

EnFilm™: the Energy of Things

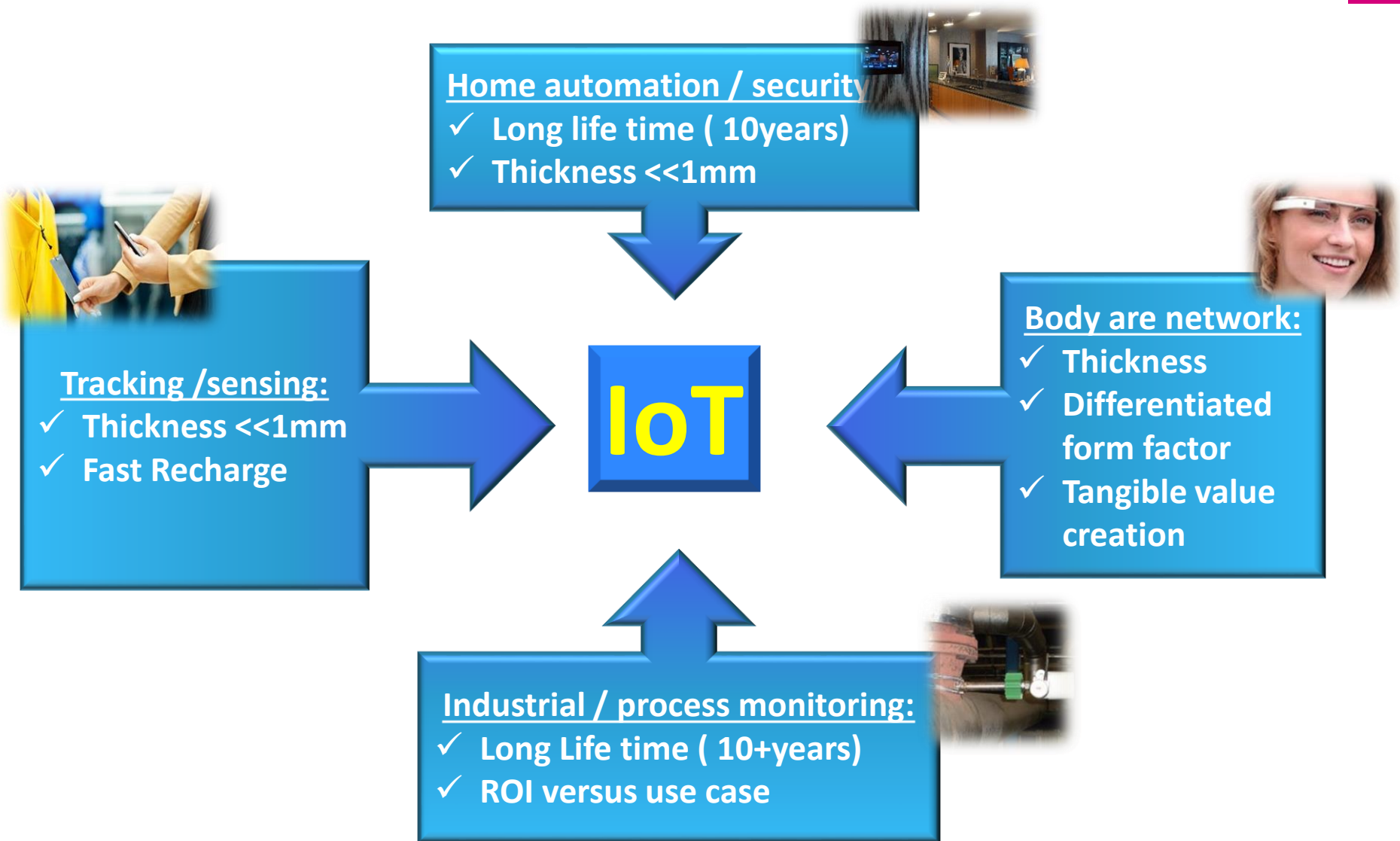
Thin-film rechargeable battery



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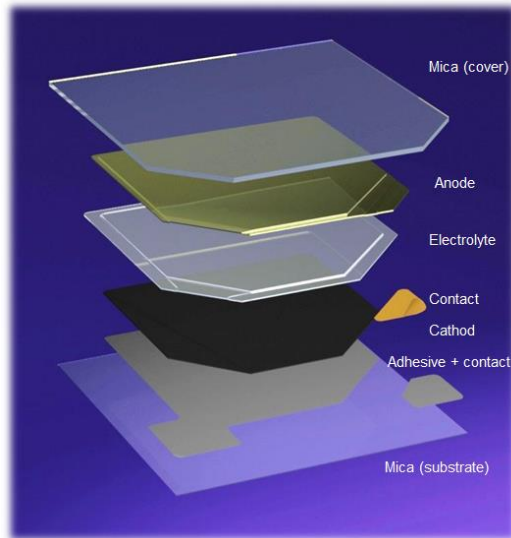
IoT enablers concerning Energy

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EnFilm™ : Something more than a battery for IoT

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DIFFERENTIATORS:

- Thin and shapeable: 220µm thick for a single cell versatile form factor possible
- Robust: Extended storage and cycle life time
- Safe: No burning , no explosion
- Stackable: Increase the capacity
- Easy to use : Constant voltage charging

