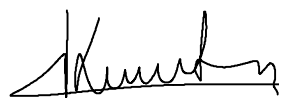




STANDARD SPECIFICATION

Non-rechargeable Li-SOCl₂ cell

LS 14500W Type

	Name	Position	Date	Signature
Written by	A. Kerouanton	Lithium Product Manager	02/05	
Checked by	G. Tardivo	Primary Lithium Quality Manager	02/05	
Approved by	PM. Leroy	Lithium Sales Director	02/05	

Issued by	A. Kerouanton				
Date	02/05				
Edition Nr	1				

LS 14500W

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RECORD OF REVISIONS

REVISION DATE	EDITION NUMBER	REVISION PAGE	MODIFICATIONS
02/2005	1	All	Creation



1. Subject

This specification presents typical and guaranteed ex-works values for the Lithium-Thionyl Chloride (Li-SOCl₂) cell type LS 14500W (IEC standard R6, ANSI standard AA).

This cell is intended for high energy applications, requesting superior voltage response in Widely fluctuating temperature environments.

2. Typical values

A. Désignation

LS 14500W.

B. Nominal voltage

3.6 V (on 18 k Ω /0.2 mA at + 20°C).

C. Nominal capacity

2.2 Ah (on 3.6 k Ω /1 mA, at + 20°C, cut-off voltage 2 V).

(The capacity returned by the cell varies according to the current drain, the temperature and the voltage cut-off).

D. Maximum recommended continuous current

60 mA

(to get 50 % of the nominal capacity at + 20°C to a 2 V cut-off. Higher currents are possible. Consult Saft).

E. Maximum recommended pulse conditions

The cell voltage response varies according to pulse characteristics (frequency, duration), temperature, cell history (storage conditions prior to usage) and the application's acceptable minimum voltage. *Consult Saft for case by case study.*

The use of parallel capacitor to enhance the voltage during the first tens of millisecond of the pulses might be recommended. *Consult Saft.*



F. Operating temperature range

- 60/+ 95°C

(short excursions up to + 130°C possible without leakage but external sleeve deterioration may occur above 105°C)

(Operation above ambient temperature may lead to reduced capacity and lower voltage readings at the beginning of pulses).

G. Typical weight

16.2 grams.

3. Construction and visual aspect

A. Construction

The LS 14500W cell is constructed according to the concentric electrodes "bobbin" technology.

A glass-to-metal seal ensures the hermeticity of the cell ($\leq 10^{-7}$ atm.cc/sec under 1 atm He).

B. Visual aspect

When inspected by eye, the LS 14500W cell should not show any trace of dents, swelling, corrosion or electrolyte leakage. Marking should be readable.

4. Environment and mechanical tests

A. Altitude simulation

The LS 14500W cell complies with the UN** and IEC*** tests which consist in a storage at + 20°C for at least 6 hours under an absolute pressure of 11.6 kPa ($\approx 15,240$ m altitude) without any leakage, fire, vent or explosion.

B. Free fall

The LS 14500W cell complies with the IEC*** test which consists of 2 drops/plane (6 in total, samples randomly oriented) onto a concrete floor from an height of 1.0 m without any leakage, vent, explosion or fire.



C. Vibration

The LS 14500W cell complies with the UL* and IEC*** tests which consist of the following:

- Frequency span : 10 to 55 Hz.
- Peak to peak amplitude : 1.6 mm.
- Test duration : 95 ± 5 mm per axis.

Test carried out on three perpendicular axes. The cell must retain its operational characteristics and normal visual aspect.

D. Mechanical shock

The LS 14500W cell complies with the UL* and IEC*** tests which consist of the following:

- Average acceleration : 75 g.
- Maximum acceleration : 125 - 175 g.

Shocks applied to each of the three perpendicular axes. The cell must retain its operational characteristics and normal visual aspect.

Safety standards mentioned:

- *UL Underwriters Laboratories Inc.
"Standard for Lithium Batteries" – UL 1642 – Third Edition – 1995
- **UN Secretariat of the United Nations
"Model Regulations on the Transport of Dangerous Goods"
Ref. ST/SG/AC.10/1 – Revision 13 – 2003
+ "Manual of Tests and Criteria"
Ref. ST/SG/AC.10/11 – Revision 3 – Amendment 1 "Lithium Batteries – 2002
- ***IEC International Electrotechnical Commission
International safety standard for lithium batteries
"IEC 60086-4" – Second Edition – 2000
- ATEX Intrinsic Safety Standard for use in explosive atmospheres
EN 50020 – Clause 10.9 – 2002.



