

## Lima has 802.11N 2x2 radio supporting up to 300 Mbps data-rate and comes in two versions: commercial or industrial temperature

Lima is a QCA 4531 chipset based module with a 650 MHz CPU and 802.11N 2x2 (MIMO) radio. Module is available in two temperature ranges: commercial\* (Lima) and industrial\*\* (Lima-I).

Lima is a surface mountable, dual-sided, Wi-Fi enabled Linux module for the (IoT) internet of everything applications.

Faster CPU, 300 Mbps data-rate, low power consumption, larger 32 MB flash memory and a development kit with more interfaces (e.g. PCIe) are the key differentiators from Carambola 2 module.

OpenWRT linux distribution source code is available on GitHub <https://github.com/8devices> and is supported by our growing community on <http://www.8devices.com/community> forum.

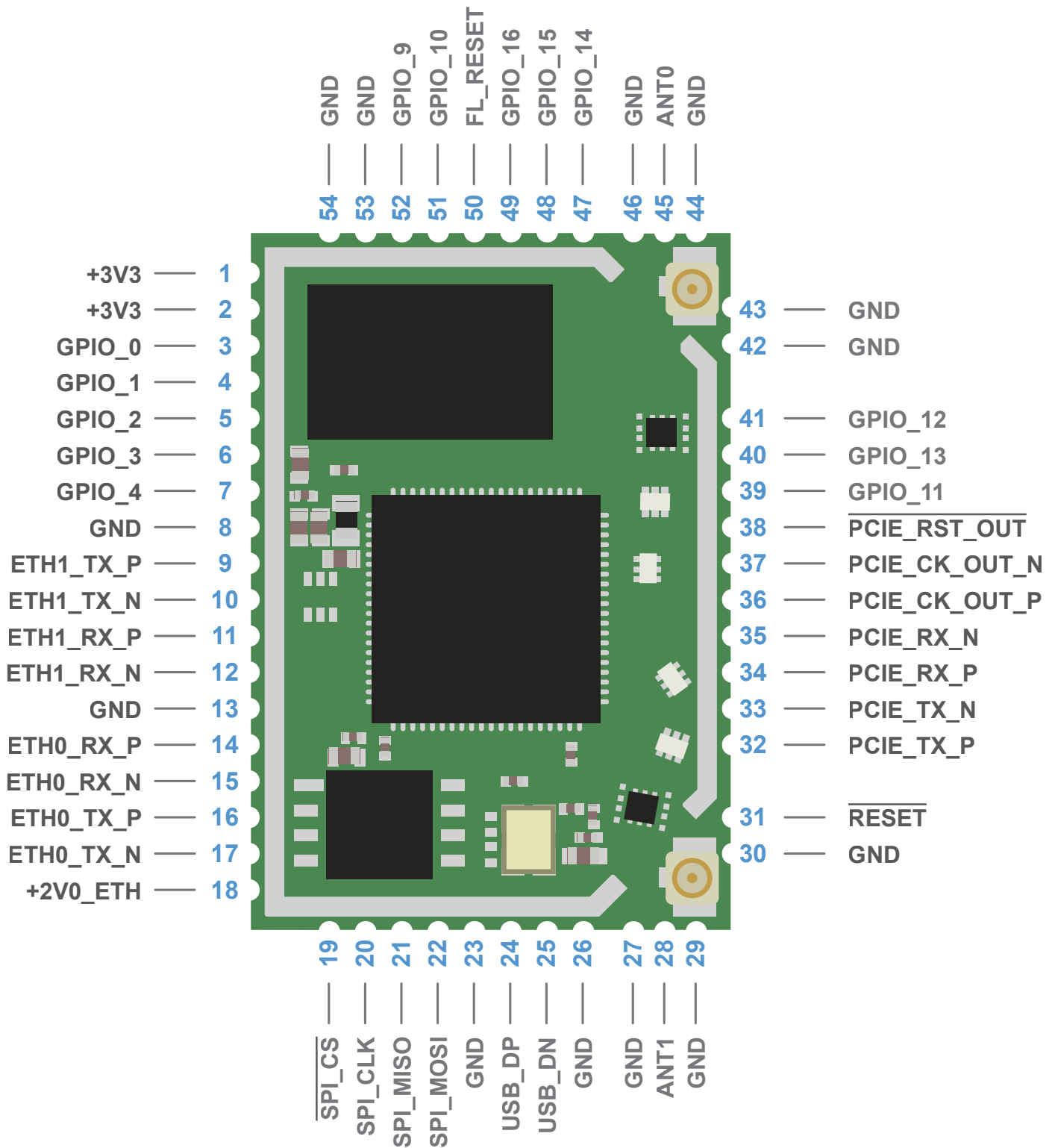
\*Commercial temperature range: 0 - 65° C

