

SONY

CATALOG
JUNE 2001



About delivery style, consult the sales representative.
About the minimum order quantity, consult the sales representative.
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June 2001

<Japanese> <http://www.sony.co.jp/Products/BAT/ION/>
<English> <http://www.sony.co.jp/en/Products/BAT/ION/>

LITHIUM ION RECHARGEABLE BATTERY



Polymer

Lighter Weight Contributed by Higher Energy Density per Weight
Non Liquid Electrolyte Construction Secures High Reliability and Safety Factor
Fine Discharge Load Characteristics, Low Temperature and Cycle Performance
Equivalent to Conventional Lithium Ion Consists of Liquid Electrolyte

Graphite

Higher Energy Density per Volume and Weight
High-rate Version Available
Fine Discharge Performance even at 3V cutoff
Excellent Cycle Performance

Hard Carbon

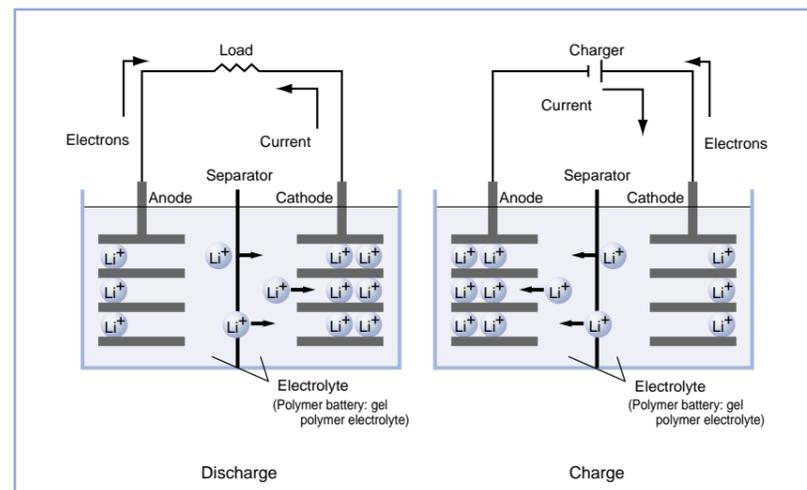
Easy to Monitor Remaining Capacity
Excellent Cycle Performance
Superior Float Charge Performance

Sony originates and keeps evolving for future

Charge / Discharge Mechanism

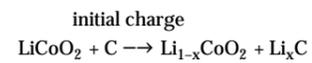
Structure

Battery charging and discharging occur through the migration of lithium ions between the cathodes and anodes and the exchange of electrons through doping and dedoping. More specifically, during charging lithium is dedoped from cathodes consisting of a lithium-containing compound, and the interlayers of carbon in anodes are doped with lithium. Conversely, during discharge lithium is dedoped from between the carbon layers in anodes, and the compound layers in cathodes are doped with lithium. Reactions occurring in lithium ion rechargeable batteries employing LiCoO_2 (lithium cobalt oxide) in cathodes and carbon in anodes are shown in the figure below.

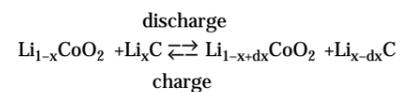


Charge and discharge mechanism of lithium ion rechargeable batteries

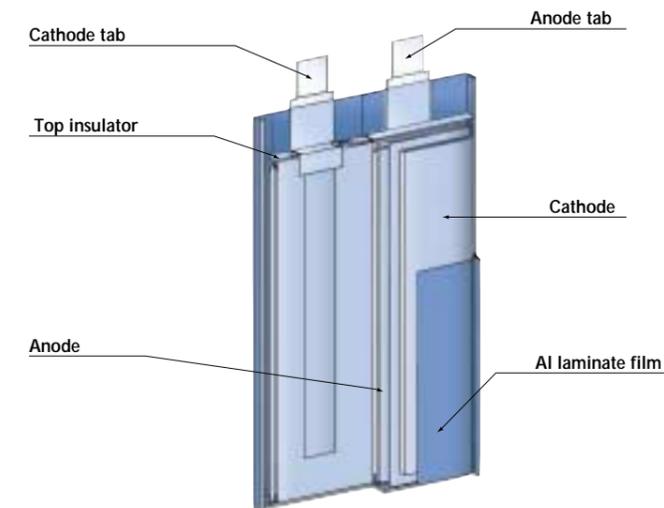
By means of the initial charging, which takes place during battery manufacturing, lithium ions migrate from the lithium compound of the cathode to the carbon material of the anode.



