the + and - terminals with conductive material. Do not carry or store the battery with metal objects (such as wire, necklace or hairpins). If the battery is in a short-circuit, excessive large current will flow and may catch on fire, smoke, explode, or cause heat generation.

- Impact

" Avoid unnecessary impact to the battery"

Unnecessary impact may cause the battery to leak, heat generation, smoke, fire or explode. Also, the protection circuit may break and that will lose the function of the battery's protection system.

- Penetration

" Do not penetrate with a nail or strike with a hammer"

The battery cell may get destroyed or damaged. And the battery's protection circuit may get damaged and case an internal short-circuit. Additionally, the battery may catch on fire, smoke, explode, or cause heat generation.

- Soldering

"Do not directly solder the battery"

The insulator could melt or the gas release vent might get damaged from the heat. Additionally, the battery may catch on fire, smoke, explode, or cause heat generation.

- Disassemble and Reconstruction

"Do not disassemble the battery"

If the protection circuit gets damaged, the battery will not be protected. Then, the battery may catch on fire, smoke, explode, or cause heat generation.

- Charge near High Temperatures

"Do not charge the battery near high temperatures"

If the battery is charged near high temperatures, the battery may not be able to charge due to the activation of the protection circuit. In these conditions, the protection circuit may break and the battery may catch on fire, smoke, explode, or cause heat generation.

! Warning

- Ingestion

"Keep away from infants"

The battery should be kept away from infants. In case of swallowing the battery, see a doctor immediately.

- Storing

"Do not put the battery in the microwave or other cooking appliances"

The battery may on fire, smoke, explode, or cause heat generation due to heat or the electrical impact from the microwave.

- Mixed Use

"Do not mix the battery with other batteries."

The battery should not be used with other batteries with different capacity, chemistry or manufacturer. Do not connect with other batteries or mix with other batteries. The battery may catch on fire, smoke, explode, or cause heat generation.

- Rust, Changing Color and Deformities

"Do not use abnormal batteries."

Please stop using the battery if there are noticeable abnormalities such as abnormal smell, heat, deformities, or discoloration. The battery may have a defect and may catch fire, smoke, heat generation or explode if used continuously.

- Charging Time

" Stop charging if the charging process cannot be finished."

If the battery can not finish the charging process within the specified time, please stop the charging process. The battery may catch on fire, smoke, explode, or cause heat generation.

- Leakage①

"Do not use a leaking battery near flames"

If the battery or liquid leaking from the battery has a pungent odor, the battery should keep away from flames. The battery may ignite and explode.

- Leakage②

"Do not touch a leaking battery"

If the liquid leaking from the battery gets into eyes, it will cause significant damage. If the leaking liquid gets into your eyes, please flush eyes immediately with pure water. Please consult a physician immediately. If the liquid remains in the eyes it will cause significant damage.

- Transport

" Pack the battery tightly during transport"

To prevent short-circuit or damages, please tightly pack the battery into a case or a carton box.

! Caution

- Use under Direct Sunlight

  Do not use or leave the battery in excessive heat such as in a car in direct sunlight.
  The battery may catch on fire, smoke, explode, or cause heat generation. Also, it might cause a deterioration of battery's characteristics and battery life.

- Static Electricity

  The battery pack has a protection circuit. Do not use the battery where it generates static electricity (more than 100V) that might damage the protection circuit. If the protection circuit is broken, the battery may catch on fire, smoke, explode, or cause heat generation.

- Charging Temperature Range

  Charging temperature range is regulated between 0℃ and 60℃. Do not charge the battery out of the specified temperature range. Otherwise, it may cause heat generation, leakage or a serious damage. Also, it might cause deterioration of the battery's characteristics and battery life.

- Manual

  Please read the manual before usage. Please save the manual for future reference.

- Charging Method

  Please read the charger's manual for the charging method.

- First Time Use

  Please contact the supplier If the battery has unusual odor, heat generation or rusts during the first usage.

- Use by Children

  Parents must explain how to use the system and the battery. Please check back periodically to ensure children are using the system and the battery correctly.

- Inflammable Materials

  Please keep away from flammable materials during the charge and the discharge. It may catch on fire, smoke, explode, or cause heat generation.