5. Storage

Before use the LS 14500W cell should be stored in dry and cool conditions, at a temperature preferably not exceeding + 30°C.

Storage at higher temperature is possible but it may affect later the cell capacity and its ability to show good start up voltage characteristics.

6. Safety

We advise, during use of the LS 14500W cell, to observe the following precautions:

- a) Do not remove the cells from their original packing before use.
- b) Do not store the cells in bulk in order to avoid accidental short circuiting.
- c) Do not heat above 100°C or incinerate.
- d) Do not disassemble.
- e) Do not recharge.
- f) Do not solder directly on the cell. *(use tabbed cell finish versions instead).*
- g) Do not mix new and used cells or cells from different origins.
- h) Respect the polarities of the cell.

The LS 14500W cell is recognized as "Technician Replaceable" by the Underwriters Laboratories Inc. under the file number MH 12609 (pending at the time of writing).

The LS 14500W cell complies with the International Electrotechnical Commission (IEC) Safety Standard IEC 60086-4.

The LS 14500W cell complies with the requirements of the clause 10.9 of the ATEX Safety Standard and is assigned to the class T4.

7. Transport

The LS 14500W cell has demonstrated an ability to pass the safety tests listed in the United Nations "Recommendations on the Transport of Dangerous Goods – Manual of Tests and Criteria" Reference ST/SG/AC.10/11 Revision 3 : Amendment 1 "Lithium Batteries" – 2002.

Hence, and in accordance with the United Nations "Model Regulations on the Transport of Dangerous Goods" Reference ST/SG/AC.10/1 – Revision 13 – 2003, the LS 14500W cell, which contains less than 1 gram of lithium metal, is declared as non-restricted to transport, that is non-assigned to class 9.



8. Guaranteed minimum values

	Initial [*]	Up to 12 months storage ^{**} in the recommended + 30°C max. conditions
Open Circuit Voltage (OCV)	3.640 V	3.640 V
On Load Voltage (after 6 seconds on $56 \Omega \pm 1 \%$ at + 20°C) ($I \approx 55 \text{ mA}$)	3.10 V	2.90 V
Capacity (on $3600 \Omega \pm 1 \%$ at + 20°C 2 V cut-off)	2.00 Ah	1.90 Ah

9. Incoming inspection

Prior to release from factory, the LS 14500W cell is 100 % inspected for Open Circuit Voltage (OCV) and On Load Voltage.

The capacity, visual aspect and dimensions are checked by sampling.

In case of incoming inspection, Saft recommends the following:

A. Sampling standards

French	British	German	American	ISO
NFX 06-022 NFX 06-023	BS 6001 BS 6002	DIN 40080 DIN ISO 3951	MIL STD 10 5D MIL STD 414	2859 3951

^{*} Initial : Within one month following the date code printed on the sleeve.

^{**} Following the date code printed on the sleeve.



B. Acceptable Quality Levels (AQL)

Cell lot size	Sampling size	AQL
1 – 3 200	32	0.4 %
3 201 – 10 000	50	0.25 %
> 10 000	80	0.15 %

10. Labelling

The external surface of the LS 14500W cell displays the following:

SAFT LITHIUM LS 14500W Made in France 3.6V +/- polarities

UL logo Safety warning Crossed-out wheeled refusal bin logo

Cell finish date code with year/day/traceability indication.

Example:

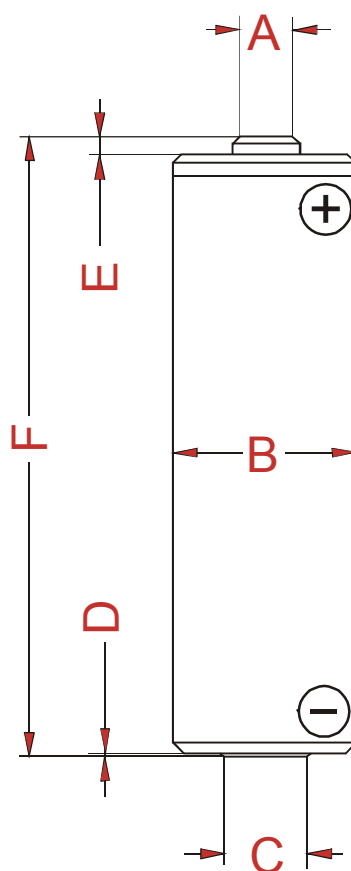
04 029 A023

(cell finished the 29th day of year 2004. Batch internal reference A023)

