6BEE Wireless Module
6B_MC13224

FCC ID: 2AC5J-6BMC13
IC: 12322A-6BMC13

wigwag

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The WigWag 6BMC13224 module enables organizations to quickly build 6LoWPAN enabled routers, gateways, and most importantly edge devices that interoperate natively with the WigWag platform. The 6BMC13224 can also be used with other Zigbee and 802.15.4 protocols and platforms; however, the core focus of this modules is for interoperability with WigWag's DeviceJS enabled products. This module enables edge-device design with a host microcontroller, amplified RF radio link-layer, and certifications for use in product in the United States, Canada, Australia, and the European Union.

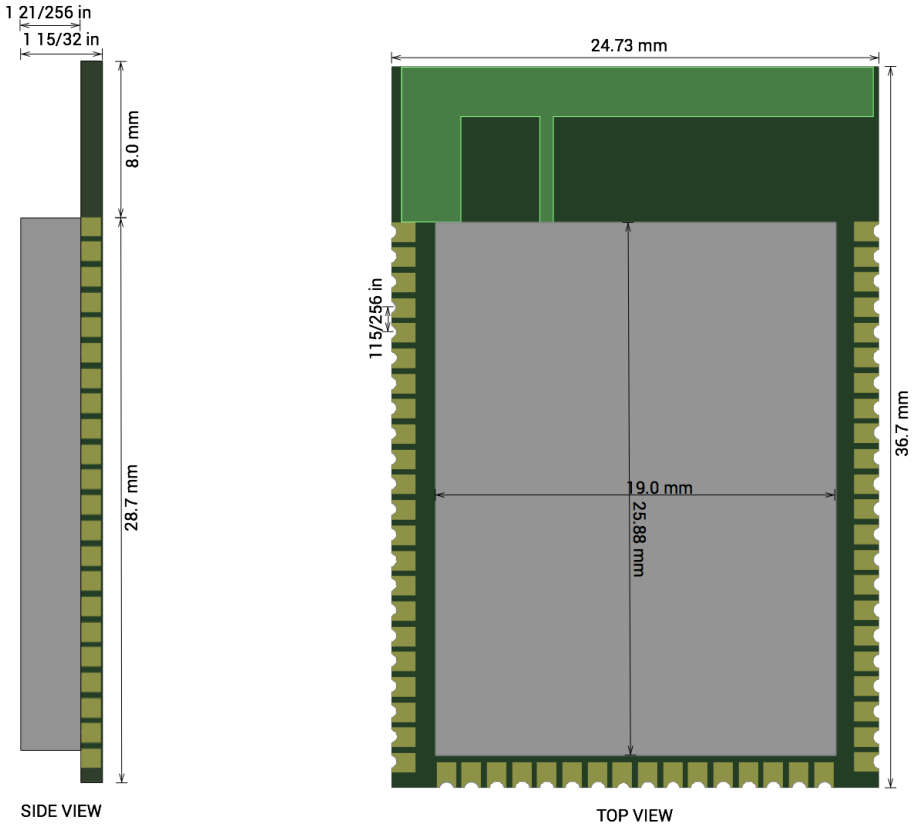
Key Features & Specifications

FEATURES	SPECIFICATIONS
Host Microcontroller ● Freescale MC13224v ARM7 microcontroller with integrated 802.15.4 radio ● ISM 2.4 GHz frequency band ● 3.6V - 2.1V operating voltage ● 24MHz, 96kB RAM, 128K Internal Flash **Certifications** ● FCC certification, FCC ID: 2AC5J-6BMC13 ● IC certification, IC: 12322A-6BMC13 **Output** ● 20dBm-0dBm output power via external amplifier and software settings **Boot options** ● Primary internal boot flash ● Secondary boot flash to facilitate robust over-the-air reprogramming **Other features** ● 32.768 kHz real time clock crystal **Formfactor** ● Solderable module ● 48 General purpose I/O pins, 46 with peripheral functions. **Software Support** ● WigWag DeviceJS support ● 6LoWPAN support with the Contiki OS ● Zigbee support with Freescale BeeKit	**Physical Dimensions** ● Length: 36.75mm (1.4455 in) ● Width: 24.8mm (.9745 in) ● Height (z-axis): 4.15mm (.164 in) **Current consumption** ● Sleep (min/max): 2/150 uA ● Idle (typical): 3 mA ● Transmitting (typical/max) 100/350mA ● Receiving: (typical/max) 100/350mA **RF Characteristics** ● TX Power (min/max): 0dBm/20dBm ● RX sensitivity (min/max): -96dBm/-100 dBm ● Range, typical (indoor/outdoor): ~200/~400 ft (60M/120M)

