

**DRAFT**

Confidential

To ICON ENERGY SYSTEM CO., LTD.

File No. UR1865-4270

Issue Date: 2018/07/24

**LITHIUM ION BATTERY  
SPECIFICATION**

BATTERY CLASSIFICATION

LITHIUM ION BATTERY

PRODUCT CODE

BJ-A101110AA

Client Agreement:

Signature: \_\_\_\_\_

Name in Block Letters: \_\_\_\_\_

Date: \_\_\_\_\_

\* If there is no reply within 30 days following delivery, this document shall be presumed to be valid.

Portable Rechargeable Battery Application Engineering Department  
Energy Solutions Business Division  
SANYO Electric Co., Ltd.  
Automotive & Industrial Systems Company  
of Panasonic Group

Dft.	<i>H. Jitar</i>
Chk.	<i>W. Murata</i>
Chk.	<i>T. Nishitani</i>
App.	<i>M. Nakajima</i>

## Table of Contents

	Page
1 Revision History.....	1
2 Safety Instructions.....	2
3 Scope.....	6
4 Battery Classification and Product Code.....	6
5 Nominal Specifications.....	7
6 Charging Control for Life End.....	8
7 Electrical Characteristics.....	8
8 Design and Dimensions.....	9
9 Appearance.....	9
10 State of Charge at Time of Shipment.....	10
11 Standard Charging Method.....	10
12 Precautions for Designing the Portable power source, the Charger and the Battery pack.....	10
13 Storing Conditions.....	14
14 Handling precautions for Lithium Ion Cells.....	14
15 Warranty Exemptions.....	15
16 Remark of Safety Design.....	15
17 Other Remarks.....	15
18 Battery Warranty Period.....	16
19 Battery Safety Requirements.....	16
20 Document Terms (Tentative Specification).....	16
Appendix.....	17

Title	Lithium Ion Battery Specification (Cylindrical Type)			Page	1/18
<b>1 Revision History</b>					
No.	Date	Class	Description		
(0)	2018/06/28	-	Issue (Preliminary)	Dft.	H.Ijitsu
				Chk.	W.Murata
				Chk.	T.Nishitani
				App.	M.Nakanishi
(1)	2018/07/24	R	Revision (Preliminary) -Change charging current -Change Cycle life (Item 7.3) -Change the cell temperature 65°C to 70°C (Item 5.9) -Change Appendix 1 and Appendix 2 -Change drawings	Dft.	H.Ijitsu
				Chk.	W.Murata
				Chk.	T.Nishitani
				App.	M.Nakanishi
				Dft.	
				Chk.	
				Chk.	
				App.	
				Dft.	
				Chk.	
				Chk.	
				App.	
				Dft.	
				Chk.	
				Chk.	
				App.	
* Legend: A for Added, D for Deleted, R for Revised					
File No.	UR1865-4270		Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	2/18
-------	--	------	------

## 2 Safety Instructions

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. Moreover, please add the following instructions as "prohibited item in usage" to the user's manual.

**Danger**

### (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 polyolefin 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.

File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	3/18
<p>(6) Use in Other Equipment</p> <p><i>Do not use the battery in equipment for which it was not intended.</i></p> <p>If the battery is used in unapproved applications or systems, the battery may become damaged and generate heat, smoke, catch fire, or explode.</p> <p>(7) Incineration and Heat</p> <p><i>Keep the battery away from heat and fire.</i></p> <p>Heat will damage the battery and may cause it to generate heat, smoke, catch fire, or explode.</p> <p>(8) Short-Circuit</p> <p><i>Do not apply a short-circuit.</i></p> <p>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.</p> <p>(9) Impact</p> <p><i>Avoid excessive impact to the battery.</i></p> <p>Excessive impact may damage the battery. This may cause the battery to leak, generate heat, smoke, catch fire, or explode.</p> <p>(10) Penetration</p> <p><i>Do not penetrate the battery with a nail or strike with a hammer.</i></p> <p>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.</p> <p>(11) Soldering</p> <p><i>Do not directly solder to the battery.</i></p> <p>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.</p> <p>(12) Disassembly</p> <p><i>Do not disassemble the battery cell and battery pack.</i></p> <p>Battery cell and/or battery pack may be deformed and damaged by disassembly. Disassembly or modification of the battery cell and/or battery pack may damage the protection functions. This may cause the battery cell and/or battery pack to generate heat, smoke, catch fire, or explode.</p> <p>(13) Charge near High Temperatures</p> <p><i>Do not charge the battery near high temperature.</i></p> <p>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.</p>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	4/18
-------	--	------	------

**Warning**

(1) Ingestion

*Keep away from small children.*

Keep the battery away from small children. If the battery or any of its component parts is swallowed, seek medical attention immediately.

(2) Storage

*Do not place the battery in or near a microwave or other cooking appliances.*

If subjected to heat or electromagnetic radiation, the battery may leak, generate heat, smoke, catch fire, or explode.

(3) Mixed Use

*Do not mix with other batteries.*

The battery should not be used with other batteries having a different capacity, chemistry, or manufacturer. Doing so could cause the battery to generate heat, smoke, catch fire, or explode.

(4) Discoloration and Deformities

*Do not use abnormal batteries.*

Immediately stop using the battery if there are noticeable abnormalities, such as smell, heat, discoloration, or deformity. The battery may be defective and could generate heat, smoke, catch fire, or explode with continued use.

(5) Charging Time

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

If the battery can not finish the charging process within the specified time, halt the charging process. The battery may generate heat, smoke, catch fire, or explode.

(6) Leakage ①

*Do not use a leaking battery near open flame.*

If the battery or liquid leaking from the battery has an irritating odor, the battery should be kept away from any open flame. If exposed to an open flame, the battery could ignite and explode.

(7) Leakage ②

*Do not touch a leaking battery.*

If liquid leaking from the battery gets into your eyes, immediately flush your eyes with clean water and seek medical attention. If left untreated, it will cause significant eye damage.

(8) Transport

*Pack the battery securely for transport.*

To prevent short-circuit or damage during transport, securely pack the battery in a case or carton.

