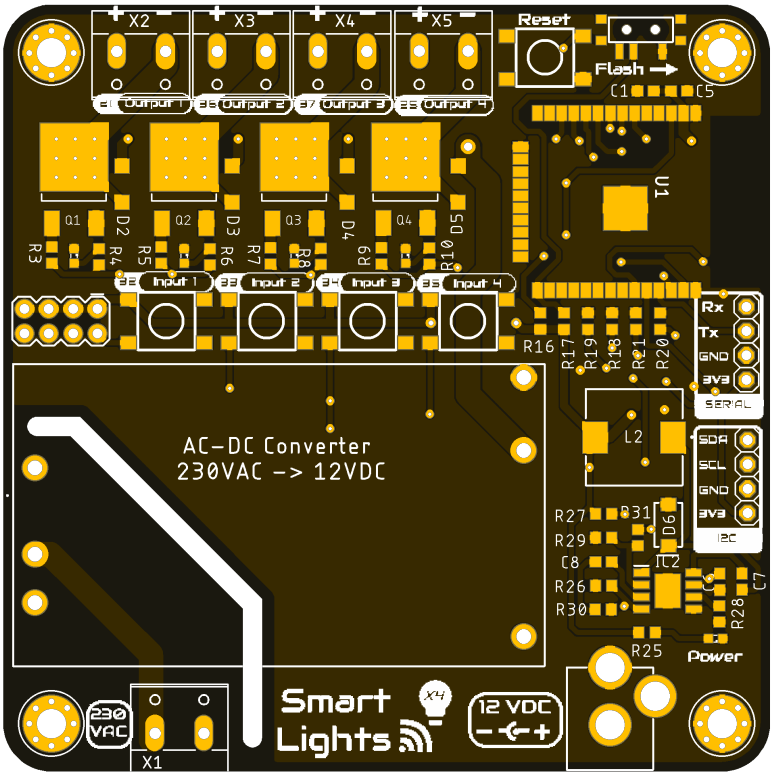
Smart Lights X4

R1

User's guide



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1 Document overview

Product	Smart Lights X4 R1
Author	J.G.Aguado
Document type	User's guide
Document revision	1.0
Repository	https://github.com/JGAguado/Smart_Lights

1.1 Document special indications

The following special indications are used to highlight important information within the document.

Info

The info box points to important information or actions to take into account when manipulating the product.

Warning

The warning box points to crucial information or actions that should be followed to avoid reduced performance or damage to the product.

1.2 Technical support

You can find this document and many more under the documentation section available in the Github repository.

If you have technical problems or cannot find the information that you need in the provided repository, please contact the support email indicated on the support email: *jon-garcia@hotmail.com*

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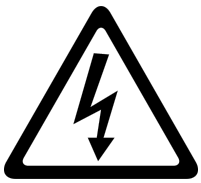
2 Safety guidelines

These safety guidelines, the operation instructions and the limit values listed in the technical data-sheet are to be read carefully before operating the product.

2.1 General information

This product has been designed for being used in domotic applications. It was not designed for any use involving serious risks or hazards that could lead to death, injury, serious physical damage, or loss of any kind without the implementation of exceptionally stringent safety precautions.

2.2 Risk of electric shock



The usage of this product could imply working with high voltage installations ($100 - 240V_{AC}$). Perform any action, specially in the area with this symbol on the board, with the appropriate means and always with safety.

If you have any question, please check with technical support (section 1.2) before taking any action potentially dangerous.

2.3 Protection against Electrostatic Discharge (ESD)

The Smart Lights X4 contains components sensitive to Electrostatic Discharge (ESD), which can be damaged by inappropriate handling. It's therefore necessary to provide some safety precautions against ESD during the handling and operation.

2.4 Usage, transport and storage

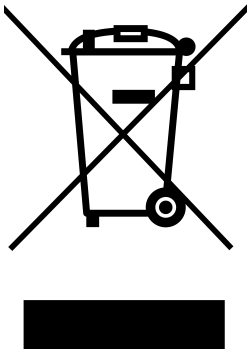
During the use, transport and storage, this product must be protected from any mechanical stress (forces applied over the board or it's components), temperatures out of the data-sheet's range, high environmental humidity or aggressive atmospheres.

