ION ENERGY

About delivery style, consult the sales representative.
About the minimum order quantity, consult the sales representative.
Product specification and appearance are subject to change for improvement.
ie ION ENERGY is a trademark of Sony Corporation.

June 2001

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

SONY

CATALOG
JUNE 2001



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

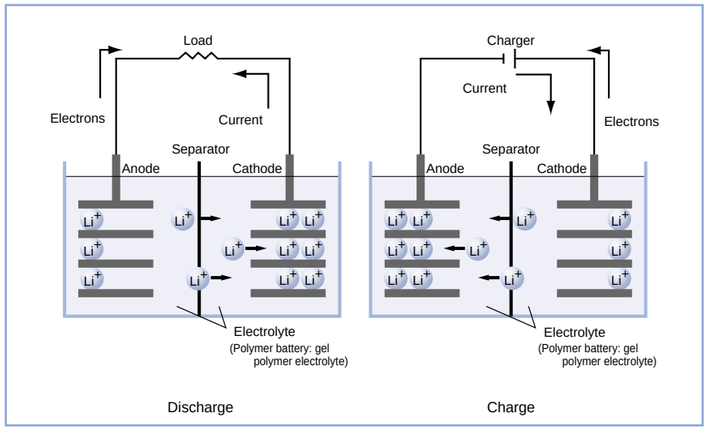
Hard Carbon

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

Sony originates and keeps evolving for future

Charge / Discharge Mechanism

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.

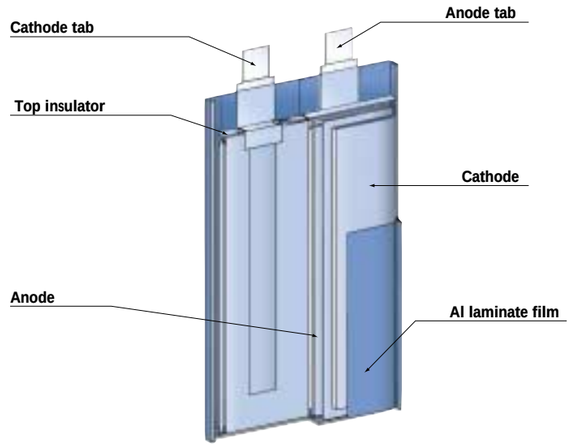
$$LiCoO_2 + C \xrightarrow{\text{initial charge}} Li_{1-x}CoO_2 + Li_xC$$

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

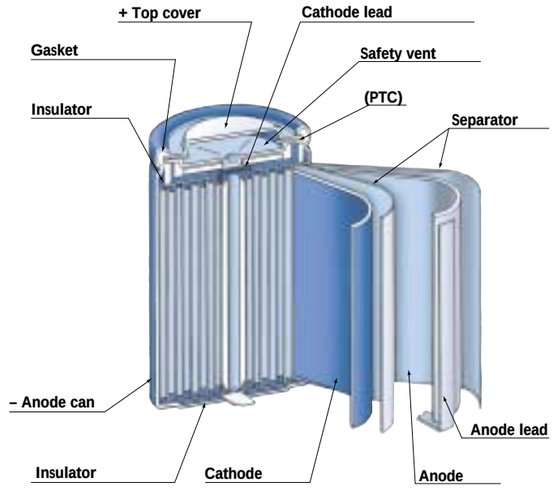
$$Li_{1-x}CoO_2 + Li_xC \underset{\text{charge}}{\overset{\text{discharge}}{\rightleftarrows}} Li_{1-x+dx}CoO_2 + Li_{x-dx}C$$