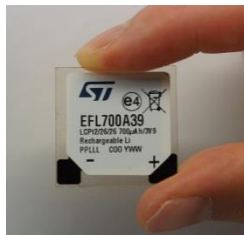
✓ **Rechargeable**

✓ **Full solid state ;**

✓ **Combine benefit of capacitors & batteries;**

✓ **Flat discharge curve**

✓ **Fast Recharge**



EFL700A39: first commercial product from the EnFilm™ family

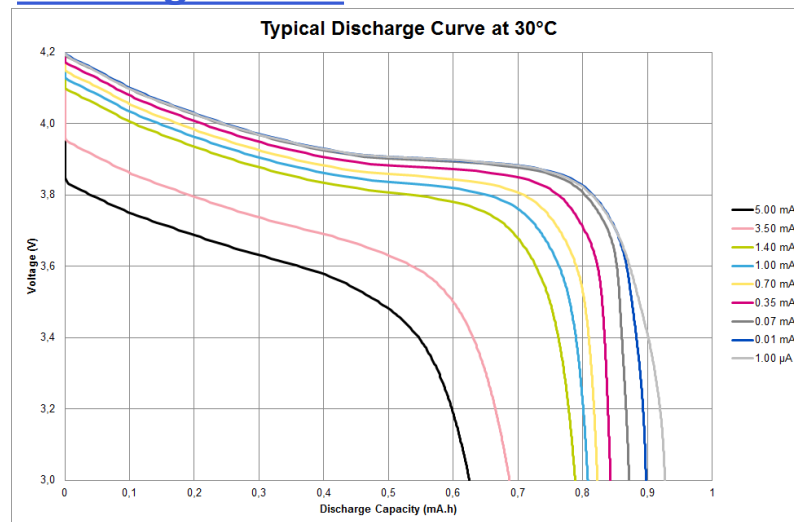
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Parameter	EFL700A39
Capacity	700μAh
Cycling voltage	4.2~ 3.0V
Resistance	100Ω @30°C
Capacity loss	20% over 10 years (2)
Cycle life	4000 (1)
Operating T°	-20°C to +60°C
Footprint	25.7 x 25.7mm ²
Thickness	0,22mm
<u>Flexibility</u>	Compliant to IEC10373
Other std	UL, RoHS , REACH