File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	5/18
<p>(9) <b>Exposure to Direct Sunlight</b> Do not use or leave the battery in a location exposed to excessive heat (over 80deg.C), such as in direct sunlight or in a car. That may cause leakage, heat, smoke, rupture, or fire. It may also cause the battery's performance and life to deteriorate.</p> <div data-bbox="545 472 1029 551" style="text-align: center; border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p><b>Caution</b></p> </div> <p>(1) <b>Static Electricity</b> The battery pack has a protection circuit. Do not use the battery where static electricity in excess of 100V is generated as it may damage the protection circuit. If the protection circuit fails, the battery may generate heat, catch fire, smoke, or explode.</p> <p>(2) <b>Charging Temperature Range</b> Only charge the battery at our specified temperature range. Charging outside of this temperature range may cause the battery to leak, generate heat, or result in serious damage. It may also cause the battery's performance and life to deteriorate.</p> <p>(3) <b>Manual</b> Read the manual before use. Keep for future reference.</p> <p>(4) <b>Charging Method</b> Read the charger's manual before use for proper charging method.</p> <p>(5) <b>First Time Usage</b> Please contact the supplier if the battery gives off an unusual odor, generates heat, or shows signs of rust prior to its initial use.</p> <p>(6) <b>Use by Children</b> 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.</p> <p>(7) <b>Flammable Materials</b> Do not charge or discharge near flammable materials. Doing so could result in fire.</p> <p>(8) <b>Leakage</b> If electrolyte leaks from the battery and comes into contact with skin or clothing, immediately flush with water. Otherwise, it may cause skin irritation.</p> <p>(9) <b>Handling of Exposed Contacts or Conductors</b> If the battery pack has a system interface consisting of stripped lead wires or exposed contact plates, handle with due care. Temporarily insulate exposed contacts and conductors with an insulator such as polypropylene tape or polyvinylchloride tape. Failure to do so could result in an electrical shock; a short circuit causing the battery to generate heat, smoke, catch fire, or explode; or the combustion of other materials.</p> <p>(10) <b>Recycling</b> When disposing of the battery, recycle it according to local rules and regulations.</p>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	6/18
-------	--	------	------

**3 Scope**

This specification applies to the Lithium Ion Battery UR1865Z-H13RA for Portable power source by ICON ENERGY SYSTEM (SHENZHEN) CO., LTD..

Do not use this battery in applications other than described above.  
If the battery was used in other applications, it may cause performance degradation and safety deterioration depending on the usage of the battery in the equipment.  
Incorrect handling of the battery may cause potential hazards of overheat, smoke, fire, or explosion.  
Battery usage other than described above could result in bodily injury or property damage.

This Specification shall not apply to special applications requiring a high degree of quality and reliability where the failure or malfunction of the products may directly jeopardize life or cause threat of personal injury. A non-exhaustive list of such applications includes: weapons, aircraft and aerospace equipment, aircraft electronics equipment, medical equipment (excluding Class 1 equipment), intrinsically safe equipment, electric vehicles, hybrid electric vehicles, and electric motorcycles (excluding electric bicycles).

**4 Battery Classification and Product Code**

4.1	Battery Classification	Lithium Ion Battery
4.2	Product Code	BJ-A101110AA
4.3	Model Name	UR1865Z-H13RA
4.4	Cell Type	UR1865ZL2

File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--



Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	7/18
-------	--	------	------

## 5 Nominal Specifications

Item		Specifications	Notes
5.1	Rated Capacity	2260 mAh	0.462A discharge at 20°C
5.2	Capacity (Minimum)	2310 mAh	0.462A discharge at 25°C
5.3	Capacity (Typical)	2380 mAh	Reference only
5.4	Nominal Voltage	3.6 V	0.462A discharge
5.5	Discharging End Voltage	2.5 V	
5.6	Charging Current	Low temp.	0.462A or less 0~10°C
		Std. temp.	1.155A or less 10~45°C
5.7	Charging Voltage	4.10 ± 0.05 V	
5.8	Charging Time (Std.)	4.0 hours	
5.9	Discharge Current (Max.) * <sup>1</sup>	10 A	The cell temperature must not exceed 70°C.
5.10	Internal Resistance	less than 40 mΩ	AC impedance 1 kHz
5.11	Weight	less than 46.6 g	
5.12	Operating Temperature	Charge	0 ~ +45°C Standard temperature range
		Discharge	-20 ~ +60°C
5.13	Shipping Charge Storage Conditions	less than 1 month	-20 ~ +50°C Recoverable Capacity: 80%* <sup>2</sup>
		less than 3 months	-20 ~ +40°C
		less than 1 year	-20 ~ +20°C

\*1 The maximum discharge current is for a single cell use (not considering cycle life). However after the battery pack assembly, maximum discharge current will be limited by a protection circuit or device.

$$*2 \text{ Recoverable Capacity} = \frac{\text{Discharge Time after Storage}}{\text{Initial Discharge Time}} * 100$$

The discharge time is measured by fully charging the battery at 25°C and then discharging it at a current of 0.462A to 2.5 V per cell in series.

File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	8/18
-------	--	------	------

**6 Charging Control for Life End**

Safety characteristics of Lithium-ion batteries can be improved by reducing the voltage lower than the rated charging voltage.  
 Therefore, when designing the battery pack using this cell, SANYO will request to reduce the charging voltage from the beginning.  
 Or SANYO will request to add a function to reduce the charging voltage when the deterioration rate reaches a certain level.

- If SOH (State of Health)<sup>\*3</sup> reaches to 50~60%, the charging voltage should be additionally reduced to 3.8V or should be exchanged

\*3 SOH is defined as below formula.  

$$SOH = \frac{\text{Capacity at a certain point during usage}}{\text{Initial Capacity}} \times 100$$

**7 Electrical Characteristics**

Item	Conditions	Criteria
7.1 Full Charge	The battery is charged at a 1.155A constant current until the voltage reaches 4.10 V. The current is then reduced to keep a constant voltage of 4.10 V. The total charging time is 4 hours at 25°C.	
7.2 Capacity	(1) Within 1 hour after fully charging at 25°C as per item 7.1, the battery is discharged at 0.462A continuously to 2.5 V at 25°C.  (2) Within 1 hour after fully charging at 25°C as per item 7.1, the battery is discharged at 2.31 A continuously to 2.5 V at 25°C.	More than 300 min.  More than 54 min.
7.3 Cycle Life	After the battery has been subjected to 1000 repeated charge and discharge cycles below condition.  Charged by CC-CV of 1.155A – 4.10 V for 77mA cut, then rest for 10min. Discharged by CC of 1.155 A to 2.5 V at 25°C then rest for 10min. The discharge time is measured as per Item 7.2, (1) after 1000 cycles	More than 240 min.
7.4 Temperature Characteristics	(1) Within 1 hour after fully charging at 25°C as per item 7.1, the battery is stored at 0°C for 3 hours. The discharge time is then measured as per Item 7.2, (2) at 0°C.  (2) Within 1 hour after fully charging at 25°C as per item 7.1, the battery is stored at 60°C for 3 hours. The discharge time is then measured as per Item 7.2, (2) at 60°C.	More than 30 min.  More than 50 min.

