

specification: IMP002

version 20130221

1. Product description

1.1 General description

The imp is a complete wireless network node in a module. It is available both in a memory card form-factor (imp001) and in a solder-down module form-factor (imp002). It works in conjunction with the imp service to allow easy connection of any device to the internet.

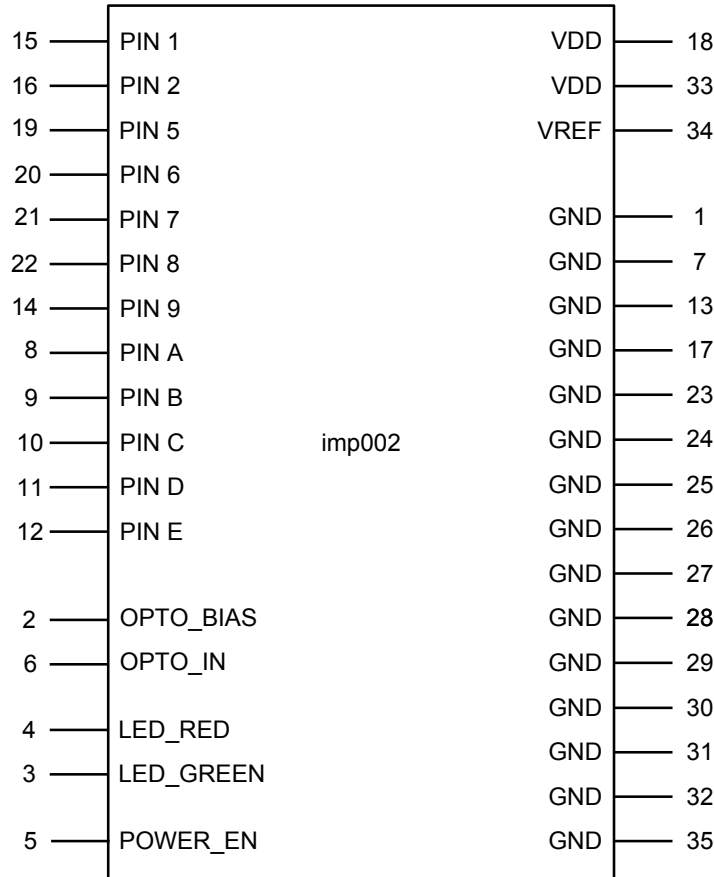
1.2 Features

- 802.11 b/g/n WiFi
 - 20MHz 11n channels, 1 x 1
 - +16.75dBm max output power (802.11b)
 - -97dBm typical sensitivity (1Mbps)
 - Integrated antenna with 2.5dBi max gain
 - TX power
 - 802.11b 16.5dBm +/-1.5dBm
 - 802.11g 14.0dBm +/-1.5dBm
 - 802.11n 12.75dBm +/-1.5dBm
- 32-bit Cortex M3 processor
 - Robust embedded operating system with fail-safe firmware updates
 - Virtual machine for vendor firmware
- LED drive for red/green status LEDs
- Phototransistor input for our patent-pending BlinkUp technology to provide optical configuration
- 12 user selectable I/Os
 - GPIO, PWM, Analog input & output
 - SPI (2 channels), UART (4.5 channels), I2C (2 channels)
- Low power 6uA sleep mode
- FCC, CE, IC C-Tick certified

2. imp terminology

Term	Description
API	The Application Programming Interface through which imp scripts may access hardware and cloud functions
BlinkUp	Our patent-pending optical programming process for commissioning an imp using a smart device (phone or tablet)
Commissioning	Initializing an imp by associating it with a user account and WiFi credentials, usually via BlinkUp
electric imp	http://electricimp.com/aboutus/ (lower case by brand convention)
Planner	The imp cloud service which provides for the connection and configuration of imps and gateway communication with other devices
Registration	The process by which an imp card or module becomes associated with host hardware
Server	The electric imp cloud service with which imps communicate
Firmware	Vendor provided code that runs within the imp's virtual machine
Agent	Vendor provided code that runs within the imp service