11. Untabbed/sleeved cell external dimensions

(Dimensions in mm)

P/N 05175H



LS 14500W	A	B	C	D	E	F
	5.5 maxi	14.5 ± 0.15	7.5 ± 0.1	0.4 ± 0.1	1.6 ± 0.3	50.0 ± 0.3



12. Main cell finish versions

A. LS 14500W CNR

(version with 2 rectangular nickel-plated steel radial tabs) P/N 05224J

B. LS 14500W CN

(version with 2 special profile nickel radial tabs) P/N 05234U

C. LS 14500W 2PF

(version with 2 nickel-plated steel radial tabs featuring 1 prong on each side) P/N 05231R

D. LS 14500W 3PF

(version with 2 nickel-plated steel radial tabs featuring 2 prongs on + side and 1 prong on – side) P/N 05232S

E. LS 14500W 3PF RP

(version with 2 nickel-plated steel radial tabs featuring 2 prongs on – side and 1 prong on + side) P/N 05233T

F. LS 14500W CNA

(version with 2 tinned-copper axial leads) P/N 05235V

See corresponding drawings on the following pages.

Other finish versions are available on request. Consult Saft

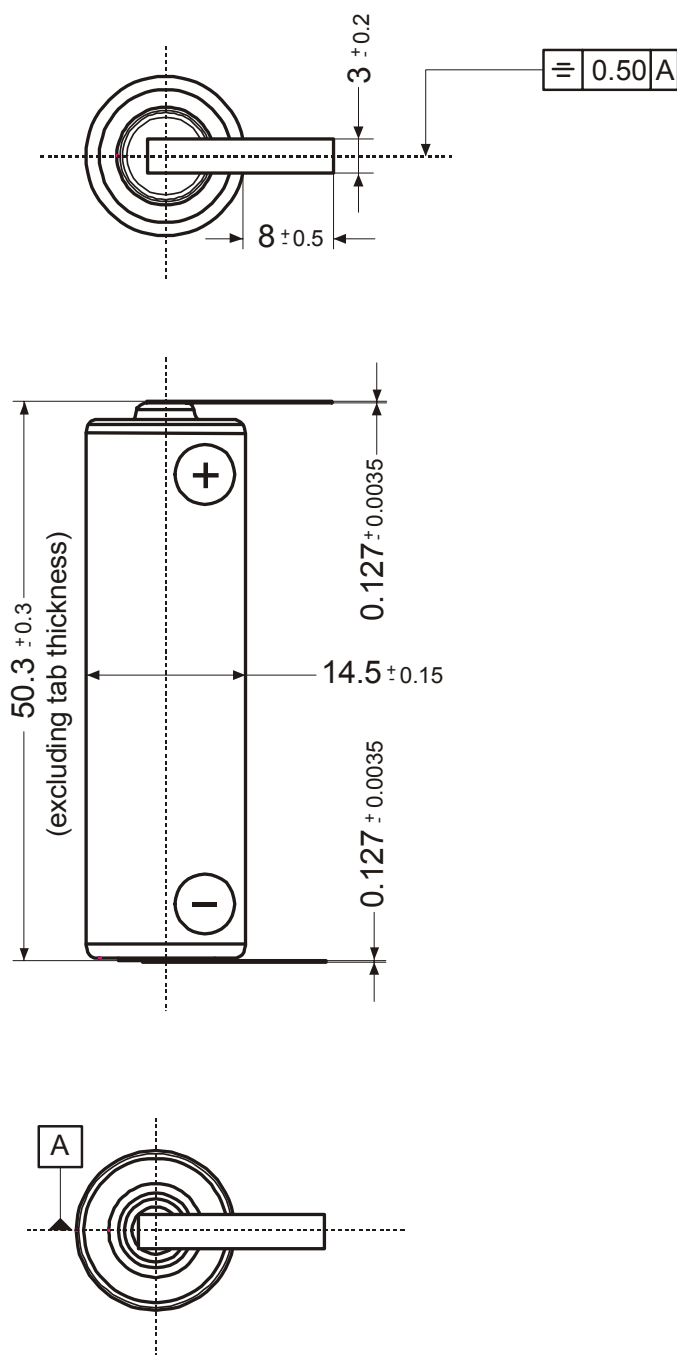


LS 14500W CNR

P/N 05224J

(dimensions in mm)