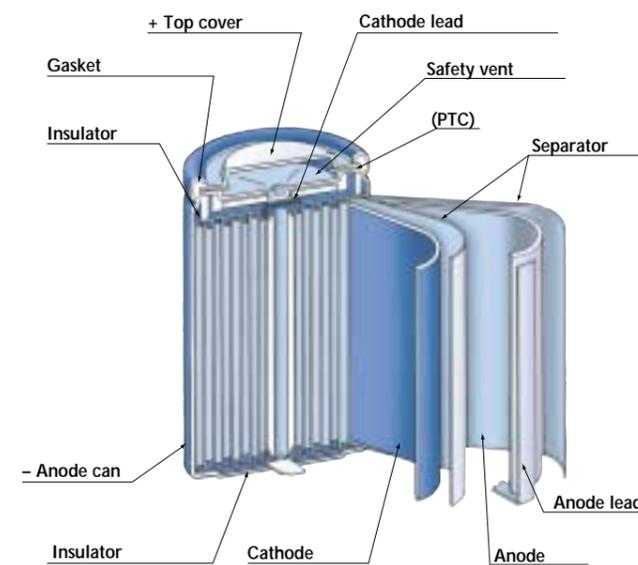
Subsequent discharge reactions occur through the migration of lithium ions from the anode to the cathode.



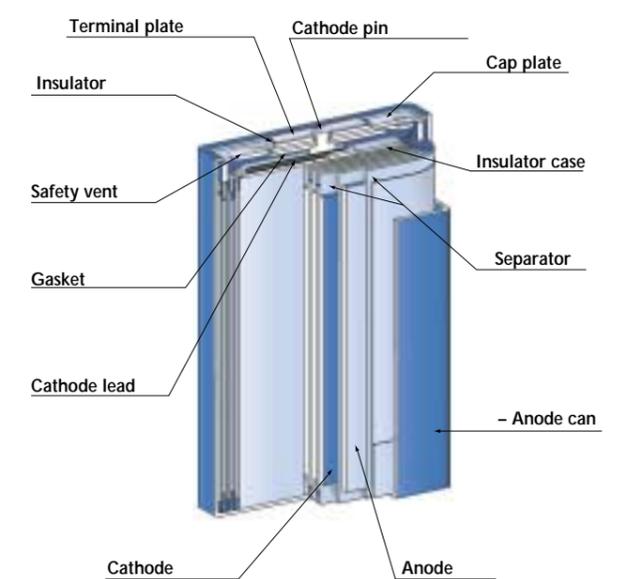
Polymer



Cylindrical



Prismatic



Polymer

Lithium Ion Polymer Rechargeable Battery



UP325385



UP383562



UP423456



UP423469



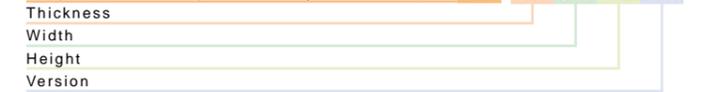
UP503759



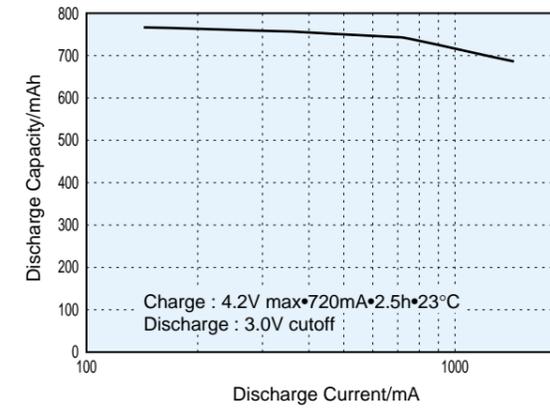
UP523048

Profile (UP383562A5)

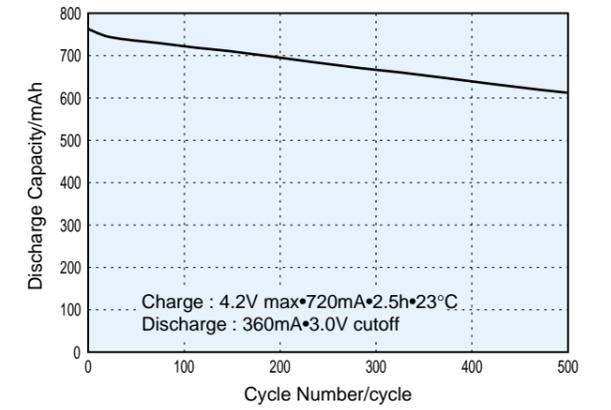
Sony Lithium Ion Polymer Rechargeable Battery **UP 383562A3**



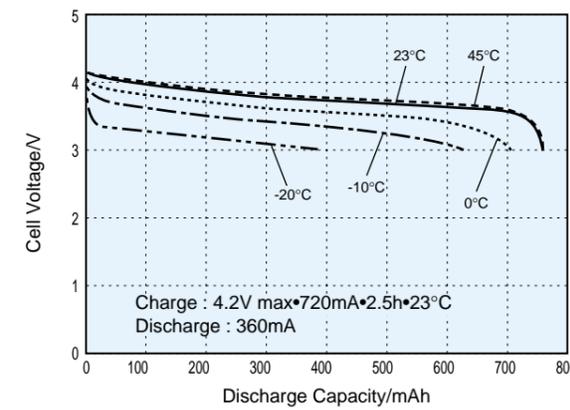
Discharge Capacity Characteristics by Current