\*\*Industrial temperature range: -40 - 85° C

### Quick specs

- 802.11 b/g/n, 2.4 GHz, 2x2 MIMO, 300 Mbps data rate, 21 dB per chain output power
- U.FL connectors or external pin for external antenna
- 32 MB FLASH, 64 MB DDR2 RAM
- Linux friendly , OpenWRT flash image and source code are available for download on [www.8devices.com/wiki\\_lima](http://www.8devices.com/wiki_lima)
- CPU – QCA 4531, 650 MHz clock speed
- Small form factor (25 by 35 mm)
- Surface mountable, dual-side design
- Industrial and commercial temperature range models
- Available interfaces - USB 2.0 host, 2 x Ethernet, UART, PCIe, GPIO, JTAG

## Pinout Information



Pin	Name	I/O	Description
1	+3V3	PI	+3V3 digital power supply
2	+3V3	PI	+3V3 digital power supply
3	GPIO_0, JTAG TCK	(I/O)	General-purpose digital I/O pin
4	GPIO_1, JTAG TDI	(I/O)	General-purpose digital I/O pin
5	GPIO_2, JTAG TDO	(I/O)	General-purpose digital I/O pin
6	GPIO_3, JTAG TMS	(I/O)	General-purpose digital I/O pin
7	GPIO_4 Bootstrap L - do not pull up	(I/O)	General-purpose digital I/O pin
8	GND	-	Ground connection
9	ETH1_TX_P	OA	LAN port 1 positive TX connection
10	ETH1_TX_N	OA	LAN port 1 negative TX connection
11	ETH1_RX_P	IA	LAN port 1 positive RX connection
12	ETH1_RX_N	IA	LAN port 1 negative RX connection
13	GND	-	Ground connection
14	ETH0_RX_P	IA	LAN port 0 positive RX connection
15	ETH0_RX_N	IA	LAN port 0 negative RX connection
16	ETH0_TX_P	OA	LAN port 0 positive TX connection
17	ETH0_TX_N	OA	LAN port 0 negative TX connection
18	+2V0_ETH	PO	+2V Ethernet power supply
19	SPI_CS (GPIO_5)	O (I/O)	SPI chip select
20	SPI_CLK	O	SPI serial interface clock
21	SPI_MISO	I	Data transmission from an external device to the Lima. On reset, SPI_MISO is input, which should be interfaced with an SPI device via a resistor divider for reliability.
22	SPI_MOSI	O	Data transmission from the Lima to an external device. On reset, SPI_MOSI is output and can directly interface with a SPI device such as a serial flash.
23	GND	-	Ground connection
24	USB1_DP	IA/OA	Positive USB connection
25	USB1_DN	IA/OA	Negative USB connection
26	GND	-	Ground connection
27	GND	-	Ground connection
28	ANT1	IA/OA	External antenna connection
29	GND	-	Ground connection
30	GND	-	Ground connection
31	RESET	I	Hardware reset
32	PCIE_TX_P	OA	PCIE positive TX connection
33	PCIE_TX_N	OA	PCIE negative TX connection
34	PCIE_RX_P	IA	PCIE positive RX connection
35	PCIE_RX_N	IA	PCIE negative RX connection
36	PCIE_CK_OUT_P	OA	PCIE positive clock connection
37	PCIE_CK_OUT_N	OA	PCIE negative clock connection
38	PCIE_RST_OUT	O	PCIE reset connection

