

The logo for embit, featuring the word "embit" in a lowercase, sans-serif font. To the right of the text is a stylized graphic consisting of several curved, overlapping lines that suggest a signal or data flow.

EMB-RasPI-130x-Cape Datasheet

embit s.r.l.

Revision 1.0

Document information

Versions & Revisions

Revision	Date	Author	Comments
0.1	2018-09-28	Embit	Initial release
1.0	2018-11-05	Embit	Revision 1.0

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1 Introduction

The **EMB-RasPI-130x-Cape** is an extension board for both EMB-LR1301-mPCIe [1] and EMB-LR1308-mPCIe, specially designed for using the Raspberry PI allowing the user to create his own LoRa gateway. It comes with the mini PCI express connector for the EMB-LR1301-mPCIe (or the EMB-LR1308-mPCIe), Raspberry PI 3 connector, 2 LEDs and a switch controllable by Raspberry PI GPIOs.

This product is designed especially for the Raspberry PI 3 model B+ [2].

1.1 Specifications

- Operating Voltage: +5V
- Operating Temperature: -40°C to +85°C
- Interfaces: mPCIe (SPI / I2C / UART / GPIOs)
- Dimensions: 85 x 56 x 1.6 mm
- Features: Easy integration with Raspberry PI 3 model B+
- Part Number: EMB-RasPI-130x-Cape (x=1 is for EMB-LR1301-mPCIe; x=8 is for EMB-LR1308-mPCIe)

1.2 Applications

The device can be used in several application where LoRaWAN gateway is needed, such as:

- Internet Of Things (IOT)
- Automated Meter Reading
- Smart Cities
- Home and Building Automation
- Wireless Alarm and Security System
- Machine to Machine (M2M)
- Industrial Monitoring and Control
- Long Range Irrigation System.

2 Description

2.1 Block Diagram

The **EMB-RasPI-130x-Cape** block diagram:

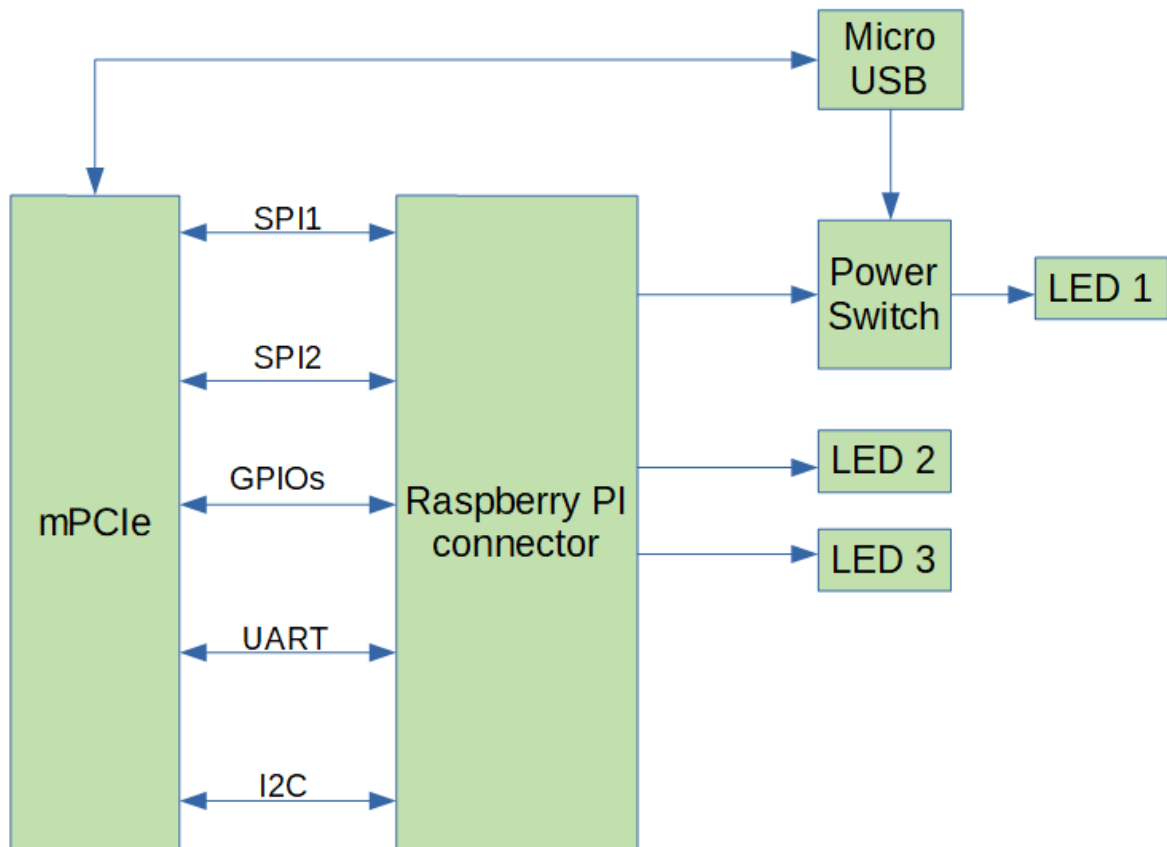


Figure 1. EMB-RasPI-130x-Cape Block Diagram.

2.2 Hardware description

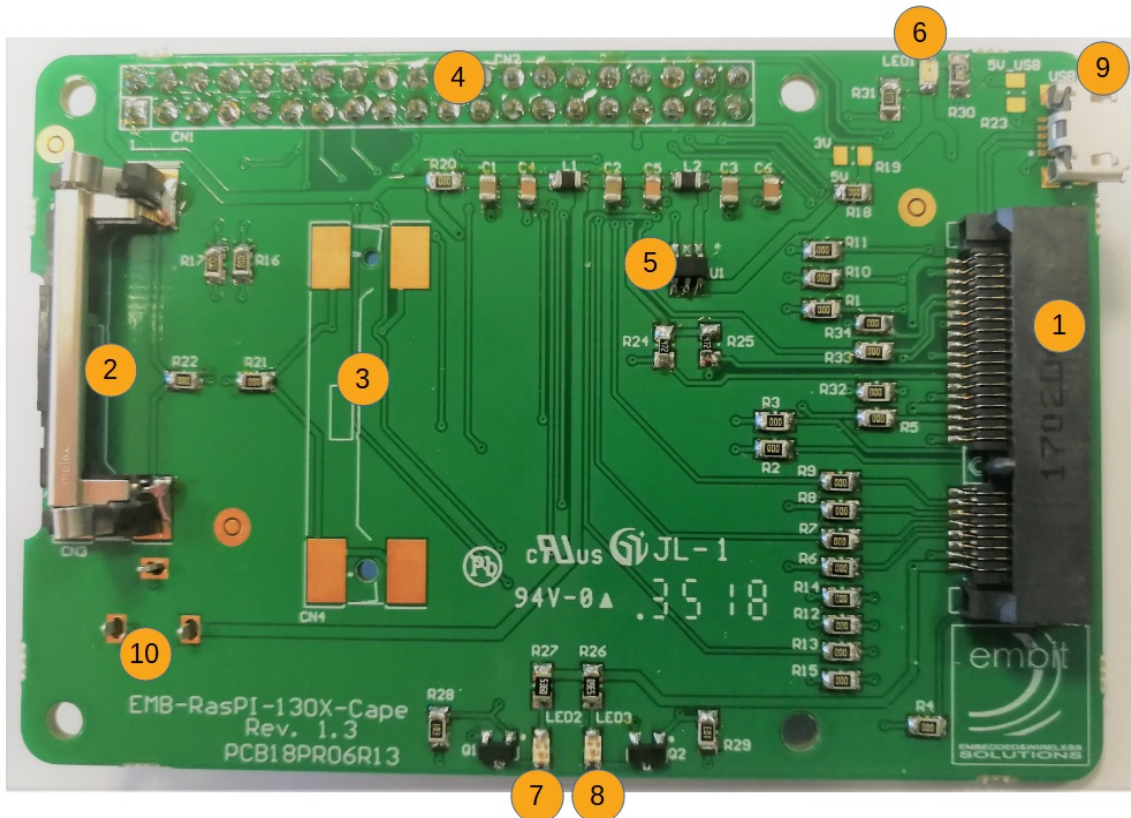


Figure 2: EMB-RasPI-130x-Cape rev.1.3 board (Top view).

