

Note: This infosheet is preliminary. Updated versions will follow soon...

*IoT Edge Gateway with Bluetooth LE 5, WiFi, Ethernet, Power-Over-Ethernet (opt.), LTE (opt.)*

## Available Options

Model	Wireless	CPU System	Interfaces
IoT Gateway "BASE"	Bluetooth LE 5.0 WiFi	Embedded Linux / OpenWRT	- Ethernet 100MBit - MicroUSB (Console and Power) - external USB-A 2.0 - Micro-SD Card Slot
IoT Gateway "POE"			like "BASE" plus - Power over Ethernet (PoE Mode B)
IoT Gateway „LTE“			like "BASE" plus - LTE Cat 1 - no external USB-A 2.0

Note: A GPS/GNSS receiver with integrated antenna is available optionally on request.

## Overview

The IoT-Gateway is a compact device (117mm x 73mm x 25mm) featuring a powerful CPU with Embedded Linux / OpenWRT, as well as wireless standards Bluetooth 5 Low Energy / BLE 5 and 2.4GHz WiFi. Additional interfaces are a 100MBit Ethernet port, a USB 2.0 host, micro SD card and a micro USB connector for power and Linux console. In addition to this base configuration, a version with Power-Over-Ethernet (PoE) power supply as well as a version with LTE 4G cellular internet connectivity are available.

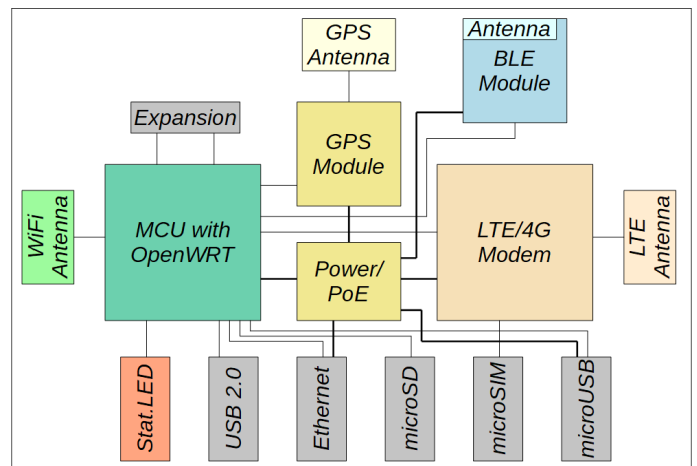


## Features

The IoT-Gateway provides the following features:

- MCU module with Linux/OpenWRT
- 2.4GHz WiFi 802bg/n
- 10/100 MBit Ethernet Port
- Power over Ethernet (PoE Mode B)
- LTE/4G Cat-1 Cellular Modem with micro SIM slot (LTE version)
- Bluetooth 5 LE Module (long range)
- micro SD-card (SDHC)
- micro USB for Power and Linux Console
- Status LED
- Internal Antennas for WiFi, BLE and LTE

See the block diagram for a brief overview on the internal structure of the IoT-Gateway.



## 2.4GHz WiFi

The IoT-Gateway provides 2.4GHz WiFi internet connectivity with the following features:

- 1T1R 2.4 GHz with 150 Mbps PHY data rate
- Legacy 802.11b/g and HT 802.11n modes
- 20/40 MHz channel bandwidth
- 802.11v
- Green AP/STA - Intelligent Clock Scaling (exclusive) - DDRII: ODT off, Self-refresh mode

## Bluetooth 5 Low Energy

The Bluetooth 5 LE / BLE 5 functionality is realized with a separate BLE module, which can receive data from Bluetooth beacons, sensors etc. or establish BLE connections to other Bluetooth devices stand-alone. It can be programmed in a simple smartBASIC programming language, which allows for implementing filtering of BLE data by MAC address, device name etc., which frees the Linux CPU from processing unwanted data.

## Power-Over-Ethernet

The PoE version of the IoT-Gateway can be powered through the RJ45 ethernet connector. The internal PoE circuit is IEEE 802.3 standard-compliant, including pre-standard (legacy) PoE support. It uses the spare pairs for power transmission, which is commonly supported by many PoE ethernet switches or PoE injector devices.