Pin	Name	I/O	Description
39	GPIO_11	(I/O)	General-purpose digital I/O pin
40	GPIO_13 Bootstrap L	(I/O)	General-purpose digital I/O pin
41	GPIO_12	(I/O)	General-purpose digital I/O pin
42	GND	-	Ground connection
43	GND	-	Ground connection
44	GND	-	Ground connection
45	ANT0	IA/OA	External antenna connection
46	GND	-	Ground connection
47	GPIO_14	(I/O)	General-purpose digital I/O pin
48	GPIO_15 Bootstrap L	(I/O)	General-purpose digital I/O pin
49	GPIO_16 Bootstrap L	(I/O)	General-purpose digital I/O pin
50	FLASH_RESET	(O)	External memory flash reset (active LOW)
51	GPIO_10 Bootstrap_L, UART TX	(I/O)	General-purpose digital I/O pin
52	GPIO_9 UART RX	(I/O)	General-purpose digital I/O pin
53	GND	-	Ground connection
54	GND	-	Ground connection

**IA** analog input signal  
**I** digital input signal  
**I/O** digital bidirectional signal  
**OA** analog output signal

**O** digital output signal  
**PI** power input  
**PO** power output

## General GPIO characteristics

Parameter	Units	Min	Max
Output high voltage	V	2.44	2.8
Output low voltage	V	-0	0.1
Input high voltage	V	1.93	3.0
Input low voltage	V	-0.3	0.75
Current drive	mA	-	24

## Bootstrap

Bootstrap HIGH or LOW means that during bootstrap process (first few milliseconds when the device is turned on) these pins need to be in the specified state. If pins are not in required state then device will not boot correctly.

## GPIO

If you have some hobby project, it is advised to use GPIO pins 11, 12, 14 without any worries. These pins are not used during the booting process. Other GPIO pins should not be used if you don't know exactly what you want to achieve, because they are used during the boot process (bootstrap).

## SPI interface

SPI interface must be used carefully, it's connected to the internal FLASH memory and CS1 or CS2 must be used.

## Power supply

It is recommended to use pin 1 and pin 2 to give power supply to the module. Use 100nF ceramic capacitors for decoupling.

## Software

8devices is providing OpenWRT linux distribution source code with necessary patches on GitHub <https://github.com/8devices> and is supported by our growing community on <http://www.8devices.com/community> forum.

## Power ratings

For the optimal performance and stability recommended power ratings must be used. Device might malfunction outside minimum and maximum power ratings.

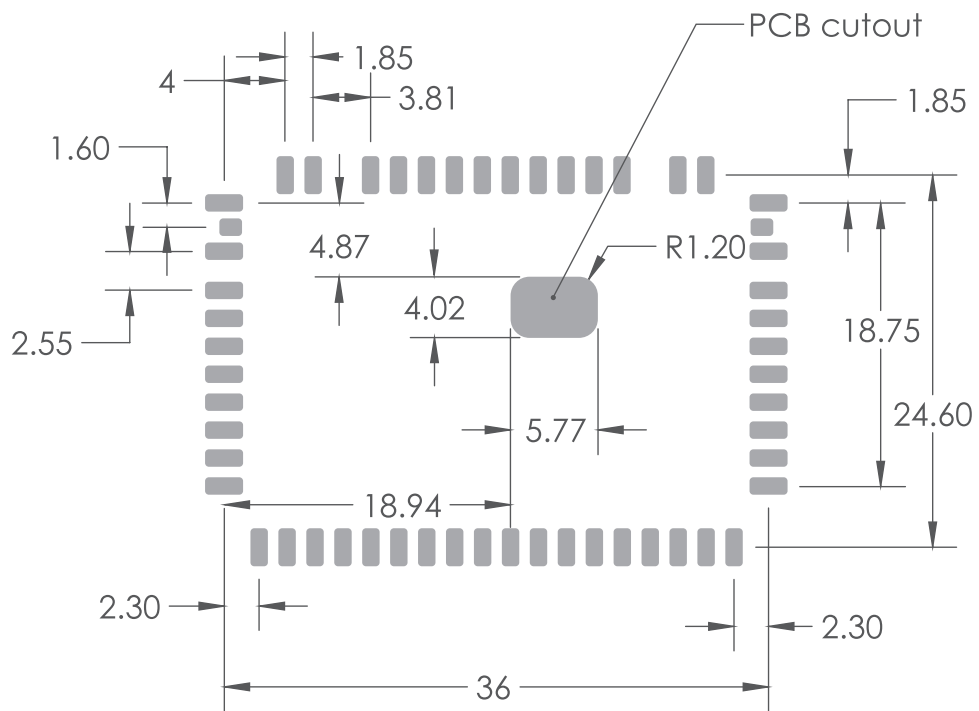
Parameter	Units	Min	Nominal	Max
Supply Voltage (+3V3)	V	3.14	3.3	3.47
Network Transformer Voltage (+2V0_ETH)	V	1.9	2.0	2.15
Current consumption	mA	-	-	1200

