

**BUILD YOUR OWN**

**PASSIVE COOKER**



DAL 1877

**Barilla®**

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**BARILLA**

**PASSIVE COOKER**



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**BARILLA**

## **PASSIVE COOKER**

The Barilla Passive Cooker is a cooking system composed of two elements, an App that allows you to set preferences (country, type of pasta etc.), and a device which, when connected via Bluetooth to the App, allows you to detect when the water comes to a boil so that the guided cooking process can continue correctly.

In addition to the app, it is therefore necessary to have the device available.

The directions that follow allow you to do this yourself.

The level of difficulty of each is indicated immediately below the step name, but in general the process does not require a high level of skill/knowledge.

The instructions will be divided into two parts, one less in-depth and less technical, suitable for those who simply want to make the device, and a more in-depth part for those interested in more technical knowledge and understanding of how the device is designed and made.

There are three main stages:

1) The first gives directions on how to arrange and set the printing parameters for the casing that will contain the electronics;

2) The second gives directions on how to load the firmware onto the Arduino Nano 33 BLE board, i.e. the software that allows the device to measure temperature and communicate it to the app;

3) The third and final step gives instructions on how to assemble the electronic components and position the assembled board in the casing to be used.

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**PRINTING THE  
THERMOMETER CASING**



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## PRINTING THE

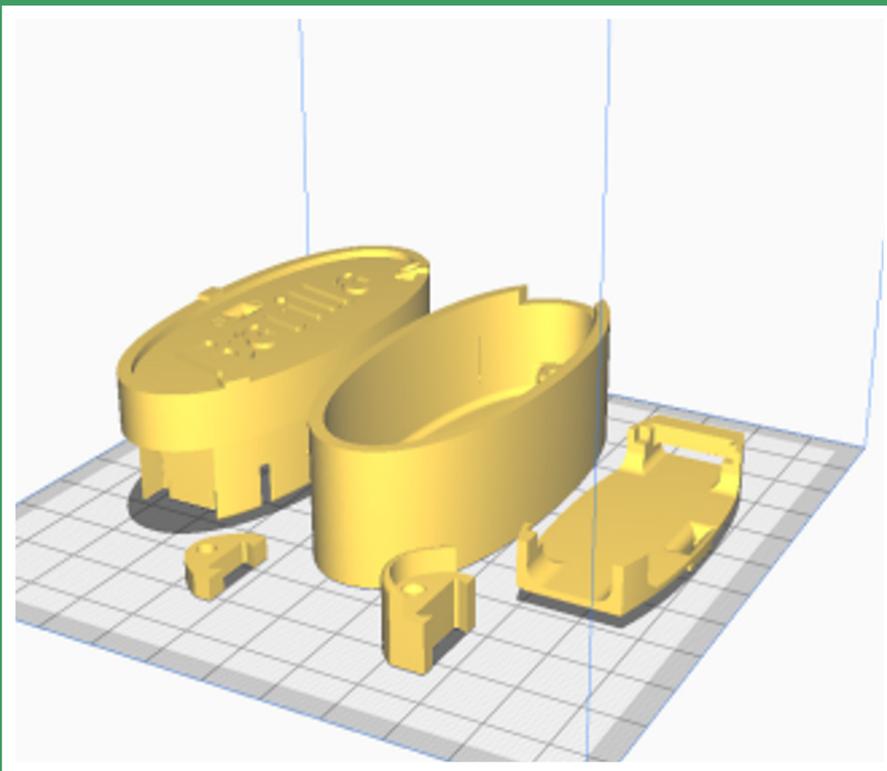
## THERMOMETER CASING

Difficulty level: **Easy**

Recommended material: See table List of Components

When printing the casing, use a material that is resistant to the heat of the lid on which it will rest, i.e. over 110°C. It should not 'soften' at lower temperatures. The material chosen by us is the one indicated and is biodegradable and heat resistant up to 150°C.

Download the files for the 3D models of the casing and position them as shown in the following picture:



**N.B.** If the total print time is too long, place just one model on the plate, taking care to print them all with the same settings.