- Leakage

  If electrolyte leak from the battery and adhere to the skin or clothes, immediately flush it with water. Otherwise, it may cause skin irritation.

- Insulation

  If lead wires or metal objects come out from the battery, please seal and insulate them completely. Otherwise, the battery may cause a short circuit and catch on fire, smoke, explode, or cause heat generation.

- Recycle

  Please recycle the battery according to local rules or regulations after use.

4. Extent of the Application

This specification is applied to SANYO Lithium Ion Battery of UF604462SW for WiFi-Router with SCUD (FUJIAN) ELECTRONICS CO., LTD..

For special applications in which quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or cause threat of personal injury such as for weapon, aircraft and aerospace equipment, aircraft electronics equipment, medical equipment (a part of class 2 equipment, class 3 or more equipment), or cause large-scale system troubles, explosion-proof equipment, electric vehicle, hybrid electric vehicle, and electric motor cycle (except electric power-assisted bicycle), this specification shall not be applied.

5. Battery Classification and Type

5.1 Battery Classification SANYO Lithium Ion Battery

5.2 Battery Type UF604462SW

6. Nominal Specifications

Items		Specifications	Notes
6.1 Rated Capacity		2420mAh	0.48A discharge at 20℃
6.2 Capacity	Minimum	2420mAh	0.48A discharge at 25℃
	Typical	2480mAh	Reference only 0.48A discharge at 25℃
6.3 Nominal Voltage		3.8V	0.48A discharge
6.4 Discharging End Voltage		2.50V	
6.5 Charging Current (Std.)		1.69A	
6.6 Charging Voltage		4.35±0.05V	0 ~ +45℃
		4.25±0.05V	+45 ~ +60℃ ※1
6.7 Charging Time (Std.)		4.0 hours	
6.8 Continuous Discharging Current (Max.)※2		4.84A	0 ~ +40℃
6.9 Internal Resistance		less than 80mΩ	AC Impedance 1 kHz
6.10 Weight		less than 39.5g	
6.11 Operating Temperature	Charge	0 ~ +60℃	
	Discharge	-20 ~ +60℃	
6.12 Storing Conditions	less than 1 month	-20 ~ +50℃	Percentage of recoverable capacity 80%※3
	less than 3 months	-20 ~ + 40℃	
	less than 1 year	-20 ~ + 20℃	

※1 Re-charging condition is recommended that cell voltage goes down 3.70V or less.

※2 The maximum discharge current for a single cell use. However after the battery pack assembly , there will be a limitation of maximum discharge current due to a protection circuit or a protection device.

※3 Percentage of recoverable capacity
= (Discharging time after storage / Initial discharging time) ×100
The discharging time is measured by the discharge current of 0.48A until 2.50V of end voltage after the battery is fully charged at 25℃.

7. Electrical Characteristics

Items	Conditions	Criteria
7.1 Full Charge	The battery is charged with 1.69A constant current until the voltage reaches 4.35V. Then, the current is reduced in order to keep the constant voltage of 4.35V. The total charging time is 4.0 hours at 25 ℃.	
7.2 Capacity	①Within 1 hour, after fully charged at 25℃, the battery is discharged with 0.48A continuously until 2.50V of end voltage at 25℃.	More than 300min.
	②Within 1 hour, after fully charged at 25℃, the battery is discharged with 2.42A continuously until 2.50V of end voltage at 25℃.	More than 54min.
7.3 Cycle Life	The battery is repeated 500 times of Charge and Discharge cycles, (Charged by CC-CV of 1.69A-4.35V for 4.0 hours, Discharged by CC of 2.42A to 2.50V (E.V.)) at 25℃. After the 500 cycles, the discharge time is measured by the Item 7.2.①.	More than 210min.
7.4 Temperature Characteristics	①Within 1 hour, after fully charged at 25℃, the battery is stored at 0 ℃ for 3 hours. After that, the discharge time is measured Item 7.2.② at 0 ℃.	More than 25min.
	②Within 1 hour, after fully charged at 25℃, the battery is stored at 60 ℃ for 3 hours. After that, the discharge time is measured Item 7.2.② at 60 ℃.	More than 50min.
	③Within 1 hour, after fully charged at 25℃, the battery is stored at -20 ℃ for 3 hours. After th at, the discharge time is measured Item 7.2.① at -20 ℃.	More than 90min.
7.5 Storage at Fully Charged State	①After fully charged at 25℃, the battery is stored for 10 days at 60 ℃. After the storage, the battery is set in 25℃ for 3 hours. Then, the discharge time is measured Item 7.2.②.	More than 25min.
	Then, the same battery is fully charged again and checked the second discharge time by the Item 7.2.② at 25 ℃.	More than 35min.