## Operating conditions

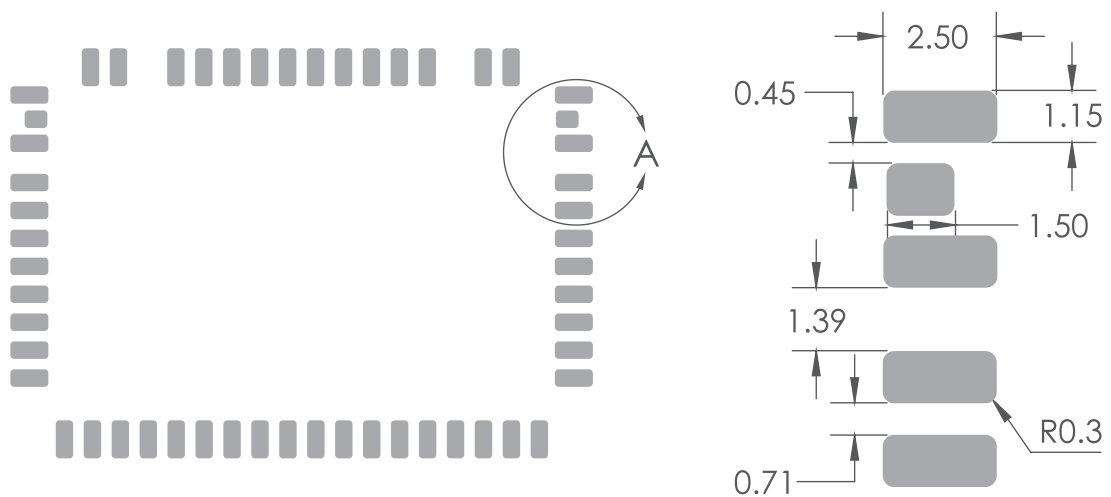
The module can operate in a wide temperature range and different conditions depending on the enclosure. The following guidelines guarantee that it will work correctly.

Parameter	Units	Min	Max
Working temperature (Lima/ Lima-I)	°C	0/ -40	65/ 85
Storage temperature (Lima/ Lima-I)	°C	-40	70/ 90
Humidity	%RH	10	90
Storage humidity	%RH	5	90