3. Pin assignments



4. Pin description

Pin number	Pin name	Description
1, 7, 13, 17, 23 to 32 & 35	GND1 to 15	Ground
18, 33	V _{DD}	Power input
2	OPTO_BIAS	Phototransistor power; connects to collector of phototransistor
6	OPTO_IN	Phototransistor signal; connects to emitter of phototransistor, which is connected to ground via a bias resistor (typically 100k)
3	LED_GREEN	Green LED open-drain output (connect to cathode of LED)
4	LED_RED	Red LED open-drain output (connect to cathode of LED)
5	POWER_EN	Active-high output for boost DCDC enable. Is driven high when the module requires a 2.5-3.3v power supply, which is generally when WiFi is active. This pin has an internal pulldown.
34	V _{REF}	ADC reference voltage input. If unused, connect to V _{DD}

8 to 12, 14 to 16 & 19 to 22	PIN1, 2, 5 to E	I/O, please refer to Pin mux table
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5. Pin mux

In addition to acting as a GPIO, each pin on the imp002 can be configured to one of several specialized functions. While pins may only have one function at a time, they may be reconfigured during run-time to change function as needed. For example, a pin may first be configured as a DAC and then reconfigured as an ADC. Additionally, not all the pins in a hardware function need to be assigned to that function. For example, pins 8 and 9 could be used as UART and pins 1 and 2 could be used as I2C.

All I/O pins are initially tri-stated.

The imp002 can be woken from low power sleep mode with a rising edge on PIN1. If this signal is pulsed, the minimum pulse width is 20ms.

Pin	GPIO	UART	I2C	SPI	DAC	ADC	PWM	Pulse Count	Wake
PIN 1	Yes	U1-CTS, U3-TX	I1-SCL	SPI1-SCLK	Yes	Yes	Yes	Yes	Yes
PIN 2	Yes	U1-RTS, U3-RX	I1-SDA	SPI2-MISO		Yes	Yes		
PIN 5	Yes	U2-TX		SPI2-SCLK	Yes	Yes	Yes		

PIN 6	Yes	U6-TX							
PIN 7	Yes	U2-RX		SPI2-MOSI		Yes	Yes		
PIN 8	Yes	U1-TX	I2-SCL	SPI1-MOSI		Yes	Yes		
PIN 9	Yes	U1-RX	I2-SDA	SPI1-MSO		Yes	Yes		
PIN A	Yes					Yes	Yes		
PIN B	Yes	U4-RX				Yes	Yes		
PIN C	Yes						Yes		
PIN D	Yes	U1-RX							
PIN E	Yes	U6-RX							

7. Electrical characteristics

Parameter	Condition	Min	Typ	Max	Unit.
Operating temperature		-20		55	°C
Operating voltage		1.8[1]	3.0	3.6	V
Sleep current	WiFi is off, processor sleep, RTC on, nvrnram preserved		6		µA
Operating current	Normal operation, WiFi on	70	80	400[2]	mA
	Power-save mode enabled	2	5	400[2]	mA
Pin drive	Maximum current drive on I/O pins			4	mA
V _{IL}	I/O input low level voltage	V _{SS} -0.3		0.3V _{DD}	V
V _{IH}	I/O input high level voltage	0.7V _{DD}		3.6	V
LED current sink				8	mA
Load capacitance	Pins 1 to 9		20		pF
	Pins 10 to 14		5		pF

