

## EnFilm™ - rechargeable solid state lithium thin film battery

Datasheet – production data



### Features

- All solid-state
- Ultra thin
- Fast recharge
- Low capacity loss
- Long cycle life
- RoHS compliant
- UL file number: MH47669

### Complies with the following standards

- IEC 62133
- UN Manual of Tests and Criteria, Part III, subsection 38.3
- ISO7816 / IEC10373 (mechanical / flexibility smartcard standards)

### Applications

Device is intended to be used in a wide range of applications including:

- Internet of things
- Sensors and networks
- Smart card
- RF ID tags
- Energy storage for energy harvesting devices
- Non implantable medical applications
- Backup power
- Wearable applications

### Description

The EFL700A39 is a thin film rechargeable lithium battery. The battery has a  $\text{LiCoO}_2$  cathode, LiPON ceramic electrolyte and a lithium anode.

**Table 1. Device summary**

Symbol	Value
Capacity	0.7 mAh
$V_{\text{nominal}}$	3.9 V
$V_{\text{op}}$	3.0 to 4.2 V
$R_{\text{int}}$	100 ohm
$I_{\text{p}}$	10 mA
Dimension	25.7 x 25.7 mm
Thickness	220 $\mu\text{m}$

TM: EnFilm is a trademark of STMicroelectronics

# 1 Characteristics

**Table 2. Absolute ratings**

Symbol	Parameter	Value	Unit
V <sub>op</sub>	Operating voltage	3.0 – 4.2	V
I <sub>c</sub>	Maximum continuous discharge current	5	mA
I <sub>p</sub>	Maximum pulsed discharge current <sup>(1)</sup> at 30 °C	10	mA
T <sub>stg</sub>	Storage temperature range	- 20 to 60	°C
T <sub>op</sub>	Operating temperature range <sup>(2)</sup>	- 20 to 60	°C
C <sub>life</sub>	Cycle life (to minimum of 80% of initial capacity) <sup>(3)</sup>	4000	cycle

1. Pulsing conditions: 100 ms on, 0.9 s off, cut off voltage during pulse = 2 V for higher pulses current contact ST representative
2. 1/30 C discharge at -20 °C: operating at 60 °C reduces the cycle life
3. 1C discharge rate: cycling between SoC = 75% to SoC = 0% (SoC = state of charge)

**Table 3. Electrical characteristics**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
C	Nominal capacity (minimum)	T = 30 °C Discharge @ 1 mA Cut-off voltage = 3.0 V	0.7	-	-	mAh
R <sub>int</sub>	Internal resistance	T = 30 °C	-	100	120	ohm
C <sub>t</sub>	Charge time to 80% of full capacity	Constant voltage = 4.2 V	-	-	20	mn
S <sub>Disch</sub>	Self discharge	Charge loss (recoverable)	Room temperature <sup>(1)</sup> SoC = 50%	-	3	%/year
		Capacity loss (Non-recoverable)		-	20	% over 10 years