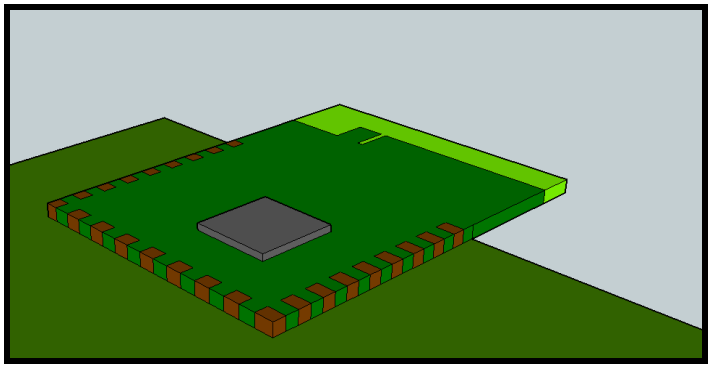
Mechanical drawings

*All dimensional drawings are in mm

Dimensions

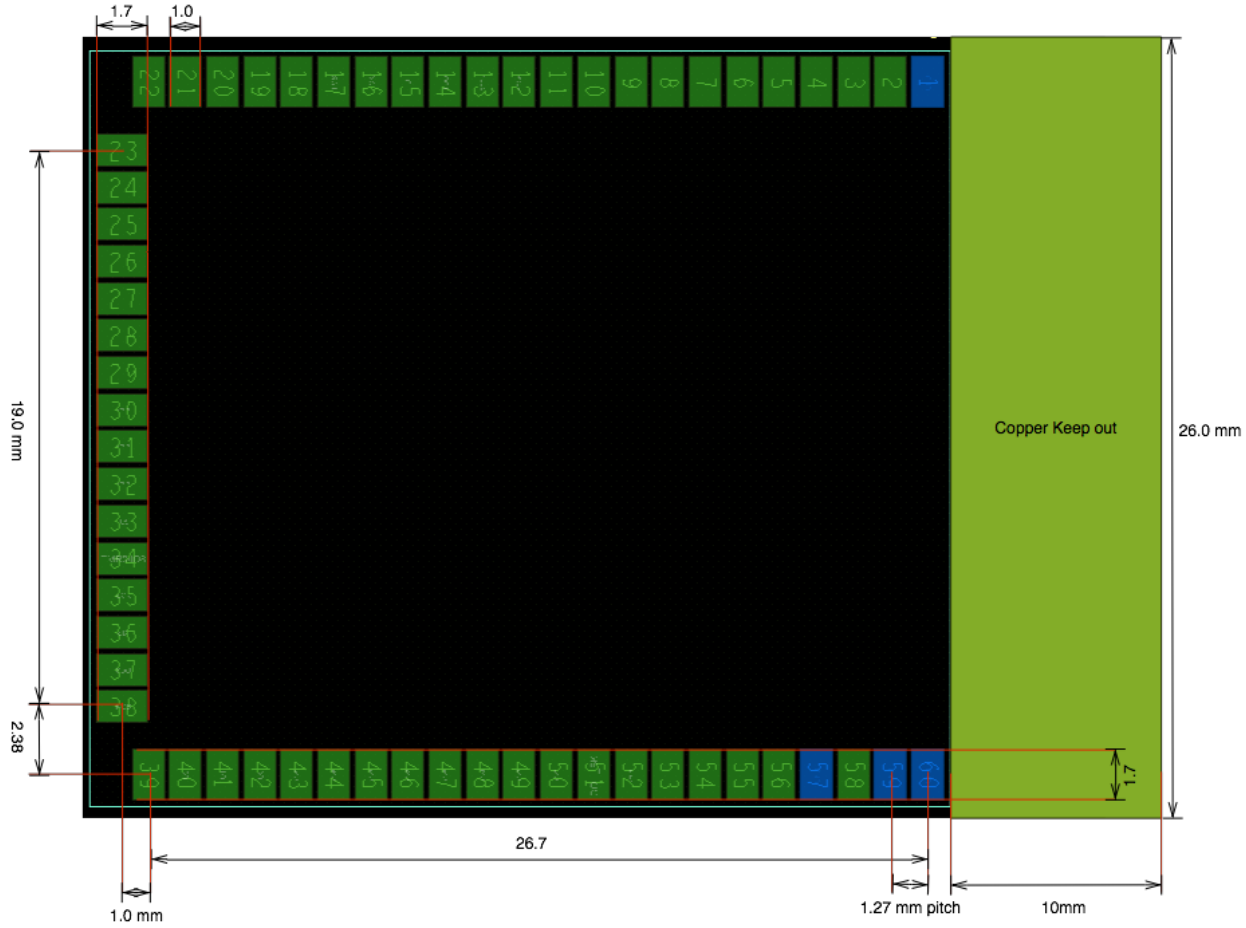


Design consideration: mounting location



RF Caution: The 6BMC13224 is designed to “hang off” a PCB edge in order to avoid interference from ground planes under the module. Placing this module over batteries, ground plane, components, or tracks within any layer of the main board, or other obstructive material will lessen the capable range of the module. A safe distance is to place these items outside of 20m of the 3 free sides of the antenna. Tracks and components may be placed adjacent to the metal shield, but should not be placed within 20mm of the antenna.

Module PCB Footprint



The module is a “solderable module and therefore the pad dimensions must be followed exactly.
*All dimensions are in mm

IO Port Configuration

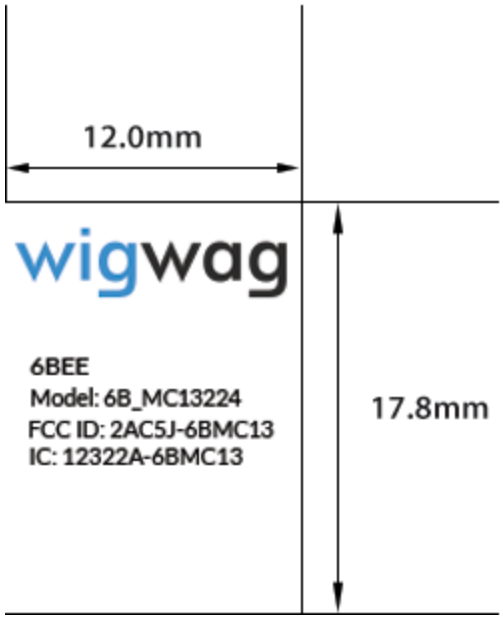
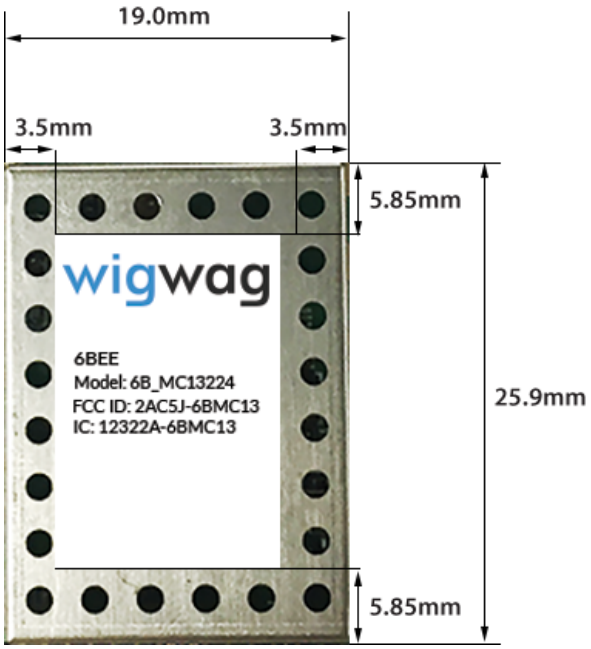
Pin	Name	GPIO	Description
1	GND		Ground