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## PRINTING THE

## THERMOMETER CASING

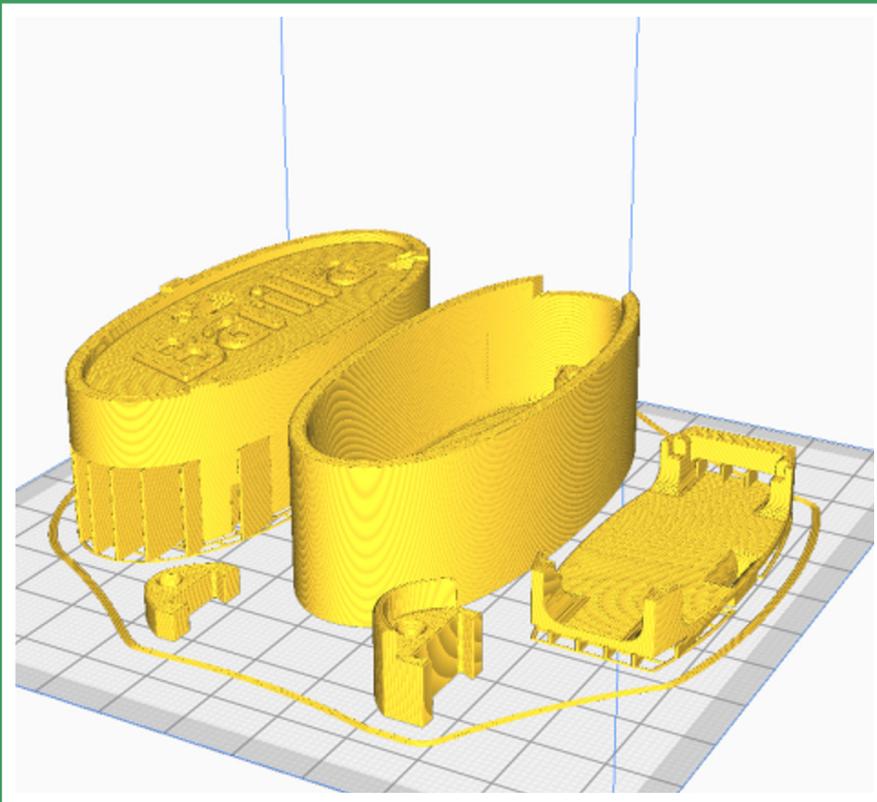
The printing parameters are basically standard.

We recommend:

- Quality (layer height) 0.1 or 0.15 mm;
- Temperatures of the extruder and hotplate, if any, according to the material chosen;
- Wall thickness 1mm;
- Filling 100%;
- Supports all;
- Speed according to the characteristics of your printer.

Do not print too fast for better final quality.

Once the parts are placed, the print preview should look as follows:



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**CODE**

**AND FIRMWARE**



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## CODE

## AND FIRMWARE

### ■ Loading the code and firmware into the Arduino Nano 33 BLE board

Difficulty level: Easy

Let's see how to select the Arduino Nano BLE board connected to the computer and how to upload the Sketch to it, using Arduino IDE 2.0.

You can download the IDE from [Here](#).

If you don't know how to install it, you can find the full tutorial at this [Link](#).