Avoid using it in areas where it cannot be assured the previously mentioned environmental conditions.

2.5 Repairs

If any of the components on the board gets damaged, a reparation is possible. This repair can be performed by yourself if you identify the problem and have the means for desoldering & soldering. If this is not the case, just write us to the technical support mail to reach a solution.

2.6 Disposal



In accordance with national and local environmental protection and material recovery and recycling regulations, electronic devices that can no longer be used (in case a repair is not possible) must be disposed of separately and not with normal household garbage.

3 Introduction

3.1 Product description

The Smart Lights X4 is an electronic board based on the ESP32 with the target of controlling up to 4 dimmable led strips under 24VDC. It can read up to 4 switches so you can also program the response of the light depending on physical inputs

Figure 1: Smart Lights X4

It can be powered from an standard electric socket (since the board can mount a $100-240V_{AC}$ to $12V_{DC}/24V_{DC}$ power transformer) and being able to regulate 4 independent monochromes LED strips or one RGBW LED strip.

3.2 Features

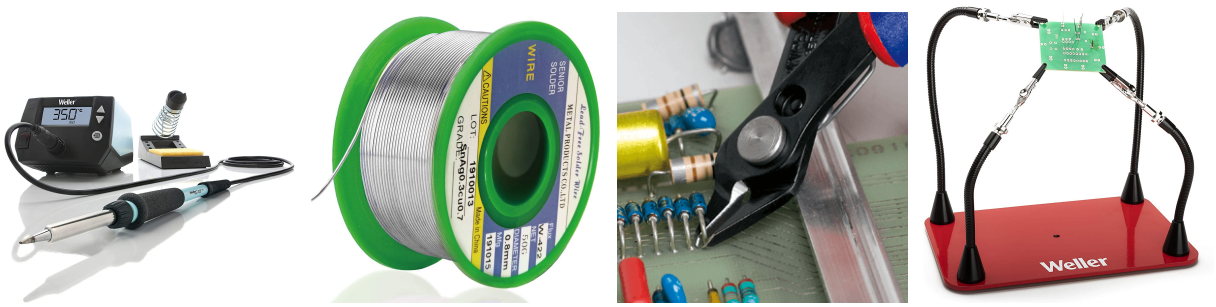
- ESP32-S based
- Power supply though $100-240V_{AC}$
- 4 independent dimmable outputs
- 4 pushbutton inputs
- I^2C bus for expansions

4 Assembly

Info

Please note that assembling this board requires specialized tools for SMT and THT soldering, therefore is only recommended for people with the following equipment and some experience.

For the Through Hole Technology (THT) components, the following tools will be required:



(a) Soldering iron (b) Lead-free solder wire (c) Wire cutting pliers (d) Board holding station

Figure 2: THT components soldering basic kit

For the Surface-mount Technology (SMT) components, the following tools will be required:

(a) Reflow oven (b) Solder paste (c) Precision tweezers

Figure 3: SMT components soldering basic kit

The *partially assembled* option (figure 5, requires the assembly of the components listed on table 1 placed as disposed on figure 4.

Info

Note that for the Smart Lights X4 R1 the input power jack is not listed since it should not be used.