Structure

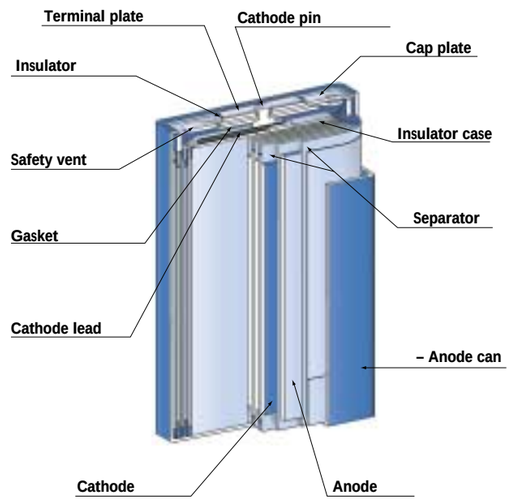
Polymer



Cylindrical



Prismatic



Polymer

Lithium Ion Polymer Rechargeable Battery



UP325385



UP383562



UP423456



UP423469



UP503759



UP523048

Lineup & Specifications

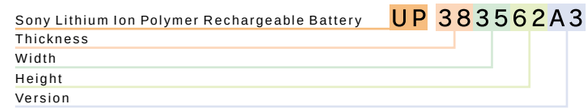
	Nominal Voltage(V)	Nominal Capacity(mAh)*1	Dimensions(mm/max)			Weight(Approx. g)
			Thickness	Width	Height	
UP325385A4H	3.7	1230	3.2	53.0	85.0	27.5
UP383562A3	3.7	650	3.8	35.0	62.0	15.5
UP383562A5	3.7	760	3.8	35.0	62.0	15.5
UP423456A3	3.7	630	4.2	34.0	56.0	15.5
UP423469A3	3.7	800	4.2	34.0	69.0	19.5
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

*2

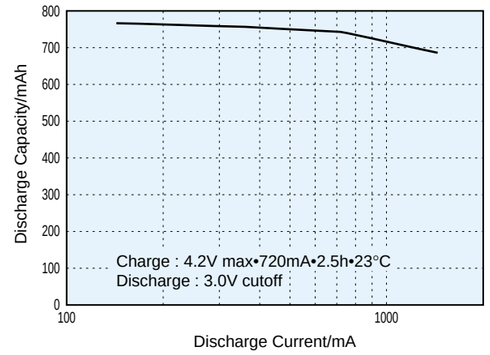
Charge Voltage	Cycle Life	Temperature		
		Charge	Discharge	Storage
4.2 ± 0.05V	More than 500 times	0°C ~ + 45°C	–20°C ~ + 60°C	–20°C ~ + 45°C

*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.

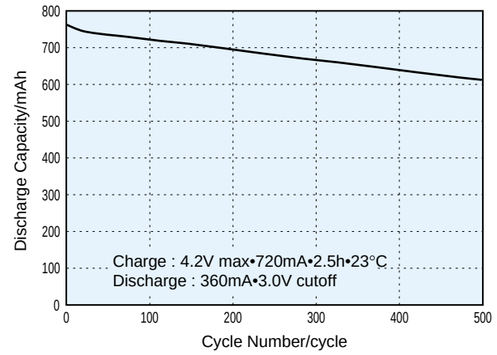
Profile
(UP383562A5)



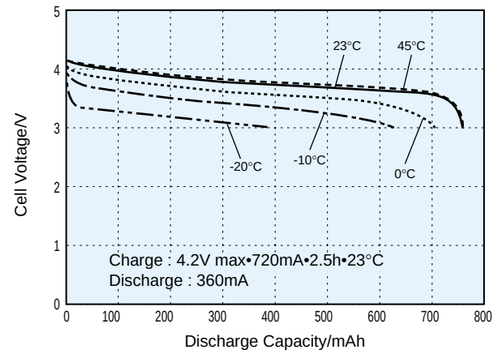
Discharge Capacity Characteristics by Current



