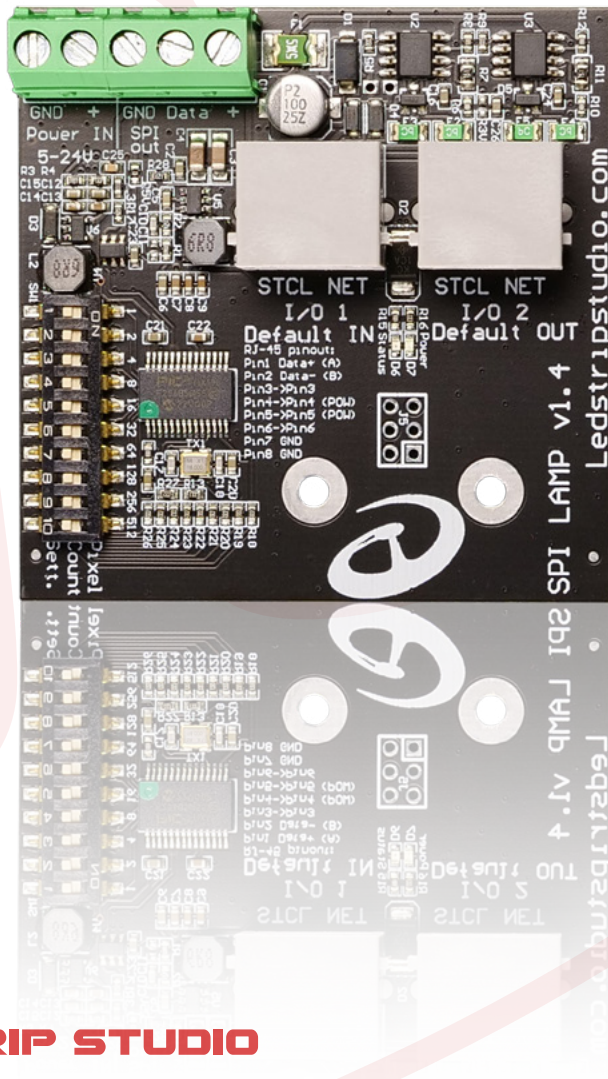




SPI LAMP

User Manual

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SAFETY INSTRUCTIONS

Installation should be performed only by a competent person or professional electrician. Make sure that the installation complies with the standards and rules that apply in your country.

- **Do not use the device if it seems to be damaged.**
- **Use the device only as described in this user manual.**
Any other use or use under other operating conditions is improper and may result in personal injury or property damage.
- **No liability will be assumed for damages resulting from improper use.**
Never open the controller and do not attempt repairs yourself.
- **Do not place the device close to heat sources and always ensure enough ventilation.**
- **Do not place the unit on surfaces that are heat sensitive.**

This device has been designed for indoor use only. Do not expose the unit to direct sunlight. Do not allow this device to meet liquids. Electrical shock could result. Also, damage to the device, smoke, and overheating could result from contact with liquids. Clean the device components that are accessible from the outside regularly. The cleaning frequency depends on the operating environment: damp, smoky or particularly dirty environments can cause greater accumulation of dirt on the device components. Clean with a dry soft cloth. Stubborn dirt can be removed with a slightly dampened cloth.

- **Never use solvents or alcohol for cleaning.**
- **Establish all connections when the unit is switched off.**
Use the shortest possible high-quality cables for all connections.
Make sure that cables cannot cause a trip hazard.
- **Never touch the plug contacts with sharp or metal objects.**
- **Ensure that plastic bags, packaging, etc. are disposed of properly and are not within reach of babies and young children. Choking hazard!**
- **Ensure that children do not detach any small parts (e.g. screws, connectors or the like) from the unit. They could swallow the pieces and choke!**
- **Never let children unattended use electrical devices.**

DEVICE INTRODUCTION



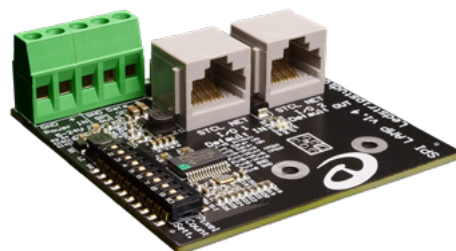
Typically when you need to illuminate a lot of objects using individually addressable SPI LED strips (or pixels) you are facing the issue that you need a lot of physical SPI outputs or you have to route SPI data from one object to another. Lot of physical SPI outputs require lot of controllers and routing SPI data from one object to another often causes signal integrity issues even if cables are only few meters long.

SPI LAMP has been developed to solve these SPI signal distribution issues by increasing count of physical SPI outputs as needed. Basically you can connect several SPI LAMPs in a daisy chain topology to single physical output of LEC3 or SPI MATRIX controller and get independent SPI output from each SPI LAMP. SPI LAMP works on custom LSS strip protocol which is very robust to interference and can use long cables from one SPI LAMP to another. For convenience it uses standard RJ-45 connectors for SPI LAMP to SPI LAMP interconnection. SPI LAMP power voltage input is wide range and perfectly fits almost all SPI LED strips (or pixels) installation needs. Thanks to its physical shape fits perfectly into plastic electrical junction boxes widely available in electrical stores.