1. For other operating conditions contact ST representative

Figure 1. Typical discharge curve

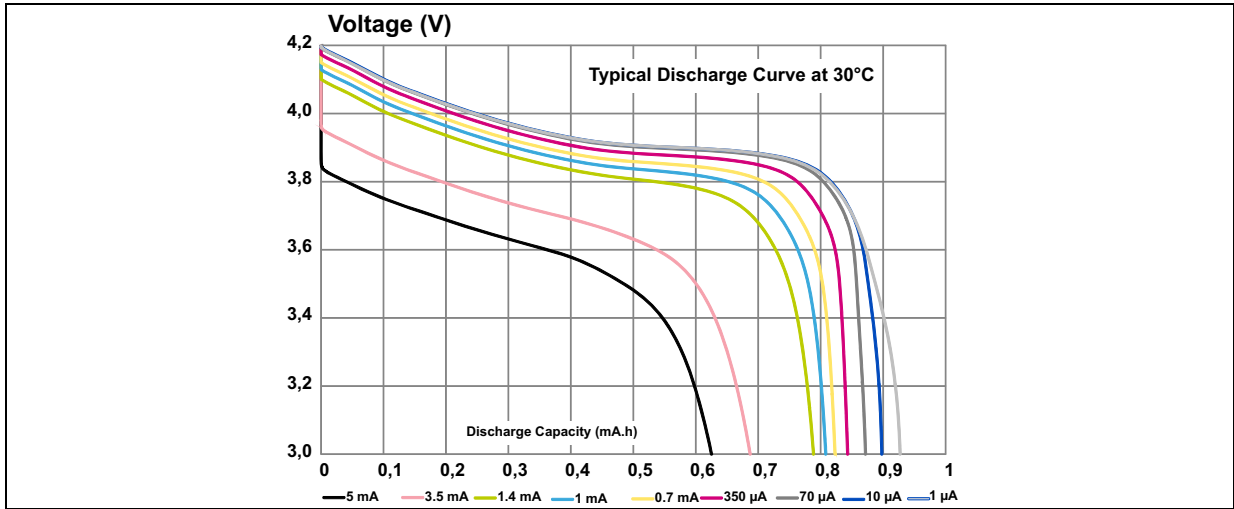


Figure 2. Typical charge curve

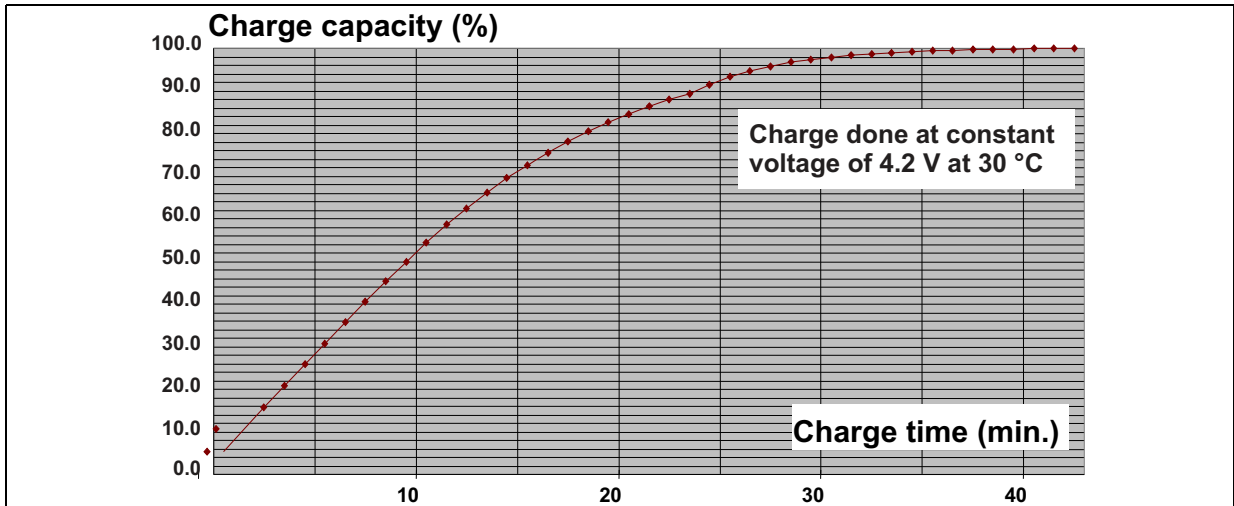
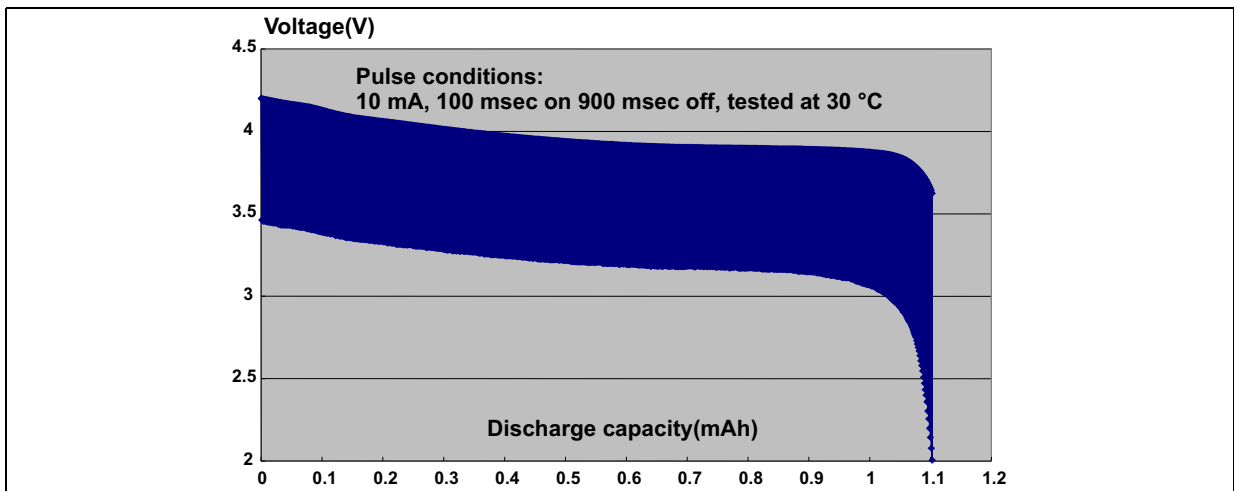