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	9/18
Item	Conditions		Criteria	
7.5 Storage at Fully Charged State	<p>After fully charging at 25°C as per item 7.1, the battery is stored for 20 days at 60°C After storage, the battery is held at 25°C for 3 hours. Then, the discharge time is measured as per Item 7.2, (2).</p> <p>Then, the same battery is fully charged again and discharged a second time and measured as per Item 7.2, (2) at 25°C.</p>		More than 30 min.	
7.6 Storage at Full Discharged State	<p>After fully charging at 25°C, the battery is discharged as per Item 7.2, (2). Then, the battery is stored for 20 days at 60°C. After storage, the battery is held at 25°C for 3 hours and is then fully charged as per item 7.1. Then, the discharge time is measured as per Item 7.2, (2) at 25°C.</p>		More than 40 min.	
7.7 Drop	<p>After fully charging at 25°C, the cell is dropped 3 times in random directions from a height of 1 m onto a flat surface of concrete.</p>		More than 50 min.	
<p><b>STANDARD TEST CONDITIONS:</b></p> <p>All tests shall be conducted with new cell delivered within the last 7 days. Tests shall be performed at a temperature of 25±2°C and a humidity of 65±20% (the standard temperature tolerance for Class 2 and the standard humidity tolerance for Class 20, respectively, as specified by <i>JIS Z 8703, Standard Atmospheric Conditions for Testing</i>). The precision of the voltmeter and ammeter used in the tests shall be higher than Class 0.5 as specified by <i>JIS C 1102-2, Special Requirements for Ammeters and Voltmeters</i>. Cells are able to meet criteria in item 7 in accordance with the described test condition, not actual usage condition.</p>				
<p><b>8 Design and Dimensions</b></p>				
<p>The battery design is shown in the following documents or drawings.</p>				
<ul style="list-style-type: none"> <li>• Drawing number           UR1865Z-H13RA01</li> </ul>				
<p><b>9 Appearance</b></p>				
<p>There shall be no such defects as followings, which may adversely affect commercial value of the cell:</p>				
<ul style="list-style-type: none"> <li>• Scratch</li> <li>• Rust</li> <li>• Discoloration</li> <li>• Dirt</li> <li>• Deformation</li> </ul>				
File No.	UR1865-4270	<p style="text-align: center;">Energy Solutions Business Division SANYO Electric Co., Ltd.</p>		