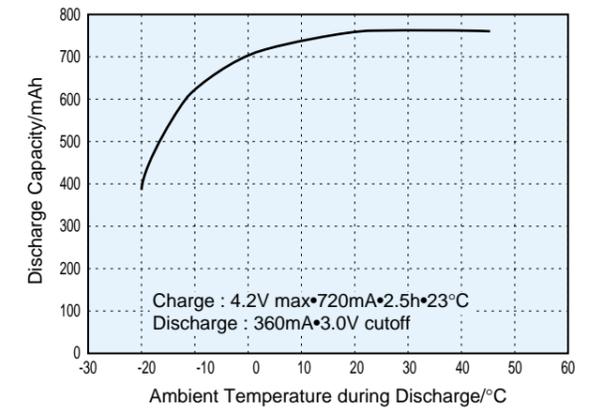
Cycle Life Characteristics



Discharge Characteristics on Temperature



Temperature Dependence on Discharge Capacity



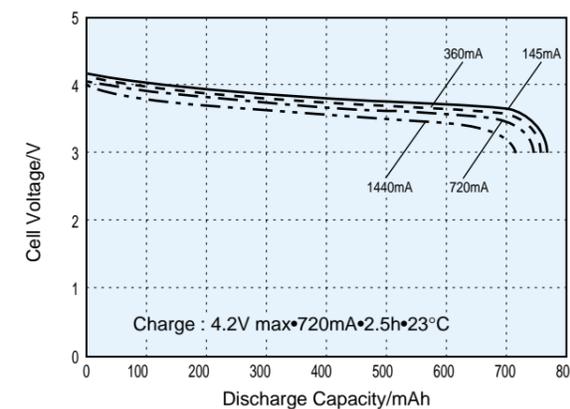
Lineup & Specifications

	Nominal Voltage(V)	Nominal Capacity(mAh)*1	Dimensions(mm/max)			Weight(Approx. g)
			Thickness	Width	Height	
UP325385A4H	3.7	1230	3.2	53.0	85.0	27.5
UP383562A3	3.7	650	3.8	35.0	62.0	15.5
UP383562A5	3.7	760	3.8	35.0	62.0	15.5
UP423456A3	3.7	630	4.2	34.0	56.0	15.5
UP423469A3	3.7	800	4.2	34.0	69.0	19.5
UP423469A4	3.7	890	4.2	34.0	69.0	19.5
UP503759A4H	3.7	1000	5.1	37.0	59.0	20.5
UP523048A4H	3.7	650	5.2	30.0	48.0	13.5

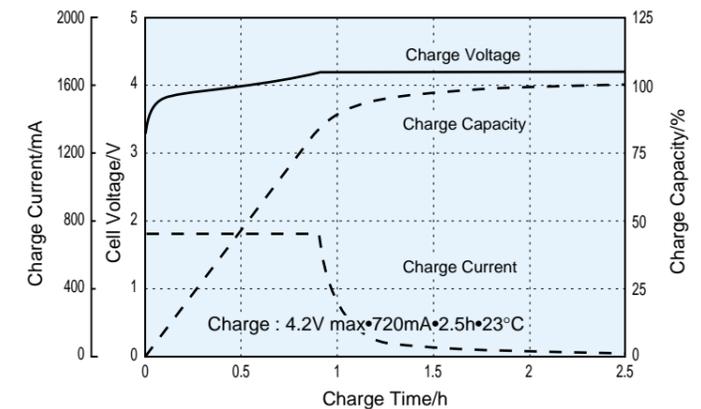
Charge Voltage	Cycle Life	Temperature		
		Charge	Discharge	Storage
4.2 ± 0.05V	More than 500 times	0°C ~ +45°C	-20°C ~ +60°C	-20°C ~ +45°C

*1 Nominal Capacity : 0.2C · 3.0V cutoff Average Discharge Capacity
*2 Charge voltage, cycle life and temperature are applicable to all models.
* About the tolerance of cell dimensions, delivery style and availability, consult the sales representative.

