TOCAD ENERGY
COMPANY LIMITED

November.14. 2017
No. SDS-17-025E(1)

Explanatory sheet about safety of product (Safety Data Sheet)

1. Basic item

Part Name	Lithium ion battery
UN Number	3480 or 3481(Contained in Equipment or Packed with Equipment)
Customer Model Number	BA-E001
Part Code	LAG680001
Product Model Number	2UR18650A-0891
Manufacturer Name	TOCAD ENERGY Co.,Ltd.
Address	4-1-14 Higashimachi, Shiroishishi, Miyagi, 989-0225 Japan
Department in charge	Production Control Div. Product design Development Technical Assistance Division.
Phone number	+081-224-25-0133
E-mail	info_green@tocad.co.jp

2. Product information

Basic composition of the product
This product is a battery which consists of such main component as core battery pack assembled with some Lithium ion cells. And it consists of any combination of plastic casing, tube casing, protection circuit boards, safety devices and interface terminals.

3. Safety Information

- TOCAD ENERGY certifies the battery has passed and satisfied the UN Manual of Tests and Criteria Part III, sub-section 38.3 testing in TOCAD ENERGY shipping.
- TOCAD ENERGY manufactured the battery under the quality management programme required in UN Model regulations 2.9.4(e).

3-1) Component cell

The Watt-hour rating of the component Lithium ion cells is not more than 20Wh.
Refer to Appendix "SDS (SDS-IAT-00002)".

3-2) Battery pack

1. The Watt-hour rating of the battery is not more than 100Wh.
2. Packages of the battery satisfy the following conditions when TOCAD ENERGY ships.
   (1) The product name "Lithium ion batteries" and how to deal with the damage of the package are written on the label and attached document.
   (2) The package has passed the drop test from the height of 1.2m.
   (3) The package weight is not more than 10kg.
3. The battery is not defective for safety reasons, not damaged. It is not collected battery for recycling or disposal.
4. The battery can be transferred as Non Dangerous Goods (Not Restricted) in sea and road transportation (e.g., See Special Provision 188 of IMDG Code).
5. The battery should be transported by Cargo aircraft as UN3480, Class 9 Dangerous Goods, and state of charge not exceeding 30%, attached by required marks and labels, according to Packing Instruction 965 Section IB of the ICAO and IATA regulations.

Person in charge

TOCAD ENERGY Co., Ltd.
Production Control Div. Product design Development.
Technical Assistance Division.
Toshiaki Miyake

Safety data sheet for product

1. PRODUCT AND COMPANY IDENTIFICATION

- Product name: Lithium ion rechargeable battery cell
- Product code: None
  (All models Sanyo manufactured and whose capacity is less than or equal to 5.4Ah, including the cell branded as Panasonic, excluding the cell whose shape is prismatic and two or more side of short / middle / long side excess 12mm/85mm/110mm.)
- Company name: Sanyo Electric Co., Ltd., Panasonic group
- Address: 222-1 , Kaminaizen, Sumoto City, Hyogo, Japan
- Telephone number: +81-799-24-4111
- Fax number: +81-799-23-2879
- Emergency telephone number: [Weekday] +81-799-23-3931 [Night and holiday] +81-799-24-4131

2. HAZARDS IDENTIFICATION

For the battery cell, chemical materials are stored in a hermetically sealed metal or metal laminated plastic case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage.

However, if exposed to a fire, added mechanical shocks, decomposed, added electric stress by miss-use, the gas release vent will be operated. The battery cell case will be breached at the extreme, hazardous materials may be released.

Moreover, if heated strongly by the surrounding fire, acrid gas may be emitted.

- GHS classification: Not available
  (This product is outside the scope of GHS system since it's considered as an "article".)

- Most important hazard and effects
  Human health effects:
  Inhalation: The steam of the electrolyte has an anesthesia action and stimulates a respiratory tract.
  Skin contact: The steam of the electrolyte stimulates a skin. The electrolyte skin contact causes a sore and stimulation on the skin.
  Eye contact: The steam of the electrolyte stimulates eyes. The electrolyte eye contact causes a sore and stimulation on the eye. Especially, substance that causes a strong inflammation of the eyes is contained.
  Environmental effects: Since a battery cell remains in the environment, do not throw out it into the environment.

- Specific hazards:
  If the electrolyte contacts with water, it will generate detrimental hydrogen fluoride.
  Since the leaked electrolyte is inflammable liquid, do not bring close to fire.