Version with 2 rectangular nickel-plated steel radial tabs



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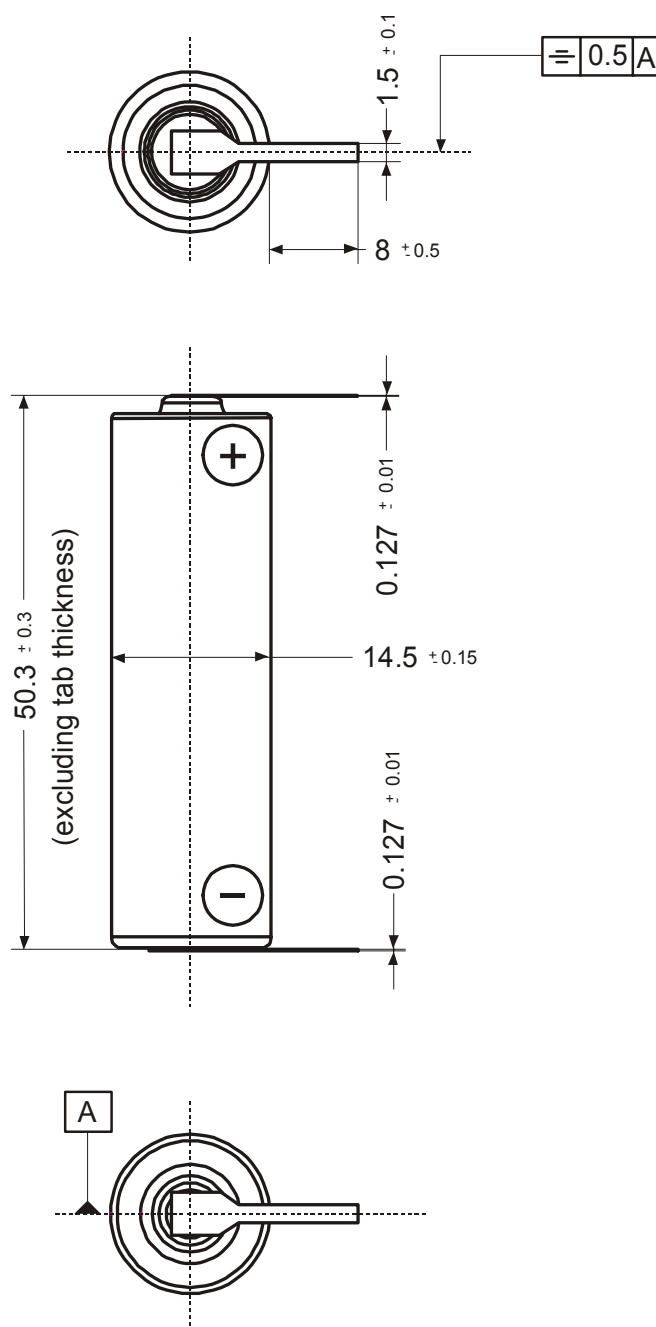


LS 14500W CN

P/N 05234U

(dimensions in mm)

