



Smart2Go 

*H2020-ICT-02-2018*  
*Flexible and Wearable Electronics*

## **Smart2Go**

**Smart and Flexible Energy Supply Platform for Wearable Electronics**

Starting date of the project: 01/01/2019  
Duration: 36 months

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**= Design Contest Handbook =**

Version 1.0



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825143.

## About us

Smart2Go is a project funded by the **EU Horizon 2020** research and innovation programme. The aim of the Smart2Go project is the creation of an autonomous energy-supply platform. Based on the results of the project it will be possible to use a wearable without caring about recharging over its entire lifetime.

The Smart2go project is creating the world's first fully **R2R printed and assembled autonomous energy management and supply platform** (ESP) with high number of discrete components bonded and embedded on flexible plastic substrate.

Half-way through the Smart2Go project, all components of the platform have been successfully developed. With its different components and functionalities, ESP will be able to serve many different applications in the area of **flexible and wearable electronics**.

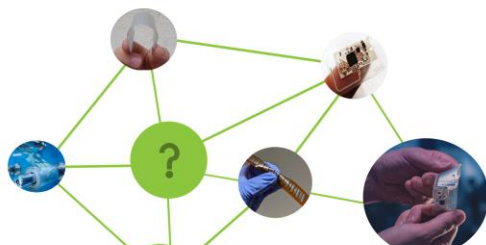
Smart2Go includes **top EU innovation performers** (researchers and companies) involved in flexible electronics and energy scavenging and storage, as well as 2 partners with very challenging product use scenarios, validating the platform as suitable for multiple needs.

In addition, the Smart2Go External Advisory Board (EAB) is setup with the aim to receive support in the following aspects:

- 1) Exploring new applications and interaction with the end-users;
- 2) Interaction with industrial integrators and manufacturers;
- 3) Standardization and pre-normative activities and
- 4) Networking, clustering and interaction with SMEs associations.

# Smart2Go

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## DESIGN CONTEST - HANDBOOK

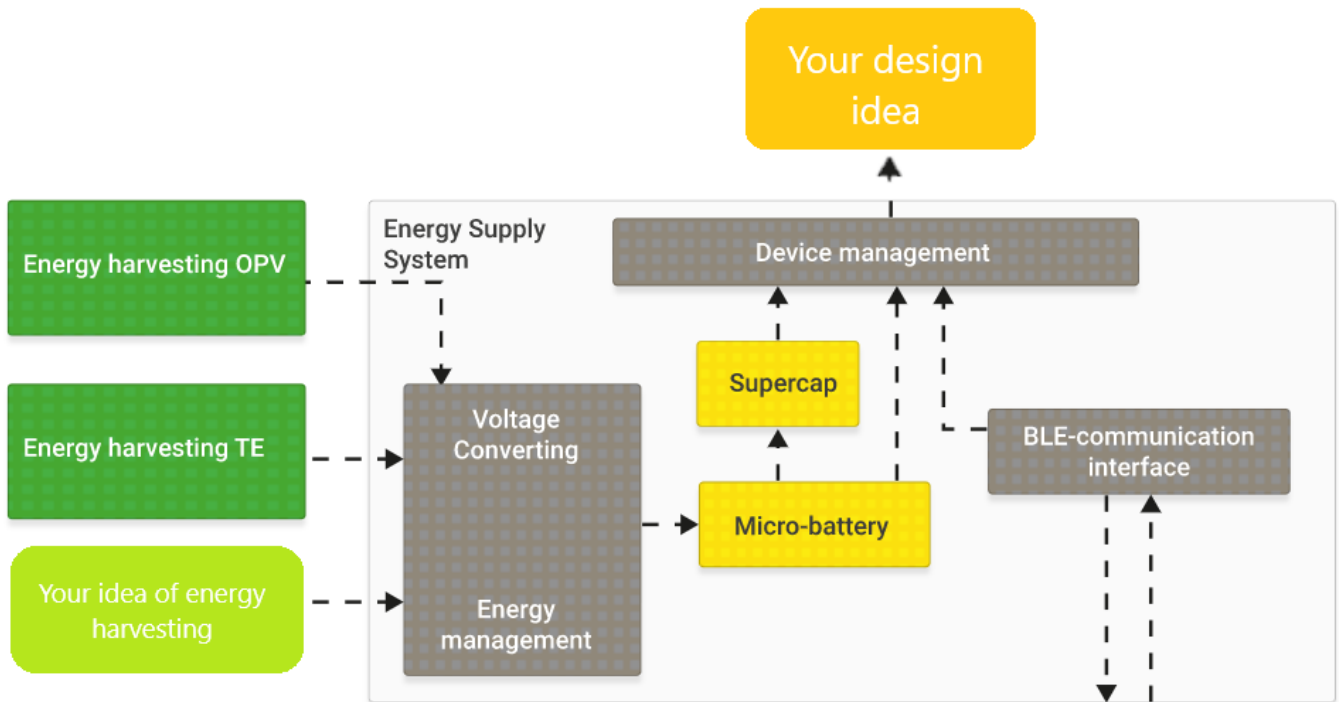
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## 1. Introduction