Discharge Characteristics on Load



Charge Characteristics



Graphite

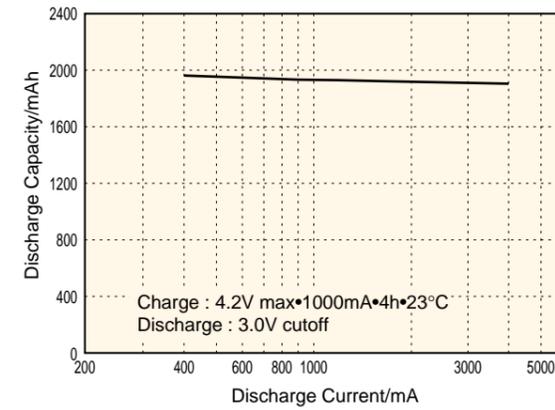
Lithium Ion Rechargeable Battery



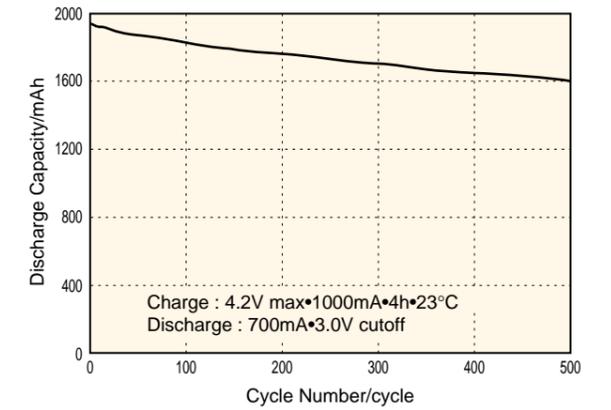
Profile (US18650G4)

Sony Lithium Ion Rechargeable Battery **US 18650 G3**
 Diameter/Thickness
 Height/Width
 Height(0:Cylindrical)
 Version

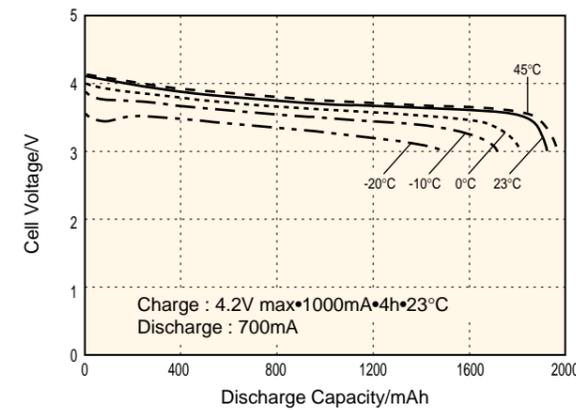
Discharge Capacity Characteristics by Current



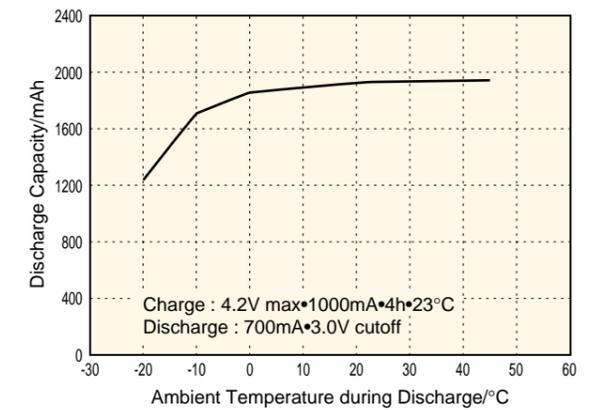
Cycle Life Characteristics



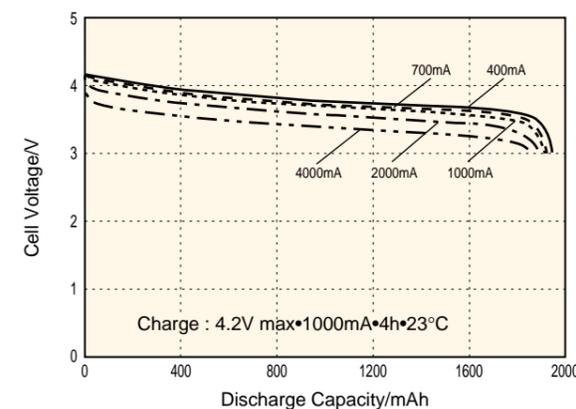
Discharge Characteristics on Temperature



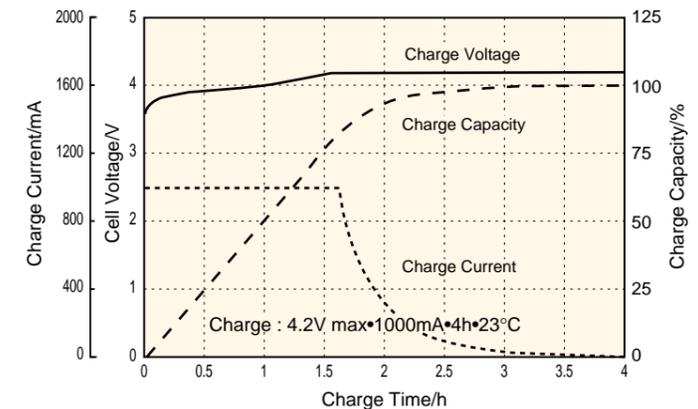
Temperature Dependence on Discharge Capacity