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	10/18
<p><b>10 State of Charge at Time of Shipment</b></p> <p>At time of shipment, the battery's state of charge shall be 30% of its rated capacity or less.</p> <p><b>11 Standard Charging Method</b></p> <p>(1) The standard charge condition is a constant current – constant voltage method with a current of 1.155A and a maximum voltage of 4.10 V. The charging process should be halted when either time, battery voltage, or current reach certain values. Also, if SOH reaches 50~60%, charging voltage reduction or alarm function for battery replacement should be installed.</p> <p>(2) When the battery is in a state of over-discharge (the battery voltage is less than 2.0 V per cell), the battery should be charged by a pre-charge circuit to prevent heat generation in the charge FETs.</p> <p>(3) The pre-charging current should be approximately 0.231A. Once, the battery voltage reaches more than 3.0V per cell, the charger can resume the standard charging method. The pre-charge function should have a cut-off timer in order to detect a short circuit. If the voltage does not recover to over 3.0V per cell within the specified time, charging must be terminated.</p> <p>(4) The current interrupt device (CID) may activate if the battery is charged continuously after it has reached a fully-charged state or if the battery is charged at a high temperature. Please consult SANYO for instruction on the charge method.</p> <p><b>12 Precautions for Designing the Portable power source, the Charger and the Battery pack</b></p> <p>Please comply with the following instructions during every stage of application, charger, battery pack design and assembly processes otherwise the battery may experience a deterioration of functionality, quality, and safety. In the worst case, the battery may generate heat, smoke, catch fire, or explode.</p> <p><b>12.1 Precautions for Designing the Portable power source and the Charger</b></p> <p>(1) Charge</p> <ul style="list-style-type: none"> <li>• The battery is charged by a method of constant current-constant voltage.</li> <li>• Regarding UR1865Z-H13RA, the charging current should not exceed 1.155A /cell.</li> <li>• The charging voltage is required to be set at less than or equal to 4.10V/cell.</li> <li>• The charging voltage should not exceed 4.15V/cell with considering the accuracy of charger. Even if the charger is failed, the total safety shall be secured.</li> <li>• The charger shall be equipped with a pre-charge system.</li> <li>• If battery voltage goes down to less than 3.0V/cell, the battery should be charged by pre-charge current of maximum 0.231 A. Once, the battery reached more than 3.0V/cell by the pre-charging, the charger can resume the standard charging method. However, if the battery voltage never recovers more than 3.0V/cell, the charger must be stopped and turned off.</li> </ul>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	11/18
<ul style="list-style-type: none"> <li>• The charger shall be equipped a full charge detection.</li> <li>• 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.</li> <li>• The charging temperature should be confined to the range 0°C to +45°C.</li> <li>• It is recommended that charging should be stopped to avoid continuous charging, when either of the following conditions are met; <ul style="list-style-type: none"> <li>- The charging current reaches approximately 46 mA in CV mode.</li> <li>- The charging time reaches 4h in case of charging at 1.155A.</li> </ul> </li> </ul> <p>(2) Discharge</p> <ul style="list-style-type: none"> <li>• The discharge current should not exceed 10 A /cell.</li> <li>• The discharge temperature should be between -20°C to +60°C.</li> <li>• Cell surface temperature should not exceed 70°C during discharge.</li> <li>• The discharge end voltage should be more than 2.5 V/cell If cells are to be connected in series, please refer to Item 14.1.</li> </ul> <p>(3) Over discharge</p> <ul style="list-style-type: none"> <li>• Do not discharge the battery less than 2.0V/cell.</li> <li>• Please control to prohibit recharge once the cell discharged to 1.3V or less.</li> <li>• However even if the battery is discharged to 0V, it does not cause leakage, smoke and catch fire.</li> </ul> <p>(4) Design of Portable power sources and chargers</p> <ul style="list-style-type: none"> <li>• The cells should be kept away from heat generating electronic parts in order to avoid deterioration of battery performance.</li> </ul> <p>(5) Strength of the battery pack enclosure</p> <ul style="list-style-type: none"> <li>• The battery pack enclosure must be designed to have sufficient strength to resist damage from specified or typical expected mechanical stresses such as bending, twisting, and impact due to drop of application.</li> </ul> <p><b>12.2 Precautions for Battery Pack Design</b></p> <p>(1) Shape, mechanism and material of battery packs</p> <ul style="list-style-type: none"> <li>• The battery pack shall be designed to prevent large current flow into one battery cell from other battery cells. If large current flow into the battery cell, the battery cell may leak, smoke, fire or explode.</li> <li>• The battery pack should be designed so it cannot connect to unauthorized chargers.</li> <li>• The battery pack should be designed so it cannot connect with unauthorized equipment and/or devices.</li> <li>• 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.</li> <li>• The terminal shape and structure should be designed so that it cannot connect in backwards.</li> </ul>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	12/18
<ul style="list-style-type: none"> <li>• The battery pack should be designed to prevent static electricity, electrolyte, or water ingress issues.</li> <li>• The battery pack should be designed so the protection circuit functions can be inspected during the assembly process.</li> <li>• The battery pack should be designed so electrolyte cannot reach to the protection circuit board even if electrolyte leak out of the cells.</li> <li>• Plastic cases should be closed with glue. If an ultrasonic welding method is applied to the case sealing, SANYO will not accept any responsibilities for any defects.</li> <li>• The cells should be fixed by tape or glue in the case. If the battery pack is dropped, the cells should be protected against dents, deformations, and other mechanical stresses.</li> <li>• The pack shall be designed so end users cannot remove or disassemble the cells.</li> <li>• The battery pack should be designed with considering control of temperature distribution in the battery pack, Otherwise there is the risk that the battery's life becomes short by it.</li> <li>• If the battery pack is used out of the operation region for performance (see appendix 1), that may cause deterioration of performance and life for the battery.</li> <li>• If the battery pack is used out of operation region for safety (see appendix 2), that may cause leakage, heating or damage of the battery, and may lead to unsafe state.</li> <li>• If SOH of battery reaches to 50~60%, the charging voltage should be reduced to 3.8V or should be exchanged.</li> <li>• The battery pack or the product shall be designed for the functions of anti-thermal propagation and flame containment in all usage. For ICON ENERGY SYSTEM (SHENZHEN) CO., LTD.'s reference, the battery design items are shown as follows. <ul style="list-style-type: none"> <li>- Gas management structure not to remain heated-gases.</li> <li>- Prevention of large current flow from other cells.</li> <li>- Prevention of heat transfer to neighbor cells.</li> </ul> </li> <li>• The battery pack or the product should be designed to adjust the voltage difference between each battery cell block in series. There is a possibility that the voltage difference between each battery cell block occurs by deterioration of the battery cell. Cell has the characteristics of performance deterioration by its usage, storage period, and storage condition.</li> <li>• The battery pack or the product shall be designed with considering control of temperature distribution in the battery pack, Otherwise there is the risk that battery cell's life becomes short by it.</li> <li>• The battery pack shall be installed at the stable environment area that is controlled temperature and humidity, and be kept away from heat generating electronic parts in order to avoid deterioration of battery cell performance. If cell temperature exceed 80deg.C, the cell with such a history will not be not guaranteed.</li> <li>• The battery pack or the product shall be designed that whole system does not shut down even if one or more the battery cell's voltage become lower or CID in battery cell operate.* <ul style="list-style-type: none"> <li>※ CID in battery cell operates by increasing inner pressure. Inner pressure is increased by long storage and/or repeated charge / discharge cycles. The CID operation is one of life-end mode, not abnormal phenomenon.</li> </ul> </li> <li>• In order to prevent by cell smoking or fire, the battery pack or the product shall be designed to prevent thermal propagation and flame leakage out of the product, even if cell becomes thermal runaway due to cell defect.</li> <li>• The battery pack or the product shall be designed to prevent the deformation of the battery cell by shock, impact force, or vibration. It causes the catching fire, smoke, abnormal heat of the battery cell by abnormal shock, impact force or vibration with repetition even if the deformation of the battery cell does not find.</li> </ul>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	13/18
-------	--	------	-------

- In case of high voltage battery pack (equal or more than 60V), please design battery pack with considering insulation to prevent electric shock by high voltage.
- The battery pack or the product should be designed to prevent static electricity, electrolyte, water, or foreign particle ingress issues.

\*SANYO defines “battery pack” as follows

- (i) Assembling one or more than two cells
- (ii) (i) with electrical control unit
- (iii) Assembling one or more than two of (ii)

(2) Protection circuit

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

- **Overcharge protection**

We recommend the overcharge protection engages when cell voltage reaches more than 4.15V/cell then, the current shall be shut down.

- **Over discharge protection**

If cell voltage reaches approximately 2.2V/cell, we recommend that the over discharge protection circuit shuts down the discharge current and the circuit consumption current is set to less than 1μA.

Additionally If cell voltage reaches approximately 1.30V/cell by self-discharge and so on, the battery pack should be equipped the function that never charging again.

- **Over current protection**

If discharge current exceeds approximately 10A /cell, 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 and an ultrasonic welding method. Additionally, the cells also should be protected by thermal and vibration influence indirectly. 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 2.

**12-3. Traceability**

The Battery system shall be designed to implement traceability system that is able to link between cell 2D code information, the battery module ID, and system for improvement of quality control, reliability, and fast cell traceability.