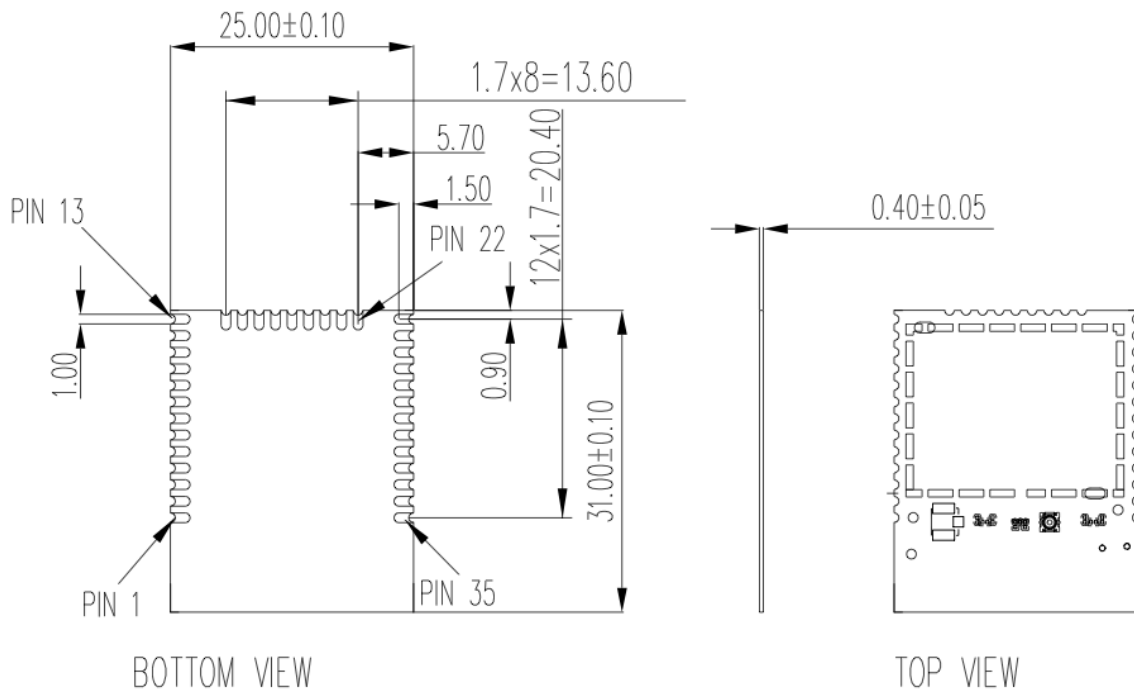
I/O input leakage current	$V_{SS} \leq V_{IN} \leq V_{DD}$			4	μA
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[1] WiFi requires 2.5v minimum for operation, but user code can run at 1.8v. The POWER_EN pin is driven to enable an external boost converter that will provide 2.5v+ during WiFi usage.

[2] 400mA current is during worst-case TX events. These are a maximum of ~4.8ms long (802.11b 1Mbps)