In order to provide information as clearly as possible, the Organizer is providing the datasheets contains products specifications.

The following scheme is showing how the platform interacts with the applications and the harvesting.



For further information or support please contact Organizer.

## 2. PACKAGE 1

### 2.1. Short Description of the Component

The **Energy Supply Platform** is managing the energy flow between harvester applications and storage components.

### 2.2. Specifications

**Table 1: Energy Supply Platform specifications**

Energy Supply Platform	
Mechanical Specifications	
Length	120 mm with flexible battery
Width	50 mm
Hight	1.3 mm
Bending radius	60 mm
Other mechanical features	The interconnection between the ESP and the battery must be handled carefully.
Connectivity Specifications	
Connectors (type)	Female CrimpFlex housing, pitch 1,27 mm
Cables included into the package	Male CrimpFlex connectors having flat cables
Safety advice	
Organization	
Pieces available	10

Timing of making the pieces available	if additional samples are required, we will check availability separately.
<b>Electrical Specifications</b>	
Input voltage	Energy harvester: 50mV-5V
Input current	max. 90 mA
Output voltage	3.3Vcc from the energy harvester and 3.3V from the microcontroller pins
Output current	max. 80mA from harvester, max. 15mA from MCU
Others	Internal memory: 192 KB Flash, 24 KB RAM
<b>Other Specifications</b>	
Communication	Bluetooth 5
Special features	Digital I2C bus available for additional external sensors. Supply voltage 3.3V
Instruction of usage	The platform is programmed by the Owner (here VTT). Operation needs to be determined in advance.
Communication software	Software coding is done by VTT. Please provide basic function of the system.

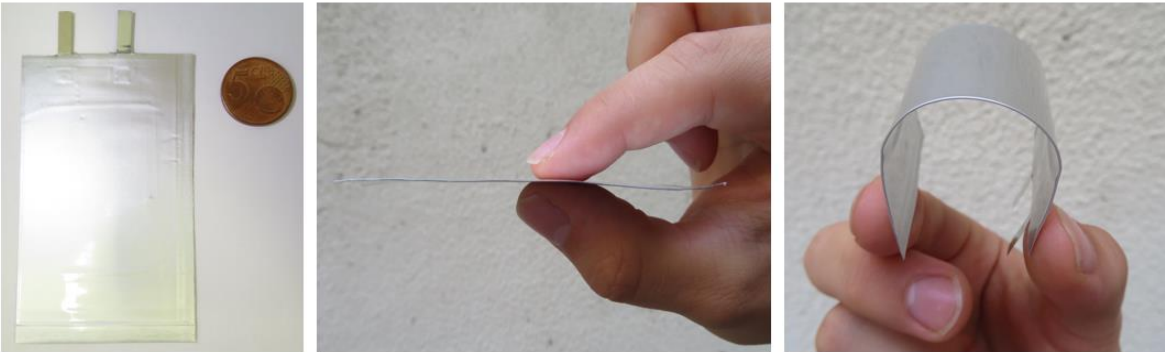
### 3. PACKAGE 2

#### 3.1. Short Description of the Component

The **Microbattery** is the main energy storage device connected to the platform.

