PRODUCT SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

SDS Number	:	68004
Product Name	:	Lithium-Ion (Rechargeable) Battery Cells
Manufacturer	:	Medtronic ECC 6800 Shingle Creek Parkway Brooklyn Center, MN 55430 United States
		(+1-763) 514-1105 Phone (+1-763) 514-1110 Fax
Emergency Information	**:**	**INFOTRAC 24-hour service** US & Canada 800-535-5053 International 352-323-3500
Intented Use	:	Energy source for implanted electrical medical devices

PI 965 - Section IA *(See 14-Transportation Information)*		
Part Number	W/h	Weight (g)
None	> 20	

PI 965 - Section IB or II *(See 14-Transportation Information)*		
Part Number	W/h	Weight (g)
None	> 2.7 < 20	

PI 965 - Section II *(See 14-Transportation Information)*		
Part Number	W/h	Weight (g)
411382001	< 2.7	19
A11907001	< 2.7	9
M940052A001	< 2.7	4
M967655A001	< 2.7	4
M943442A003	< 2.7	1

2. HAZARD(S) IDENTIFICATION

Company supplies the following items that meet the definition of a manufactured article or article under EU REACH, US OSHA, Canadian WHMIS, Australian WHS and the GHS. These products do not release substances or mixtures during normal use. A Safety Data Sheet (SDS) is not required for this item.

CAUTION: Battery may leak, flame, or rupture if opened, crushed, connected improperly, or disposed of in fire. Electrolyte is flammable and may cause irritation to the eyes, skin and respiratory tract. Electrolyte may react with water forming hydrofluoric acid which is corrosive and may cause severe burns to the eyes and skin. Burns may not be immediately painful or apparent. May be harmful if swallowed. Keep battery in original package until ready to use.

3. COMPOSITION/INFORMATION ON INGREDIENTS

These products are considered manufactured articles under US OSHA, Canadian WHMIS, Australian NOHSC and other international hazard communication systems. Lithium-ion cell ingredients are enclosed in a hermetically sealed stainless steel container and present no hazard. The list of ingredients below represent chemical that may be present in a lithium ion battery. Not all ingredients are present in every battery. The ingredients listed in this section only present a hazard if the integrity of the cell is compromised by physical, chemical, or electrical abuse.

Ingredient	CAS#	EC#	Percent Range
Lithium Cobalt Oxide	12190-79-3	235-362-0	<20
Graphite	7782-42-5	231-955-3	<15
Diethyl Carbonate	105-58-8	203-311-1	<10
Propylene Carbonate	108-32-7	203-572-1	<15
Ethylene Carbonate	96-49-1	210-510-0	<15
Ethyl Methyl Carbonate	623-53-0	433-480-9	<15
Dimethyl Carbonate	616-38-6	210-478-4	<15
Lithium Hexafluorophosphate	21324-40-3	244-334-7	<3
Lithium Titanate	12031-95-7	234-759-6	<15
Trimethoxyboroxin	102-24-9	203-016-8	<3
Biphenyl	92-52-4	202-163-5	<1

4. FIRST-AID MEASURES

General Advice: The chemicals in this battery are sealed in the casing. No exposure to the chemical ingredients occurs during normal use. Exposure can only occur if the battery is damaged through exposure to high temperatures or if mechanically or electrically abused. The following first aid applies to contact with battery contents. If intact battery is swallowed, seek immediate medical attention.

Exposure:	**First-Aid Treatment:**
Eye	Immediately flush eyes with large amount of water for at least 15 minutes. Seek immediate medical attention
Skin	Flush contact area with large amounts of cool water for at least 15 minutes. Remove contaminated clothing. Seek medical attention if necessary.
Inhalation	Move to fresh air. Get medical attention immediately.
Ingestion	For ingestion of fluids wash mouth out with water. Seek immediate medical attention.