Figure 3. Typical pulsed discharge curve



## 2 Application information

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## 3 Recommended charge and discharge processes

### 3.1 Charge

Battery can be charged from a 4.2 V  $\pm$ 0.05 V constant voltage source with or without current limit. More than 90% of the total capacity is recharged when the charge current falls below 0.1 mA.

### 3.2 Discharge

When discharging under constant current or constant load, the cut-off voltage should be no less than 3.0 V. Cut-off voltage can be lowered to 2.0 V for pulsed discharge.

### 3.3 Design recommendations:

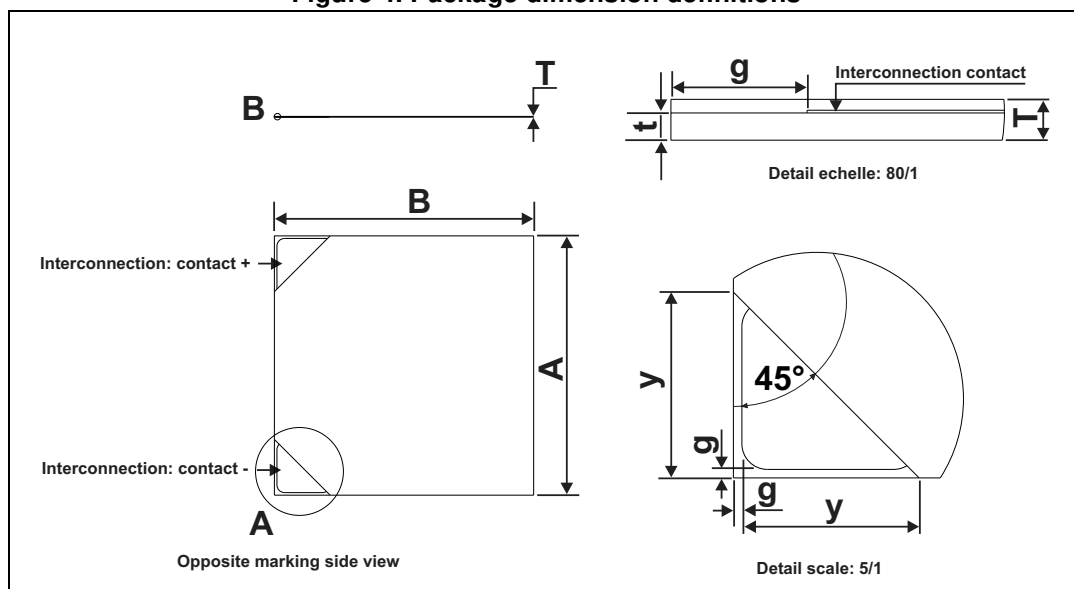
Refer to STMicroelectronics application note:

AN4085:Design considerations of the EFL700A39.

## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**Figure 4. Package dimension definitions**



**Table 4. Package dimension values**

Ref	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	25.2	25.7	26.05	0.992	1.012	1.026
B	25.2	25.7	26.05	0.992	1.012	1.026
T		0.20	0.22		0.008	0.009
t		0.07			0.003	
Y	5.3		5.9	0.209		0.232
g		0.3			0.012	

**Figure 5. Footprint**

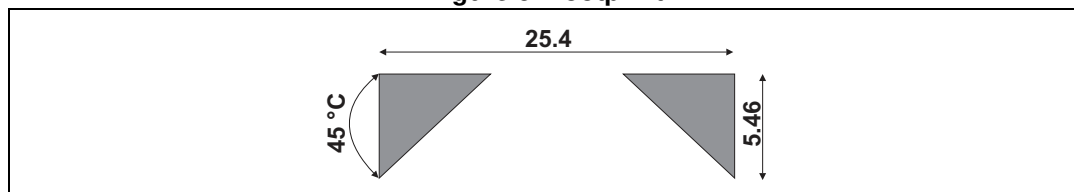


Figure 6. Tray dimensions

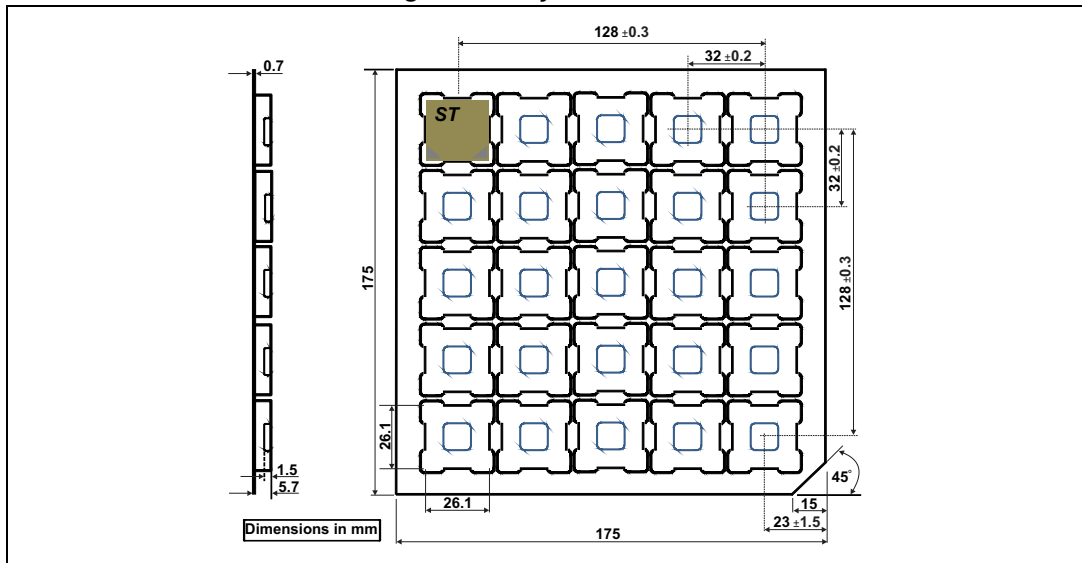
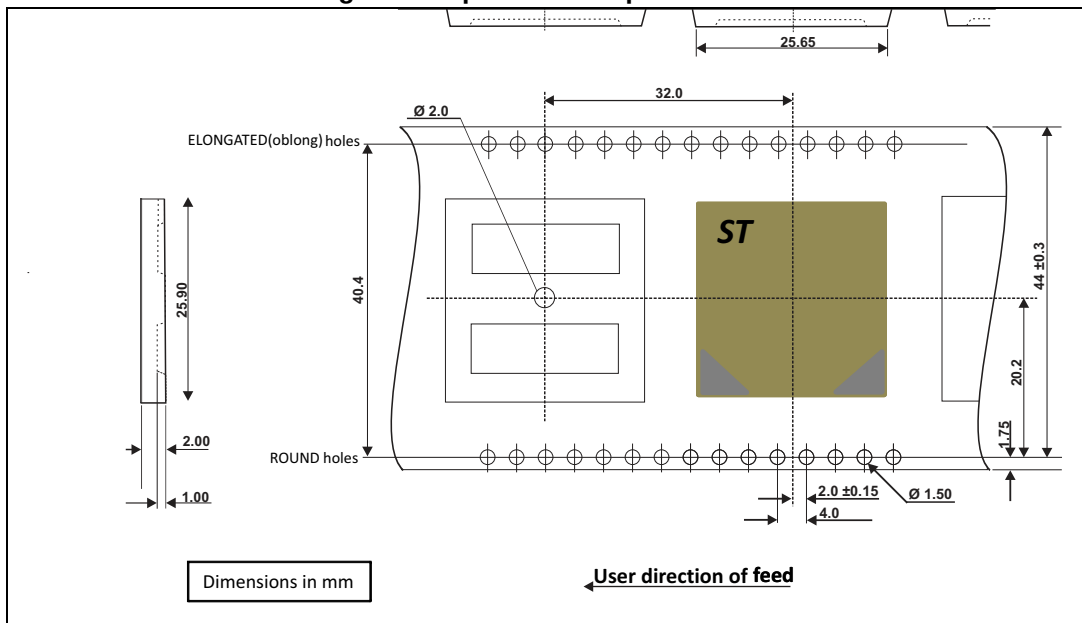