3. COMPOSITION / INFORMATION ON INGREDIENTS

- Substance or preparation: Preparation
- Information about the chemical nature of product: *1

Portion	Material name	Concentration range (wt %)
Positive electrode	Lithium transition metal oxidate ($Li[M]_m[O]_n$ *2)	20~60
Positive electrode's base	Aluminum	1~10
Negative electrode	Carbon	10~30
Negative electrode's base	Copper	1~15
Electrolyte	Organic electrolyte principally involves ester carbonate	5~25
Outer case	Aluminum, iron, aluminum laminated plastic	1~30

**1 Not every product includes all of these materials.*

**2 The letter M means transition metal and candidates of M are Co, Mn, Ni and Al. One compound includes one or more of these metals and one product includes one or more of the compounds. The letter m and n means the number of atoms.*

4. FIRST-AID MEASURES

Spilled internal cell materials

- Inhalation:
  Make the victim blow his/her nose, gargle. Seek medical attention if necessary.
- Skin contact:
  Remove contaminated clothes and shoes immediately. Wash extraneous matter or contact region with soap and plenty of water immediately.
- Eye contact:
  Do not rub one's eyes. Immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention immediately.

A battery cell and spilled internal cell materials

- Ingestion:
  Make the victim vomit. When it is impossible or the feeling is not well after vomiting, seek medical attention.

5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media: Plenty of water, carbon dioxide gas, nitrogen gas, chemical powder fire extinguishing medium and fire foam.
- Specific hazards: Corrosive gas may be emitted during fire.
- Specific methods of fire-fighting: When the battery burns with other combustibles simultaneously, take fire-extinguishing method which correspond to the combustibles. Extinguish a fire from the windward as much as possible.
- Special protective equipment for firefighters:
  Respiratory protection: Respiratory equipment of a gas cylinder style or protection-against-dust mask
  Hand protection: Protective gloves
  Eye protection: Goggle or protective glasses designed to protect against liquid splashes
  Skin and body protection: Protective cloth

6. ACCIDENTAL RELEASE MEASURES

Spilled internal cell materials, such as electrolyte leaked from a battery cell, are carefully dealt with according to the followings.

- Precautions for human body:
  Remove spilled materials with protective equipment (protective glasses and protective gloves). Do not inhale the gas as much as possible. Moreover, avoid touching with as much as possible.
- Environmental precautions: Do not throw out into the environment.
- Method of cleaning up: The spilled solids are put into a container. The leaked place is wiped off with dry cloth.
- Prevention of secondary hazards: Avoid re-scattering. Do not bring the collected materials close to fire.

7. HANDLING AND STORAGE

- Handling suggestions
  - Do not connect the positive terminal to the negative terminal with electrical wire or chain.
  - Avoid polarity reverse connection when installing the battery to an instrument.
  - Do not wet the battery with water, seawater, drink or acid; or expose to strong oxidizer.
  - Do not damage or remove the external tube.
  - Keep the battery away from heat and fire.
  - Do not disassemble or reconstruct the battery; or solder the battery directly.
  - Do not give a mechanical shock or deform.
  - Do not use unauthorized charger or other charging method. Terminate charging when the charging process doesn't end within specified time.
- Storage
  - Do not store the battery with metalware, water, seawater, strong acid or strong oxidizer.
  - Make the charge amount 30~50% then store at room temperature or less (temperature= -20~35 degree C) in a dry (humidity: 45~85%) place. Avoid direct sunlight, high temperature, and high humidity.
  - Use insulative and adequately strong packaging material to prevent short circuit between positive and negative terminal when the packaging breaks during normal handling. Do not use conductive or easy to break packaging material.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION (WHEN THE ELECTROLYTE LEAKS)

- Control parameters
  ACGIH has not been mentioned control parameter of electrolyte.
- Personal protective equipment
  Respiratory protection: Respirator with air cylinder, dust mask
  Hand protection: Protective gloves
  Eye protection: Goggles or protective glasses designed to protect against liquid splashes
  Skin and body protection: Working clothes with long sleeve and long trousers

9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance
  Physical state: Solid
  Form: Cylindrical or Prismatic or Pouch (laminated)
  Color: Metallic color or black(without tube if it has tube)
  Odor: No odor

10. STABILITY AND REACTIVITY

- Stability: Stable under normal use
- Hazardous reactions occurring under specific conditions
  - Conditions to avoid: When a battery cell is exposed to an external short-circuit, crushes, deformation, high temperature above 100 degree C, it will be the cause of heat generation and ignition. Direct sunlight and high humidity.
  - Materials to avoid: Conductive materials, water, seawater, strong oxidizers and strong acids.
  - Hazardous decomposition products: Acrid or harmful gas is emitted during fire.