2	ADC2_VREFL	39	ADC sample channel can be used by either ADC_1 or ADC_2.
3	ADC1_VREFL	41	ADC sample channel can be used by either ADC_1 or ADC_2.
4	ADC1_VREFH	40	ADC sample channel can be used by either ADC_1 or ADC_2.
5	ADC2_VREFH	38	ADC sample channel can be used by either ADC_1 or ADC_2.
6	ADC_0	30	ADC sample channel can be used by either ADC_1 or ADC_2.
7	ADC_1	31	ADC sample channel can be used by either ADC_1 or ADC_2.
8	ADC_2	32	ADC sample channel can be used by either ADC_1 or ADC_2.
9	ADC_3	33	ADC sample channel can be used by either ADC_1 or ADC_2.
10	ADC_4	34	ADC sample channel can be used by either ADC_1 or ADC_2.
11	ADC_5	35	ADC sample channel can be used by either ADC_1 or ADC_2.
12	ADC_6	36	ADC sample channel can be used by either ADC_1 or ADC_2.
13	ADC_7 RTCK	37	ADC sample channel can be used by either ADC_1 or ADC_2. Alternately, the signal returns TCK for JTAG to support adaptive clocking.
14	TDO	49	JTAG Test Data Output
15	TDI	48	JTAG Test Data Input
16	TCK	47	JTAG Test Clock Input
17	TMS	46	JTAG Test Mode Select Input