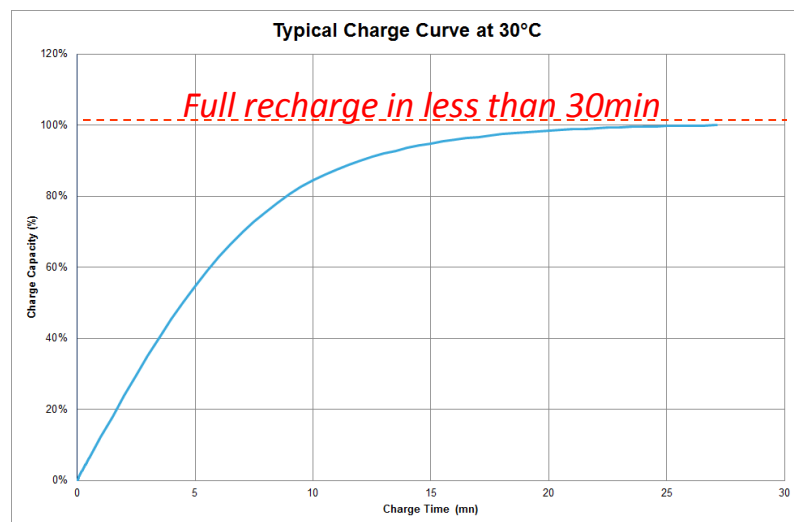
(1) : 80% of initial capacity . Cycle between 75%SoC and 0%SoC.

(2) : 50% SoC , 25°C

Discharge curve:



Charge curve:



Storage and cycle life Model

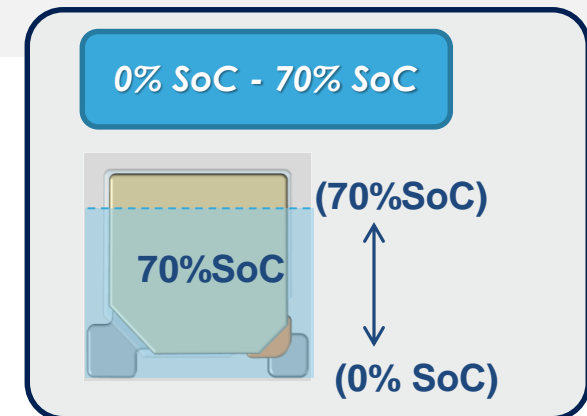
Temperature Mission Profile								
Mission Profile	0.00%	0.00%	0.00%	0.00%	5.00%	80.00%	10.00%	5.00%
MP1	-40	-30	-20	-10	0	25	30	50

Storage

Input : Variables		Output : Lifetime	
Failure rate	20.00%	8.86E+04	hours
Capacity loss	20.0%	10.12	years
State of Charge	70%		

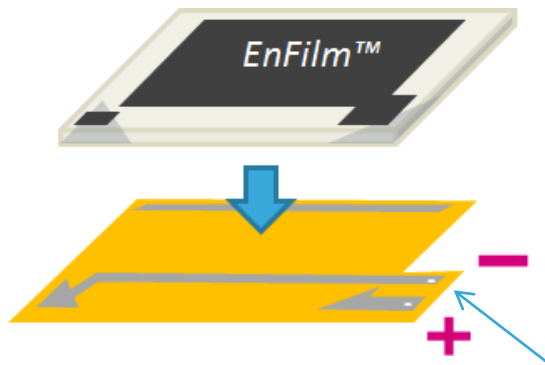
Cycling

Variable		Lifetime	
Failure rate	10.00%	7.27E+03	cycles
DQ/Q	10%		
% SoC	70%		



Stacked EnFilm™

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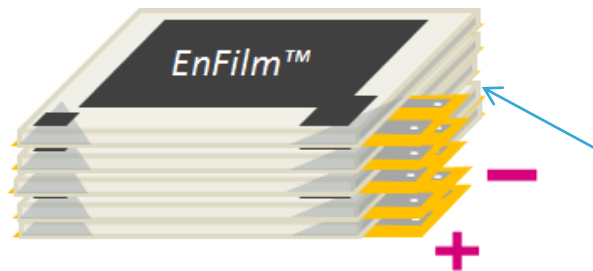
✓ **Parallel connection:**