11. TOXICOLOGICAL INFORMATION

Organic Electrolyte

- Acute toxicity:
  LD_{50}, oral - Rat 2,000mg/kg or more
- Irritating nature: Irritative to skin and eye

12. ECOLOGICAL INFORMATION

- Persistence/degradability:
  Since a battery cell and the internal materials remain in the environment, do not bury or throw out into the environment.

13. DISPOSAL CONSIDERATIONS

- Recommended methods for safe and environmentally preferred disposal:

Product (waste from residues)

Specified collection or disposal of lithium ion battery is required by the law like as "battery control law" in several nations. Collection or recycle of the battery is mainly imposed on battery's manufacturer or importer in the nations recycle is required.

Contaminated packaging

Neither a container nor packing is contaminated during normal use. When internal materials leaked from a battery cell contaminates, dispose as industrial wastes subject to special control.

14. TRANSPORT INFORMATION

In the case of transportation, avoid exposure to high temperature and prevent the formation of any condensation. Take in a cargo of them without falling, dropping and breakage. Prevent collapse of cargo piles and wet by rain. The container must be handled carefully. Do not give shocks that result in a mark of hitting on a cell. Please refer to Section 7-HANDLING AND STORAGE also.

UN regulation

- UN number: 3480 (3481 when the battery is contained in equipment or packed with equipment)
- Proper shipping name:
  Lithium ion batteries ("lithium ion batteries contained in equipment" or "lithium ion batteries packed with equipment")
- Class: 9 *
- Packing group:

** Although this product meets the criteria of "dangerous goods" and are classified as "lithium ion batteries", depending on the battery's total capacity in the packaging, etc., they may not be subject to the fully regulated provisions.*

Regulation depends on region and transportation mode

- Worldwide - Air transportation:
  ICAO/IATA-DGR [packing instruction 965 section IB or II]
  (When shipping batteries "packed with" or "contained in" equipment, use packing instruction 966 or 967 as appropriate.)
- Worldwide - Ocean transportation:
  IMO-IMDG Code [special provision 188]
- Europe - Ground transportation:
  ADR [special provision 188]

** Instructions or provisions in the box brackets are conditions to make the battery cell exempted from full regulation.*

15. REGULATORY INFORMATION

- Regulations specifically applicable to the product:
  Wastes Disposal and Public Cleaning Law [Japan]
  Law for Promotion of Effective Utilization of resources [Japan]
  US Department of Transportation 49 Code of Federal Regulations [USA]

** About overlapping regulations, please refer to Section 14-TRANSPORT INFOMATION.*

16. OTHER INFORMATION

- This safety data sheet is offered an agency who handles this product to handle it safely.
- The agency should utilize this safety data sheet effectively (put it up, educate person in charge) and take proper measures.
- ***The information contained in this Safety data sheet is based on the present state of knowledge and current legislation.***
- This safety data sheet provides guidance on health, safety and environmental aspects of the product and should not be construed as any guarantee of technical performance or suitability for particular applications.

Reference

Dangerous Goods Regulations – 58th Edition Effective 1 January 2017: International Air Transport Association (IATA)
IMDG Code – 2016 Edition: International Maritime Organization (IMO)
The European Agreement concerning the International Carriage of Dangerous Goods by Road – 2017: The United Nations Economic Commission for Europe (UNECE)

First edition: Apr. 28, 2010
Prepared and approved by: Technology Planning Department
Rechargeable Battery Business Division
Sanyo Electric Co., Ltd.
Panasonic group

LITHIUM CELL/BATTERY TEST SUMMARY AND SUPPLIER INQUIRY

IN ACCORDANCE WITH SUB-SECTION 38.3
OF MANUAL OF TESTS AND CRITERIA

N/A = Not Applicable

1. Name of cell / battery
BAE001

2. Manufacturer of cell / battery	
Name	Tocad Energy Co. LTD.
Address	4-1-14 Higashicho, Shiroishi City Miyagi Japan
Phone	+81-224-25-0131
Email	info_green@tocad.co.jp
Website	https://www.tocad.co.jp/