DEVICE SPECIFICATION

SPI LAMP

Signal splitter for RGB/RGBW/WWA SPI LED strips/pixels



Applications

- General illumination
- Decoration illumination
- Events, lounges, clubs
- Scenography
- Theatre
- Light show
- Special effects
- Showcase

Technical specification

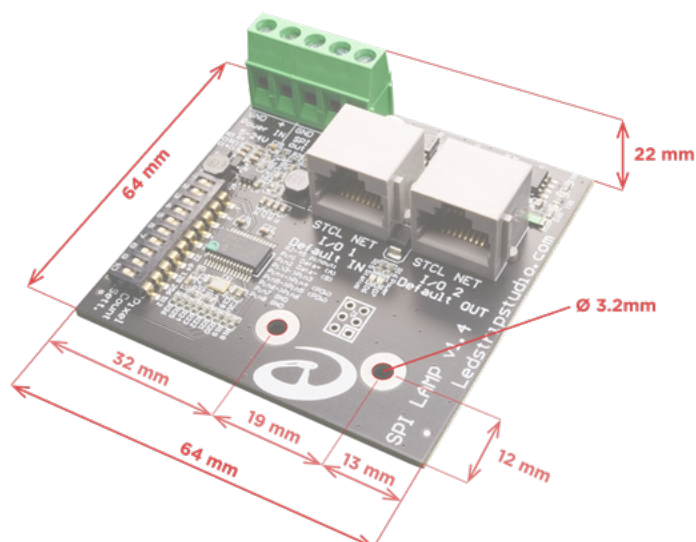
Controls over	LSS strip protocol
Operating voltage	5-24V DC
Self power consumption	1W
Power input connector	2 pole screw terminal block pitch 5mm for wires <2.5mm²
Max. total pass thru current	5A
LSS strip protocol Input port connector type	RJ-45 non-shielded
LSS strip protocol Input port electrical type	Differential
LSS strip protocol Input port protection	Yes, ESD
LSS strip protocol Input connector pins	Data+ (A), Data- (B), GND
LSS strip protocol Communication protocol	Custom LSS strip protocol. 2.5Mbps
LSS strip protocol Output port connector type	RJ-45 non-shielded
LSS strip protocol Output port electrical type	Differential
LSS strip protocol Output port protection	Yes, ESD
LSS strip protocol Output connector pins	Data+ (A), Data- (B), GND
LSS strip protocol Output communication protocol	Custom LSS strip protocol. 2.5Mbps
SPI LED Output port connector type	3 pole screw terminal block pitch 5mm for wires <2.5mm²
SPI LED Output port electrical type	Single ended TTL 5V asynchronous
SPI LED Output port contain power	Yes
SPI LED Output port protection	No

SPI LED Output connector pins	GND, Data, +POWER
SPI LED Output communication protocol	WS2811, WS2812B, SK6812, TM1809 and compatible RGB/WWA/RGBW.... (TM1814 or UCS5603 on request)
LED pixel count setting	10bit DIP switch
Status LEDs	Green: Power, Yellow: status
Maximum controller count	85pcs in one daisy chained string
Maximum cable length for LSS strip protocol	100m with Cat5e or better
Minimum pixel count per SPI LED Output	9
Maximum pixel count per SPI LED Output	1023 RGB / 768 RGBW
Maximum of pixels total	1023 RGB / 768 RGBW in one daisy chained string
Special features/options:	Firmware updateable by user
Works with controller	LEC3 or SPI MATRIX
Operating air temperature	-10°C to 45°C
Storage air temperature	-30°C to 60°C
Relative humidity	5% to 80% non-condensing
Waterproof	No
Ingress protection	IP00
Weight	33g
Dimensions	64 x 64 x 22 mm
Enclosure	no, PCB only, designed to fit into standard plastic electrical surface mounted junction-box 75 x 75 x 40mm or similar/bigger
Mouting options	2x mounting hole diameter 3.2mm

Default package content

- SPI LAMP PCB

Dimensions



DEVICE VARIANTS

SPI LAMP has no variants, however type of SPI protocol generated by SPI LAMP on its SPI output depends on its firmware & config. By default SPI LAMP is supplied with firmware & config suitable for most common RGB SPI protocol WS2811, WS2812B, SK6812, TM1809 and many others compatible SPI LED strips (or pixels) working on same protocol.

On request we can supply SPI LAMP with loaded firmware & config suitable for RGBW* types or TM1814** or UCS5603** protocol. Firmware & config change is also possible to be done by an end user at any time after purchase.