## PCB footprint



## Soldering paste footprint

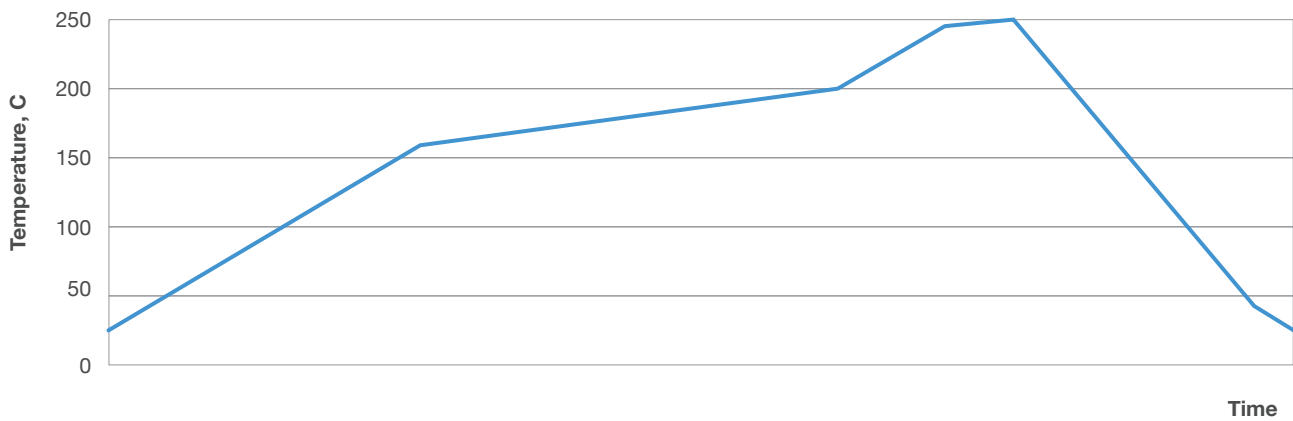


DETAIL A  
SCALE 6 : 1

## Reflow profile recommendation

Ramp up rate	3°C/second max
Maximum time maintained above 217°C	120 seconds
Peak temperature	250°C
Maximum time within 5°C of peak temperature	20 seconds
Ramp down rate	6°C/second max