Figure 7. Tape and reel specification



## 5 Recommendations for the assembly on PCB

Refer to the STMicroelectronics Application note:

AN4046: “EnFilm™ micro battery EFL700A39, recommendations for manual assembly on PCB”.

AN4351: “EnFilm™ micro battery EFL700A39, automatic or semi-automatic mounting on PCB”.

## 6 Ordering information

Figure 8. Ordering information scheme

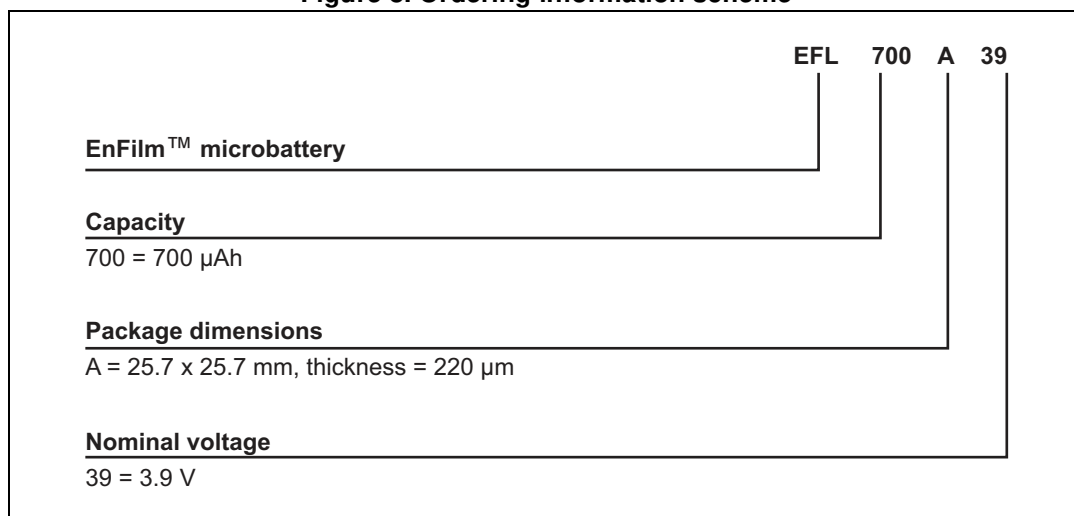


Table 5. Ordering information

Order code	Marking	Weight	Base qty	Delivery mode
EFL700A39	EFL700A39	0.2 g	25	Tray
EFL700A39-RL	EFL700A39	0.2 g	100	Tape and reel

## 7 Revision history

Table 6. Document revision history

Date	Revision	Changes
08-Apr-2010	1	Initial release.
23-Apr-2012	2	Insert AN4046 reference for recommendations for the soldering process and update <a href="#">Figure 4</a> .
27-Sep-2013	3	Updated <a href="#">Figure 4</a> and <a href="#">Chapter 5</a> .
05-Nov-2013	4	Updated <a href="#">Figure 1</a> and <a href="#">Features</a>
02-Jun-2014	5	Updated <a href="#">Features</a> , <a href="#">Applications</a> , <a href="#">Table 1</a> , <a href="#">Table 2</a> , <a href="#">Table 3</a> , <a href="#">Table 4</a> , <a href="#">Table 5</a> , <a href="#">Figure 4</a> and <a href="#">Figure 8</a> . Added <a href="#">Figure 5</a> , <a href="#">Figure 6</a> and <a href="#">Figure 7</a> . Added <a href="#">Chapter 3.3</a> .

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