5. FIRE-FIGHTING MEASURES

General	:	In case of fire, avoid breathing fumes
Extinguishing Media	:	The lithium salts in the cell are water-reactive. Do not expose ruptured cell to water. Use powdered graphite (Lith-X) or other similar Class-D extinguisher suitable for metal fires if battery contents are exposed.
Combustion Products	:	Combustion of lithium-ion cells may emit hazardous products including: Lithium hydroxide (LiOH), hydrogen gas (H_2), cobalt oxides, carbon oxides, phosphorus oxides, titanium oxide, hydrogen fluoride (HF) and hydrocarbons.
Special Fire-Fighting Equipment	:	Self-Contained Breathing Apparatus (SCBA) and Full Protective Clothing

6. ACCIDENTAL RELEASE MEASURES

Intact batteries are not hazardous – pick and return to packaging. If batteries are damaged; remove all personnel from the area, allow the cell to cool, and allow any air contaminants to dissipate. When the cell has cooled and the air contaminants have dissipated, the cell should be carefully collected and disposed of in accordance with federal and local regulations. Wear appropriate protective clothing (See Section 8) and pick up the cell and collect any liquid contents with an (non-combustible) absorbent material. Place in a sealable container.

7. HANDLING AND STORAGE

Activities that can damage cells and jeopardize the safety of personnel include: short circuiting; forced overdischarging; excessive heating or incineration; crushing; puncturing; disassembly; rough handling, excessive shock and vibration. Install batteries in accordance with the manufacturer's instructions. Do not disassemble lithium-ion cells without taking the necessary precautions to protect personnel and property.

Lithium-Ion cells should be stored in their original shipping trays. The storage area should be well ventilated, cool, and free of combustible materials. Do not stack or scatter cells. Cells should be kept in plastic trays with individual compartments for each cell.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits: Not applicable. No exposure to contents occurs during normal use.

No protective equipment is needed for handling intact batteries. The following personal protective equipment may be necessary to handle compromised lithium batteries/cells:

Respiratory Protection	:	SCBA In a fire situation where if air contaminants may be present.
Ventilation	:	Local exhaust ventilation if air contaminants are present.
Hand Protection	:	Impervious gloves such as rubber or neoprene.
Head/Face/Eye Protection	:	Safety goggles.
Other Protective Clothing and Equipment	:	Protective apron or clothing

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Geometric Solid
Output Voltage	:	2.4 – 3.6 Volts
Critical Temperature	:	167°F (75°C)
Weight	:	3.0 – 20.0 grams
Lithium Content	:	0.01 – 0.5 grams

10. STABILITY AND REACTIVITY

Under normal conditions lithium cells are stable and non-reactive.

Conditions to avoid	Short circuiting; forced overcharging; excessive heating or incineration; severe mechanical abuse, puncture or disassembly; excessive shock and vibration; storing cells loosely.
Materials to avoid	Metal surfaces; sharp objects; personal jewelry that could contact the terminals.
Hazardous decomposition products	Lithium hydroxide (LiOH) – corrosive Cobalt oxides, - toxic, carcinogenic Phosphorus Oxides - toxic Carbon oxides – toxic Hydrogen fluoride (HF) – toxic, corrosive Hydrocarbons - toxic

11. TOXICOLOGICAL INFORMATION

Under normal conditions lithium cells do not pose a toxicological hazard.

Cell ingredients are potentially hazardous by ingestion, inhalation, and skin or eye contact. Cells contain irritating and potentially corrosive materials capable of causing chemical burns to the eyes, skin, and mucous membranes.

Lithium and lithium compounds have been implicated in neurological, cardiac, hepatic, and kidney dysfunctions. Chronic exposure to fluoride compounds may cause digestive disturbances, mottled tooth enamel and changes to the bone, liver and kidneys. Cobalt compounds may cause skin sensitization (allergic reaction). Chronic inhalation of cobalt compounds may result in lung damage. Persons

with preexisting neurological, cardiac, hepatic, or kidney conditions may be more susceptible to lithium poisoning. Chronic exposure to ethylene carbonate may cause liver and kidney damage.

Cobalt and cobalt compounds are classified as possibly carcinogenic to humans (Group 2B) by IARC and as a Confirmed Animal Carcinogen with Unknown Relevance to Humans by ACGIH.