Version with 2 special profile nickel radial tabs



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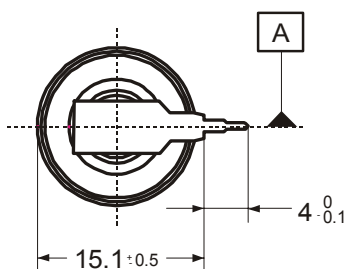
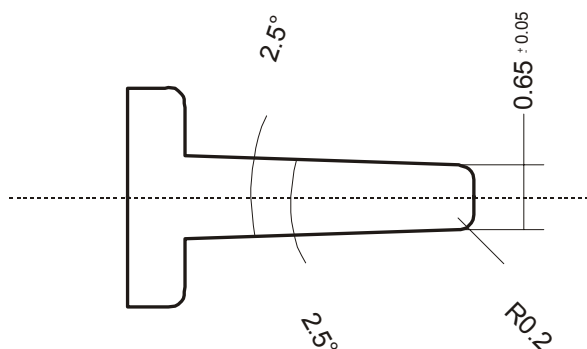
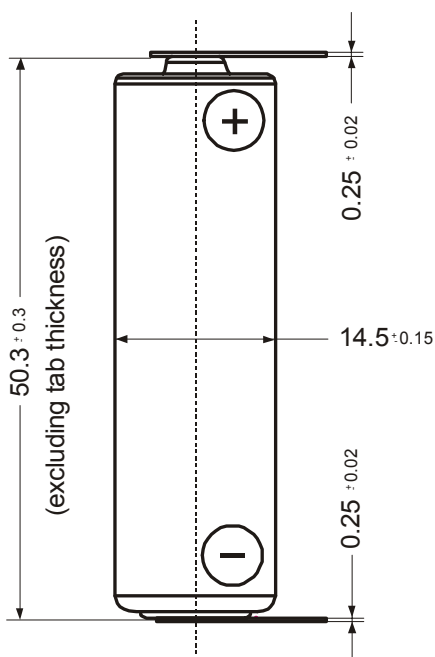
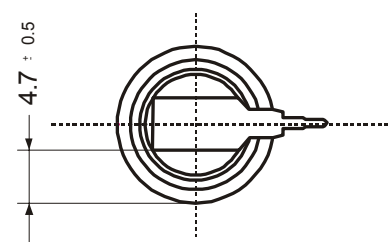


LS 14500W 2PF

P/N 05231R

(dimensions in mm)

Version with 2 nickel-plated steel radial tabs featuring 1 prong on each side



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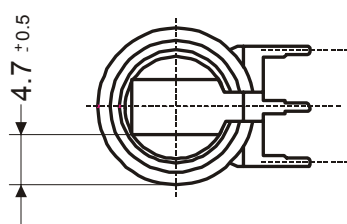


LS 14500W 3PF

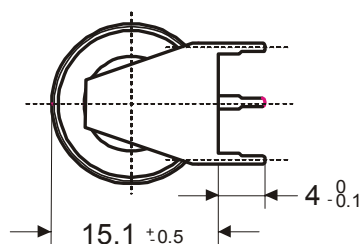
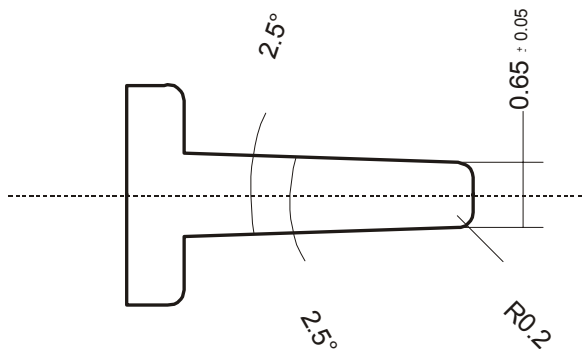
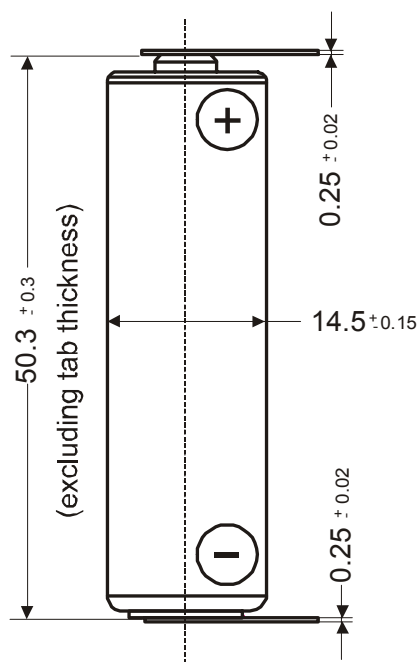
P/N 05232S

(dimensions in mm)