18	UART2_RTS	21	UART2 Request to Send input
19	UART2_CTS	20	UART2 Clear to Send output
20	UART2_RX	19	UART2 RX data input
21	UART2_TX	18	UART2 TX data output
22	UART1_RTS	17	UART1 Request to Send input
23	UART1_CTS	16	UART1 CTS control output.
24	UART1_RX	15	UART1 RX data input
25	UART1_TX	14	UART1 transmit data output.
26	I2C_SDA	13	2C bus signal SDA
27	I2C_SCL	12	2C bus signal SCL
28	TMR_3	11	Pin is used as counter output or counter input clock.
29	TMR_2	10	Pin is used as counter output or counter input clock.
30	VCC		3.3v
31	VCC		3.3v
32	VCC		3.3v
33	TMR_1	09	Pin is used as counter output or counter input clock.
34	TMR_0	08	Pin is used as counter output or counter input clock.
35	SPI_SCK	07	SPI port clock.
36	SPI_MOSI	06	SPI Port Master Out Slave In (MOSI) data signal.
37	SPI_MISO	05	SPI Port Master In Slave Out (MISO) data signal.
38	SPI_SS	04	SPI Port Slave Select (SS) signal.
39	SSI_BITCK	03	SSI serial TX/RX clock and is bi-directional.
40	SSI_FSYN	02	SSI frame sync for data (RX or TX) and is bi-directional.

41	SSI_RX	01	SSI serial RX data input.
42	SSI_TX	00	SSI serial TX data output.
43	KBI_7	29	Used as output for keyboard interface.
44	KBI_6	28	Used as output for keyboard interface.
45	KBI_5	27	Used as output for keyboard interface.
46	KBI_4	26	Used as output for keyboard interface.
47	KBI_3	25	Used as output for keyboard interface.
48	KBI_2	24	Used as output for keyboard interface.
49	KBI_1	23	Used as output for keyboard interface.
50	KBI_0_HST_WK	22	Used as output for keyboard interface / Alternative function as a wake-up output (based on a timer) to external device.
51	COIL_BK		Onboard buck converter connection to external coil, driven by onboard MOSFET.
52	LREG BK FB		• When using onboard buck converter, connect to load side of coil. • When not using buck converter, connect to VBATT.
53	RESET		Active low, asynchronous reset
54	TX_ON	44	Programmable control pin
55	ANT_1	42	Programmable control pin
56	ANT_2	43	Programmable control pin
57	GND		Ground
58	RX_ON	45	Programmable control pin
59	GND		Ground
60	GND		Ground

Ordering Information

Simple SKU ordering: 6B_MC13224-001

Label dimensions	Label positioning on shield
	

Label location on module

Regulatory and Certifications

FCC Statement:

This equipment has been tested and found to comply with the limits for 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 to an outlet on a circuit different from that to which the receiver is connected.

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.

Note: Modifications to this product will void the user's authority to operate this equipment.

RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

FCC Information to OEM integrator
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.
The user manual which is provided by OEM integrators for end users must include the following information in a prominent location.

1. To comply with FCC RF exposure compliance requirements, the antenna 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, except in accordance with FCC multi-transmitter product procedures.

2. Only those antennas with same type and lesser gain filed under this FCC ID number can be used with this device.

3. The regulatory label on the final system must include the statement: “Contains FCC ID: xxxx or using electronic labeling method as documented in KDB 784748.
4. The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system

IC Statement:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada licence-exempt RSS standard(s). 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."

IC Déclaration:

En vertu de la réglementation de l'industrie du Canada, cet émetteur de radio ne peuvent fonctionner en utilisant une antenne d'un type et maximum (ou moins) Gain approuvé pour l'émetteur par Industrie Canada. pour réduire risque d'interférence aux autres utilisateurs, le type d'antenne et son gain doivent être choisis de sorte que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas ce qui est nécessaire pour la réussite de communication.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Remarque: Toute modification de ce produit annule l'autorité de l'utilisateur à utiliser cet équipement.

RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2. This equipment complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

IC Information to OEM integrator

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1. To comply with IC RF exposure compliance requirements, the antenna 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, except in accordance with IC multi-transmitter product procedures.

2. Only those antennas with same type and lesser gain filed under this IC number can be used with this device.

3. The regulatory label on the final system must include the statement: “Contains IC: xxxx “.

4. The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.