1. mPCIe Connector.

Connector for EMB-LR1301-mPCIe or EMB-LR1308-mPCIe board.

2-3. mPCIe Latch.

Latch for the EMB-LR1301-mPCIe board (2) and latch for the EMB-LR1308-mPCIe board (3).

4. Raspberry PI Connector.

Connector for the Raspberry PI 3 model B+.

5. Power Switch.

Switch to power on/off the EMB-LR1301-mPCIe board. It is controllable by Raspberry PI GPIO.

6-7-8. LEDs.

Green (6) LED (power on indicator); yellow (7) and blue (8) LEDs controllable by two Raspberry PI GPIOs.

9. Micro USB Port.

Used to power up all the system (Raspberry PI 3+ EMB-RasPI-130x-Cape + EMB-LR1301-mPCIe) (Optional for EMB-LR1301-mPCIe) and for USB communication if used the EMB-LR1308-mPCIe.

10. Jack Connector.

Used to power up all the system (Raspberry PI + EMB-RasPI-130x-Cape + EMB-LR1301-mPCIe) (Optional, mounted on the bottom side).

There are 3 ways to power on the board (and carry the power to the EMB-LR1301-mPCIe or EMB-LR1308-mPCIe board). They are: (1) from the Raspberry PI connector (suggested one), (2) from the USB connector and (3) from the Jack connector.

2.3 Hardware Setup

The hardware setup for creating the LoRa gateway is very simple. Just mount the EMB-LR1301-mPCIe (or the EMB-LR1308-mPCIe) into the mini PCI express connector and then mount the **EMB-RasPI-130x-Cape** onto the Raspberry PI 3.

See picture below.

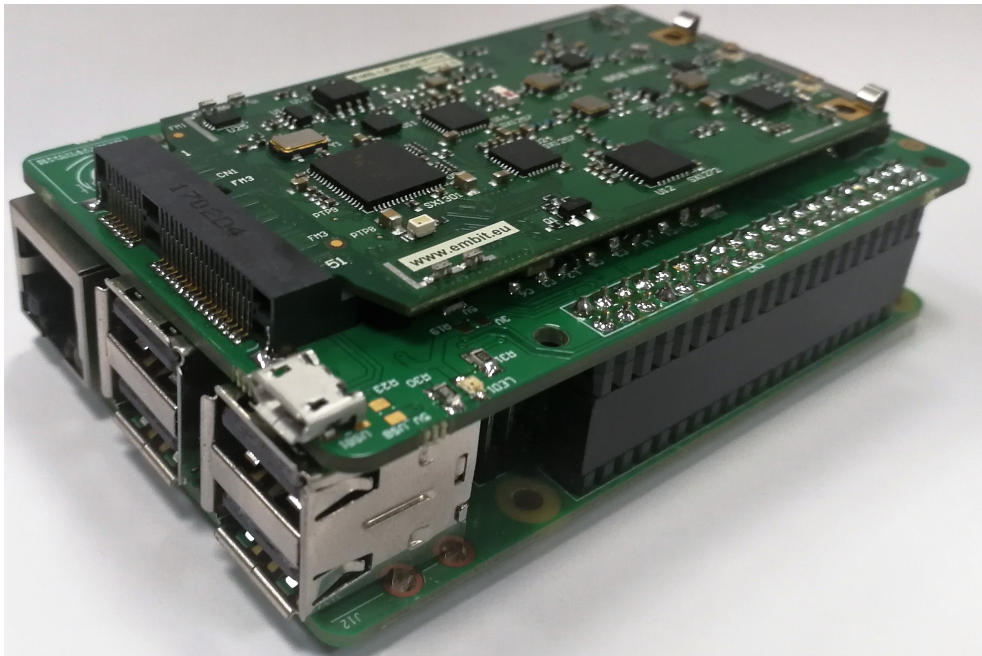


Figure 3. LoRa gateway with EMB-1301-mPCIe + EMB-RasPI-1301-Cape + Raspberry PI 3 model B+.