Discharge Characteristics on Load



Charge Characteristics



Lineup & Specifications

	Nominal Voltage(V)	Nominal Capacity(mAh) *1	Dimensions(mm/max)		Weight(Approx. g)
			Diameter	Height	
US14430G3	3.7	570	14.2 *2	43.0	16
US14500G4D	3.7	680	14.2 *2	49.6	19
US14650G1	3.7	780	14.2 *2	65.1	24
US17670G3	3.7	1500	17.1 *2	67.0	38.5
US17670G3D	3.7	1450	17.1 *2	67.0	38.5
US17670G4D	3.7	1550	17.1 *2	67.0	39.5
US18500G3	3.7	1180	18.4 *2	49.3	34
US18650G3	3.7	1800	18.4 *2	65.1	45
US18650G3D	3.7	1680	18.4 *2	65.1	44.5
US18650G4	3.7	1960	18.4 *2	65.1	44.5
US18650G4D	3.7	1800	18.4 *2	65.1	45
US063048G3	3.7	700	6.4x29.3x48.0(TxWxH)		21
US063048G4	3.7	800	6.4x29.3x48.0(TxWxH)		22
US063067G3	3.7	1000	6.4x29.3x67.0(TxWxH)		31
US063067G4	3.7	1200	6.4x29.3x67.0(TxWxH)		32.5
US063450G3	3.7	900	6.7x34.0x49.9(TxWxH)		29
US093447G2	3.7	1150	9.3x34.0x47.0(TxWxH)		42
US093447G3	3.7	1300	9.3x34.0x47.0(TxWxH)		42
US103463G4	3.7	2000	10.4x34.0x62.9(TxWxH)		60

Charge Voltage	Cycle Life	Temperature		
		Charge	Discharge	Storage
4.2 ± 0.05V	More than 500 times	0°C ~ +45°C	-20°C ~ +60°C	-20°C ~ +45°C

*1 Nominal Capacity : 0.2C · 3.0V cutoff Average Discharge Capacity
 *2 Diameter : Including thickness of outer tube
 *3 Charge voltage, cycle life and temperature are applicable to all models.
 * About the tolerance of cell dimensions, delivery style and availability, consult the sales representative.

Hard Carbon

Lithium Ion Rechargeable Battery



US18650



US26650

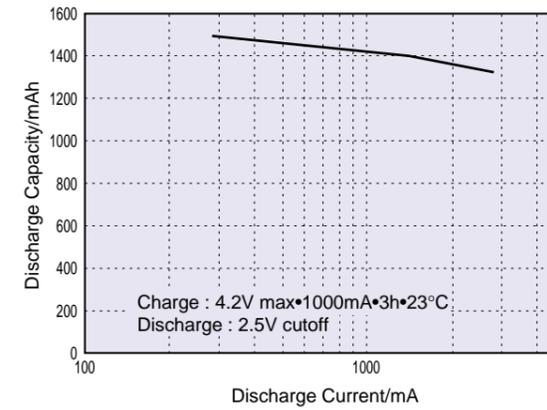


US103463

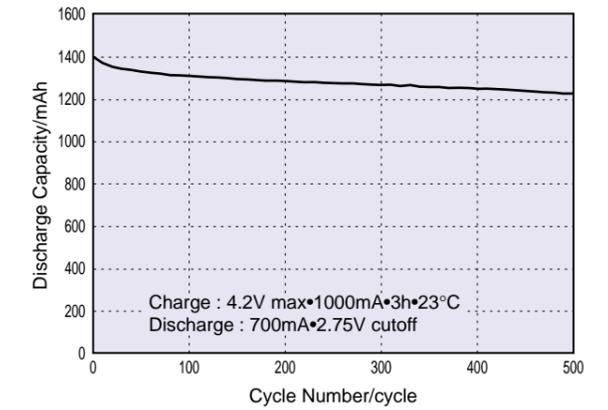
Profile (US18650)

Sony Lithium Ion Rechargeable Battery	US 18650
Diameter/Thickness	
Height/Width	
Height(0:Cylindrical)	

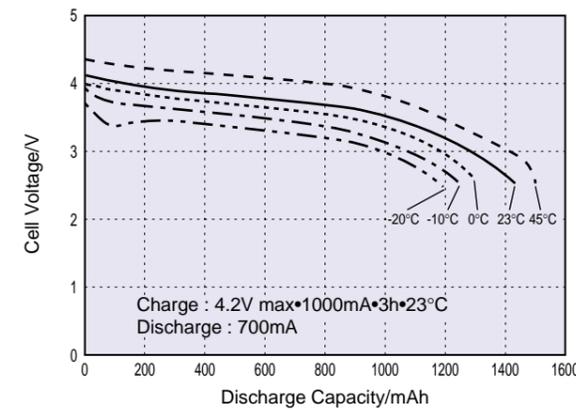
Discharge Capacity Characteristics by Current