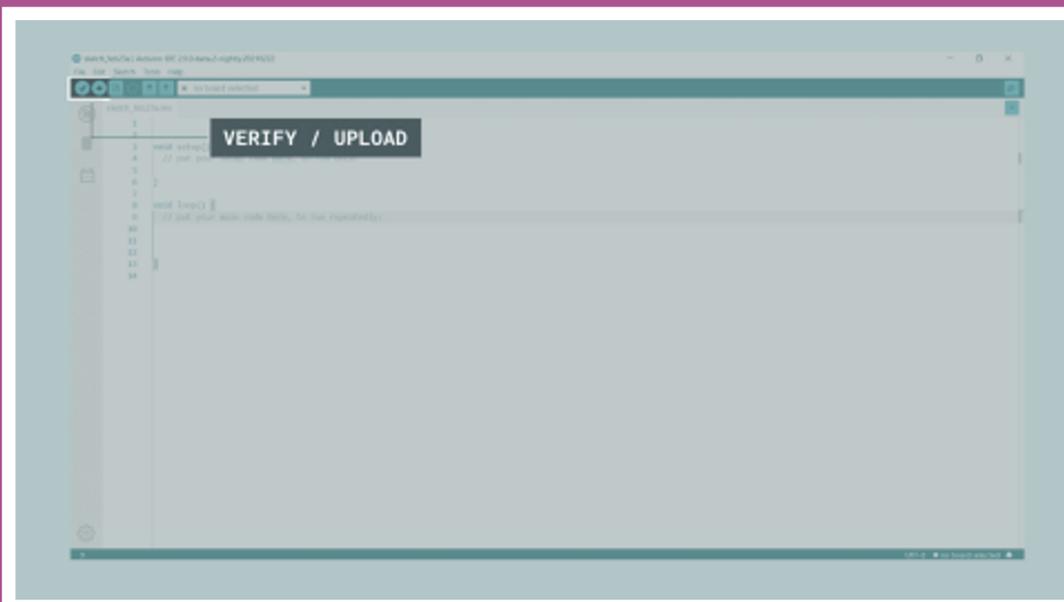
#### Requirements

- Arduino IDE 2.0 installed

## 3.1/5 Let's load the Sketch

1) Open Arduino IDE 2.0. and import the file BLE\_Pastable1.1.ino;

2) With the editor open, let's take a look at the toolbar at the top. On the far left, there is a tick and an arrow pointing to the right. The tick is used to check and the arrow is used to load;



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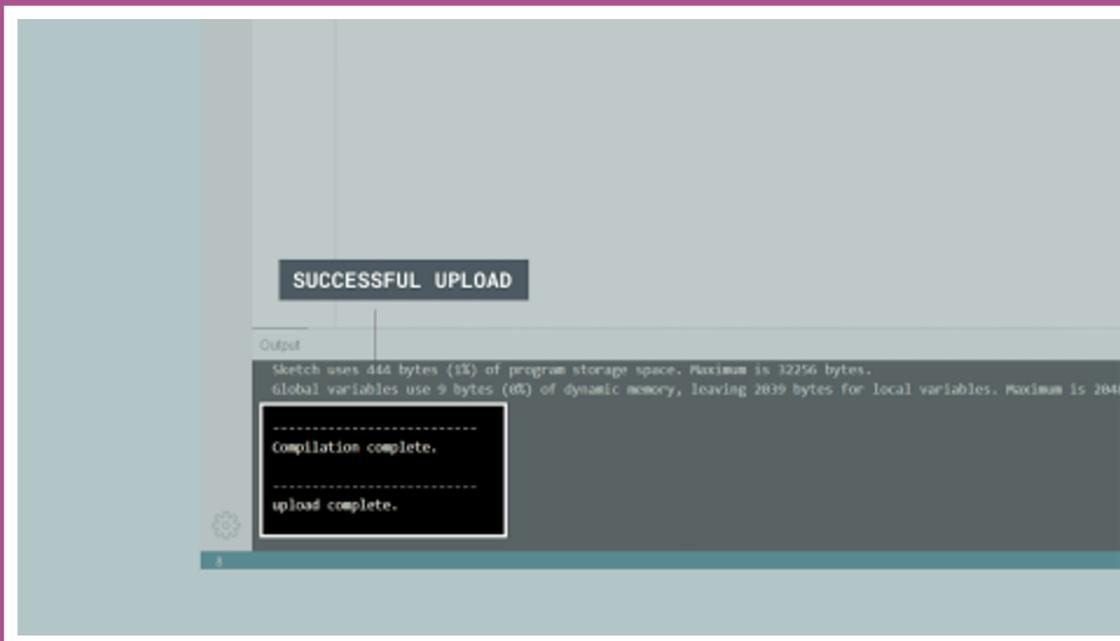
## CODE

## AND FIRMWARE

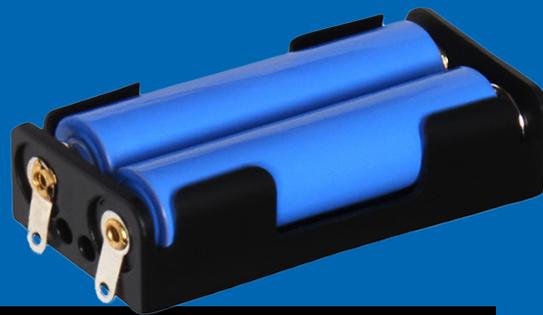
3) Now, before we can load the code, we must first select the board we are using. We can do this by navigating to Tools> Port> {Board}. The board connected to your computer should appear here and we have to select it by clicking on it (if it does not appear, check that you have installed the right drivers or try disconnecting and reconnecting the board). In our case, our board is displayed as COM2 (Arduino Nano BLE);

4) With the board selected, click the load button and it will start loading the Sketch on the board;

5) When finished, it will notify you in the console.