#### 3.2. Specifications

**Table 2: Microbattery specifications**

<b>Microbattery</b>	
	
<b>Mechanical Specifications</b>	
Size	Without connecting taps:
Length	75mm
Width	50mm
Hight	0.45mm
Bending radius	Max. 1.5cm
<b>Connectivity Specifications</b>	

Connectors (type)	Positive Electrode: Al-tap Negative Electrode: Ni-tap
<b>Safety advice</b>	
<b>Organization</b>	
Pieces available	50 pieces
Timing of making the pieces available	Lead time 1 Month
<b>Electrical Specifications</b>	
Input voltage	Max. 4.2V
Input current	Max. 90mA
Output voltage	Min. 2.8V
Output current	Max. 90mA
Others	Capacity: 55mAh
<b>Other Specifications</b>	
Communication	For the physical battery, a disclaimer of liability has to be signed before shipping

## 4. PACKAGE 3

### 4.1. Short Description of the Component

The **Supercapacitor** is capable of providing high output power for short time.

### 4.2. Specifications

**Table 3: Supercapacitor specifications**

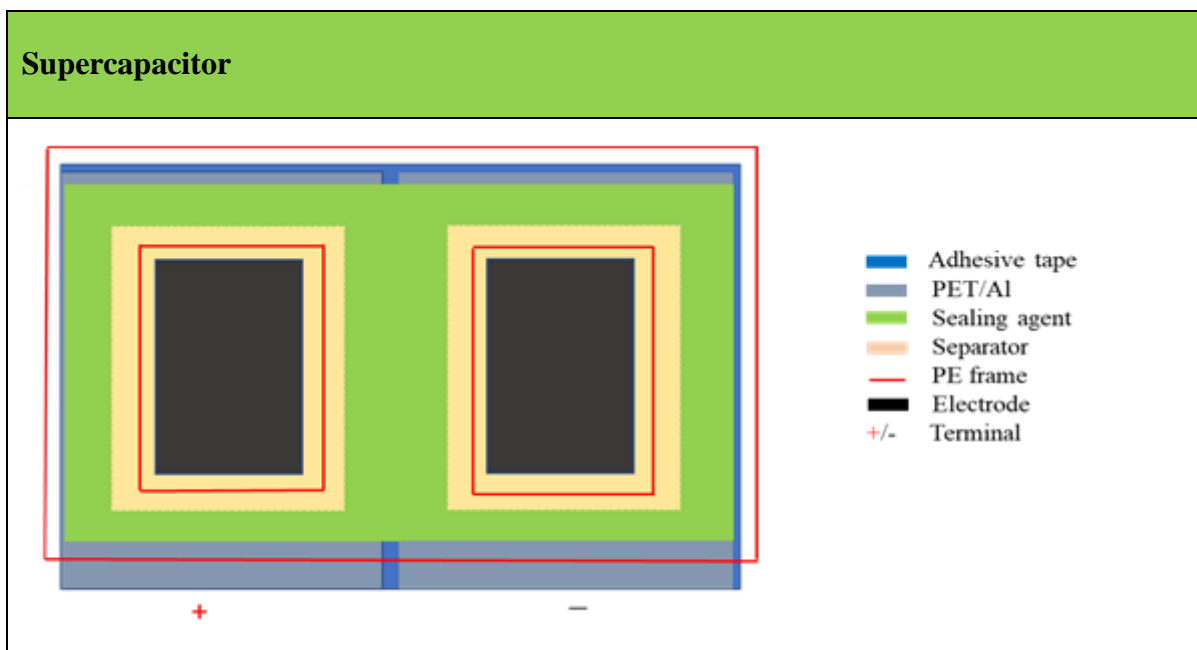




Figure 1: Schematic structure and fabricated supercapacitor

Mechanical Specifications	
Size	5 cm by 6 cm
Length	6 cm
Width	5 cm
Hight	0.5 mm
Bending radius	0.5 cm
Other mechanical features	Dual cell, printed, flexible, laminated, etc.
Connectivity Specifications	
Connectors (type)	<ul style="list-style-type: none"> <li>• Connector such as alligator clips</li> <li>• Conductive tape such copper tape</li> <li>• Conductive ink pastes such as silver</li> </ul>
Safety advice	
Organization	
Pieces available	10 or more
Timing of making the pieces available	Dec or early Jan 2022 (Or depends on the requirements)
Safety handling and precautions	<ul style="list-style-type: none"> <li>• Be aware not apply over-voltage to the supercapacitor.</li> <li>• Do not disassemble, crush, or smash the supercapacitor.</li> <li>• Avoid high temperature, high humidity, and direct contact with corrosive and toxic substances.</li> <li>• In case if body skin contacts with electrolyte or electrode, it is recommended to wash the skin with excess of running water.</li> <li>• Care should be taken while handling device.</li> </ul>