12. ECOLOGICAL INFORMATION

Ecotoxicity	:	Classified as Harmful to aquatic organisms with possible long-term effects in the EU based on proprietary component.
Persistence	:	Slowly biodegradable
Bioaccumulation Potential	:	No data available
Environmental Fate	:	None known

13. DISPOSAL CONSIDERATIONS

Industrial/Commercial use: Follow federal and local regulation for disposal of lithium-ion batteries. For proper disposal, the cell electrode or terminal must be protected from contact with metal surfaces.

14. TRANSPORT INFORMATION

UN 38.3: Medtronic Energy & Component Center certifies that all of its lithium batteries (cells) meet the requirements of the UN Manual of Tests and Criteria, Part III subsection 38.3.

The transportation carrier has final authority over the transportation of lithium cells; therefore, transportation decisions should be confirmed with the carrier prior to shipment.

The following agencies and authorities have established regulations for the shipment of lithium cells:

- United Stated Department of Transportation (DOT)
- International Air Transport Association (IATA)
- International Civil Aviation Organization (ICAO)
- International Maritime Organization (IMO)

Shipping Information — International Air Transport Association (IATA)

UN (Identification) number	:	UN3480
Proper Shipping Name	:	Lithium ion batteries
Class	:	Class 9
Packing Group	:	*(leave blank)*
Packing Instruction	:	PI 965

Shipping Information — Department of Transportation (DOT)

Identification number	:	UN3480
Proper shipping name	:	Lithium ion batteries
Hazard class	:	Class 9
Packing group	:	II
Packaging authorization	:	185

15. REGULATORY INFORMATION

UNITED STATES
TSCA: All of the components of the components of this product are either listed on the TSCA inventory or not subject to TSCA.
Note – medical devices are not subject to TSCA.

SARA Section 311/312 Hazard Category: These products are considered manufactured articles and not subject to regulation.

SARA Section 313 Reportable Ingredients: These products are considered manufactured articles and not subject to regulation.

CERCLA Hazardous Substance: Releases of this product over the RQ (reportable quantity) must be reported to the National Response Center. The RQ for the product, based on the RQ for Biphenyl (1% maximum) of 100 lbs, is 10,000 lbs. Many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.

Additional Product Label Required for the Netherlands

These labels must be on the packaging of the lithium cell (if sold separately from the product) or in the manual of the product containing the cell with statements about removal of the cell.

16. OTHER INFORMATION

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty (either expressed or implied) or guarantee is made to the

accuracy, reliability or completeness of the information contained herein.

This information relates to the specific materials designated and nay not be valid for such materials used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of this information for his particular use.

Medtronic does not accept liability for any loss or damage that may occur, whether direct, indirect, incidental or consequential, from the use of this information. Medtronic does not offer warranty against patent infringement.

Definitions:

- Cell: A single encased electrochemical unit (one positive and one negative electrode) which exhibits a voltage differential across its two terminals.
- Battery: "Battery" means two or more cells which are electrically connected together and fitted with devices necessary for use.

DISCLAIMER: This information is offered in good faith. Each user of this article needs to evaluate the conditions of use and design in the appropriate protective mechanisms to prevent employee exposures, property damage or release to the environment.
Medtronic assumes no responsibility for injury to the recipient or third persons for any damage to property resulting from misuse of the product.

REVISION SHEET

Revision	Updates/Changes	Date / Name
B	Added MicroStim and Intellis batteries	14-Dec-2011
C	Updated Transportation Information Updated 'Proper Shipping Name' and labeling Updated Address and phone number Updated Emergency Contact Information.	18-Jun-2013
D	Updated to MSDS# to "68001". Reviewed the Part Numbers assigned to this MSDS. Added DOT section.	18-Dec-2013
E	Add article exemption statement, in §1 Update part number table with W/h and weight, in §1 Add "UN 38.3" Testing statement, in §14 Removed labeling in §14	02-Nov-2014
F	§14 updated (removed) Packing Group information, as per 2015 IATA and DOT Regulations	23-Dec-2014
G	Converted to PSDS – changes to most sections	23-Feb-2015
H	Remove part number M943442A001 and M943442A002	26-Jul-2016
I	Add part number M967655A001	05-Aug-2016
J	Add part number M943442A003 to Section 1	11-Nov-2017