*RGBW limit is 768 pixels for WS2811-like protocol

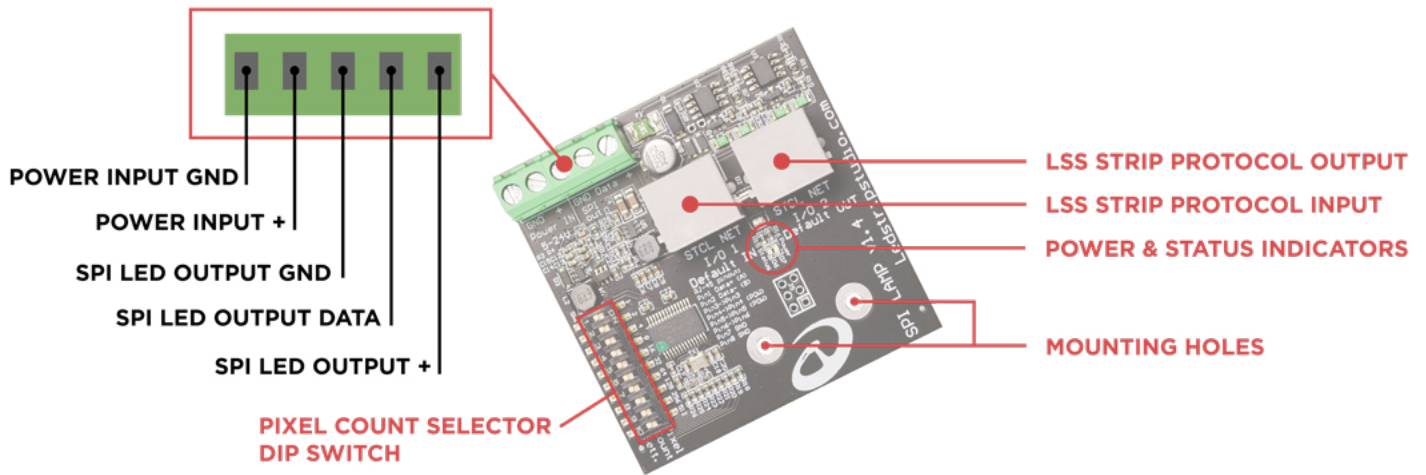
**on these protocols, different limitation of maximum pixel count exist

DEVICE COMPATIBILITY

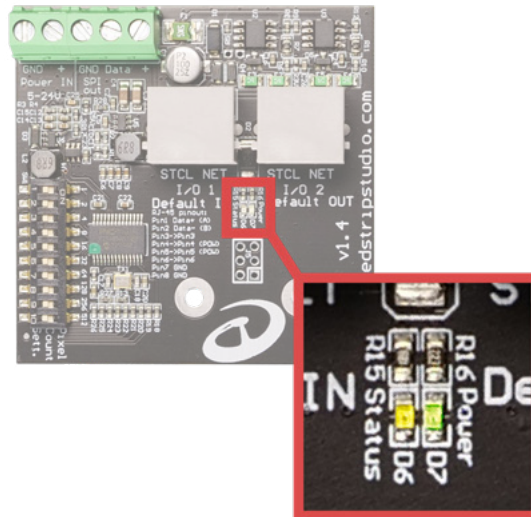
As SPI LAMP uses custom LSS strip protocol, the only compatible controllers are:

- **LEC3**
- **SPI MATRIX**

DEVICE OVERVIEW



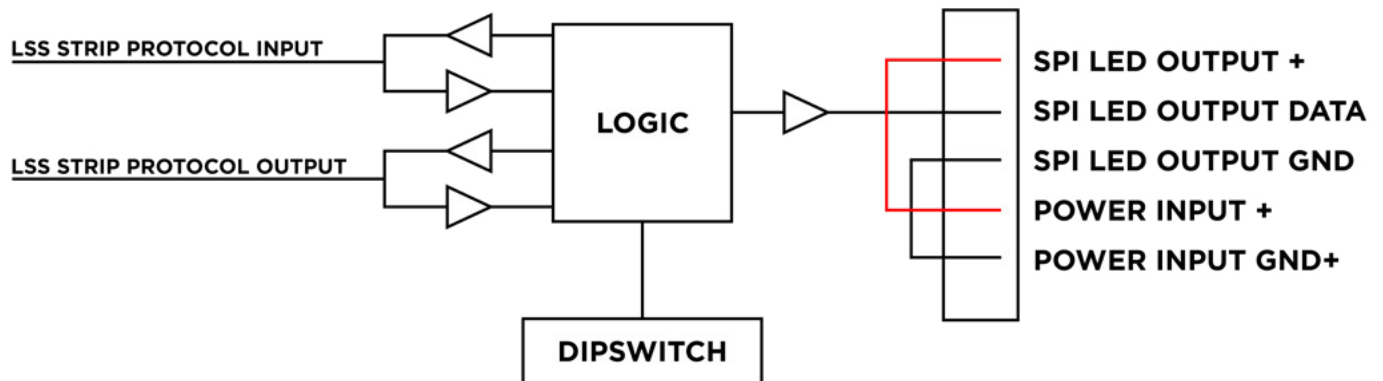
STATUS INDICATORS



Power (Green LED) ON = Power is present
Power (Green LED) OFF = Power is not present