Electrical Specifications	
Capacitance	3 – 5 mF
ESR	< 3 $\Omega$
Input voltage	2.5 V/cell
Leakage current	0.1 $\mu$ A - 0.3 $\mu$ A
Input current	> 1A
Others	High power density, long life cycle, fast charge-discharge
Other Specifications	



Special features	<ul style="list-style-type: none"> <li>• Organic electrolyte (Propylene carbonate)</li> <li>• Environmentally friendly, thermally stable, wide temperature range</li> <li>• Low-cost printing</li> <li>• Energy storage device</li> <li>• Peak power to portable devices</li> <li>• Flexible</li> <li>• Mechanical and electrical reliable</li> </ul>
Instruction of usage	<ul style="list-style-type: none"> <li>• The positive and negative sign should be checked before making supercapacitor connections. This will prevent short circuit / damage to the device.</li> <li>• Avoid bending and handle device with care.</li> <li>• Do not overcharge the supercapacitors (2.5 V/cell)</li> <li>• Dispose the supercapacitor if its overheated, dried, bulge, leakage electrolyte etc.</li> </ul>

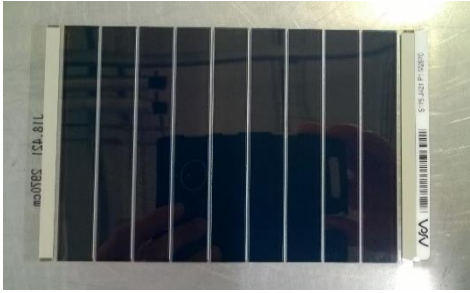
## 5. PACKAGE 4

### 5.1. Short Description of the Component

The **Energy harvesting: Photovoltaics** is harvesting the energy from ambient light sources.

### 5.2. Specifications

**Table 4: Energy harvesting: Photovoltaics specifications**

Energy harvesting: Photovoltaics	
	
Mechanical Specifications	
Total Size	170mm x 50mm
Length	30mm active / 50mm total
Width	123mm active / 170mm total
Hight	0,29 mm
Bending radius	15mm
Connectivity Specifications	
Connectors (type)	crimps
Cables included into the package	no
Safety advice	
Organization	

Pieces available	Yes, for 30mm design, few tens of pieces available	
Timing of making the pieces available	6 to 8 weeks for a new run	
<b>Electrical Specifications</b>		
	<b>1000W/m<sup>2</sup></b>	
	<b>30mm</b>	<b>100mm</b>
Output voltage	7,3 V	
Output current	29,4 mA	98 mA
Pmax	144 mW	480 mW
Vmax	6 V	
<b>Other Specifications</b>		
Special features	Operating temperature: -10°C to 60°C	
Instruction of usage	Positive terminal side = Asca barcode side	