File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	14/18
<p><b>13 Storing Condition</b></p> <p><b>13.1 Storage Temperature and Humidity (Within 3 months)</b></p> <ul style="list-style-type: none"> <li>• Cells should be stored in a stable environment characterized by low-humidity (less than 70%RH), free of corrosive gasses, and an ambient temperature between -20°C and +40°C</li> <li>• To prevent rust, avoid conditions that can create condensation such as rapid fluctuations in the ambient.</li> </ul> <p><b>13.2 Long Duration Storage</b></p> <ul style="list-style-type: none"> <li>• When long duration storage cells should be stored in a stable environment characterized by low-humidity (less than 70%RH), free of corrosive gasses, and an ambient temperature between -20°C and +20°C.</li> <li>• To prevent rust, avoid conditions that can create condensation such as rapid fluctuations in the ambient.</li> <li>• For long term storage, a discharged or partial charged state of charge per section 10 is recommended.</li> </ul> <p><b>14 Handling Precautions for Lithium Ion Cells</b></p> <ul style="list-style-type: none"> <li>• This section describes handling precautions for lithium ion cells which will be assembled as battery packs with ICON ENERGY SYSTEM (SHENZHEN) CO.,LTD.. This battery pack consists of UR1865Z-H13RA.</li> </ul> <p><b>14.1 Series Connections Precautions</b></p> <ul style="list-style-type: none"> <li>• When cells are connected in series in battery pack, make sure that the lot number, shipping charge date, and capacity rank match. Please do not mix cells with different lot numbers, shipping charge dates, or capacity ranks. The voltage variability between cells should be within 20mV.</li> <li>• The lot number, the shipping charge date and the capacity rank are indicated on the shipping carton label.</li> <li>• If cells are connected in series, the discharge end voltage should be set more than 3.0 V/cell.</li> </ul> <p><b>14.2 Inspection of the Battery Pack before Shipping</b></p> <p>All battery packs shall be inspected for:</p> <ul style="list-style-type: none"> <li>• Voltage</li> <li>• Internal impedance</li> <li>• Function of protection circuit</li> <li>• Thermistor resistance</li> <li>• Thermal fuse</li> </ul>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		



Title	Lithium Ion Battery Specification (Cylindrical Type)		Page	15/18
<p><b>14.3 Precautions on Pack Assembly</b></p> <ul style="list-style-type: none"> <li>• Do not use potentially abnormal cells which have been dropped, shorted, or deformed during handling or assembly even if no damage is readily apparent. Do not use cells giving off the odor of electrolyte.</li> <li>• Do not bring battery near or into contact with heat sources such as soldering irons.</li> <li>• Do not allow any metal to come into direct contact with cells inside the battery pack compartment.</li> <li>• Do not lift the core pack by holding the lead wires or the printed circuited board. Do not unnecessarily twist or bend the lead wires or the printed circuited board.</li> <li>• Do not re-work the battery.</li> </ul> <p><b>15 Remark of Safety Design</b></p> <ul style="list-style-type: none"> <li>• SANYO has been addressing to enhance the quality and the reliability of battery cell, but we also require our customers to introduce the safety design into the battery pack for avoiding unsafety situation.</li> <li>• The event such as abnormal heat generation, smoke, fire and explosion might happen due to the failure of battery cell and the use out of the specification. In order to prevent the accident such as injury, death, fire and social harm as a result of cell failure, ICON ENERGY SYSTEM (SHENZHEN) CO.,LTD. should discuss with the product manufacturer about the safety design such as redundant design, countermeasure design for fire spreading and so on, and should comply with the usage within this specification.</li> <li>• SANYO will not be liable for any damage due to insufficient safety design. And, the damage should be dealt under ICON ENERGY SYSTEM (SHENZHEN) CO.,LTD's responsibility.</li> </ul> <p><b>16 Other Remarks</b></p> <ul style="list-style-type: none"> <li>• If there are some problems in this specification, SANYO will revise the specification after consultation.</li> <li>• SANYO can discuss specification or precautions that are not described in this specification.</li> <li>• Do not use the cells to other applications which are not mentioned in the specification.</li> </ul> <p><b>17 Warranty Exemptions</b></p> <ul style="list-style-type: none"> <li>• SANYO will not be liable for any damages that are caused by violations of the prohibited matters (section 2) and the precautions (section 12, 14~16) in this specification. If some problem happen in the battery, please handle this matter under ICON ENERGY SYSTEM (SHENZHEN) CO.,LTD.'s responsibility.</li> <li>• SANYO will not be liable for any problems caused by design defects of the battery packs, Portable power source, or chargers.</li> <li>• SANYO will not take responsibility for the defective cell caused by pack assembling process.</li> </ul>				
File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.		

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	16/18
-------	--	------	-------

**18 Battery Warranty Period**

If a defect is found in a cell, SANYO will replace only this cell at no charge only in case that the defect meets all of following terms.

- (i) The defect is found and reported to SANYO within 1 year from the date of shipment of the defective battery;
- (ii) The defect is caused by the reasons attributable to SANYO, such as a defect in design or manufacture; and
- (iii) It is clear by evidence data such as log or/and inspection data that the defect is not caused by the reasons attributable to any third party other than SANYO, such as any misuse of the battery or failure to comply with this specification.
- (iv) SANYO judges that the defect is caused by the reason attributable to SANYO.

**19 Battery Safety Requirements**

In order to ensure the safety of the battery, please consult design condition, product configuration, protection unit of battery etc. with person in charge of SANYO. Also, please consult the special usage condition such as high current, quick charge, special purpose/ condition or the usage under special environment with person in charge of SANYO in advance.

**20 Document Terms (Tentative Specification)**

- The expiration period for this document is 6 months from the cover date.
- If a new revision of the document is released, please return or destroy the previous revision.
- Since it is tentative specification, the value in this specification is provisional.

File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	17/18
-------	--	------	-------