	②After fully charged at 25℃, the battery is stored for 20 days at 60 ℃. After the storage, the battery is set in 25℃ for 3 hours. Then, the discharge time is measured Item 7.2.②.	More than 20min.
	Then, the same battery is fully charged again and checked the second discharge time by the Item 7.2.② at 25 ℃.	More than 30min.
7.6 Storage at Full Discharged State	After fully charged at 25℃, the battery is discharged by the Item 7.2.②. Then, the battery is stored for 20 days at 60 ℃. After the storage, the battery is set in 25℃ for 3 hours. Then, the discharge time is measured by Item 7.2.② at 25℃.	More than 45min.
7.7 Drop	After fully charged at 25℃, the cell is dropped with the following condition. Height: 1.5m Floor : Steel Plate Time: 2 times in each face	No rupture, no fire

STANDARD TEST CONDITIONS:

The testes shall be implemented with new batteries that were delivered within the last 7 days. The tests shall be performed at 25±2 ℃ (The standard temperature of second grade is specified by *JIS Z 8703* (Standard Test Conditions)), 65±20 % (The standard humidity of twentieth grade is specified by *JIS Z 8703* (Standard Test Conditions)). The grade of voltmeter and ammeter in the tests shall be higher than Class 0.5 which is specified by *JIS C 1102* (Electric Indicator).

8. Design and Dimensions

The battery design is shown in the following documents or drawings.

(Refer to 1/14 page.)

9. Appearance

The battery should not have the following appearance issues at delivery:

- ・Scratch
- ・Rust
- ・Discoloration
- ・Dirt
- ・Deformation
- ・Leakage

The battery should be in good condition.

10. Shipping Charge

The battery is shipped out with the approximately 50%* charged state.
*The 50% capacity is the condition in which SANYO ships the battery but it's not the condition when SCUD (FUJIAN) ELECTRONICS CO., LTD. receives the battery.

11. Precautions for Designing of WiFi-Routers, the Chargers and the Battery Packs

11-1. Precautions for Designing of WiFi-Router and the Charger.

(1) Charge
- The battery is charged by a method of constant current-constant voltage.
- Regarding UF604462SW, the charging current should not exceed 2.42A /cell.
- The charging voltage should not exceed 4.35V /cell.
  The charging voltage is required to be set to less than 4.40V/cell with considering the accuracy of charger. Even if the charger is failed, the total safety shall be secured.
- The charger shall be equipped with a pre-charge system.
  If battery voltage goes down to less than 2.50V/cell, the battery should be charged by pre-charge current of maximum 0.10A. Once, the battery reached more than 2.50V /cell by the pre-charging, the charger can resume the standard charging method. However, if the battery voltage never recovers more than 2.50V/cell, the charger must be stopped and turned off.
- The charger shall be equipped a full charge detection.
  The charger shall detect the full-charged state by a timer, current detection or open circuit voltage detection. When the charger detects the full-charge, the charger shall stop charging. Do not apply the continuous charging (trickle charging) method.
- The charging temperature range should be set between 0 to +60 ℃.

(2) Discharge
- The discharge current should not exceed 4.84A/cell.
- The discharge temperature should be between -20℃ to ＋60 ℃.
- The discharge end voltage should be more than 2.50V/cell.

(3) Over discharge
- Do not discharge the battery less than 2.0V/cell.

(4) Design of WiFi-Routers and chargers.
- The cells should be kept away from heat generating electronic parts in order to avoid deterioration of battery performance.

11-2. Precautions for Battery Pack Design.

(1) Shape, mechanism and material of battery packs
- The battery pack should be designed so it does not connect with to unauthorized chargers.
- The battery pack should be designed so it cannot connect with unauthorized equipment and/or devices.