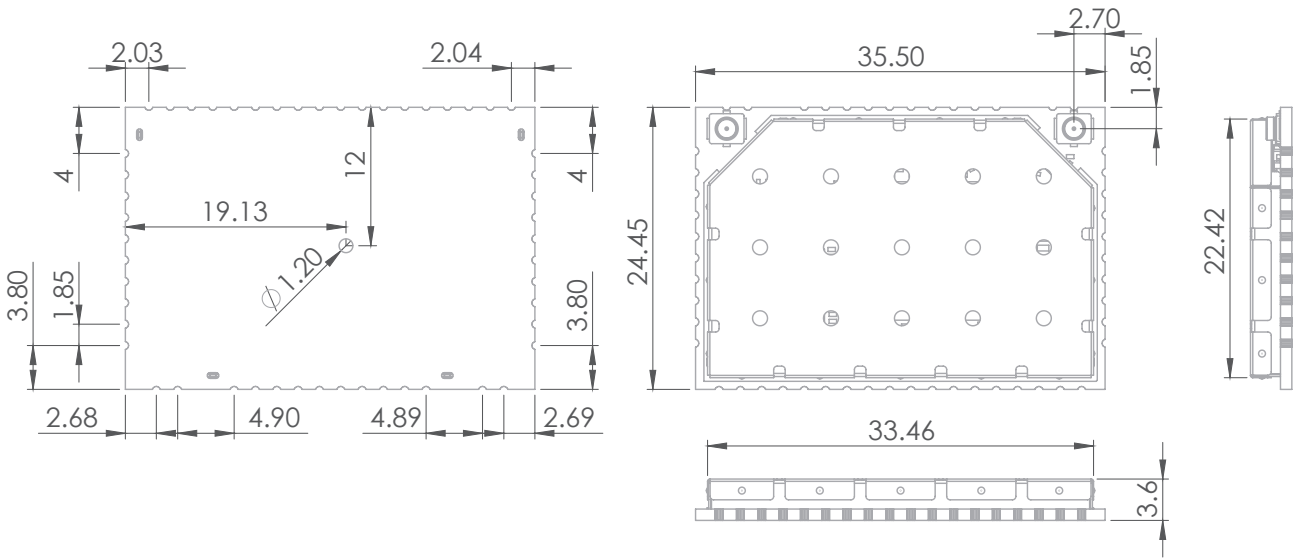
## Reflow profile



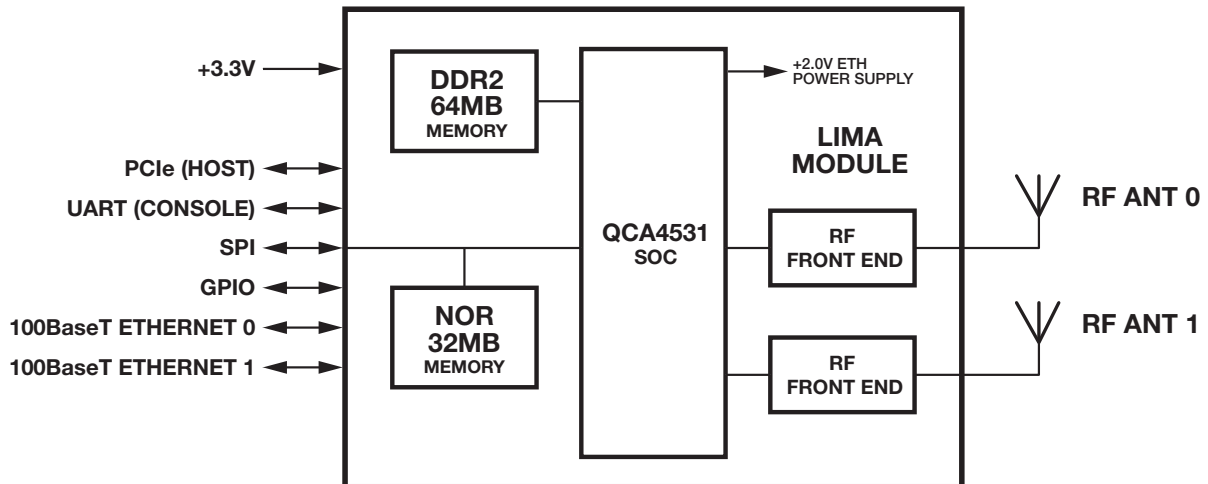
## Radio characteristics

Receive sensitivity (dBm)	802.11N (20 MHz)	7.2 Mbps	14.4 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps
			-90	-90	-88	-83	-79	-75	-74
Output power (dBm)	802.11N 20 MHz	15 Mbps	30 Mbps	45 Mbps	60 Mbps	90 Mbps	120 Mbps	135 Mbps	150 Mbps
			-90	-89	-87	-83	-78	-73	-72
Output power (dBm)	802.11N 40 MHz	7.2 Mbps	14.4 Mbps	21.7 Mbps	28.9 Mbps	43.3 Mbps	57.8 Mbps	65 Mbps	72.2 Mbps
			20	19	19	18	18	17	16.5
Output power (dBm)	802.11N 40 MHz	15 Mbps	30 Mbps	45 Mbps	60 Mbps	90 Mbps	120 Mbps	135 Mbps	150 Mbps
			20	19	19	18	18	17	16.5

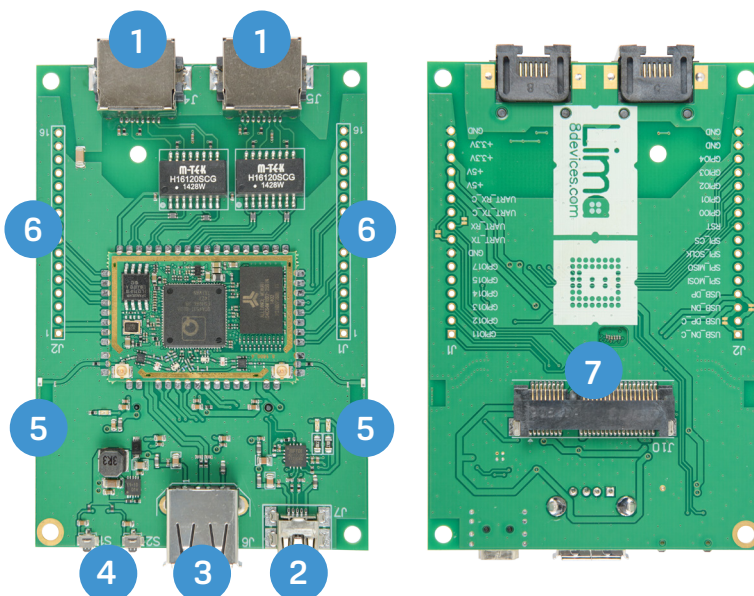
## Module dimensions



## Block diagram



## Development kit



- 1 - 2 x 100 Base-T Ethernet ports
- 2 - Mini USB Type-A socket (console + power)
- 3 - USB Type-A socket
- 4 - Buttons: S1 - programmable (GPIO connected), S2 - reset
- 5 - Two integrated antennas
- 6 - 2.45 mm pitch connector holes
- 7 - MINI PCIe socket