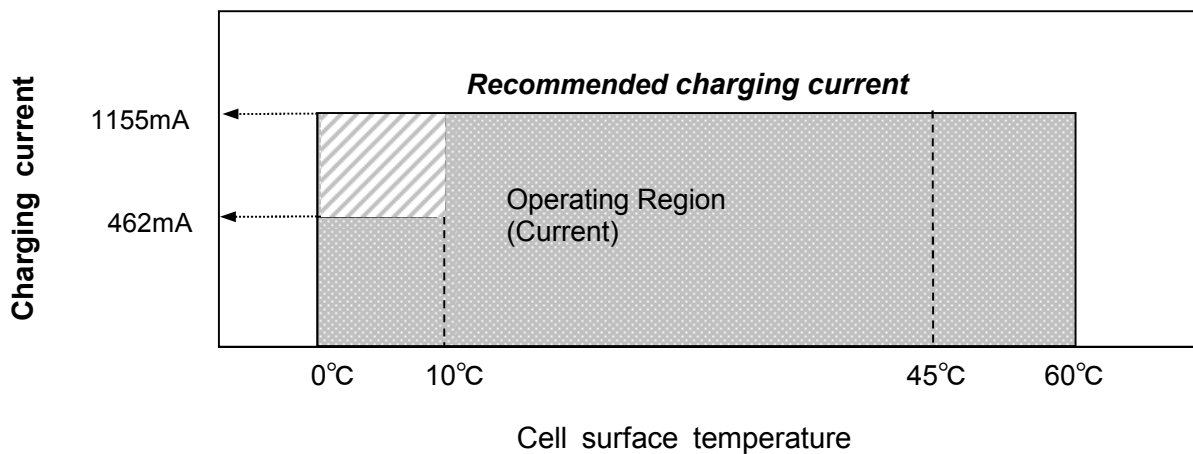
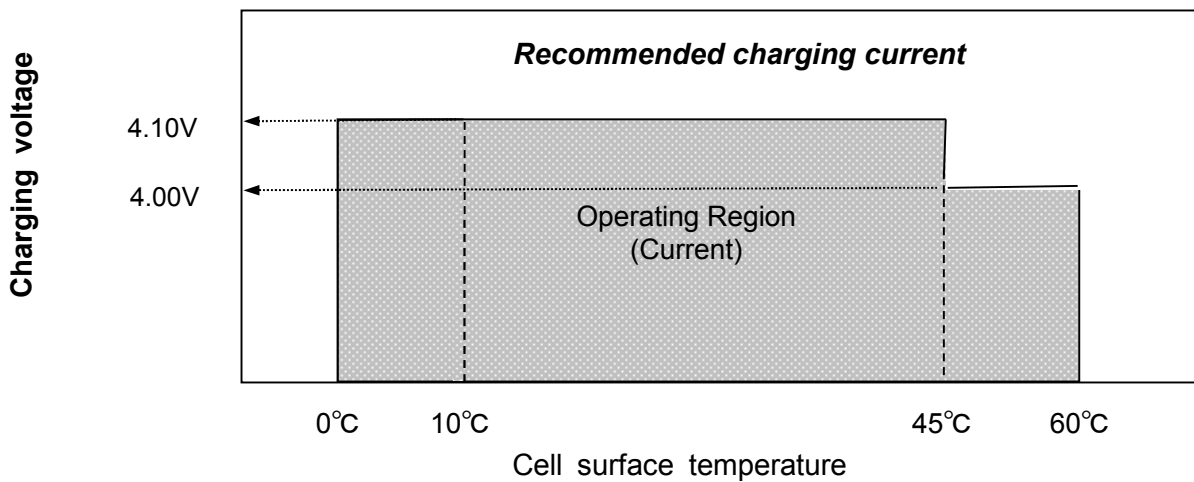
### Appendix 1 < For Performance >

Regarding Operating Region for Performance, please follow the below condition.  
 The charging voltage and current should be lower than following Recommended maximum charging voltage and Recommended maximum charging current in Table.1 for suppression of deterioration.  
 If the battery pack is used out of the performance operation region that may cause deterioration of performance and life for the battery.

Model: UR1865Z-H13RA

Table.1 Operating region (Cell surface temperature, voltage, current)

Temperature	Recommended maximum charging voltae	Recommended maximum charging current
0°C~10°C	4.10 V	462 mA
10°C~45°C	4.10 V	1155 mA
45°C~60°C	4.00 V	1155 mA



File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

Title	Lithium Ion Battery Specification (Cylindrical Type)	Page	18/18
-------	--	------	-------

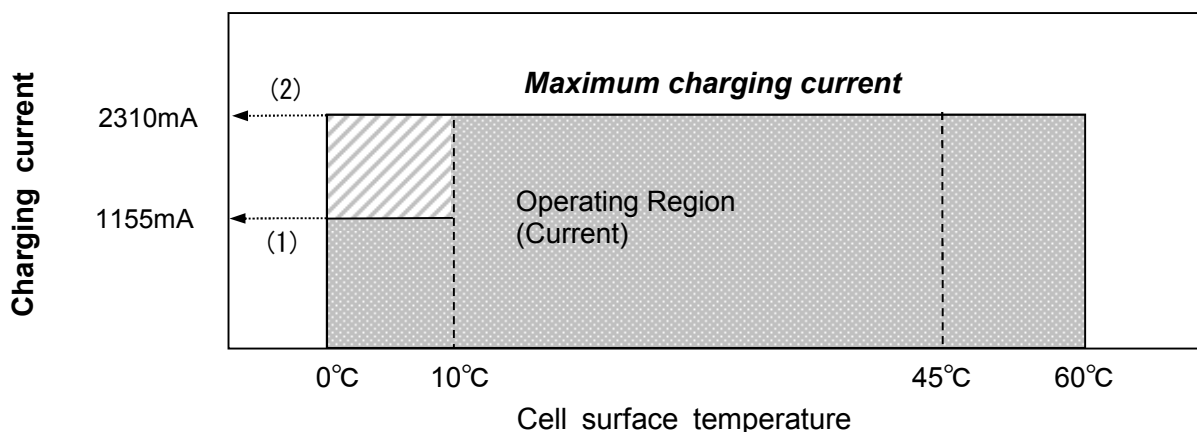
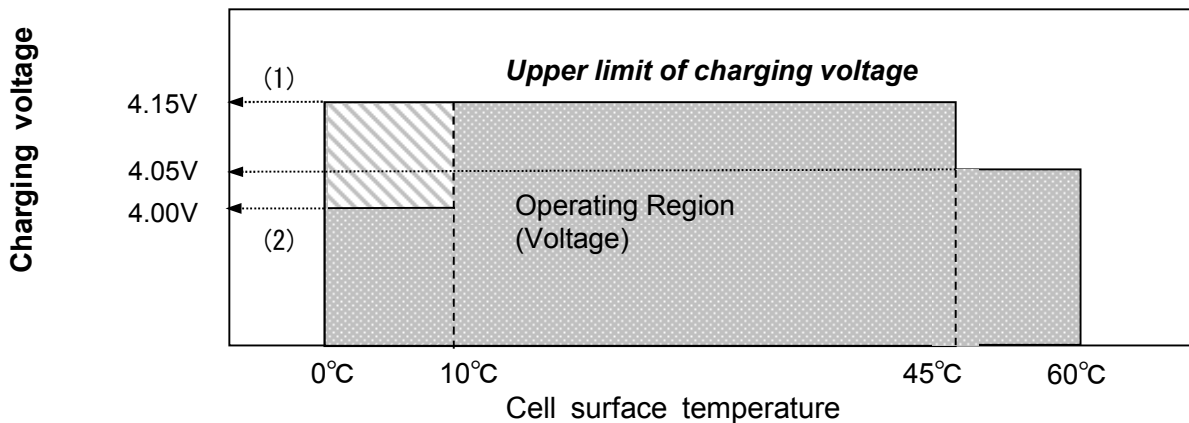
## Appendix 2 < For Safety >

Regarding Operating Region for Safety, please follow the below condition.  
 The charging voltage and current shall not exceed following Upper limit of charging voltage and Maximum charging current in Table.2 for safe use.  
 If the battery pack is used out of the safety operation region that may cause leakage, heating or damage of the battery, and may lead to unsafe state.