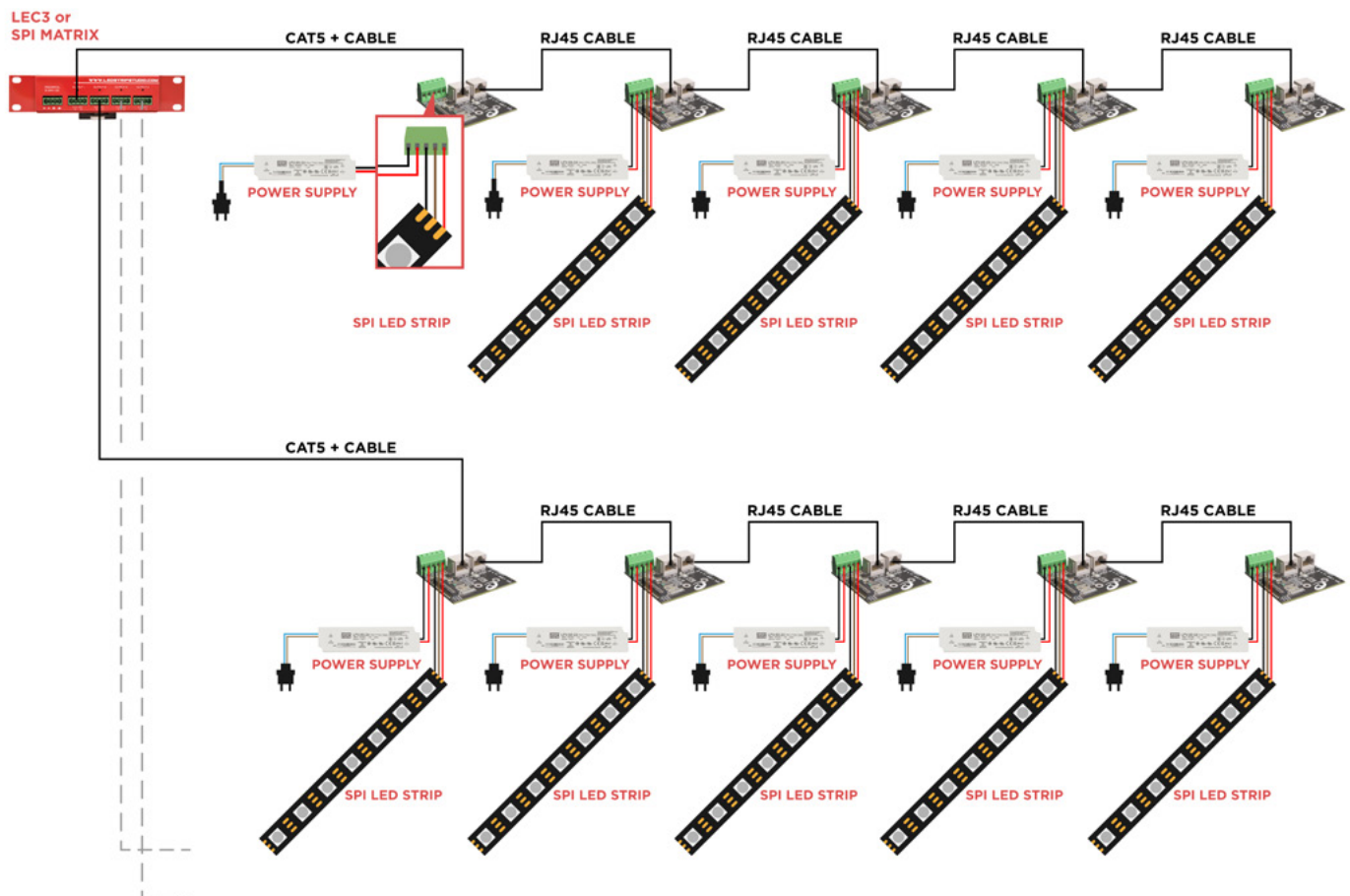
Yellow LED ON = Normal operation, LSS strip protocol detected on input port
Yellow LED BLINKING = No LSS strip protocol detected
Yellow LED OFF = Reverse operation, LSS strip protocol detected on output port