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# ELECTRONICS AND CASE ASSEMBLY



# 4/5

## ELECTRONIC AND

## CASE ASSEMBLY

Difficulty Level: Medium/Easy

Material: See table List of Components

### 4.1/5 General Description of the Device

The device that allows the app to be notified when the water in the pot starts to boil is an Arduino Nano 33 BLE board, which also provides Bluetooth connectivity and allows all the necessary electronics to be assembled in a very small space.

A sensor (hereafter called a thermistor or probe), the same one found in 3D printers, is used to detect the temperature.

The rest of the components are required to measure the current flowing through it and to convert it into a temperature measurement, using the program written for the Arduino board and the features of the board itself.

**In depth:** at the heart of this object is a thermistor: a thermistor is a component that varies its resistance as the temperature changes.

The 100k Ohm probe has a negative temperature coefficient, which means that as the temperature increases, the resistance decreases.

The resistance value is measured with a simple circuit that creates a voltage divider with the thermistor in one branch and a fixed 100 K Ohm resistor in the other.

The voltage once divided is applied to the analogue port A7 and sampled for use by the firmware.

To stabilise the signal and avoid noise, we place a 10nF ceramic capacitor in parallel with the probe.

Required:

- 1x 100k Ohm thermistor;
- 1x 10nF (nanofarad) capacitor;
- 1x 100k Ohm resistor;

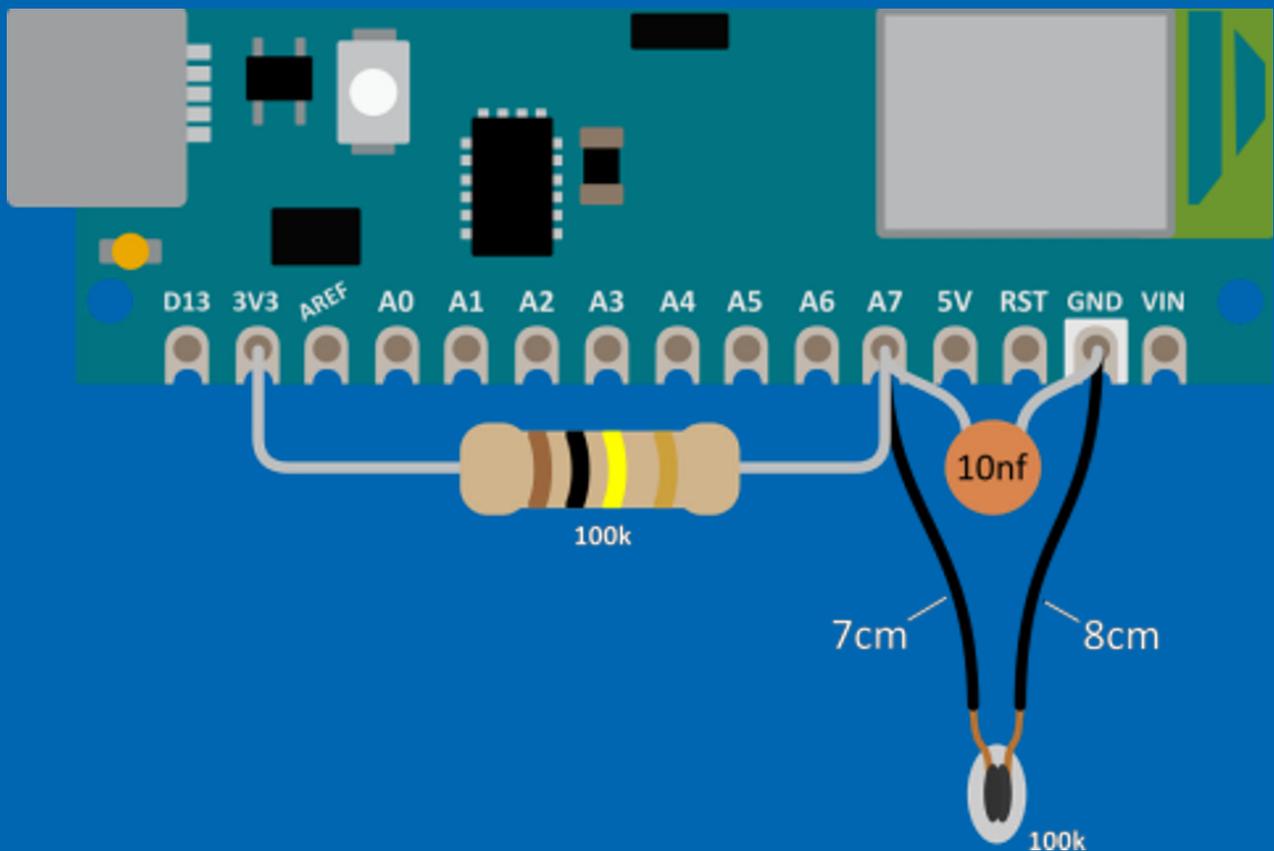
For soldering:

- A soldering iron;
- Some solder.

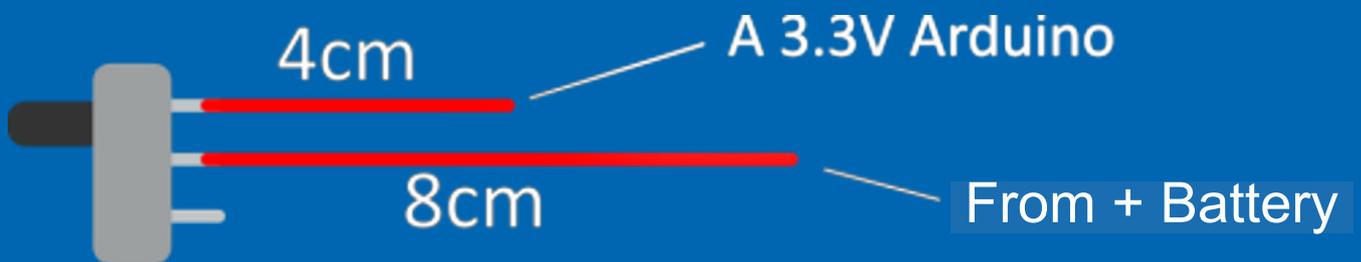
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# ELECTRONIC AND CASE ASSEMBLY

For assembly follow the diagram below:



Preparing the power switch:



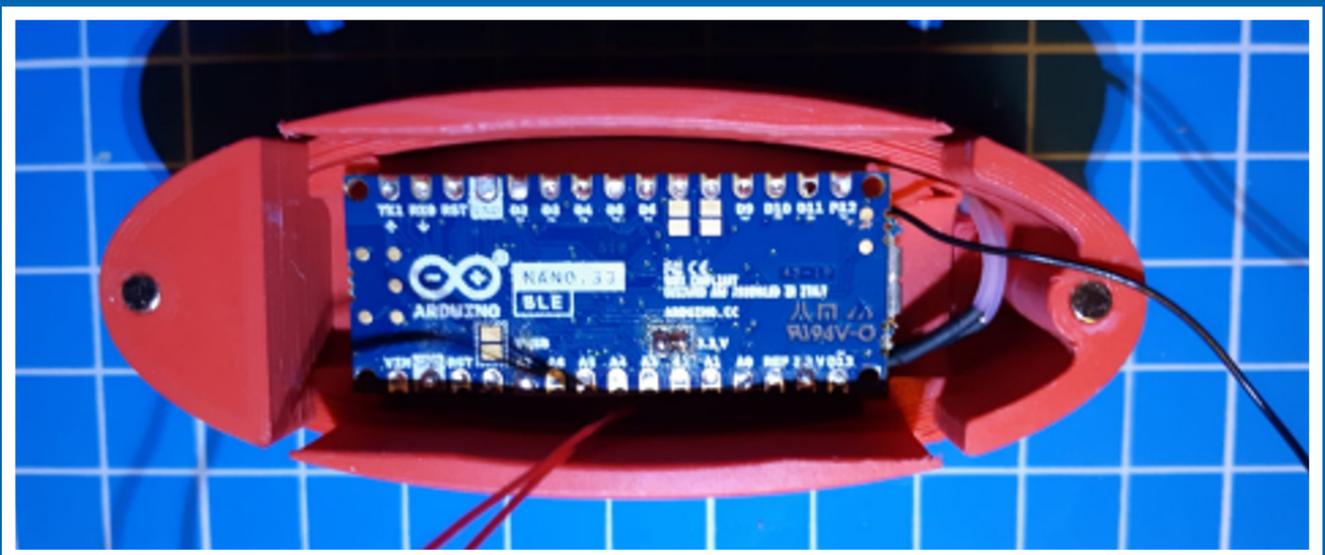
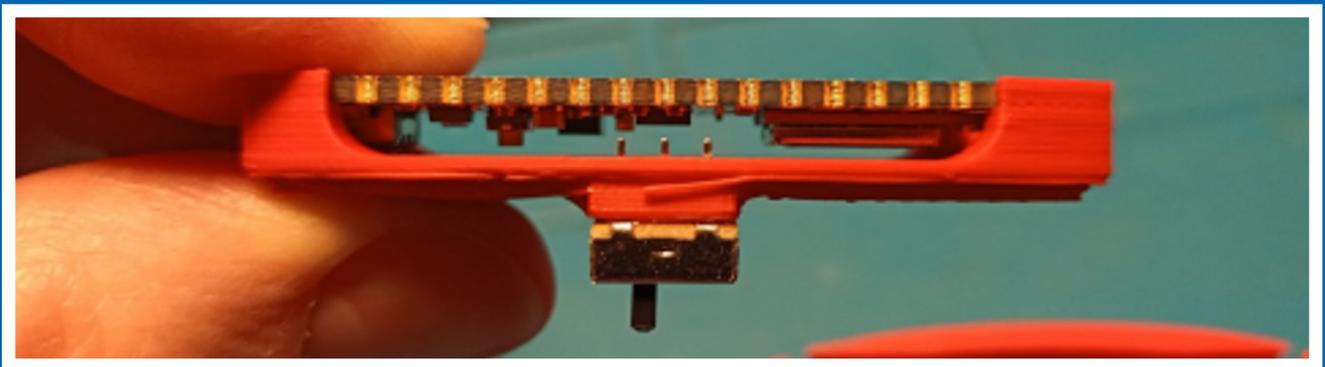
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## ELECTRONIC AND CASE ASSEMBLY