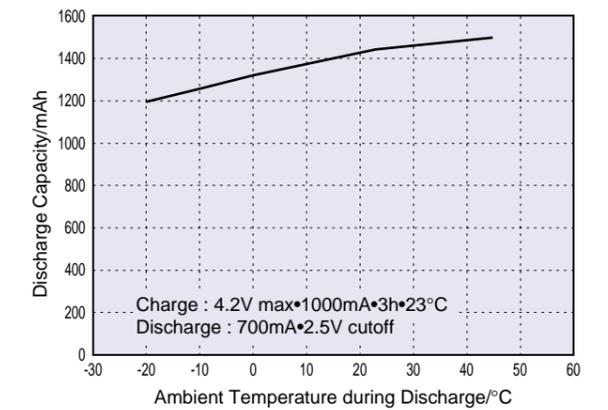
Cycle Life Characteristics



Discharge Characteristics on Temperature



Temperature Dependence on Discharge Capacity



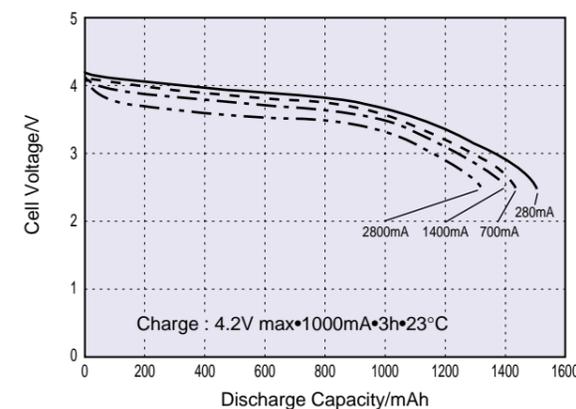
Lineup & Specifications

	Nominal Voltage(V)	Nominal Capacity(mAh)*1	Dimensions(mm/max)		Weight(Approx. g)
			Diameter	Height	
US18650	3.6	1500	18.4 *2	65.1	41
US26650	3.6	2800	26.6 *2	65.7	83
US103463	3.6	1700	10.2 x 34.0 x 62.9(TxWxH)		58

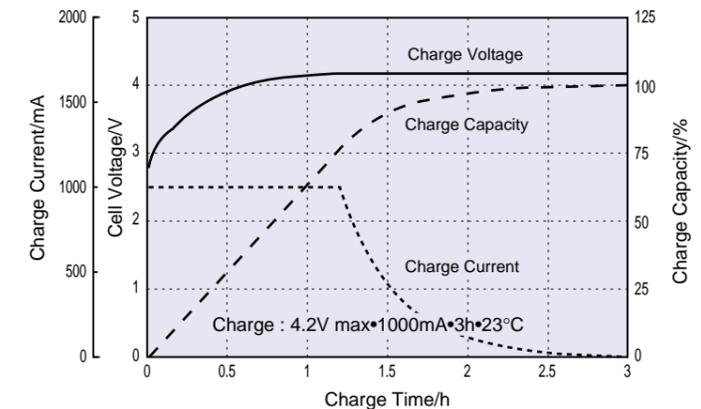
Charge Voltage	Cycle Life	Temperature		
		Charge	Discharge	Storage
4.2 ± 0.05V	More than 500 times	0°C ~ +45°C	-20°C ~ +60°C	-20°C ~ +45°C

*1 Nominal Capacity : 0.2C · 2.5V cutoff Average Discharge Capacity
 *2 Diameter : Including thickness of outer tube
 *3 Charge voltage, cycle life and temperature are applicable to all models.
 * About the tolerance of cell dimensions, delivery style and availability, consult the sales representative.

Discharge Characteristics on Load



Charge Characteristics



Handling Precautions

Safety Instructions for Lithium Ion Rechargeable Battery

WARNING

- Keep away from infants. If infant happens to swallow the battery, consult a doctor immediately.
- In case of eye contact with the battery electrolyte, immediately flush eyes thoroughly with water, and consult a doctor.
- In case the battery electrolyte happen to come into mouth, gargle well enough and consult a doctor immediately.
- Do not heat or disposed in fire or water. Do not modify or disassemble the battery. It may damage the gasket, and may cause ignition, heating, leakage or explosion.
- Keep away from fire if battery has leakage or odor to prevent fire hazard.
- Assure the charge voltage is controlled within $4.2 \pm 0.05V$. Inappropriate charge voltage may cause permanent deterioration of the battery performance, or swelling, leakage, ignition or explosion.
- Do not overdischarge the battery lower than 0V. It may lead to reversed polarity and cause ignition, heating, leakage or explosion.
- Do not short-circuit positive (+) and negative (-) terminals. Keep away from metal or other conductive materials. Jumbling the batteries of direct contact with positive (+) and negative (-) terminals and metal or other conductive materials may cause short-circuit.
- Do not solder the battery directly. Excessive heating may cause deformation of the battery components such as the gasket, which may lead to the battery swelling, leakage, explosion or ignition.
- When the battery is stored or disposed, isolate positive (+) and negative (-) terminals of the battery to avoid those terminals touch each other.
- Insert the battery with positive (+) and negative (-) terminals correctly oriented.