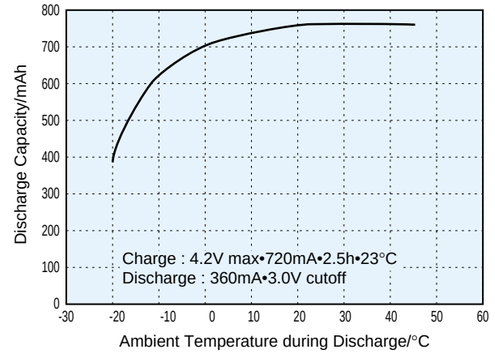
Cycle Life Characteristics



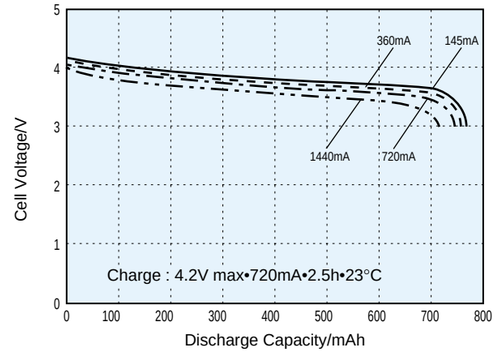
Discharge Characteristics on Temperature



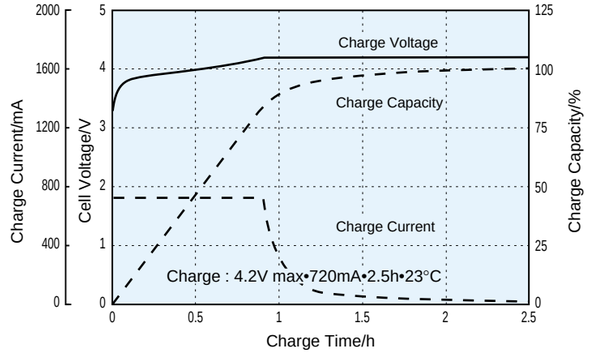
Temperature Dependence on Discharge Capacity



Discharge Characteristics on Load



Charge Characteristics



Graphite

Lithium Ion Rechargeable Battery



US14430GR　US14500GR　US14650GR　US17670GR　US18500GR　US18650GR



US063048GR　US063067GR　US063450GR　US093447GR　US103463GR

Lineup & Specifications

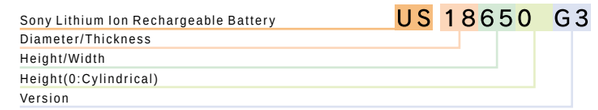
	Nominal Voltage(V)	Nominal Capacity(mAh) *1	Dimensions(mm/max)		Weight(Approx. g)
			Diameter	Height	
US14430G3	3.7	570	14.2 *2	43.0	16
US14500G4D	3.7	680	14.2 *2	49.6	19
US14650G1	3.7	780	14.2 *2	65.1	24
US17670G3	3.7	1500	17.1 *2	67.0	38.5
US17670G3D	3.7	1450	17.1 *2	67.0	38.5
US17670G4D	3.7	1550	17.1 *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

*3

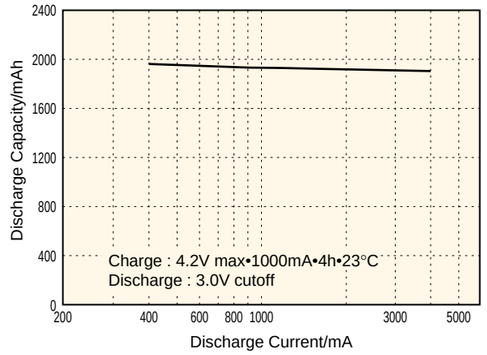
Charge Voltage	Cycle Life	Temperature		
		Charge	Discharge	Storage
4.2 ± 0.05V	More than 500 times	0°C ~ + 45°C	–20°C ~ + 60°C	–20°C ~ + 45°C

*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.