DEVICE BLOCK DIAGRAM

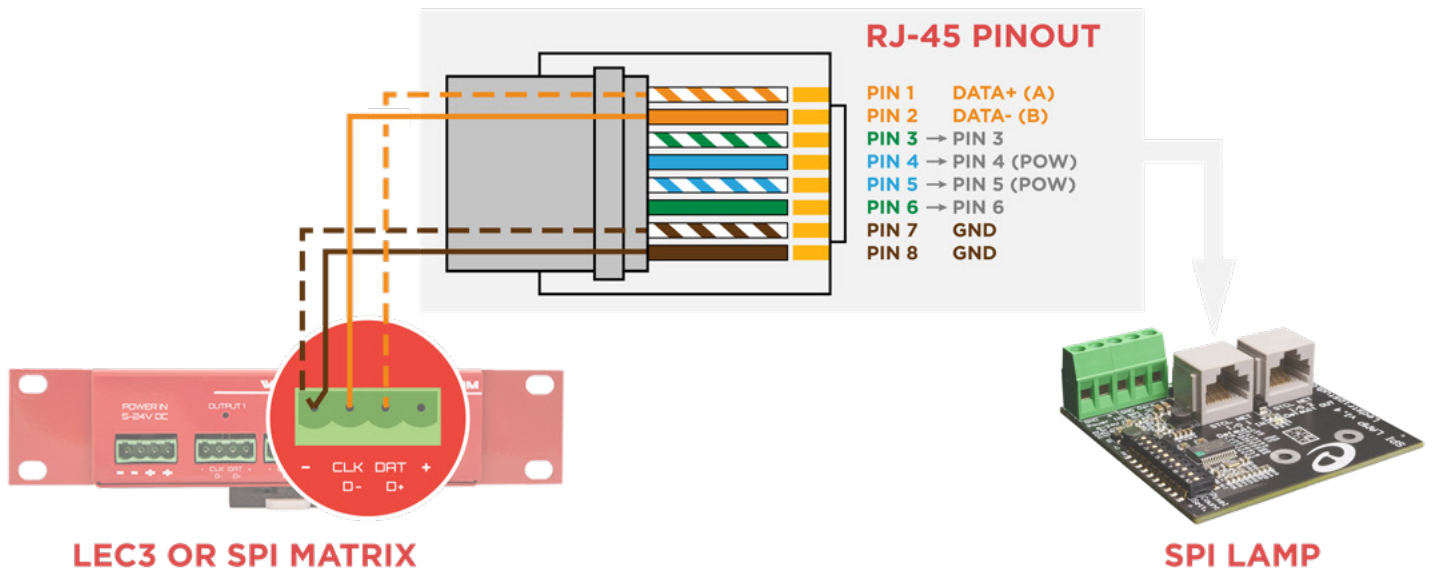


DEVICE CONNECTION

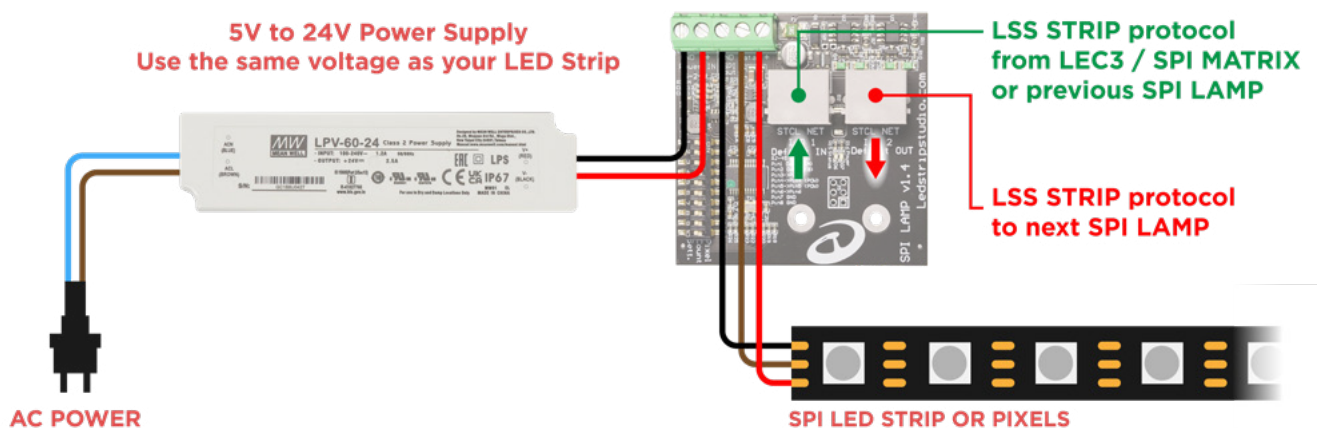
Principal SPI LAMP connection diagram:



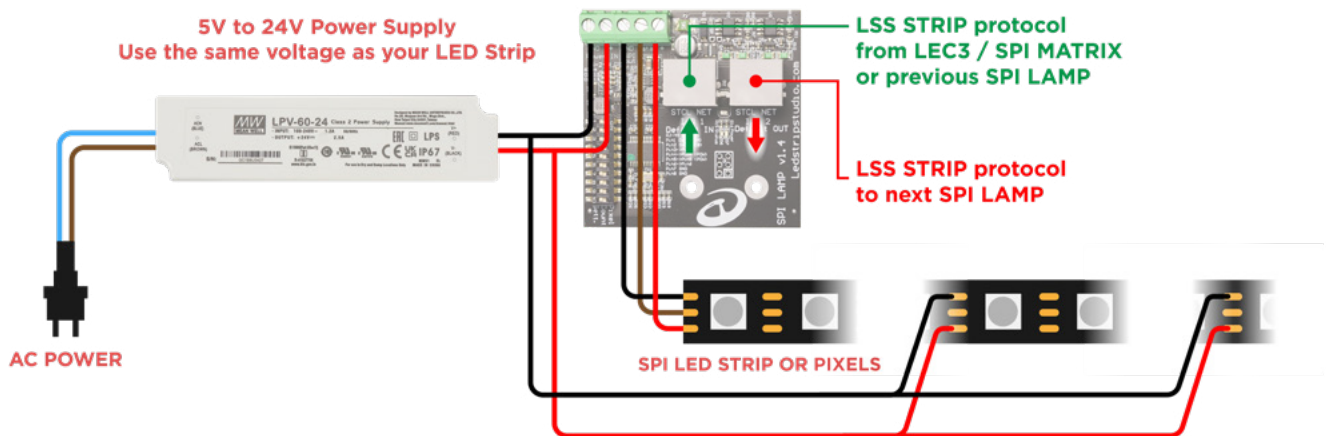
LEC3 or SPI MATRIX to SPI LAMP detail connection diagram:



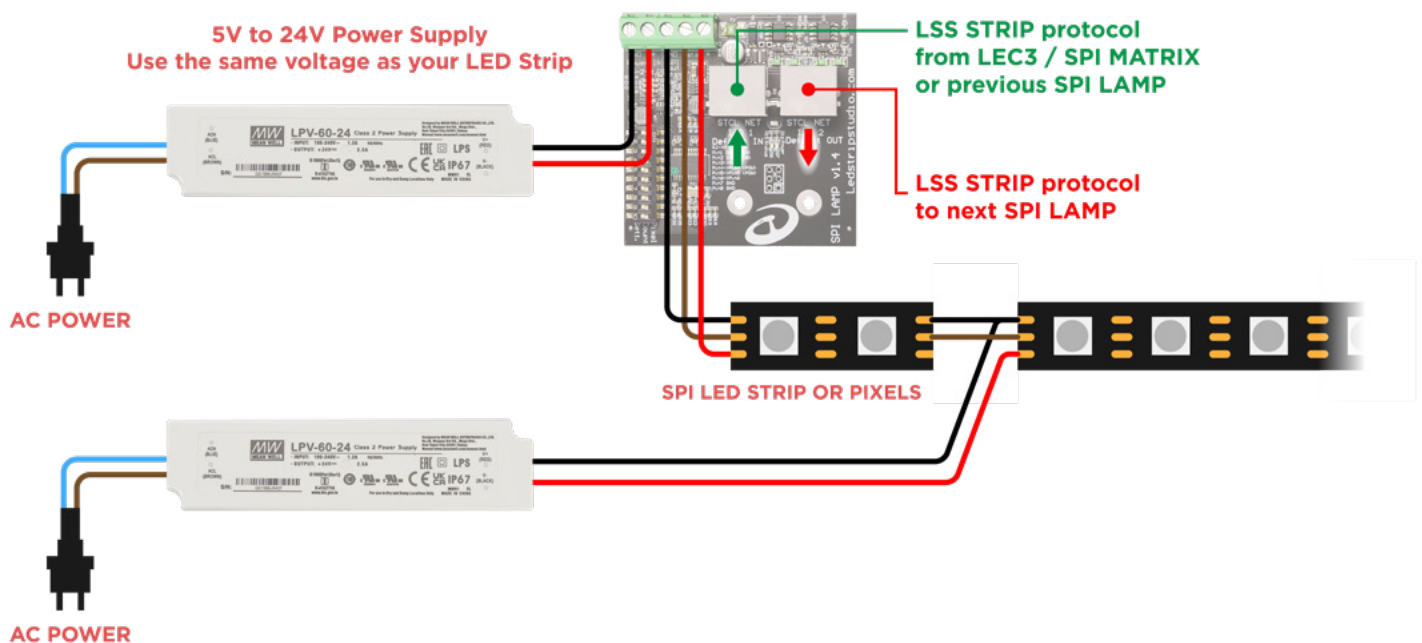
SPI LAMP Power supply and SPI LED output connection diagram:



Power injection example diagram for longer LED strip runs:



Power distribution example diagram when more than one power supply is needed:



DEVICE SETTINGS

Pixel count connected to SPI LAMP output needs to be set on SPI LAMP DIP switch in binary format. Pixel count is a sum of all enabled values.

DIP No.	DIP #1	DIP #2	DIP #3	DIP #4	DIP #5	DIP #6	DIP #7	DIP #8	DIP #9	DIP #10
Pixel count value	1	2	4	8	16	32	64	128	256	512

Example: to set 300 pixels, DIP #3, #4, #6, #9 needs to be ON as $4+8+32+256=300$.

IMPORTANT: Minimum pixel count value is 9 and if less then 9 is set on DIP switches, then pixel count 9 is automatically set.

To change SPI LAMP config (for example to change from RGB to RGBW) you will need:

- **PC connected to LEC3 or SPI MATRIX**
- **LEC3 or SPI MATRIX connected to SPI LAMP (or multiple SPI LAMPs) which you wish to config**
- **Micro SD card**
- **Follow these steps:**

1. Insert FAT32 formatted micro SD card to LEC3 or SPI MATRIX
2. Create a file with name: "SPILAMP1.cfg" in your PC
3. Open this file using text editor (notepad) and write following text into file:

```
[DeviceConfig]
appName=SPILAMP1
stripType=15*
```

*The **stripType** number represents the ID of the IC type.
You can find the list of supported IC types and their corresponding IDs on pages [17](#), [18](#), and [19](#)

4. Log in into LEC3 or SPI MATRIX using web browser
5. Go to "Advanced sett." tab

6. In “Upload files” / “File:” click on “Choose files”, and locate file “SPILAMP1.cfg” in your PC
7. Press “Upload file to SD”
8. Click on “Reset” in Reset device tab
9. Refresh your web browser
10. After about 30 seconds, config will be sent and written to all SPI LAMPs connected to LEC3/SPIMATRIX