- The terminal shape should be designed to avoid short circuit issues. In addition, the battery pack should be equipped with an over current protection function in order to prevent from external short circuit issues.
- The terminal shape and structure should be designed so it does not connect in backwards.
- The battery pack should be designed to prevent static electricity, electrolyte or water ingress issues.
- The battery pack should be designed so the protection circuit functions can be inspected during the assembly process.
- The battery pack should be designed so electrolyte cannot reach to the protection circuit board even if electrolyte leak out of the cells.
- The cells should be fixed by a tape or a glue in the case. If the battery pack is dropped, the cells should be protected against dents, deformations and other mechanical stresses.
- Do not apply heat, pressure, shock or any other damaging elements to the gas release vent area. SANYO will not take any responsibilities for defects of cell performance or troubles caused by them.
- Plastic cases should be closed with glue. If an ultra sonic welding method is applied to the case sealing, SANYO will not take any responsibilities for any defects.
- The pack shall be designed so end users cannot remove or disassemble the cells.
- Protection devices (For example: PTC or a thermal fuse) shall be equipped on every cell in the appropriate area of the cell where temperature can be detected accurately. A wrong setting will result in defects and issues.

(2) Protection circuit

The following protection circuit should be equipped in the battery pack:

- Overcharge protection

  We recommend the overcharge protection works when cell voltage reaches more than 4.40V. Then, the current shall be shut down.
- Over discharge protection

  If cell voltage reaches approximately 2.2V, we recommend the over discharge protection will shut down the discharge current and the circuit consumption current will be set to less than 1μA.
- Over current protection

  If discharge current exceeds approximately 4.84A, the over current protection will shut down the current.

(3) Electric circuit

- To avoid over discharge mode during long storage times, the consumption current of the battery pack's protection circuit should be set as low as possible.

(4) Cell connection

- The cells should not be connected using a soldering process. In order to avoid any damages, cells should be connected to lead plates by a spot welding method.

(5) Precautions on label

・ The rating label should indicate required information and precautions. The precautions should be based on the information in section 3.

12. Storing Condition

12-1 Storage Temperature and Humidity (Within 3 months)

・ Cells should be stored between -20℃ to +40℃ in a low humidity condition (less than 70 %RH) without any corrosive gases.

・ No condensation on the cell

12-2 Long Duration Storage

・ Cells should be stored between -20℃ to +20℃ in a low humidity condition (less than 70%RH) without any corrosive gases. We recommend the discharged state or partially charged state SANYO shipped out for the long duration storage.

・ No condensation on cells.

13. Handling Precautions for Lithium Ion Cells

・This section describes handling precautions for SANYO lithium ion cells which will be assembled as WiFi-Router's battery packs with SCUD (FUJIAN) ELECTRONICS CO., LTD.. This battery pack consists of UF604462SW.

13-1 Series Connections Precautions

・ When cells are connected in series, make sure the lot number, the shipping charge date, and capacity rank match. Please do not mix cells with different lot numbers, shipping charge date, and capacity rank. Also, the voltage variability should be within 20mV.

・ The lot number, the shipping charge date and the capacity rank are indicated on the shipping carton label.

・ If cells are connected in series, the discharge end voltage should be set more than 3.0V/cell.

13-2 Cell Terminal Precautions

・ Do not apply excessive stress to the cell terminals. It may cause a leakage or short-circuit.

13-3 Inspection of the Battery Pack before Shipping

All battery packs shall be inspected for:

・Voltage
・Internal impedance
・Function of protection circuit
・Thermistor resistance
・Thermal fuse

13-4 Abnormal Cells

・ Do not use damaged cells by dropping, and/or short circuit and cells with electrolyte smell and any other damaged cells.

14. Warranty Exemptions

・ SANYO will not be liable for any damages that are caused by violations of the precautions in this specification.
・ SANYO will not be liable for any problems caused by design defects of the battery packs, WiFi-Router and/or chargers.
・ SANYO will not accept any abnormal cells that were caused due to any incorrect assembly process.

15. Other Remarks

・ If there are problems in this specification, SANYO will take them into consideration.
・ SANYO can discuss specs or precautions that are not described in this specification.
・ Do not use the provided cells for other applications.

16. Standard Charging Method

(1) The standard charge condition is 1.69A/cell - 4.35V/cell (Constant current-constant voltage). The charging process should be discontinued when either time, the, OCV or current, reach certain values.