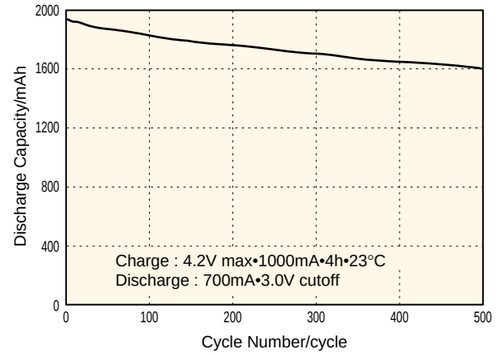
Profile
(US18650G4)



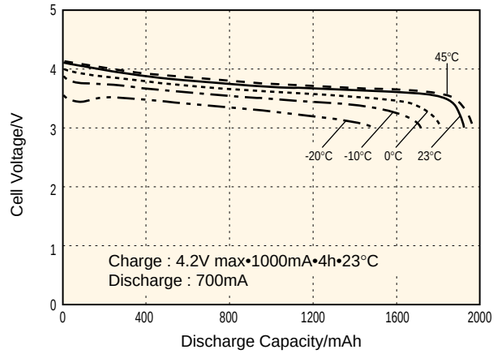
Discharge Capacity Characteristics by Current



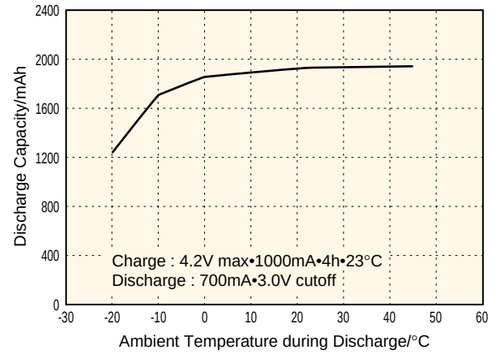
Cycle Life Characteristics



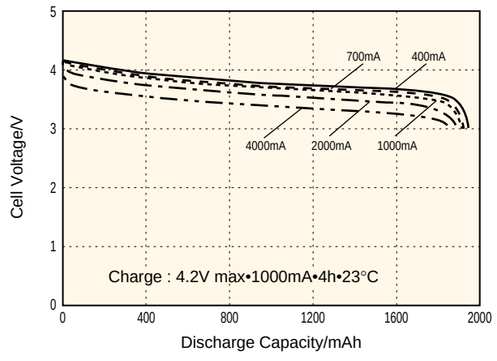
Discharge Characteristics on Temperature



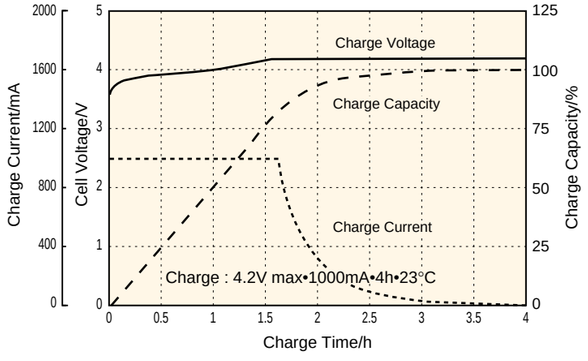
Temperature Dependence on Discharge Capacity



Discharge Characteristics on Load



Charge Characteristics



Hard Carbon Lithium Ion Rechargeable Battery



US18650



US26650



US103463

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

*3

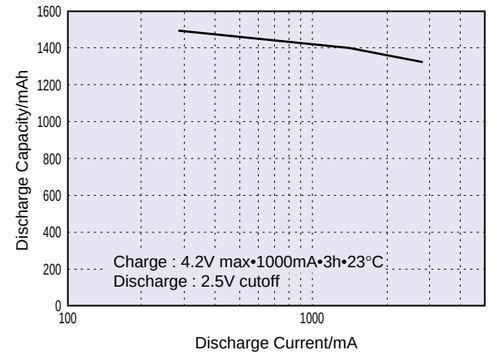
Charge Voltage	Cycle Life	Temperature		
		Charge	Discharge	Storage
4.2 ± 0.05V	More than 500 times	0°C ~ + 45°C	–20°C ~ + 60°C	–20°C ~ + 45°C

*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.