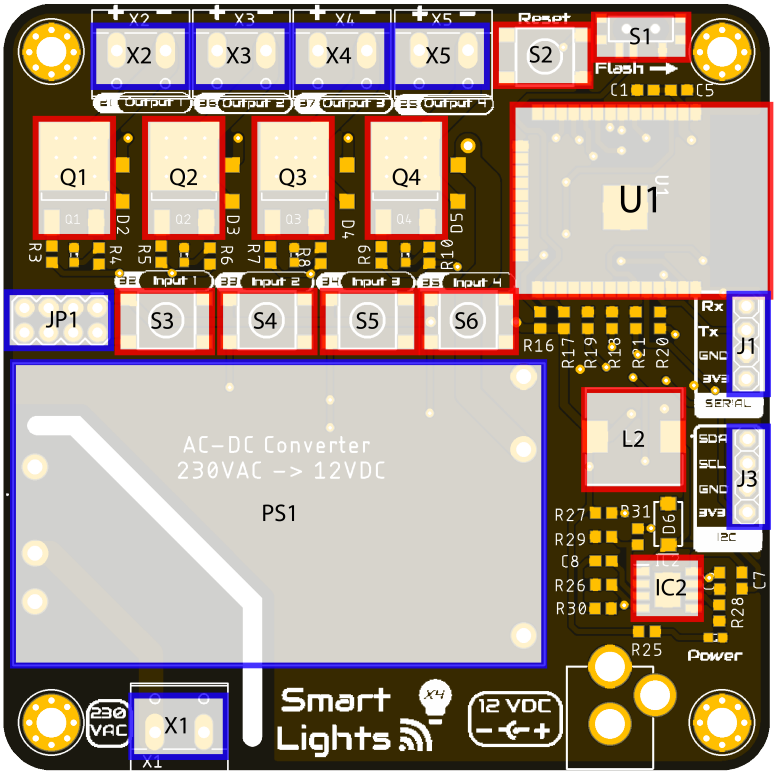


Figure 4: SMT in red and THT in blue

Type	ID	Description	Value
THT	X1-X5	Screw terminal block	1x2 (5.08 mm pitch)
	J1, J2	Male pin headers	1x4 (2.54mm pitch)
	JP1	Male pin headers	2x4 (2.54mm pitch)
	PS1	Power supply	HLK-40M12
SMT	S1	Slide switch	KPS-1290
	S2-S5	Momentary switch	6x6mm
	Q1-Q4	Mosfet	IRLR2905TRPBF
	U1	Microcontroller module	ESP32-S
	IC2	Buck-down regulator	MP1584EN
	L2	Power inductor	SLF10145T-100M2R5-H[1]

[1] Any other power inductor of 10uH and footprint of 10x10mm should be valid as well.