In order to set SPI LAMP to RGB use same steps above, but text in “SPILAMP1.cfg” file has to be:

```
[DeviceConfig]
appName=SPILAMP1
stripType=2
```

*The **stripType** number represents the ID of the IC type.
You can find the list of supported IC types and their corresponding IDs on pages [17](#), [18](#), and [19](#)

To change SPI LAMP firmware you will need:

- **Firmware file for SPI LAMP “SPILAMP1.bin”**
- **PC connected to LEC3 or SPI MATRIX**
- **LEC3 or SPI MATRIX connected to SPI LAMP (or multiple SPI LAMPs)**
- **Micro SD card**
- **Follow these steps:**

1. Insert FAT32 formatted micro SD card to LEC3 or SPI MATRIX
2. Log in into LEC3 or SPI MATRIX using web browser
3. Go to “Advanced sett.” tab
4. In “Upload files” / “File:” click on “Choose files”, and locate file “SPILAMP1.bin” in your PC
5. Press “Upload file to SD”
6. Click on “Reset” in Reset device tab
7. Refresh your web browser

After about 90 seconds, firmware will be sent and written to all SPI LAMPs connected to LEC3/SPIMATRIX.

IS RJ-45 INPUT/OUTPUT COMPATIBLE WITH REGULAR ETHERNET NETWORK ?

No. Do not attempt to connect SPI LAMP directly to PC network interface card or network switches or routers. RJ-45 input/output of SPI LAMP has different pinout, voltage levels, speed and protocol from standard 10/100/1000 Mbps Ethernet network.

WHAT IF LSS STRIP SIGNAL IS CONNECTED TO “OUTPUT” INSTEAD TO “INPUT”?

SPI LAMP will work, but SPI output on its output will be pixel reversed. So data for first pixel will be sent to last pixel and vice-versa. This feature exist to provide a redundancy backup in future.

IS THERE ANY OTHER CONTROLLER WORKING WITH SPI LAMP THAN LEC3 OR SPI MATRIX?

No. SPI LAMP uses custom LSS strip protocol and it is **NOT compatible** with any other controller than LEC3 or SPI MATRIX.

WARRANTY

This device has been designed and made using high quality components with several quality checks and testings. Therefore we are proud to provide 5 year limited warranty for this device.

This limited warranty is valid for company or person (user) who purchased new device from us, or our authorized dealer/distributor and warranty period starts from date when user receive this device.

Limited warranty cover:

- **material defects**
- **assembly failures**
- **device malfunction**
- **this device only**

Limited warranty DO NOT cover and is void when this device:

- **has been used for different usage as specified in this manual**
- **has been opened without our permission**
- **has been modified or disassembled without our permission**
- **has been operated wrong way. E.g. over-voltage, over-current, exposed to high electromagnetic fields/discharges such as lighting strikes or ESD events with parameters way outside of HBM model**
- **has been stored or used outside of storage/operating temperature and humidity**
- **has been used in aggressive environment, corrosive environment, dusty environment or in environment with increased vibrations**
- **has been in contact with liquids**
- **has been connected wrong way. E.g. Short circuits, reverse polarity etc.**
- **has been mechanically damaged**
- **got unofficial attempts to firmware updates**

Limited warranty DO NOT cover:

- **shipping expenses to handle defective device.**
- **failures or damage of other equipments connected to this device**
- **user expenses caused by defective device**

For limited warranty claim process:

- **user must be able provide sufficient proof of purchase**
- **use email info@ledstripstudio.com with detailed description of device failure**
- **takes less than 30 days to resolve. This period starts from day we physically receive defective device (device return)**

DISPOSAL OF YOUR OLD DEVICE

This device is an electronic device, and can be categorized as hazardous waste in your country. Dispose of this device through an approved waste disposal firm or through your local waste facility. When discarding the device, comply with the rules and regulations that apply in your country. If in doubt, consult your local waste disposal facility.

SUPPORTED IC TYPES

LIST OF SUPPORTED IC TYPES OF LED STRIP STUDIO CONTROLLERS

ID	IC	COMPATIBILITY	LEC 3.0, 3.1 SPI MATRIX 3.0, 3.1	LEC 3.2 SPI MATRIX 3.2	SPI LED CONTROLLER	REACTIVO 1, 2 SPI LED 2	SPI LAMP	SPI LAMP FW 2	PROFILED
0	D705 1000kHz	D705 1000kHz LPD6803 1000kHz	✓	✓	✓	✓	✗	✗	✗
1	APA102-65536 2600kHz	APA102-65536 2600kHz	✓	✓	✓	✓	✗	✗	✗
2	TM1809 800kHz	TM1809 800kHz TM1803 800kHz WS2811 800kHz WS2812 WS2813 SK6812 SK6822 LPD1886 8bit UCS1903 800kHz UCS2903 APA104 800kHz P9883 800kHz WS2815 GS8208 SM16703 FW1935 WS2818	✓	✓	✓	✓	✓	✓	✓

✓ - supported / ✗ - not supported

Our list of supported IC types is constantly growing,
so if this list does not include yours, contact us via phone or email.