## LTE/4G Cellular

The LTE/4G version of the IoT-Gateway is equipped with a Quectel EG91 LTE-Cat 1 modem and internal multiband chip antenna. The EG91 is fully supported by OpenWRT kernel drivers. It is internally connected through USB to the OpenWRT module. The EG91 power supply can be turned on and off by the user application, thus providing lower power consumption when not connected cellular.

## Embedded Linux / OpenWRT

The IoT-Gateway is based on a Mediatek MT7688 chipset with internal 2.4GHz WiFi, 32MB flash memory, 128MB ram memory and many common peripherals like ethernet, USB, UARTs, I2C, SPI, etc.

The gateway comes with preloaded with Linux/OpenWRT and full root access is available through the console. This way any application can be added and executed as well as a complete own Linux/OpenWRT system can be installed. A description of how to set up and compile an own Linux/OpenWRT system is available.

## Configuration Interface

The standard OpenWRT Luci web interface is available for configuring the IoT-Gateway.

## External Connectors

The following picture shows all external connectors and slots.



*Connectors / Interfaces from left to right:*

**Status LED** **USB-A 2.0 Host** **RJ45 Ethernet** **micro SD-card** **micro-SIM** **micro-USB**

The connectors are also described on the product top label.

**Status LED:** The status LED is a red/green dual color LED. The green LED is fix connected as WiFi status/activity, whilst the red LED can be controlled by the user application through a GPIO signal of the Linux/OpenWRT module.

**USB-A 2.0 Host:** This USB interface can be used for connecting external peripherals, like memory sticks or other wireless RF dongles. Make sure to use this interface properly, since it does not provide an internal current limit or over-current protection.

*Note: The USB-A 2.0 host is not available on the LTE/4G cellular version of the IoT-Gateway, since USB is then used to connect the internal LTE/4G modem.*

**RJ45 Ethernet:** The ethernet interface of the IoT-Gateway is 100Base-T and almost any twisted-pair ethernet cable can be used to connect the gateway to a local network. The RJ45 connector provides two LEDs. The left LED is a power indicator and goes on as soon as the internal Linux/OpenWRT power supply is up. The right LED is the regular ethernet phy/activity LED.

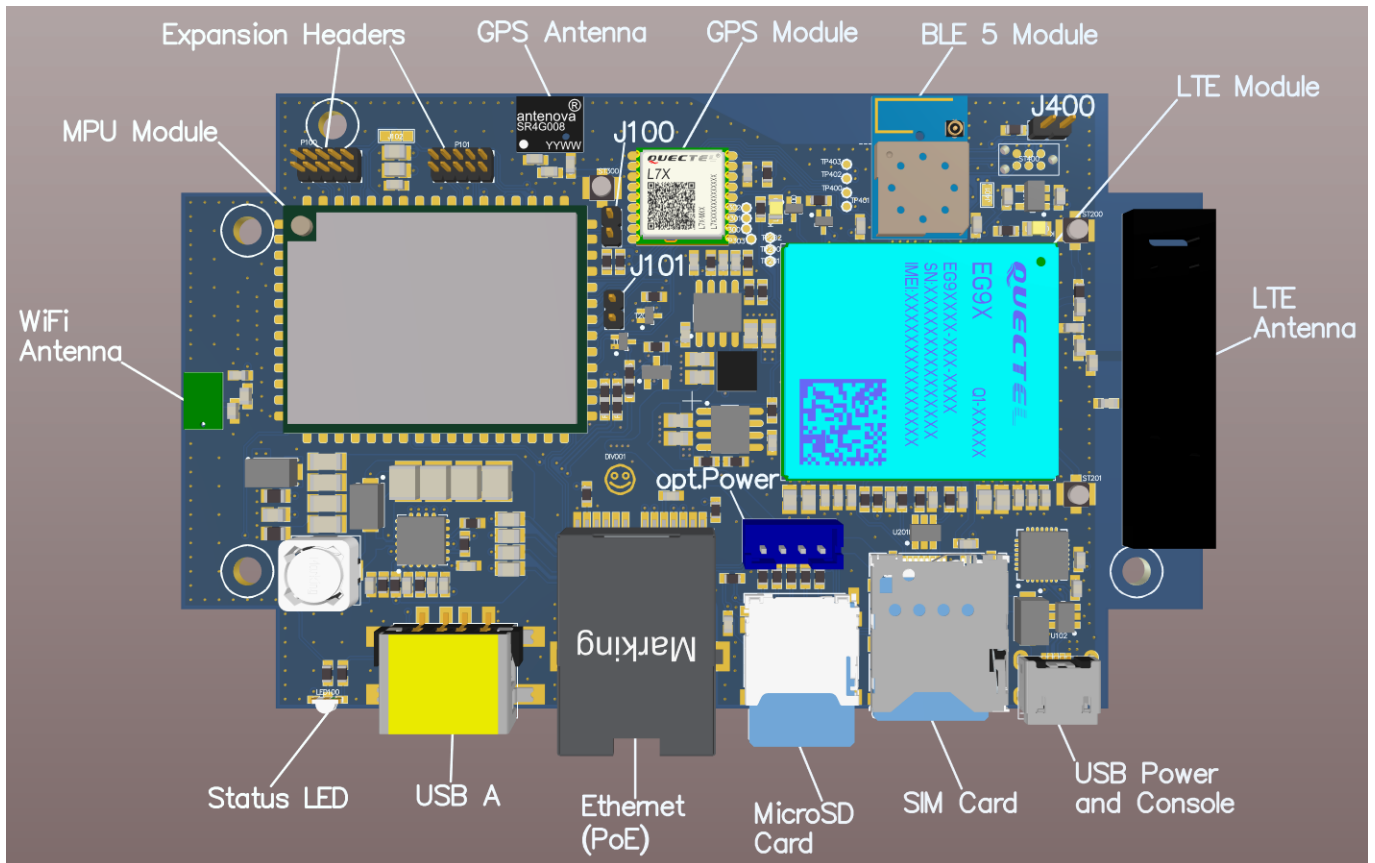
**micro SD-card:** A micro SD-card can be used as additional storage memory from within the user application. Make sure to have the proper packages/feeds compiled into the OpenWRT build.