PRECAUTIONS

- Do not put the battery into microwave oven or drying machine.
- Do not drop, apply excessive damage or deform the battery.
- Do not mix the used battery together with the new battery or different type of batteries.
- Consult the sales representative, when series or parallel connection of several batteries is required.
- For transportation, observe the package instruction to be specified by the manufacturer. Assure not to apply excessive vibration or not to drop the batteries packaged.
- Do not store the battery in high temperature and high humidity location and where the battery is exposed to sunlight to avoid performance deterioration, swelling or leakage of the battery.

Remarks for Appropriate Usage

- Temperature
 - Charge $0^{\circ}C + 45^{\circ}C$
 - *Battery performance may deteriorate when charged above $45^{\circ}C$.
 - Discharge $-20^{\circ}C \sim +60^{\circ}C$
 - Storage $-20^{\circ}C \sim +45^{\circ}C$
- Current
 - Charge 1C max.
 - Discharge 2C max.
 - *Reference only. For details, consult the representatives or ask information.
- Voltage
 - Charge $4.2 \pm 0.05V$
 - Discharge Polymar, Graphite : 3.0V cutoff
Hard Carbon : 2.5V cutoff
- Battery Pack Design
 - Battery terminals should be designed to prevent incorrect installation to the charger and/or end product.
- Charge Condition
 - Constant Voltage and Constant Current Method
 - Voltage 4.2V/cell
 - Current 0.2C ~ 1C
 - *Reference only. For details, consult the representatives or ask information.
- Protection Circuit
 - Protection circuit should be installed either in battery pack, end product and/or charger.
 - Protection circuit should have three functions specified below.
 1. Over-charge Protection :
Should be within a range of 4.25V/cell ~ 4.4V/cell.
 2. Over-discharge Protection :
Should be within a range of 2.0V/cell ~ 2.5V/cell.
Leak current should be controlled less than $5\mu A$.
 3. Over-current Protection :
Should operate at less than approx. 3C.

Lithium Ion Battery Transport Regulations

Lithium ion batteries containing no more than 1.5g/cell and 8g/battery pack of lithium can be treated as "non-dangerous goods" under the United Nations Recommendations on the Transport of Dangerous Goods, Special Provision 188, provided that the packaging is strong and prevents the products from short-circuiting.

With regard to air transport, the International Civil Aviation Organization (ICAO) Special Provision A45 accepts the above UN Recommendation as is; further, the International Air Transport Association (IATA) adopts ICAO Provision A45. In addition, the regulations of the US Department of Transportation (DOT) for land, sea and air transportation are based on the UN Recommendations.

All of Sony's lithium ion cells and most* of its lithium ion battery packs fulfill the conditions of the UN Recommendations on the Transport of Dangerous Goods, Special Provision 188 (ICAO Special Provision A45) and can be treated as "non-dangerous goods." The mass of lithium in a lithium ion battery is calculated as follows;

(a) For the cell: (Ah of a cell) x (0.3g/Ah)

(b) For the battery pack: (Ah of a cell) x (number of cells used in the pack) x (0.3g/Ah)

(E.g., the amount of lithium in a pack using six 18650 (2Ah) cells = $2Ah \times 6 \times 0.3g/Ah = 3.6g$.)