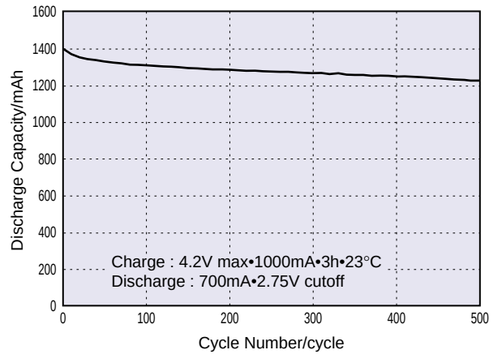
Profile
(US18650)

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

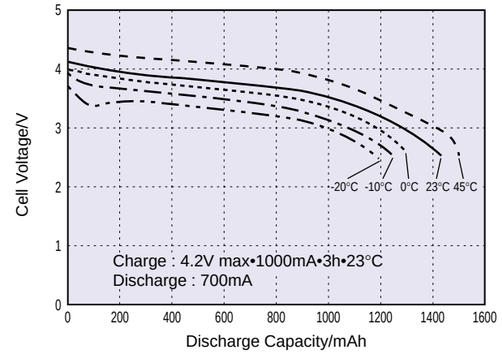
Discharge Capacity Characteristics by Current



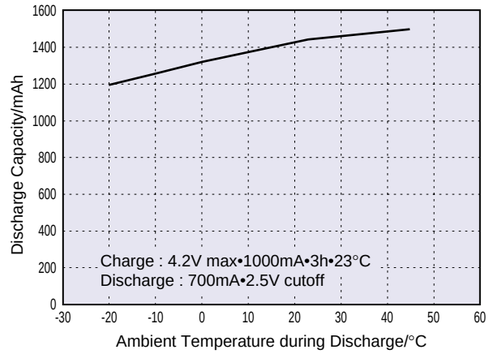
Cycle Life Characteristics



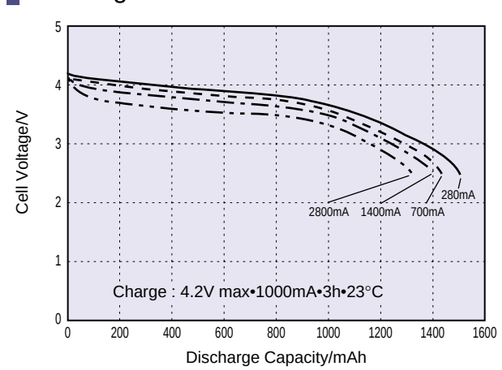
Discharge Characteristics on Temperature



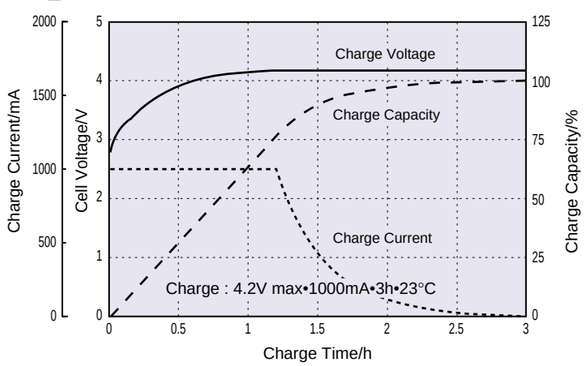
Temperature Dependence on Discharge Capacity



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± 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°C+45°C
    *Battery performance may deteriorate when charged above 45°C.
  - Discharge -20°C ~ +60°C
  - Storage -20°C ~ +45°C
- Current
  - Charge 1C max.
  - Discharge 2C max.
    *Reference only. For details, consult the representatives or ask information.
- Voltage
  - Charge 4.2±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 5μA.
  3. Over-current Protection :
     Should operate at less than approx. 3C.