Model: UR1865Z-H13RA

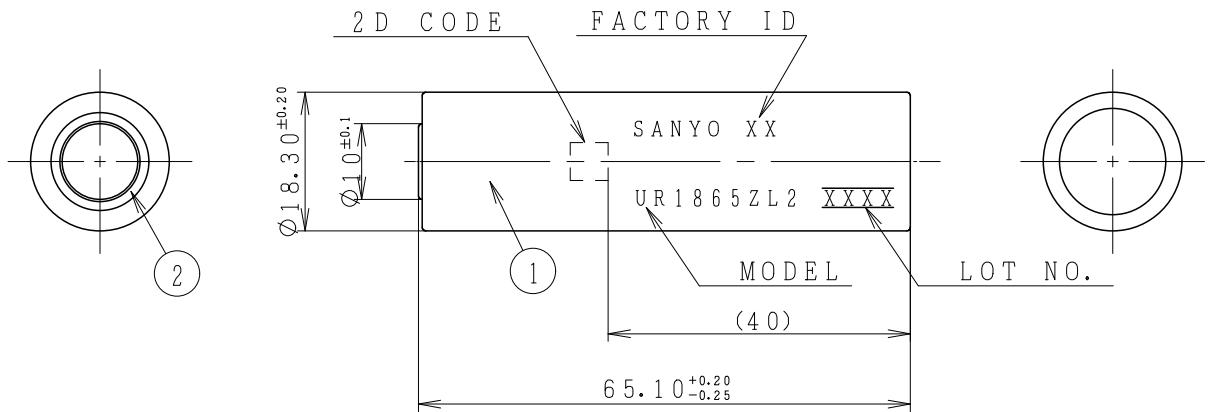
Table.2 Operating region (Cell surface temperature, voltage, current)

Temperature		Upper limit of charging voltage	Maximum charging current
0°C~10°C	(1)	4.15 V	1155 mA
	(2)	4.00 V	2310 mA
10°C~45°C		4.15 V	2310 mA
45°C~60°C		4.05 V	2310 mA



File No.	UR1865-4270	Energy Solutions Business Division SANYO Electric Co., Ltd.
----------	-------------	--

NO.	PART NAME	APPLICATION PART CODE	QTY.	MATERIAL SPECIFICATION	NOTE
	BATTERY		1	UR1865ZL2	SHIPPING WITH CHARGE
1	TUBE		1	PET	PET TUBE RED
2	INSULATION RING		1	PAPER 0.25t	WHITE



NOTE.

- 2D CODE TO BE PRINTED ON THE CAN.
  - 2D CODE ON CELL CAN BE READ BY THE EQUIPMENT SR-1000 (KEYENCE).
  - 2D CODE TYPE: DATA MATRIX CODE (ECC200), 16 DIGIT CHARACTER INSIDE.
- STAMP LOT NO. ON THE TUBE. (LOT NO. IS CHARGING DATE)
 

XXXX

  - DAY (1ST=01, 2ND, =02, .. 30TH=30, 31ST=31)
  - MONTH (JAN=1, FEB=2, .. SEP=9, OCT=X, NOV=Y, DEC=Z)
  - YEAR ('96=6, '97=7, .. '18=8, '19=9, ..)

EX.) JUL. 24. 2018.....8724
- STAMP "SANYO", FACTORY ID & MODEL ON THE TUBE.
- STAMP FACTORY ID ON THE TUBE AS SHOWN IN THE FOLLOWING TABLE. 1.
- STAMP CONTENTS SHOULD BE LOCATED WITHIN THE RANGE OF 40mm FROM THE BOTTOM OF THE CAN.

TABLE. 1

FACTORY ID	FACTORY
Z	SANYO ENERGY (SUZHOU) CO., LTD.

DRAWING NOT TO SCALE

DATE	REMARK	SYMBOL	DATE	DESCRIPTION
JUL. 24. 2018		▲	JUL. 24. 2018	ALL CHANGED DRAWING.
		△	JUN. 28. 2018	1st DRAWING (K. Yoshimoto)
DR	I. Shimojyou			
CHK	K. Yoshimoto			
CHK				
ENG				
APP	Y. Ido			