- **Scale up the embedded capacity;**
- **Increase drain current capability;**

✓ **Serial Connection:**

- **Increase voltage;**

Interposer to make easier interconnection



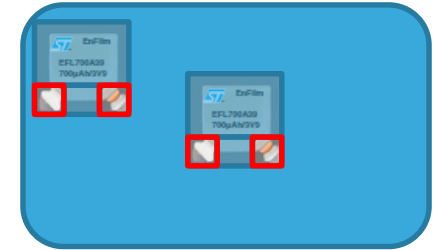
Stacked EnFilm™ Cell

Conceptual drawings

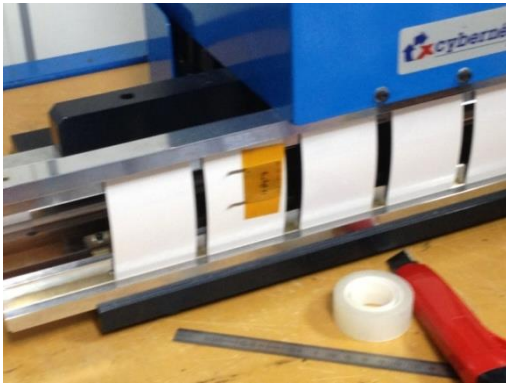
Mechanical Flexibility

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- Compliance test to ISO7816 / ISO10373 standard (mechanical flexibility of smartcard)
- Type test :
 - 1000 Flexions
 - 1000 Torsions
 - EnFilm EFL700 positioned at two different location on the card:
- Outcomes : Check battery integrity : Capacity, resistance
- Test bench :



Dynamic Flexions:

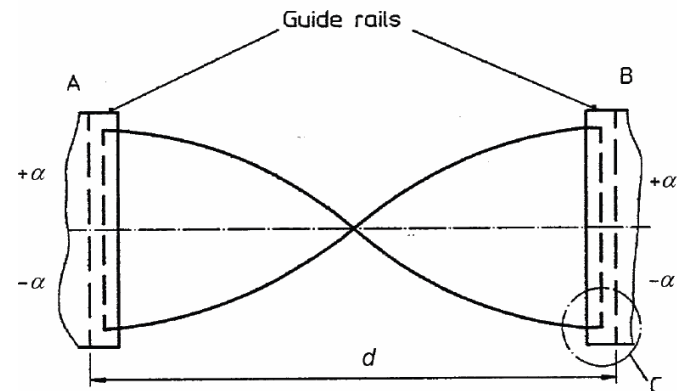


Deflection range:

2mm-20mm along length axis (2x 250 flx)

1mm -10mm along width axis (2 x 250 flx)

Dynamic Torsions:



Torsions angle : 15°

Frequency :0.5Hz

Make the battery conforms to the design!

(Pictures are proof of concept only)

Square : 700 μ Ah – 25,4 x 25,4 x 0,22mm



Coin :12.5mAh – 7.75mm diam /5.3mm thick



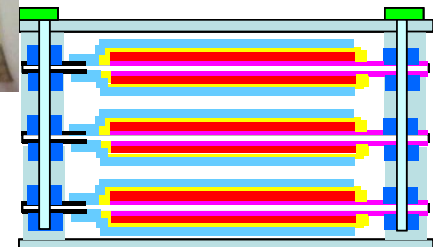
Narrow band: 0,6mAh :25,4 x 6 x 0,15mm:



Prismatic stack :20mAh 15x15x1.3mm:



Stack double face



Storage technologies alternatives: Super cap and batteries

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	EnFilm™	Batteries	Super Cap
Thickness	-220µm for a single cell -Up to 1mm for a stack	$\geq 2\text{mm}$	$\geq 2\text{mm}$
Capacity loss (Non recoverable)	20% in 10 years	1%	n/c
Charge loss / leakage current	$\approx 3\text{nA}$	1%	$\geq 3\mu\text{A}$
Discharge curve	Flat	Flat	Linear slope
Specific Charge/Discharge cycles	1000	From 300 to 1000 max	Over 500 000
Charge method (Time)	Constant voltage	Constant voltage	constant voltage (Very fast)
Pulse drive current	Above 100	50 max	No limit
Energy density	20Wh/l	200 to 400Wh/l	$< 3\text{Wh/l}$
Shapeable	Yes	No	No

EnFilm™ : Best Trade Off

Super cap

EnFilm™

Battery

Best Middle Worst

Application for EFL700A39

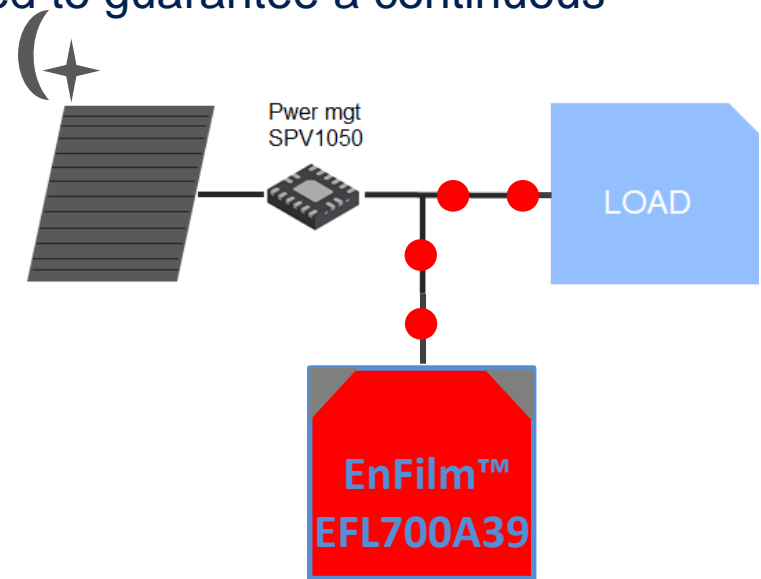
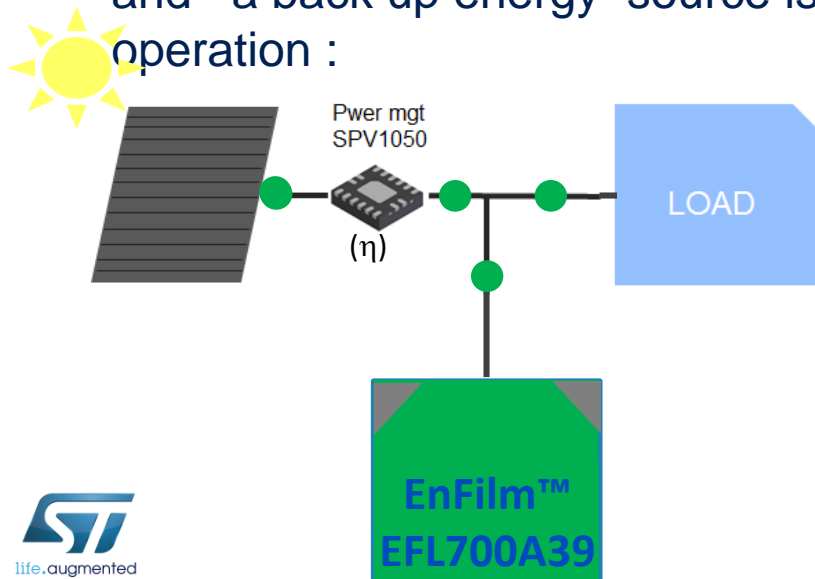
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- Application where the EFL700 differentiators can be « € valued » in the device and a premium price can be justified :

- Thickness (220 μm);
- Life time (10years / 4000 cycles);
- Safety;
- Fast recharge
- Low leakage etc...