Lithium Ion Battery Transport Regulations

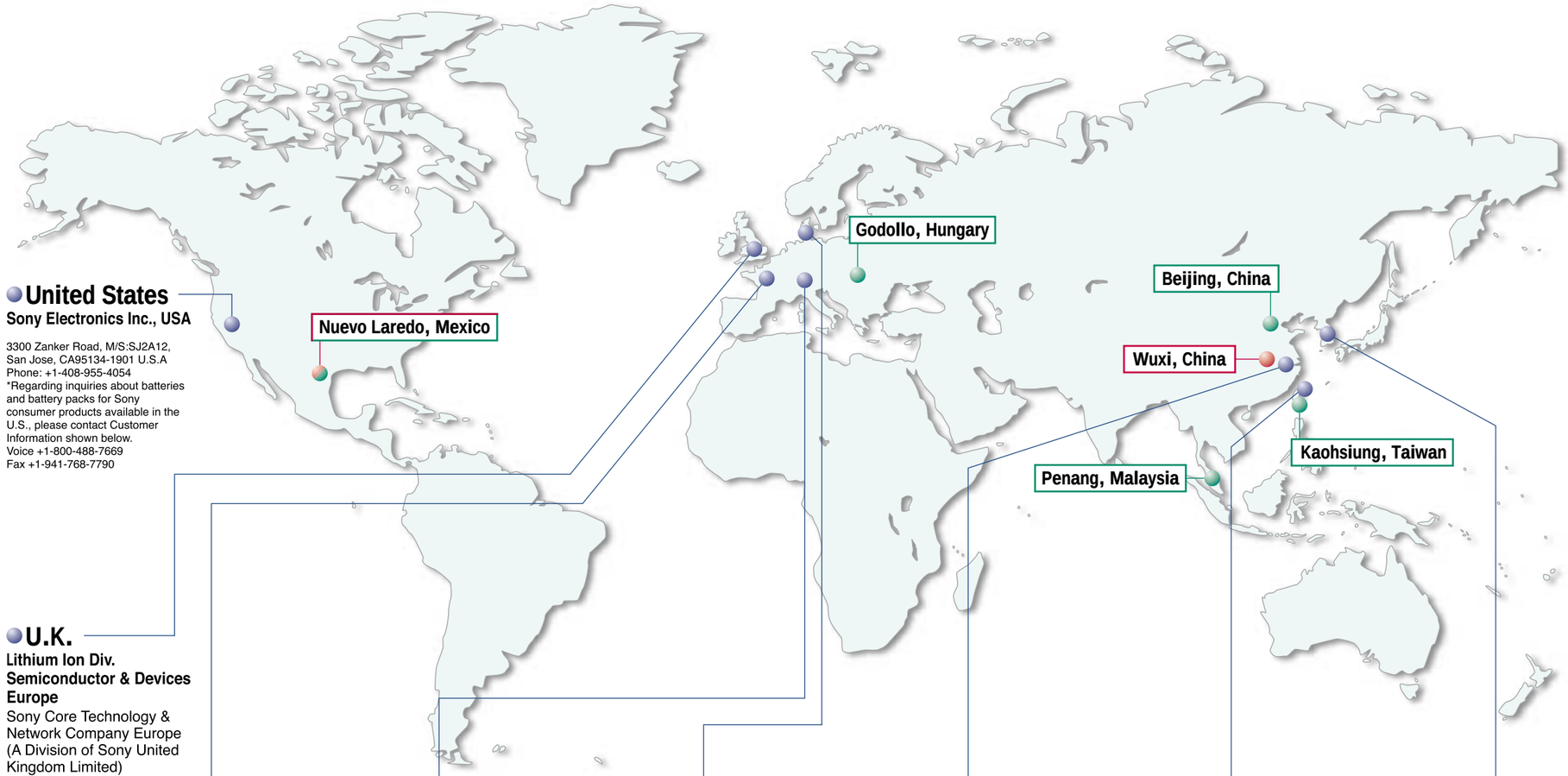
Lithium ion batteries containing no more than 1.5g/cell and 8g/battery pack of lithium can be treated as "non-dangerous goods" under the United Nations Recommendations on the Transport of Dangerous Goods, Special Provision 188, provided that the packaging is strong and prevents the products from short-circuiting.
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 x 6 x 0.3g/Ah = 3.6g.)