(2) In case of the over discharge state (For example: Battery voltage is less than 2.0V), the battery should be charged by a pre-charge system in order to prevent FET's heat generation in a circuit.

(3) The pre-charging current should be approximately 0.10A. Once, the battery voltage reaches more than 2.50V/cell, the charger can resume the standard charging method. The pre-charging should have a cut-off timer and if the voltage doesn't recover over 2.50V/cell in the set time, the charging should be stopped.

(4) The cell may be swelled during usage, continuous charging, and especially under the high temperature.
Please consult SANYO for the charging method instructions.

17. Battery Warranty Period

The warranty period is limited to one year from date of shipment. SANYO will replace batteries if it is clear that there was a defect in SANYO's manufacturing process and that the battery was not misused.

18. Battery Safety Requirements

In order to ensure the safety of the battery, please contact SANYO to discuss the application design from a mechanical or a electrical viewpoint. Also, if there are special conditions (For example: lager current load, a quick charge method or an unique usage pattern), please contact SANYO to check the conditions before the product specification is fixed.

19. Precautions for Prismatic Cells

Prismatic type cells may swell during usage. The value described in the drawing is the thickness after 500 cycles (Please refer to section 7.3). Cell thickness may swell unexpectedly in the below scenarios:

- The charging voltage exceed 4.35V.
- The ambient temperate of usage is not 25±2 ℃.
- The battery is charged and discharged more than 500 cycles.
- The battery is stored for a long time.

20. Safety Characteristics and International Standards

Test Item	UL1642 Condition	PSE Condition	UN Condition (38.3 Lithium batteries)
External Short-Circuit	PASS	PASS	PASS
Abnormal Charge	PASS	N/A	N/A
Forced Discharge	PASS	PASS	PASS
Crush	PASS	PASS	N/A
Impact	PASS	N/A	PASS
Shock	PASS	PASS	PASS
Vibration	PASS	PASS	PASS
Heating (Thermal)	PASS	PASS	PASS
Temperature Cycling	PASS	PASS	N/A
Low Pressure (Altitude simulation)	PASS	PASS	PASS
Projectile	PASS	N/A	N/A
Continuous Charging	N/A	PASS	N/A
Free Fall	N/A	PASS	N/A
Overcharge	N/A	PASS	N/A
Against a high charging rate	N/A	PASS	N/A
Forced Internal Short-Circuit	N/A	PASS	N/A

The above table does not mean we got qualification of standards.
Those are just test results we have performed.

NO.	PART NAME	APPLICATION·PART CODE	QTY.	MATERIAL·SPECIFICATION	NOTE
	BATTERY		1	UF604462SW	SHIPPING WITH CHARGE
1	LEAD PLATE		1	ALUMINUM NICKEL CLAD	
2	INSULATION RING		1	CARD PARER 0.3t	