Table 1: Not included components on the *partially assembled* Smart Lights X4

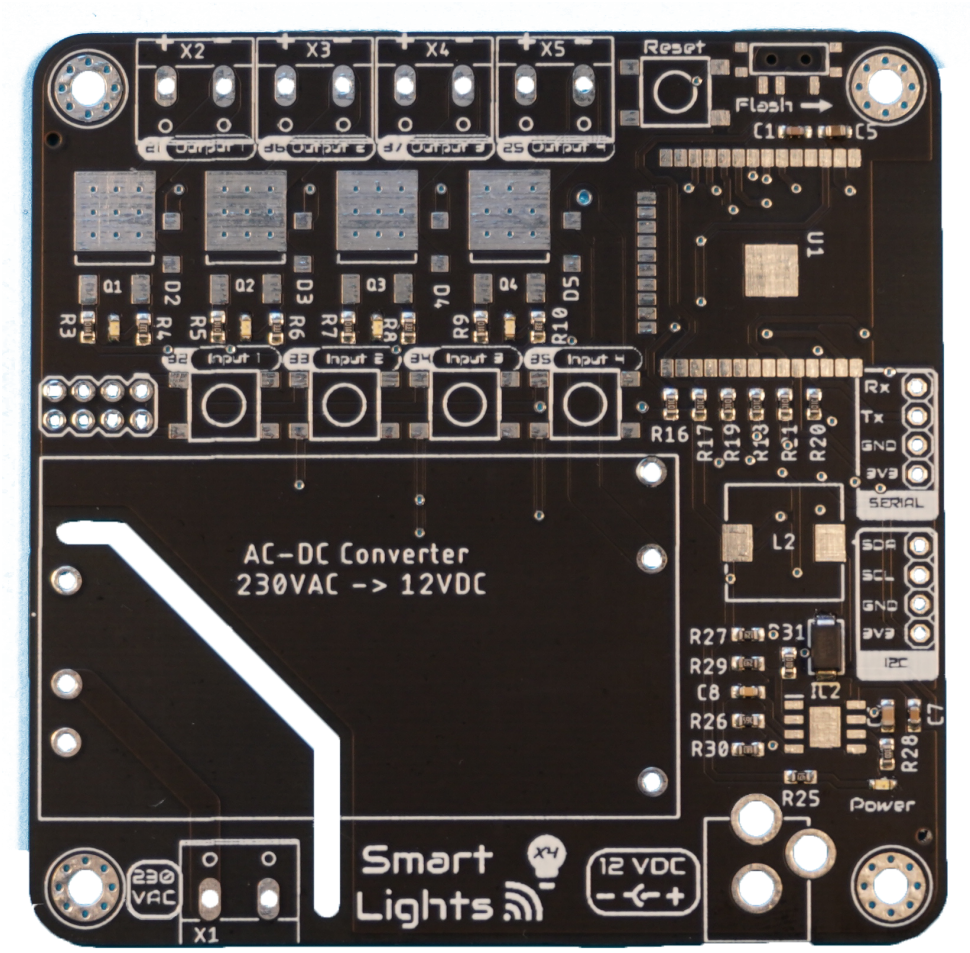


Figure 5: Partially assembled Smart Lights X4

5 Installation

5.1 Software

⚠ Warning

Do not upload any firmware with the Smart Lights X4 directly connected to an electric socket using 230VAC. Instead just power it through the USB port as described in this section.

This board is strongly recommended to be flashed with the ESPHome firmware. This way it can be updated Over-the-Air (OTA) as many times as needed without needing to modify the board physically.

ℹ Info

In order to simplify the design, the Smart Lights X4 R1 the doesn't integrate a USB driver like the CP2102 or the CH340G. Instead the Serial pins are exposed so you can access directly and program it from there.

The first time firmware upload whether you want to upload any sketch from Arduino or the ESPHome firmware, will require of the following procedure:

1. Set the *Flash* switch to the arrow position.
2. Connect the external USB driver (USB to TTL) the following way:

Smart Lights X4	USB to TTL
3V3	3V3
GND	GND
Tx	Rx
Rx	Tx

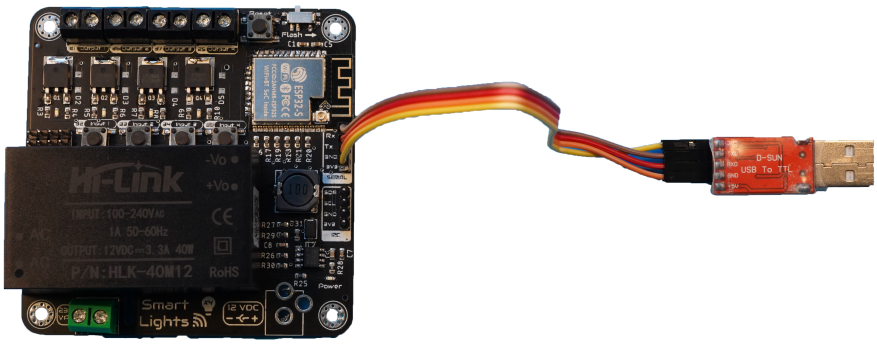


Figure 6: Smart Lights X4 with USB driver

> ⚠ **Warning**
> Please pay special attention to the power pins. The 3V3 pin powers directly the micro-controller module.

3. Compile and upload the firmware into the board.

Find an example of a *configuration.yaml* ready to be uploaded to the ESPHome firmware installed in the listing 1

Listing 1: configuration.yaml

```yaml
light:
  - platform: monochromatic
    name: "Light 1"
    id: light_1
    output: l1
  - platform: monochromatic
    name: "Light 2"
    id: light_2
    output: l2
  - platform: monochromatic
    name: "Light 3"
    id: light_3
    output: l3
  - platform: monochromatic
    name: "Light 4"
    id: light_4
    output: l4


output:
  - platform: ledc
    id: l1
    pin: GPIO23
  - platform: ledc
    id: l2
    pin: GPIO25
  - platform: ledc
    id: l3
    pin: GPIO26
  - platform: ledc
    id: l4
    pin: GPIO27

binary_sensor:
  - platform: gpio
    name: "PB1"
    pin:
      number: GPIO32
    on_press:
      then:
        - light.toggle: light_1
  - platform: gpio
    name: "PB2"
```

```
    pin:
      number: GPIO33
    on_press:
      then:
        - light.toggle: light_2
  - platform: gpio
    name: "PB3"
    pin:
      number: GPIO34
    on_press:
      then:
        - light.toggle: light_3
  - platform: gpio
    name: "PB4"
    pin:
      number: GPIO35
    on_press:
      then:
        - light.toggle: light_4
```

5.2 Hardware

5.2.1 Outputs

The Smart Lights X4 has 4 independent dimmable output channels of $12V_{DC}$. They are driven by the IRLR2905 Mosfet, able to deliver up to 110W [1].