3. Test laboratory of cell / battery	
Name	Tocad Energy Co. LTD.
Address	4-1-14 Higashicho, Shiroishi City Miyagi Japan
Phone	+81-224-25-0131
Email	info_green@tocad.co.jp
Website	https://www.tocad.co.jp/

4. ID-number and date			
Unique test report identification number	TU13-BR-001	Date of test report	12/09/2019

DESCRIPTION OF CELL / BATTERY

5. Mark the type of cell/battery with an "•"			
○	Lithium ion cell	Lithium metal cell	○
●	Lithium ion battery	Lithium metal battery	○
○	Lithium hybrid battery		

6. Parameters	Cell	Battery
Mass in gram (g):		108.5
Lithium ion: Indicate watt-hour rating (Wh):		14
Lithium metal: Indicate lithium metal content in gram (g):		1.110
Lithium hybrid: Indicate lithium metal content in gram (g) and watt-hour rating (Wh):		1.110 g 14 Wh

LITHIUM BATTERY SERVICE

LITHIUM CELL/BATTERY TEST SUMMARY AND SUPPLIER INQUIRY

IN ACCORDANCE WITH SUB-SECTION 38.3
OF MANUAL OF TESTS AND CRITERIA

Name of cell/battery (taken from field 1)
BAE001

7. **Physical description of cell / battery**
Li-ion Rechargeable Battery Pack

8. **Model numbers**
BAE001

TESTS AND RESULTS

9. **List of tests conducted and results** - Mark N/A, pass or fail with an "●"	N/A	pass	fail
T1 - Altitude simulation	○	●	○
T2 - Thermal Test	○	●	○
T3 - Vibration	○	●	○
T4 - Shock	○	●	○
T5 - External Short Circuit	○	●	○
T6 - Impact / Crush	○	●	○
T7 - Overcharge	○	●	○
T8 - Forced Discharge	○	●	○
	○	○	○
	○	○	○

10. **Reference to assembled battery testing requirements**		
	N/A	

11. **Reference to the revised edition of the Manual of Tests and Criteria used and to amendments thereto**
ST/SG/AC. 10/11, Part III sub-section 38.3

LITHIUM CELL/BATTERY TEST SUMMARY AND SUPPLIER INQUIRY

IN ACCORDANCE WITH SUB-SECTION 38.3
OF MANUAL OF TESTS AND CRITERIA

Name of cell/battery (taken from field 1)
BAE001

ADDITIONAL SUPPLIER INQUIRY

12. Quality management system for manufacturing cells / batteries Does the manufacturer of the cell/battery manufacture the products based on a documented quality management system according to transport regulations?	●	YES		NO
13. Are the following parameters exceeded? Lithium ion cell: more than 20 Wh Lithium ion battery: more than 100 Wh Lithium metal cell: more than 1 g Lithium Lithium metal battery: more than 2 g Lithium Lithium hybrid Battery: more than 1,5 g Lithium and/or more than 10 Wh		YES		NO ●

Check point 14 – 16 need to be answered when 13 has been ticked "YES":					
14. Does each cell / battery incorporates a safety venting device or is designed to preclude a violent rupture under normal conditions of carriage?			YES		NO
15. Is each cell / battery equipped with an effective means of preventing external short circuits?			YES		NO
16. Is each battery containing cells or series of cells connected in parallel equipped with effective means as necessary to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.)?		N/A	YES		NO

17. Only in air transport: State of Charge (SoC) for UN 3480 Lithium ion cells/batteries and lithium polymer cells/batteries				
State of Charge (SoC) max. 30 %		YES		NO

CELLS/BATTERIES INSTALLED IN EQUIPMENT

18. Check point 18 needs to be answered when the cells / batteries are installed in articles:					
18.a) Only button cells enclosed?			YES		NO
18.b) Number of enclosed cells (other than button cells)/batteries per equipment					
	Enclosed cells per equipment		Enclosed batteries per equipment		
When the equipment is intentionally active/switched on during transport e.g. data loggers:					
18.c) Confirmation that no dangerous amount of heat is emitted from the equipment		N/A	YES		NO
18.d) Confirmation that the equipment when transported by air fulfills the defined air transport standards for electromagnetic radiation according to DO-160		N/A	YES		NO

19. Place, Date	**20. Title, Surname, First name**	**21. Company stamp and signature**