- Application where a primary power source is available (Energy Harvesting) and a back up energy source is required to guarantee a continuous operation :



Application examples

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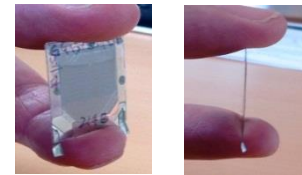
- World thinnest watch : Only 1mm thick thanks to the EFL700:



- Powered smartcard : Two stacked EFL700 in a 750µm flexible card:



Stack of 2 x EFL700



Joined project with: **gemalto**

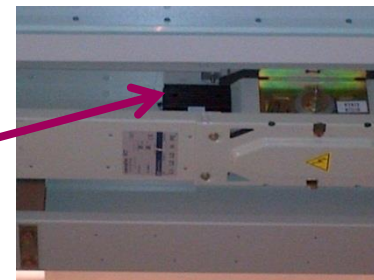


- Industrial : Power bus way temperature sensor powered with tiny silicon Thermal Electrical Generator (TEG) and the EFL700A39

*Autonomous T° sensor
With TEG and EFL700A39*



Power bus way





Where to buy samples?

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Compare Parts	Image	Digi-Key Part Number	Manufacturer Part Number	Manufacturer	Description	Quantity Available	Unit Price USD	Minimum Quantity	Series	Battery Chemistry	Battery Cell Size	Voltage - Rated	Capacity	Size / Dimension	Termination Style
		497-14838-2-ND	EFL700A39-RL	STMicroelectronics	BATT LITHIUM THIN FILM RECHRG 2-	0	30.00000	100	EnFilm™	Thin Film (Lithium)	-	3.9V	0.7mAh	1.01" L x 1.01" W x 0.01" H (25.7mm x 25.7mm x 0.2mm)	Solder
		497-14838-1-ND	EFL700A39-RL	STMicroelectronics	BATT LITHIUM THIN FILM RECHRG 2-	0	38.20000	1	EnFilm™	Thin Film (Lithium)	-	3.9V	0.7mAh	1.01" L x 1.01" W x 0.01" H (25.7mm x 25.7mm x 0.2mm)	Solder
		497-14838-6-ND	EFL700A39-RL	STMicroelectronics	BATT LITHIUM THIN FILM RECHRG 2-	0	Calculate	1	EnFilm™	Thin Film (Lithium)	-	3.9V	0.7mAh	1.01" L x 1.01" W x 0.01" H (25.7mm x 25.7mm x 0.2mm)	Solder

Results per Page 25 Page 1/1

Download Table



	497-14838-2-ND	EFL700A39-RL	STMicroelectronics	Electronic Battery EnFilm rechargeable solid state lithium thin film battery	Data Sheet	114 In Stock	1: 30,68 € 5: 29,63 € 10: 28,72 € 25: 26,56 € 50: View	<input type="button" value="Buy"/> Min.: 1 Mult.: 1
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Ref. Farnell / Ref. Fab. / Mots-clés
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Nouveau Client Farnell element14

ACCUEIL > Piles, batteries et chargeurs > Batteries - Rechargeables > EFL700A39-RL

STMICROELECTRONICS - EFL700A39-RL - BATTERY SOLID STATE RECHARGABLE LI



Fabricant: [STMICROELECTRONICS](#)
Code commande: 2428577
Référence fabricant: EFL700A39-RL
[Technical Data Sheet \(218.37KB\) EN](#)

Disponibilité
Disponibilité: En cou
Commandez cet art
l'expédierons dès q
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Prix Pour: 1 Pièce
Quantité minimum:
Multiple de comman
Data Sheet (218.37 KB)

Part Search: Control Elements

Filters: ☐ In Stock ☐ EU Stock ☐ China Stock

Manufacturer:

Apply Filters

Display: 10 Results

Part Image	Manufacturer Part Number	Manufacturer Name	Description	Data	RoHS	Additional Info	Price (1)	Quantity Available	Multiple	Quantity
	EFL700A39	STMicroelectronics	LI-Ion 3.9V				Call for Price	Qty: 0	1	<input type="text" value=""/>



Search

☐ Part Number/ Keyword ☐ Cross Reference

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EFL700

Introducing the eStore dedicated initially to offer the convenience of buying boards and development kits directly from our site. Supported by our logistics and order fulfillment partner, the eStore makes possible a quick and simple access to our available inventory of development kits and boards.