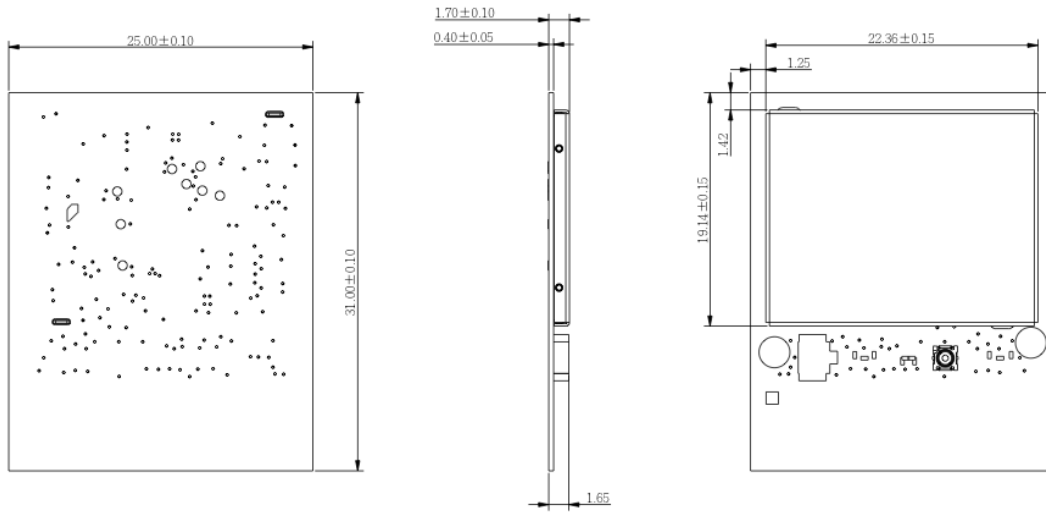
8. Package outline

PCB dimensions



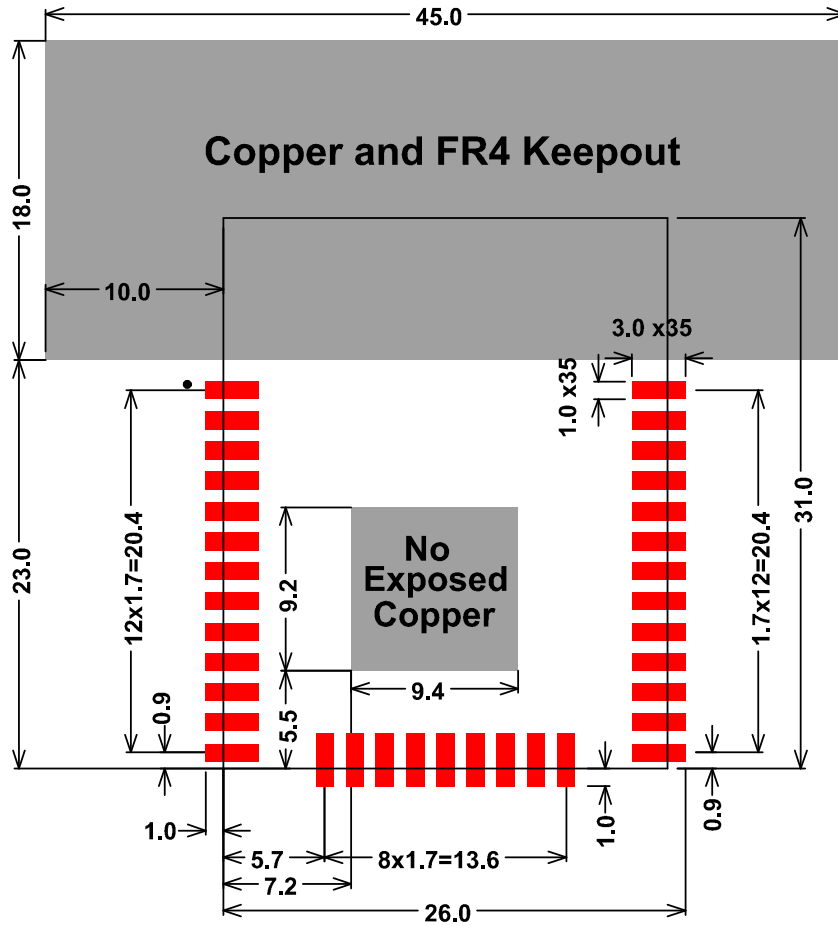
(all dimensions are in mm unless otherwise specified)

Overall module dimensions



(all dimensions are in mm unless otherwise specified)

9. Recommended footprint



(all dimensions are in mm unless otherwise specified)

FCC Caution: To assure continued compliance, (example - use only shielded interface cables when connecting to computer or peripheral devices). Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Version	Change description
20121217	updated mechanical drawings to reflect the smaller coax connector
20130103	updated recommended footprint to have a cleaner look
20130122	changed PIN 10 to 14 to PIN A to E
20130218	added FCC caution statement
20130219	added TX power in paragraph 1.2
20310221	updated TX power values

FCC Warning

Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

For P15B equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Information To Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulations. Host system must be labeled with "Contains FCCID:PPQ-IMP002", FCC ID displayed on label.

This device is to be used only for mobile and fixed application. In order to re-use the imp Module FCC approvals the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. If antenna is installed with a separation distance of less than 20 cm from all persons or is co-located or operating in conjunction with any other antenna or transmitter then additional FCC testing may be required. End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

OEM integrators must ensure that the end user has no manual instructions to remove or install the imp module. The EUT has two antenna types (External & PIFA antenna) that as below. Antennas used for this OEM module must not exceed 2dBi gain for External Antenna, and 2.86dBi is for PIFA one for mobile and fixed operating configurations.

IC Warning

Canada — Low-power license-exempt radio communication devices (RSS-210)

a. Common information Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

b. Operation in 2.4 GHz band To prevent radio interference to the licensed service, this device is intended to be operated indoors and installation outdoors is subject to licensing.

Canada - de faible puissance exempts de licence des appareils de communication radio (CNR-210)

a. Informations communes

Son fonctionnement est soumis aux deux conditions suivantes:

1. Ce dispositif ne peut causer des interférences, et
2. Ce dispositif doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

b. Le fonctionnement en bande de 2,4 GHz Pour prévenir les interférences radioélectriques aux services sous licence, cet appareil est destiné à être exploité à l'intérieur et à l'extérieur d'installation est soumise à licence.

Information To Be Supplied to the End User by the OEM or Integrator

Modular information form OEM

Information to Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulations.

Host system must be labeled with "Contains IC: 4491A-IMP002 "

This device is to be used only for mobile and fixed application. In order to re-use the imp Module IC approvals the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. If antenna is installed with a separation distance of less than 20 cm from all persons or is co-located or operating in conjunction with any other antenna or transmitter then additional IC testing may be required. End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

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