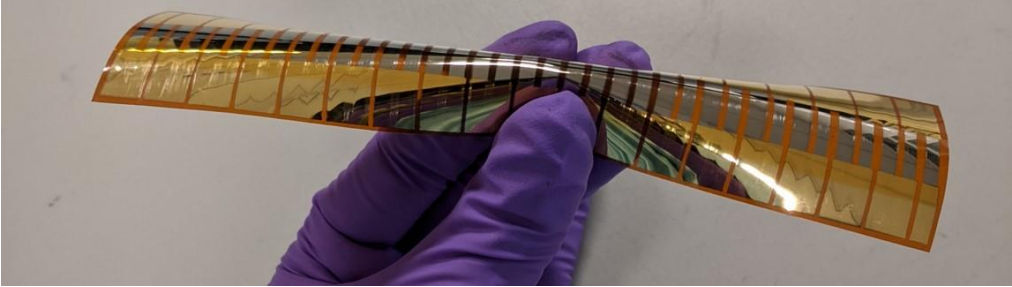
## 6. PACKAGE 5

### 6.1. Short Description of the Component

The **Energy harvesting: Thermoelectrics** is harvesting energy from electric differences.

### 6.2. Specifications

Table 5: Energy harvesting: Thermoelectrics specifications

Energy harvesting: Thermoelectrics	
	
Mechanical Specifications	
Size	12 generators, each of an area of 13 cm <sup>2</sup>
Length	1 generator: 13 cm.
Width	1 generator: 1 cm
Height	1 generator: 135 cm
Bending radius	1 generator: 1 cm lengthways (bending along the length, as shown in photo above)
Other mechanical features	12 individual TEGs can be arranged in different configurations geometrically, connected with wires between each one as user sees fit.
Connectivity Specifications	

Connectors (type)	Cu mesh
<b>Safety advice</b>	
<b>Electrical Specifications</b>	
Output voltage	260 mV open circuit voltage (of 12 in series – can be altered by arranging in series/parallel) at a temperature gradient of 25 K
Output current	140 uA closed circuit current (of 12 in series – can be altered by arranging in series/parallel) at a temperature gradient of 25 K
Others	260 mV open circuit voltage (of 12 in series – can be altered by arranging in series/parallel) at a temperature gradient of 25 K
<b>Other Specifications</b>	
Instruction of usage	Need to apply the generators so the long sides are exposed to a 25 K temperature difference between each long side.

## 7. PACKAGE 6

### 7.1. Short Description of the Component

The **Energy harvesting: Mechanical Energy** is harvesting energy from mechanical movement to electrical energy.

### 7.2. Specifications

**Table 6: Energy harvesting: Mechanical Energy**

### Energy harvesting: Mechanical Energy; Sensor: piezo- and pyroelectric

The diagram illustrates the mechanical specifications of the energy harvesting component. It features a central green square piezoelectric sensor connected to two columns of orange rectangular piezoelectric sensors. The layout includes various dimensions: 44.50, 39.89, 76.51, 12.17, 12.82, 22.76, 24.28, 12.14, and 12.74. The components are connected via purple traces to a central bus and then to external connectors at the bottom.

### Mechanical Specifications

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Size	Different geometries available (see picture) based on an A4 Design; Sensor areas between approx. 3.14 cm <sup>2</sup> and 16 cm <sup>2</sup>
Length	Approx. 4.4 cm – 7.6 cm
Width	Approx. 1.28cm – 4.3 cm
Hight	Approx. 135µm (125µm PET Substrate plus approx. 10µm printed sensor)
<b>Connectivity Specifications</b>	
Connectors (type)	TE Connectivity / AMP: 5-520315-2 (will be provided)
Cables included into the package	No
<b>Safety advice</b>	
<b>Organization</b>	
Pieces available	1 to 10 sheets
Timing of making the pieces available	Few days
<b>Electrical Specifications</b>	
Input voltage	None, active sensor element
Input current	None, active sensor element
Output voltage	mV to few volt depending on excitation
Output current	nA - µA depending on excitation
<b>Other Specifications</b>	
Instruction of usage	Application specific instructions will be provided