ID	IC	COMPATIBILITY	LEC 3.0, 3.1 SPI MATRIX 3.0, 3.1	LEC 3.2 SPI MATRIX 3.2	SPI LED CONTROLLER	REACTIVO 1, 2 SPI LED 2	SPI LAMP	SPI LAMP FW 2	PROFILED
3	TM1809 400kHz	TM1809 400kHz							
		TM1803 400kHz							
		APA104 400kHz							
		WS2811 400kHz	✓	✓	✓	✓	✗	✓	✗
		UCS1903 400kHz							
4	SM16716 1300kHz	P9883 400kHz							
		SM16716 1300kHz	✓	✓	✓	✓	✗	✗	✗
5	WS2801 1000kHz	SM16726 1300kHz 8Bit							
		WS2801 1000kHz	✓	✓	✓	✓	✗	✗	✗
6	APA102 1300kHz	WS2803 1000kHz							
		APA102 1300kHz	✓	✓	✓	✓	✗	✗	✗
7	APA102_DOUBLE 1300kHz	APA102_DOU- BLE 1300kHz	✓	✓	✓	✓	✗	✗	✗
		UCS9812 1100kHz	✓	✓	✓	✓	✗	✓	✗
8	UCS9812 1100kHz	UCS9812 1100kHz	✓	✓	✓	✓	✗	✓	✗
		MBI6120 475kHz	✓	✓	✓	✓	✗	✓	✗
9	MBI6120 475kHz	LPD8806 2000kHz	✓	✓	✓	✓	✗	✗	✗
		TM1829 1600kHz	✓	✓	✓	✓	✗	✗	✗
10	LPD8806 2000kHz	TM1829 1600kHz	✓	✓	✓	✓	✗	✓	✗
		TM1829 800kHz	✓	✓	✓	✓	✗	✓	✗
11	TM1829 1600kHz	TM1829 800kHz	✓	✓	✓	✓	✗	✓	✗
		WS2811_RGBW 800kHz							
12	WS2811_RGBW 800kHz	P9412_RGBW	✓	✓	✓	✓	✗	✓	✓
		UCS2904							
13	WS2811_RGBW 800kHz	WS2814							
		LSS RGBW strip	✗	✓	✗	✗	✗	✗	✗
14	LSS RGBW strip	LSS RGB strip	✗	✓	✗	✗	✗	✗	✗
		DMX RGBW	✗	✓	✗	✗	✗	✗	✗
15	LSS RGB strip	SM18522PS	✗	✓	✗	✗	✗	✗	✗
		DMX RGB	✗	✓	✗	✗	✗	✗	✗
16	DMX RGBW	SM18522PS	✗	✓	✗	✗	✗	✗	✗
		DMX RGB	✗	✓	✗	✗	✗	✗	✗
17	DMX RGB	SM18522PS	✗	✓	✗	✗	✗	✗	✗
		SM18522PS	✗	✓	✗	✗	✗	✗	✗

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ID	IC	COMPATIBILITY	LEC 3.0, 3.1 SPI MATRIX 3.0, 3.1	LEC 3.2 SPI MATRIX 3.2	SPI LED CONTROLLER	REACTIVO 1, 2 SPI LED 2	SPI LAMP	SPI LAMP FW 2	PROFILED
18	TM1914 800kHz	TM1914 800kHz	✗	✓	✓	✗	✗	✓	✗
19	TM1914 400kHz	TM1914 400kHz	✗	✓	✓	✗	✗	✓	✗
20	LD1510 8bit 1Mhz	LD1510 8bit 1Mhz	✗	✓	✗	✗	✗	✗	✗
21	LD1510 12bit 1Mhz	LD1510 12bit 1Mhz	✗	✓	✗	✗	✗	✗	✗
22	LD1510 8bit 500Khz	LD1510 8bit 500Khz	✗	✓	✗	✗	✗	✗	✗
23	LD1510 12bit 500Khz	LD1510 12bit 500Khz	✗	✓	✗	✗	✗	✗	✗
24	PL9823 600kHz	PL9823 600kHz	✗	✓	✓	✗	✗	✓	✗
25	TM1814 800kHz	TM1814 800kHz	✗	✓	✓	✓	✓	✓	✗
26	SM16823 800kHz	SM16823 800kHz	✗	✓	✓	✗	✗	✓	✗
27	P9813 800kHz	P9813 800kHz	✗	✓	✓	✗	✗	✗	✗
28	UCS8903 800kHz	UCS8903 800kHz	✗	✓	✓	✗	✗	✓	✗
29	UCS8904 800kHz	UCS8904 800kHz	✗	✓	✓	✗	✗	✓	✗
30	MB16024 16b, GCLK 12Mhz	MB16024 16b, GCLK 12Mhz	✗	✓	✗	✗	✗	✗	✗
31	UCS5603 800kHz	UCS5603 800kHz	✗	✓	✓	✗	✓	✓	✗

✓ - supported / ✗ - not supported

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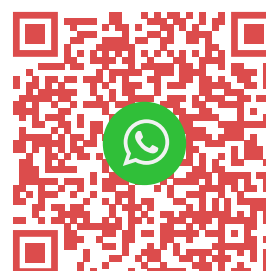
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 instagram.com/ledstripworld/



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