**Version with 2 nickel-plated steel radial tabs
featuring 2 prongs on + side and 1 prong on – side**



Negative end



Positive end

LS 14500W

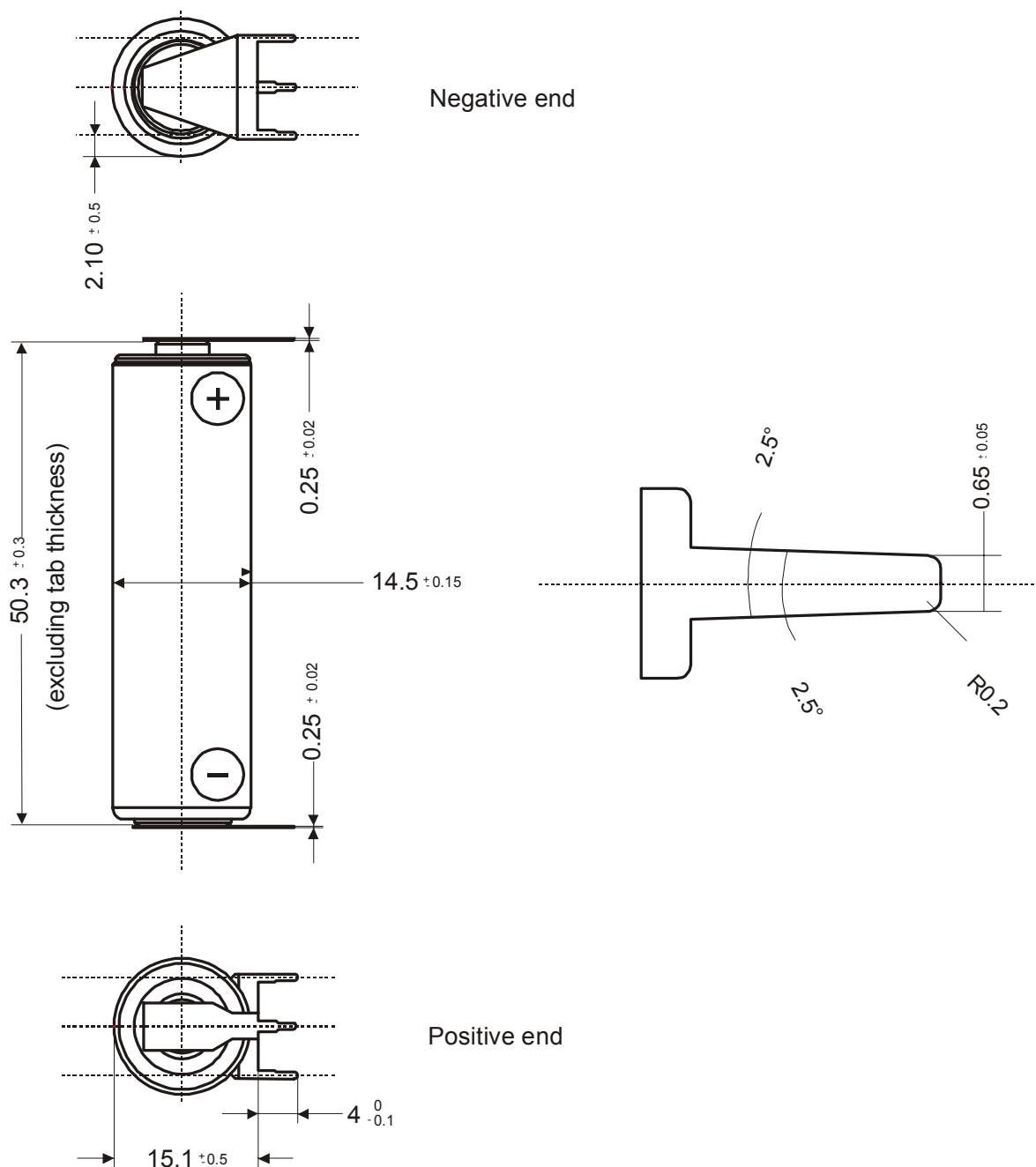


LS 14500W 3PF RP

P/N 05233T

(dimensions in mm)