Each of the output screw terminal block has the polarity defined on the silkscreen.

5.2.2 Inputs

The Smart Lights X4 has 4 independent digital inputs, ready to be use though the soldered push-buttons (S3-S5) or through the soldered pin headers.

In case you want to connect external push-buttons, the switch must be done by closing/opening the connection between the two rows. Therefore you can read up to 4 different external switches.

5.2.3 Powering

The Smart Lights X4 can be powered from two excluding ways, meaning that you can power it through one way **or** the other, but not simultaneously .

- **Serial port:** Use this way of powering (always when the main AC power source is disconnected) in case you want to debug and analyze the microcontroller's inputs/outputs.
- **AC Power:** When the board is ready to be placed in the final position and the firmware is running smoothly, use the screw terminal block X1 for powering the Smart Lights X4 from the $230V_{AC}$.

Warning

When connecting the AC Power, always screw first the power wire to the terminal blocks and then plug it on the electrical socket

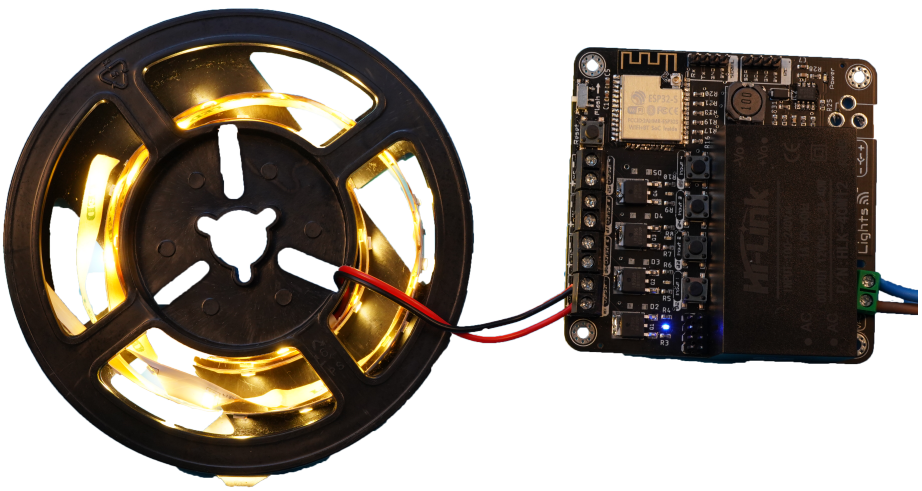


Figure 7: Smart Lights X4 with LEDs on output 1

[1] According to the component's datasheet

6 Frequently Answered Questions

After connecting everything and turning on the Smart Lights X4 , the power LED doesn't turn on, why?

If the board is correctly powered and you cannot see the power LED on, disconnect the power immediately. It could be a short-circuit. Please check with a multi-meter the resistance between 3V3 and GND and make sure they are not in contact. If the problem persist reach technical support (check section 1.2)

Can I upload ESPHome directly from the Home Assistance setup running on my Raspberry Pi?

Yes you can, and actually this is one of the simplest and more effective way to upload ESPHome.

I am powering the board through the Serial port, ?

Yes you can, and actually this is one of the simplest and more effective way to upload ESPHome.

I accidentally inverted the polarity while connecting the Serial port, what can I do?

If the component seems damaged from outside or the circuit doesn't work after connecting it back correctly, you will need to replace the microcontroller module (the ESP32-S) or send it for repair (check section 1.2).

I want to use the I^2C port for expanding the possibilities, how can I do it?

Once you have located the sensor/board that you want to connect to the I^2C port, check that is compatible with the 3.3V power supply from the Smart Lights X4 . If this is the case, just connect it directly, power the board and update the firmware!

Acronyms

ESD Electrostatic Discharge. 2, 3

GND ground. 13

I^{2}C Inter-Integrated Circuit. 5, 13

LED Light Emitting Diode. 5, 13

OTA Over-the-Air. 9

RGBW Red-Green-Blue-White. 5

SMT Surface-mount Technology. 6, 7

THT Through Hole Technology. 6, 7

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