DRAWING NOT TO SCALE

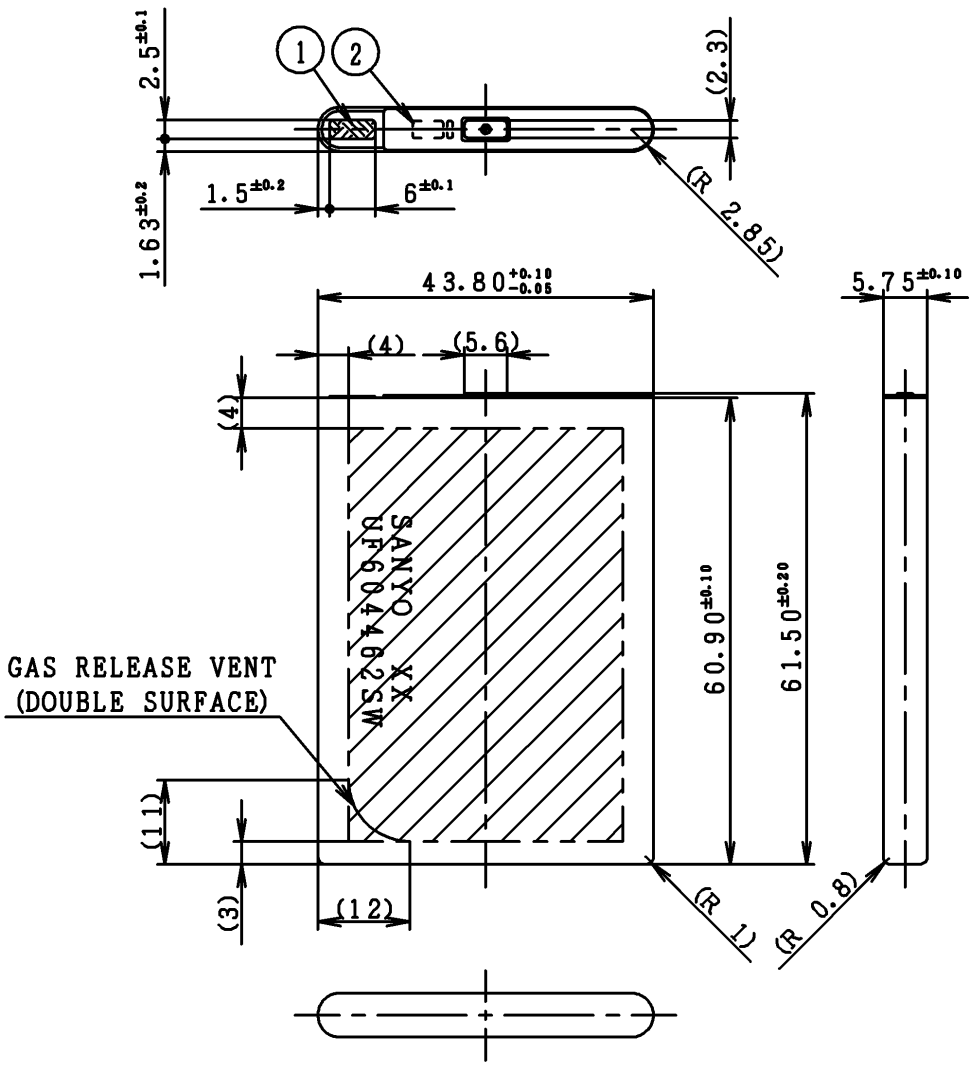

TABLE. 1

FACTORY ID	FACTORY
L	SANYO ENERGY HIGASHIURA CO.,LTD.
TD	TSUNADENKI CO.,LTD.
C	CHUOU ELECTRIC CO.,LTD.
CH	CHUOU ELECTRIC CO.,LTD. HIROTA FACTORY

NOTES.
1. BARE CELL.
2. CELL MANUFACTURED LOT CODE TO BE PRINTED ON THE CAN.
XXX
DAY (1ST=1, 2ND=2‥10TH=A, 11TH=B, ‥30TH=U, 31ST=V)
MONTH (JAN=A, FEB=B, ‥‥NOV=K, DEC=L)
YEAR (‘96=A, ‘97=B, ‥‘13=R, ‘14=S‥)
EX.) JAN.30.2013‥‥RAU
3. HATCHING AREA SHOWS THE DIMENSION AFTER FOLLOWING CONDITIONS. (////)
·AFTER DELIVERY CHARGE (MAX. 6.00mm)
·AFTER CYCLE CHARGING AND DISCHARGING(REFERENCE ONLY) (APPROX. 6.60mm)
4. STAMP ‘SANYO’, FACTORY ID & MODEL ON THE CAN OF EITHER SIDE.
5. STAMP FACTORY ID ON THE CAN AS SHOWN IN THE FOLLOWING TABLE.1.

DATE		REMARK	SYM	DATE	DESCRIPTION
JAN. 30. 2013			1		
D R	K. Washio		0	JAN. 30. 2013	1st DRAWING (K. Washio)
CHK	K. Yoshimoto	MODEL:UF604462S-H003A		材料·規格 MATERIAL	
CHK		CUSTOMER CODE:.		処理·加工 FINISH	
ENG		TOLERANCE: 250< L ±5; <L≤ ±; 50< L ≤250 ±4; 18< L ≤ 50 ±3; L ≤ 18 ±2	WEIGHT Approx. g	部品名 PART NAME	完成電池 / BATTERY PACK(finish goods)
APP	M. Kagoshima		UNIT mm; QTY 1; SCALE 1/1	PART CODE	Rev.
				DRAWING NO	UF604462S-H003A01