**Version with 2 nickel-plated steel radial tabs
featuring 2 prongs on – side and 1 prong on + side**



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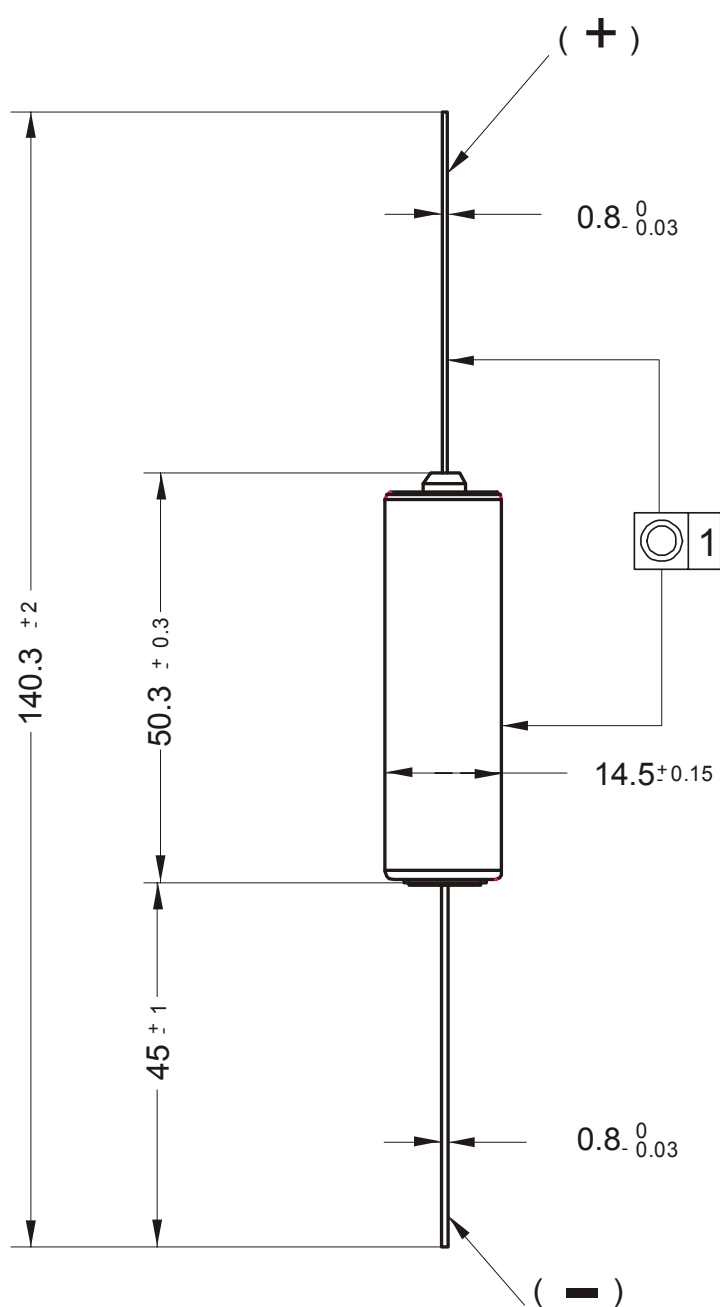


LS 14500W CNA

P/N 05235V

(dimensions in mm)

Version with 2 tinned-copper axial leads



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TRANSPORTATION CERTIFICATE

Ref. TC- LS 14500W 02/2006-1

This is to certify that the Saft cell **LS 14500W** is similar to the **LS 14500** cell that has been subject and has met the requirements of:

- UN Recommendations on the transport of dangerous goods, Model Regulations 13th Revised edition - 2001 - Ref. ST/SG/AC.10/1/Rev. 13
- UN Recommendations on the transport of dangerous goods, Manual of Tests and Criteria 4th Revised edition - 2003 - Ref. ST/SG/AC.10/11/Rev. 4

as detailed in Saft-Poitiers internal reports P 0107/01 dated 02/2001, relative to the ability to pass the T6 impact test, and P 0134/02, dated 06/2002, relative to the other tests. It follows that these test results can be considered as also applicable to the above mentioned LS 14500W cell version.

Concerned Part Numbers: all the following LS 14500W cell versions that just vary by their termination mode and labelling: 05175H, 05224J, 05231R, 05232S, 05233T, 05234U, 05235V, 05401T.

Product Description

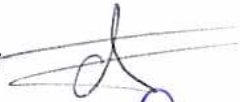
Primary (non-rechargeable) Lithium-Thionyl chloride (Li-SOCl₂) AA-sized single cell

Nominal Voltage	3.6 Volts
Nominal Capacity	2.2 Ah
Lithium metal content	0.60 gram
Maximum recommended continuous discharge current	60 mA

Product Classification

Since it passes the UN-defined transport tests and since its lithium content is below the 1 gram limit, **the LS 14500W individual cell, in all of its finish versions, is declared exempt from the Dangerous Goods. It is non-restricted to transport/non-assigned to Class 9**, providing packed in accordance with Clause 188 of UN Recommendations on the transport of dangerous goods, Model Regulations 13th Revised edition - 2001 - Ref. ST/SG/AC.10/1/Rev. 13.

Signed on Behalf of Saft Specialty Battery Group

Eric Nadeau	SBG Product Test Engineer		dated 15/02/06.
Pascal Hans	SBG Quality Manager		dated 15/02/06
Alain Kerouanton	SBG Lithium Product Manager		dated 15/02/2006