EFL700A39
EnFilm - rechargeable solid state lithium thin film battery

The EFL700A39 is a thin film rechargeable lithium battery. The battery has a LiCoO₂ cathode, LiPON ceramic electrolyte and a ... See More

Price: \$36.22
Availability: 34
Lead Time: 3
Orderable Qty: 1

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For space constrained applications
Expanding range of Automotive qualified LED array drivers null
Low-voltage STM32 MCUs For 1.8V consumer applications



- EFL700PMB : EFL700 power management board:
 - Include the charge regulation and discharge protection circuit;
 - Pulsed discharge current management with a thin Super Cap (Cellergy);
 - Ready to use in the application (direct USB charger , Energy Harvesting and load connection);
 - Current and voltage monitoring interface with the Load Board;
 - Price :\$60
- EFL700EVALKIT:
 - Complete demokit combining the EFL700PMB and a load board to monitor the EnFilm™ voltage and current;
 - Pulsed current emulation circuit is included in the load board and allows to check the behaviour of the EnFilm™ in pulsed current discharge condition;
 - Price:\$335

EFL700PMB



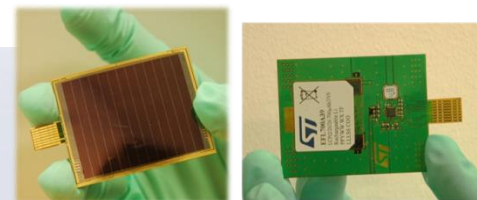
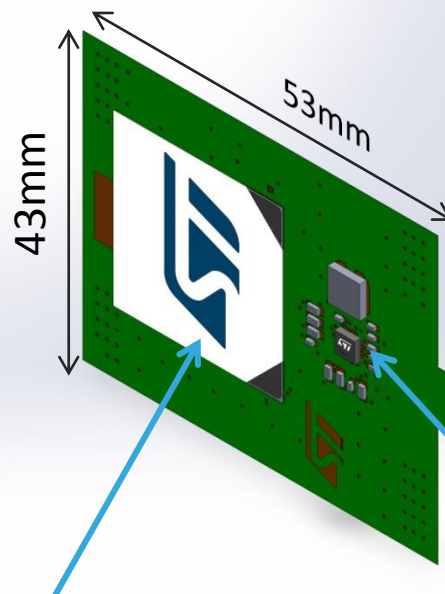
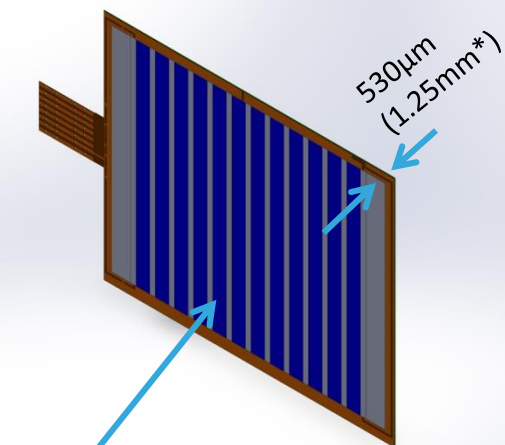
EFL700EVALKIT



PEM: Perpetual Energy Module concept: custom design can be developed on demand

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Combine Energy harvesting , EnFilm and power management in a single module



2 distribution channel
(1.8V and 3.3V).

>100 μ W (300lux)
a-Si flexible PV panel

700 μ Ah (3.9V) EnFilm (EFL700A39) ULP Power management
circuit :SPV1050

Thank You