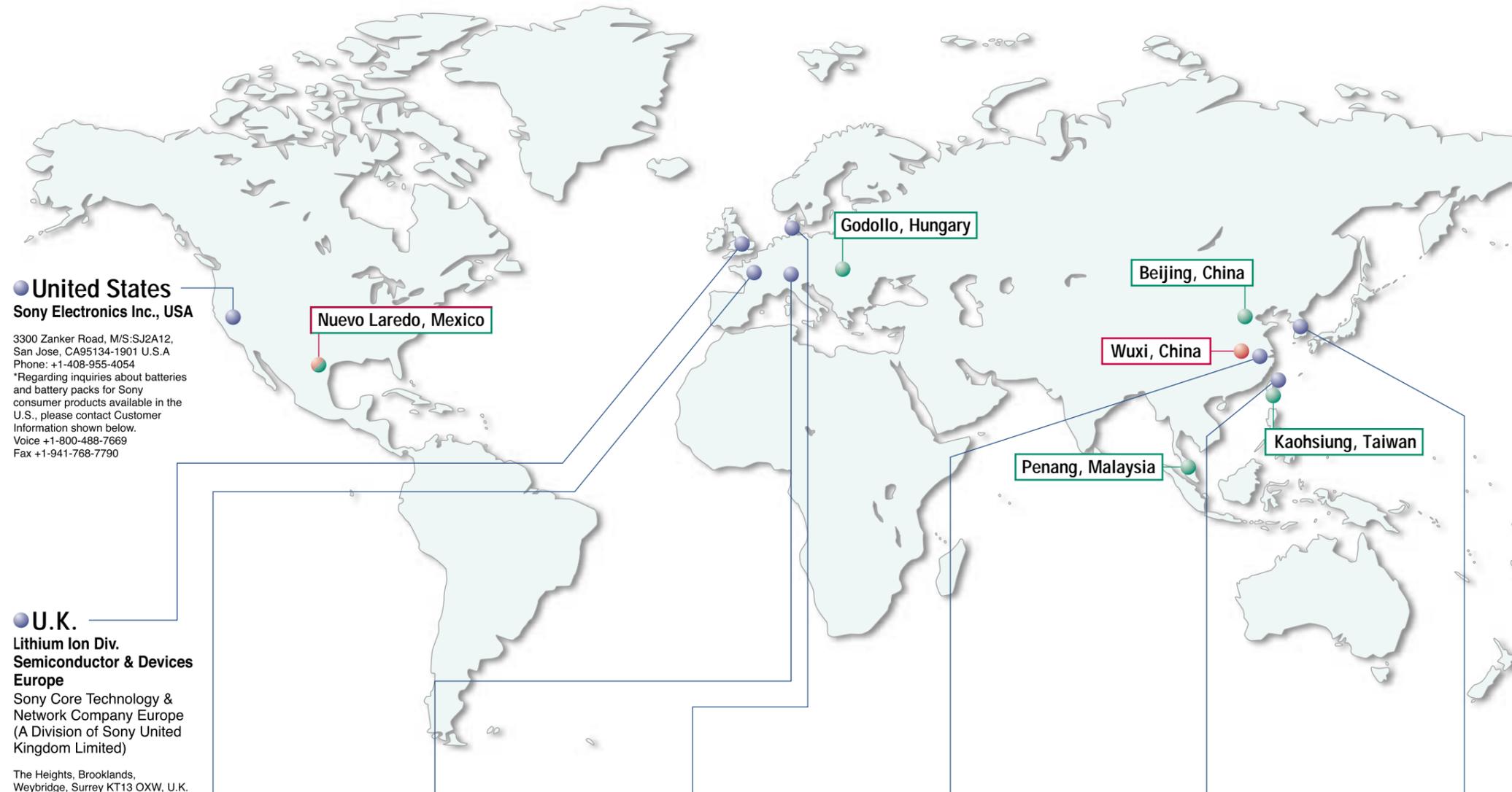
*As for the details of specific models, consult the sales representative.

Worldwide Support Backing-up for Customer Supply Chain

● Sales Offices

Production Facilities

- Factory: Cell Production
- Factory: Pack Assembly



● United States Sony Electronics Inc., USA

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San Jose, CA95134-1901 U.S.A
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*Regarding inquiries about batteries
and battery packs for Sony
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U.S., please contact Customer
Information shown below.
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● U.K. Lithium Ion Div. Semiconductor & Devices Europe

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● China Sony China Shanghai Office Battery Products Division

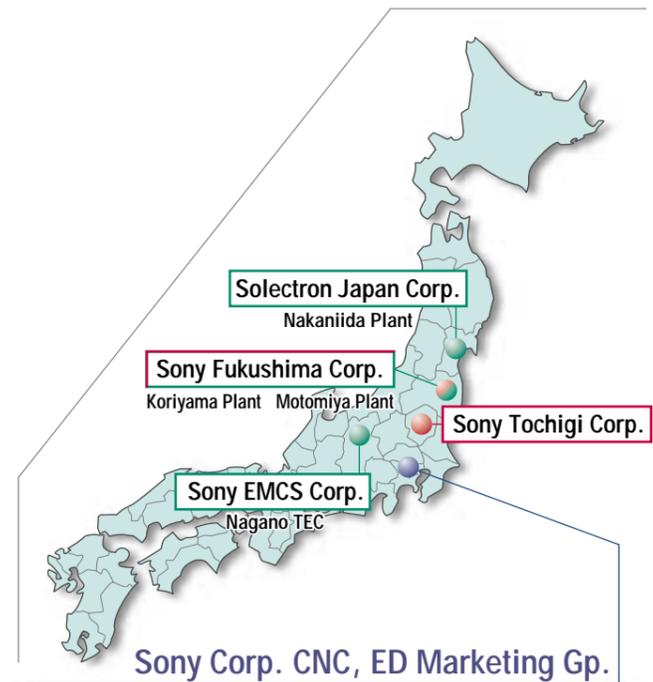
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● Korea Sony Korea Corporation Lithium-ion Battery Team Electronic Devices Marketing Korea (A Division Company of Sony Korea Corp.)

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