**micro SIM-card:** When using the LTE/4G version, a micro SIM-card has to be inserted before opening a cellular internet connection. This slot is only available on the LTE/4G version.

**micro-USB:** A standard micro-USB connector is available for both connecting to the Linux console as well as powering the IoT-Gateway. When using the PoE version of the gateway, you can power the device both through the RJ45 ethernet connection with a proper ethernet PoE switch or PoE injector or you can power it through the micro-USB port as well. For the BASE and PoE version make sure to use a 1A power supply, whilst the LTE/4G version requires at least a 2.5A power supply.

## Internal Connectors and Expandability

The following picture shows the internal setup of the IoT-Gateway.



### Jumpers

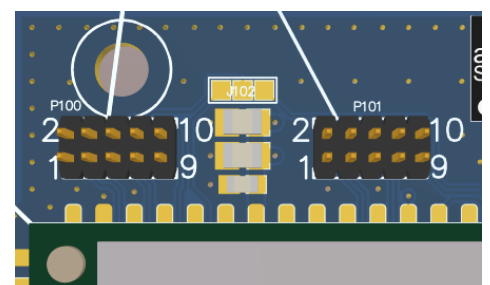
Three jumpers are available on the board. During normal operation it shouldn't be necessary to use them, but they might be helpful in case of troubleshooting.

J100	WiFi Reset	WiFi-reset of the OpenWRT module. In combination with the J101 MCU reset, this jumper provides configuration options for firmware upgrade and bootloader upgrade.
J101	MCU Reset	Closing this jumper will reset the OpenWRT module.
J400	nAUTORUN	The BL654 Bluetooth module is free programmable with smartBASIC applications. The applications can be configured to autostart after power up. Since this might be unwanted and can even brick the module, closing this jumper on power up will prevent the autostart of any smartBASIC application.

### Expansion Headers

The IoT-Gateway provides two internal expansion headers with common interfaces like UART, I2C, SPI and GPIOs. Thus small customer specific add-on boards with further peripherals and components can be developed and used. Examples are RS485 / Modbus connection, analog measurement boards for sensor connection and many more.

If you want to design an own add-on board, feel free to contact us for further information on pinout, dimensions and PCB template.