Proceeding with the assembly of the tray:

- first we glue the switch to the tray;
- the second step is to glue the Arduino;
- now we solder the remaining wires as shown, we also add a 5cm-long wire that we connect from the negative of the battery to a 'GND' pin on the Arduino (we recommend the free GND pin for convenience).

Below are some pictures showing the various stages of assembly and how the various parts that make up the device should be positioned:



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## ELECTRONIC AND CASE ASSEMBLY



The parts shown in detail are for attaching the ribbon, if needed.

If tape is to be added, fix the lower part and the tape with a 2mm diameter and 8mm long screw before gluing the upper part with the magnet. We suggest securing the magnets in place with a small drop of cyanoacrylate glue (Attack).

Note: Pay attention to the polarity of the magnets before gluing them in place, we suggest fixing the ones located on one of the pieces first, attaching the ones that would go on top and then fixing them with the correct side facing up.

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**COMPONENTS AND  
MATERIAL USED**



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**COMPONENTS AND****MATERIAL USED**

DESCRIPTION	QUANTITY	MANUFACTURER'S LINK	TYPE OF MATERIAL FOR DISPOSAL
Arduino Nano 33 BLE electronic board	1	<a href="https://store.arduino.cc/products/arduino-nano-33-ble">https://store.arduino.cc/products/arduino-nano-33-ble</a>	<b>RAE</b>
NTC probe 100K Ohm - 3950	1		
Resistor 100K Ohm / 1/4 or 1/2 Watt	1		
10nF capacitor - small diameter, thickness under 2.5mm	1		
SS-12D00 Micro Vertical Slide Switch 3 Pin 2 Positions	1		
Battery Holder 2xAAA -	1		
ENERGIZER® ULTIMATE LITHIUM BATTERIES - AAA	2	<a href="https://energizer.eu/it/product/energizer-ultimate-lithium-aaa/">https://energizer.eu/it/product/energizer-ultimate-lithium-aaa/</a>	
Mini Magnets 3mm diameter, 2mm thickness   Magnetic Grade N52 - Neodymium Magnets	4		
Complete case 3D printing filament	Red	<a href="https://www.3djake.it/extruder/green-tec-pro-red">https://www.3djake.it/extruder/green-tec-pro-red</a>	Undifferentiated
Nylon tape width 12mm	approx. 13 cm		
M2 Nickel-plated Carbon Steel Flat Head Self-Tapping Screws Length 8mm	1		



PASSIVE COOKING

**A COUPLE OF MINUTES  
CAN MAKE THE DIFFERENCE**