3 Connections

3.1 Pin Out Description

The table below gives the description of the pin out of the connector for Raspberry PI 3.

Number	Pin Name	Type	Description
1	3V3A	Power	+3.3V
2	5V0A	Power	+5V
3	SDA	Input/Output	I2C Crypto Serial Data
4	5V0B	Power	+5V
5	SCL	Output	I2C Crypto Serial Clock
6	GND_A	Power (GND)	Ground
7	GPIO04	Output	SX1301 Reset Pin, active low
8	TXD	Output	GPS Serial Interface (TX) (for SX1301 only)
9	GND_B	Power (GND)	Ground
10	RXD	Input	GPS Serial Interface (RX) (for SX1301 only)
11	GPIO17	Output	Power Enable
12	GPIO18	Output	GPS Reset pin, active low (for SX1301 only)
13	GPIO27	Output	LED2
14	GND_C	Power (GND)	Ground
15	GPIO22	Output	LED3
16	GPIO23	Output	FPGA Configuration Reset, active low
17	3V3B	Power	+3.3V
18	GPIO24	Input	FPGA Configuration Done
19	SPI_MOSI	Input	SX1301 SPI MOSI (for SX1301 only)
20	GND_D	Power (GND)	Ground
21	SPI_MISO	Output	SX1301 SPI MISO (for SX1301 only)
22	GPIO25	Input	GPS PPS Input (for SX1301 or for external GPS module)
23	SPI_CLK	Output	SX1301 SPI Clock (for SX1301 only)
24	SPI_CE0	Output	SX1301 SPI Chip Select (for SX1301 only)
25	GND_E	Power (GND)	Ground
26	SPI_CE1	NC	Not Connected
27	ID_SD	NC	Not Connected

28	ID_SC	NC	Not Connected
29	GPIO05	NC	Not Connected
30	GND_F	Power (GND)	Ground
31	GPIO06	NC	Not Connected
32	GPIO12	Input	Packet Sent IRQ (for SX1308 only)
33	GPIO13	Output	STM32 BOOT0 pin (for SC1308 only)
34	GND_G	Power (GND)	Ground
35	GPIO19	Output	FPGA SPI MISO
36	GPIO16	Output	FPGA SPI Chip Select
37	GPIO26	Output	STM32 Reset Pin, active low (for SX1308 only)
38	GPIO20	Input	FPGA SPI MOSI
39	GND_H	Power (GND)	Ground
40	GPIO21	Output	FPGA SPI Clock

Table 1: Raspberry PI 3 Connector Pin Out.

4 Electrical Characteristics

4.1 Absolute Maximum Ratings

Parameter	Value	Unit
Power Supply Voltage	+5.5	Vdc
Storage Temp. Range	-50 to +150	°C

Table 2: Absolute maximum ratings.

4.2 Operating Conditions

Parameter	Min	Max	Unit
Power Supply Voltage (Vcc)	+5	+5.5	V
Operating Temperature range	-40	+85	°C

Table 3: Operating Conditions.

5 References

- [1] Embit, EMB-LR1301-mPCIe datasheet, from www.embit.eu
- [2] Raspberry PI 3 Model B+ specifications, from www.raspberrypi.org

6 Disclaimer of liability

The user must read carefully all the documentation available before using the product. In particular, care must be taken in order to comply with the regulations (e.g., power limits, duty cycle limits, etc.).

6.1 Handling Precautions



This product is an ESD sensitive device. Handling precautions should be carefully observed.

6.2 Limitations

Every operations involving a modification on the internal components of the module will void the warranty.

6.3 Disclaimer of Liability

The information provided in this and other documents associated to the product might contain technical inaccuracies as well as typing errors. Regulations might also vary in time. Updates to these documents are performed periodically and the information provided in these manuals might change without notice. The user is required to ensure that the documentation is updated and the information contained is valid. Embit reserves the right to change any of the technical/functional specifications as well as to discontinue manufacture or support of any of its products without any written announcement.

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