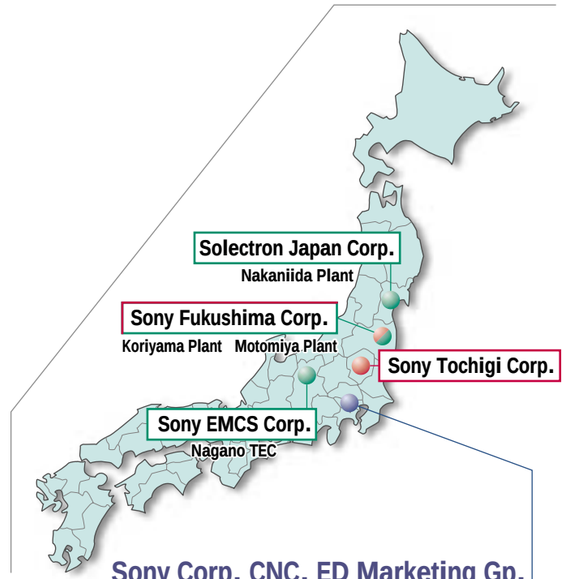
*As for the details of specific models, consult the sales representative.

Worldwide Support Backing-up for Customer Supply Chain

● Sales Offices

Production Facilities
- Factory: Cell Production
- Factory: Pack Assembly





Sony Corp. CNC, ED Marketing Gp.



Sony Corporation
Electronic Device Marketing Dept.
Core Technology & Network Company

- Devices Dept., Computer Network Marketing Div.
  Phone:03-5435-3279 FAX:03-5435-3327
- Mobile & IT Marketing Dept., Mobile & Public Marketing Div.
  Phone:03-5435-3277 FAX:03-5435-3328
- Visual Marketing Dept., Home AV Marketing Div.
  Phone:03-5435-3295 FAX:03-5435-3463

Osaki East Technology Center
Gate City Osaki East Tower, 1-11-1, Osaki Shinagawa-ku, Tokyo, 141-0032 Japan

United States
Sony Electronics Inc., USA

3300 Zanker Road, M/S:SJ2A12,
San Jose, CA95134-1901 U.S.A
Phone: +1-408-955-4054
*Regarding inquiries about batteries and battery packs for Sony consumer products available in the U.S., please contact Customer Information shown below.
Voice +1-800-488-7669
Fax +1-941-768-7790

U.K.
Lithium Ion Div.
Semiconductor & Devices Europe
Sony Core Technology & Network Company Europe (A Division of Sony United Kingdom Limited)

The Heights, Brooklands,
Weybridge, Surrey KT13 OXW, U.K.
Phone: +44-1932-816000

France
Lithium Ion Gp.
Semiconductor & Devices Europe (Paris Office)
Sony Core Technology & Network Company Europe (A Division of Sony France S.A.)

26 rue Morel, 92110 CLICHY, France
Phone: +33-1-5590-3661

Germany
Lithium Ion Gp.
Semiconductor & Devices Europe (Munich Office)
Sony Core Technology & Network Company Europe (A Division of Sony International Europe GmbH)

Max-Planck-Strasse 8, D-85609
Aschheim Dornach, Munich,
Germany
Phone: +44-89-945820

Denmark
Lithium Ion Gp.
Semiconductor & Devices Europe (Copenhagen Office)
Sony Core Technology & Network Company Europe (A Division of Sony Nordic A/S)

Hoersvinget 1, Postbox 154, DK-2630 Taastrup, Denmark
Phone: +45-4355-7000

China
Sony China Shanghai Office
Battery Products Division

43F HSBC Tower, 101 Yin Cheng East Road, Pudong New Area, Shanghai 200120, P.R. China
Phone: +86-21-6841-4893

Taiwan
Sony Taiwan Limited
Li-ion Battery Marketing Company Taiwan

Chia Hsin Sec. Bldg., 6 Floor, Rm 611,
96 Chung Shan N. RD., Sec.2,
Taipei, Taiwan
Phone: +886-2-2541-1080

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

34F, ASEM Tower, World Trade Center,
159-1, Samsung-Dong, Kangnam-Ku,
Seoul, 135-798, Korea
Phone: +82-2-6001-4268 (Marketing)
Phone: +82-2-6001-4252 (Technology Center)