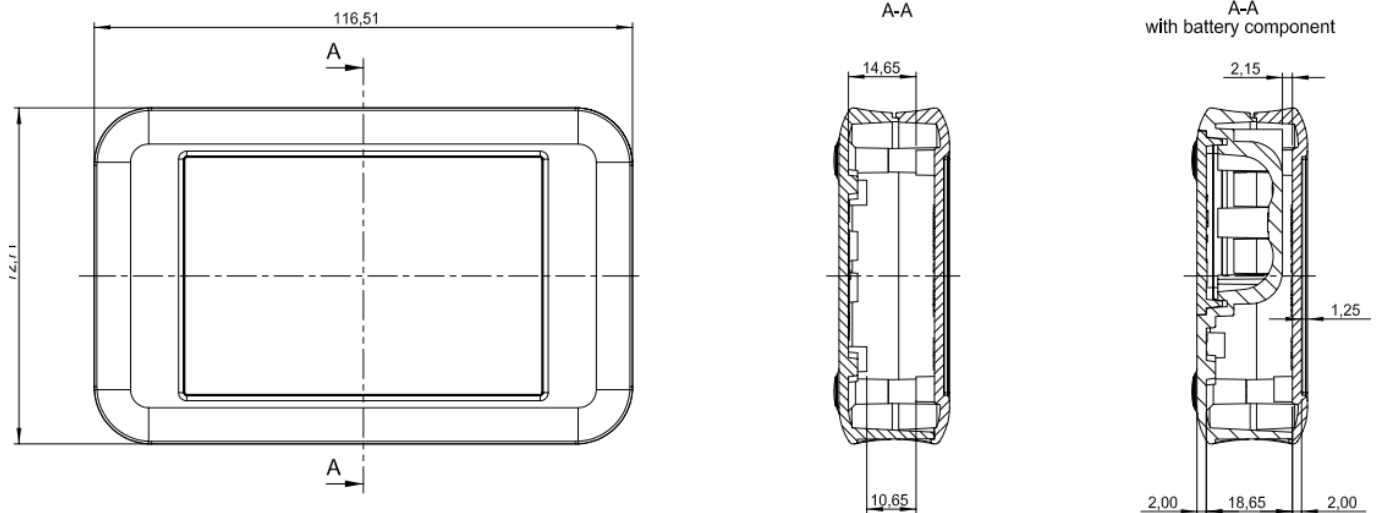
## Operating Characteristics

The following table shows the main characteristics for reference. Always refer to the components data sheets for detailed description of electrical and thermal characteristics.

Symbol	Parameter	Condition	Min	Typ	Max	Units
Vcc	External Supply Voltage	micro USB	3.9	5.0	5.5	V
		PoE		37	42	V
V33	Internal Supply Voltage	MCU, BLE		3.3		V
		LTE/4G		3.8		V
Icc	Power Supply Current  (Icc strongly depends on MCU activity, like frequency, RF activity, LTE activity, etc. The values denoted here are for reference only and can differ from final application values.)	Idle		1.2		W
		Ethernet active		1.5		W
		LTE active		2	8	W
T	Operating Temperature		-40		+85	°C

## Dimensions

The IoT-Gateway comes with a standard plastic enclosure. Dimensions are shown below.



An IP67 proof outdoor enclosure version will be available soon.

## Design and Handling Precautions

This device – just like any other semiconductor devices – is susceptible to damage by ESD. Suitable precautions should be taken when handling and transporting devices. The possible damage to devices depends on the circumstances of the handling and transporting, and the nature of the device. The extent of damage can vary from immediate functional or parametric malfunction to degradation of function or performance in use over time. Devices suspected of being affected should be replaced.

## Declaration of Electro Magnetic Conformity of the m2m Germany „IoT-Gateway“

Hereby, m2m Germany (further: m2m), declares that this product is in compliance with the essential requirements and other relevant provisions of the following directives:



Directive 2014/53/EU of the European Parliament and of the Council of April, 16th 2014 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Directive 2014/30/EU of the European Parliament and of the Council of February, 26th 2014 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Directive 2014/35/EU of the European Parliament and of the Council of February, 26th 2014 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Commission Regulation (EC) No 278/2009 of 6 April 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies.

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