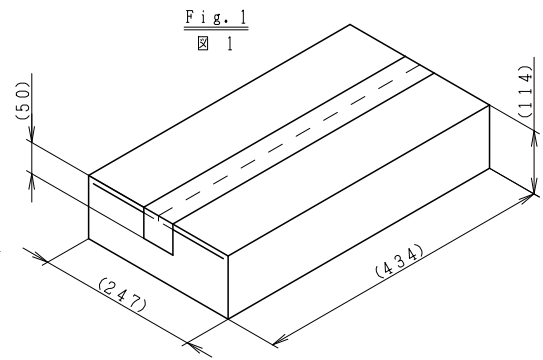
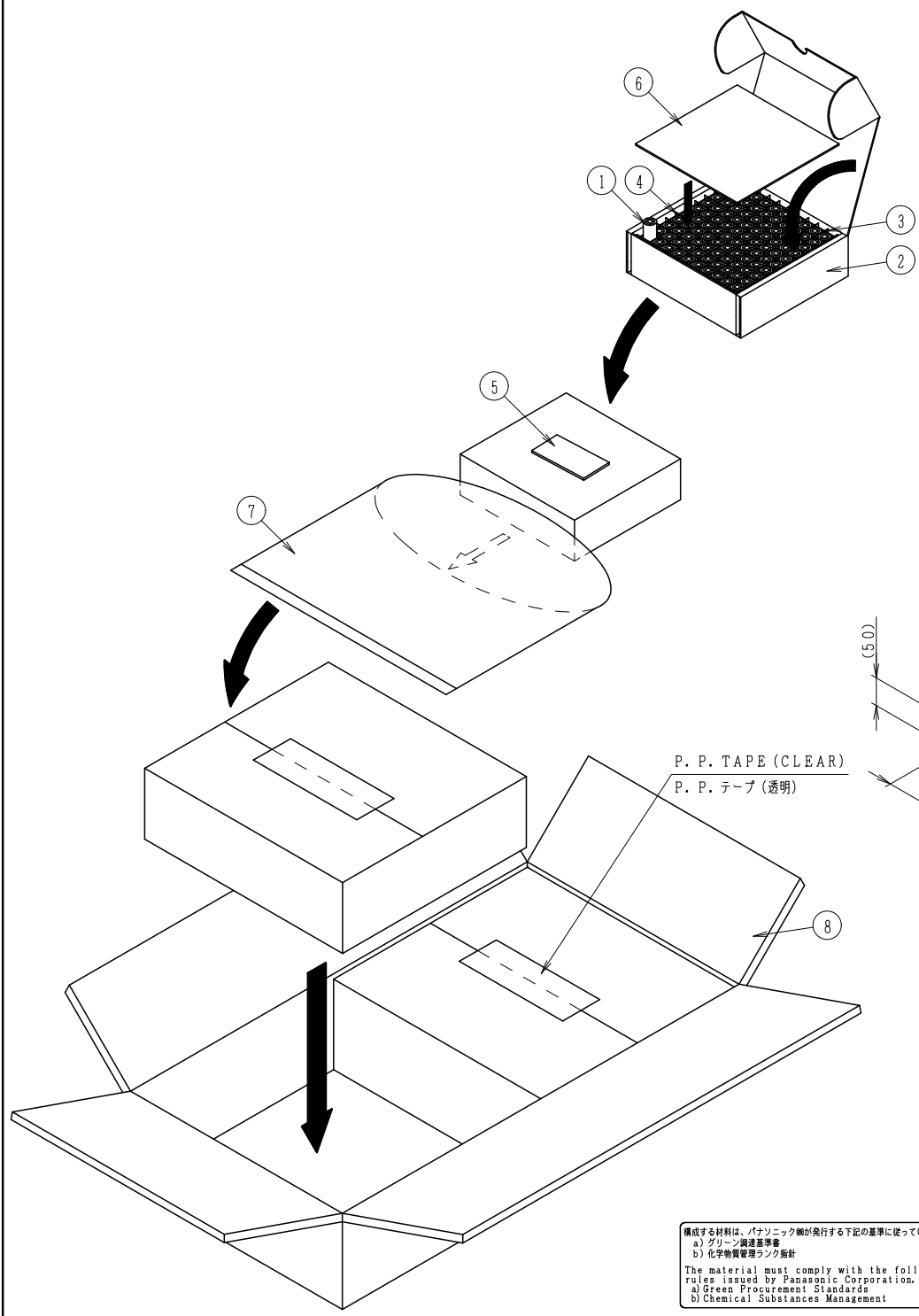
  

MODEL	CUSTOMER CODE	TOLERANCE	WEIGHT	UNIT	PART NAME	PART CODE	Rev.
MODEL:UR1865Z-H13RA		250<L ± 5	Approx. g	mm	完成電池	BATTERY PACK (finish goods)	
		<L ≤ ± 4					
		18<L ≤ 50 ± 3					
		L ≤ 18 ± 2					
			QTY	SCALE			
			1	1/1			
					DRAWING NO	UR1865Z-H13RA01	10

NO.	PART NAME	APPLICATION PART CODE	QTY.	MATERIAL SPECIFICATION	NOTE
1	完成電池 BATTERY PACK		1	UR1865ZL	
2	内箱 INNER CARTON		1/100	EF_K180/K180	
3	仕切り板A PARTITION PAD		11/100	コートボード COAT BOARD	
4	仕切り板B PARTITION PAD		11/100	コートボード COAT BOARD	
5	シリカゲル SILICAGEL		1/100		
6	板パッド SQUARE PAD		1/100	EF_K180/K180	
7	ポリ袋 PLASTIC BAG		1/100	ポリエチレン POLYETHYLENE	
8	段ボール箱 MASTER CARTON		1/200	ABF_K180/SCP120X3/K180	

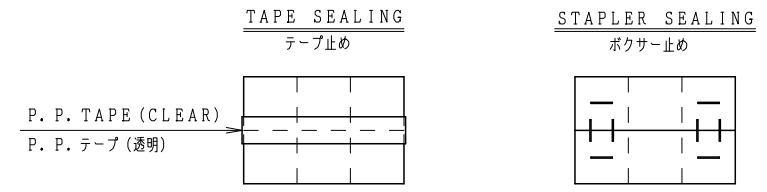
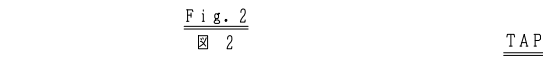
NOTES.  
 1. MASTER CARTON TO BE PACKED AS KNOWN DRAWING. (Fig. 1)  
 2. UPPER AND BOTTOM : TAPE OR STAPLER SEALING. (Fig. 2)  
 (SPECIFIED SANYO STANDARD SPEC. STD-BHP-EX)

注) 1. 段ボール箱は、図1に示す様に包装すること。  
 2. 天面、底面は、テープ止め又はボクサー止めとする。(図2参照)  
 (三洋標準仕様STD-BHP-EXに準ずる。)



・ DIMENSION SHOWS OUTER SIZES.  
 ・ QUANTITY:  
 ・ INNER CARTON 100 pcs. (10X10X1)  
 ・ MASTER CARTON 200 pcs. (2X1X1)  
 ・ GROSS MASS: APPROX. 10.5 kg

・ 寸法は外寸とする。  
 ・ 入数は下記の通りとする。  
 ・ 内箱 100個 (10列X10列X1段)  
 ・ 段ボール箱 200個 (2列X1列X1段)  
 ・ 質量 : 約10.5 kg



DRAWING NOT TO SCALE

構成する材料は、パナソニックが発行する下記の基準に従っていること。  
 a) グリーン調達基準書  
 b) 化学物質管理ランク指針  
 The material must comply with the following rules issued by Panasonic Corporation.  
 a) Green Procurement Standards  
 b) Chemical Substances Management

DATE	REMARK	DATE	DESCRIPTION
JUL. 24. 2018		JUL. 24. 2018	1st DRAWING/初回出図 (K. Yoshimoto)
DR	K. Yoshimoto	MODEL: UR1865Z-H13RA	材料・規格
CHK		CUSTOMER CODE:	MATERIAL
CHK		TOLERANCE	処理・加工
CHK		WEIGHT	FINISH
ENG		UNIT	部 品 名
APP	Y. Ido	SCALE	PACKING SPECIFICATION
		QTY	PART CODE
		FREE/	DRAWING NO
			UR1865Z-H13RA60
			Rev.