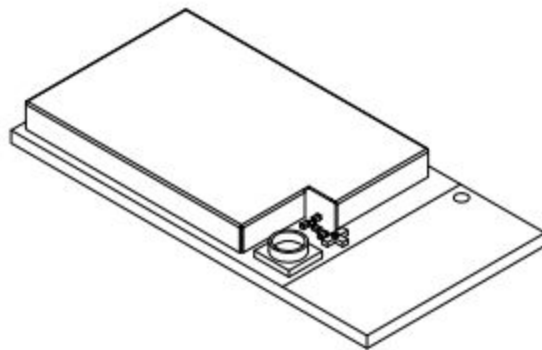


## Embedded WiFi/BLE Module for M2M and IOT



# Contents

[Contents](#)

[Introduction](#)

[Features](#)

[Block Diagram](#)

[General Specification](#)

[General Specification](#)

[Voltage](#)

[Absolute Maximum Ratings](#)

[Recommended Operating Ratings](#)

[WiFi RF Specification](#)

[RF Specification](#)

[Power Consumption](#)

[BLE RF Specification](#)

[Pin Assignments](#)

[PCB Pin Outline](#)

[Pin Description](#)

[Dimensions](#)

[Physical Dimensions](#)

[Layout Recommendation](#)

[PCB Antenna Pattern and Gain](#)

[Revision History](#)

## Introduction

iWM438 is a low-power consumption module which has Wi-Fi 802.11b/g/n functionalities. The highly integrated iWM438 module makes the possibilities of web browsing, all types of battery powered device. With seamless roaming capabilities and advanced security, iWM438 can also interact with different vendors' 802.11b/g/n Access Points in the wireless LAN.

The wireless module complies with IEEE 802.11 b/g/n standard and it can achieve up to a speed of 72.2Mbps with single stream in 802.11n draft 7.0, 54Mbps as specified in IEEE 802.11g, or 11Mbps for IEEE 802.11b to connect to the wireless LAN.

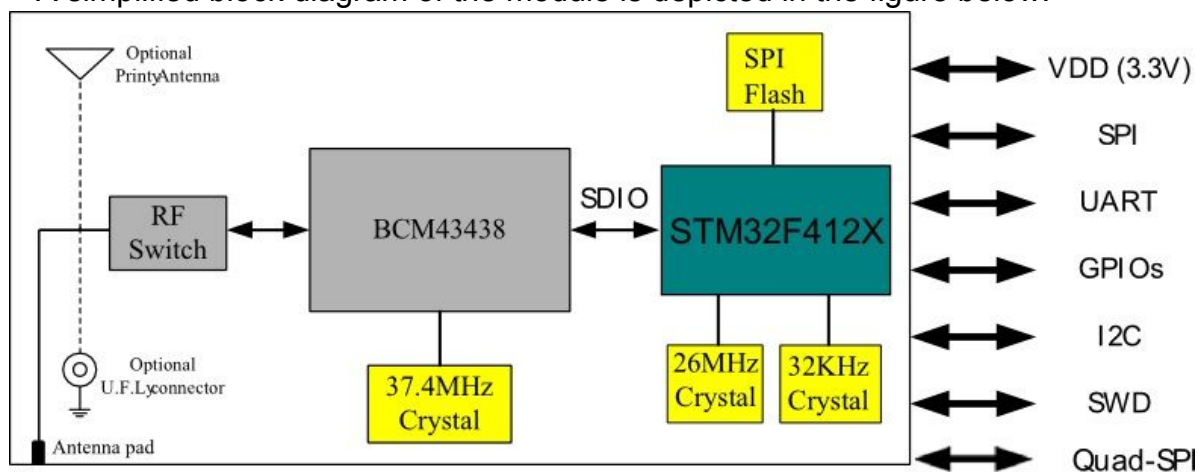
This compact module is a total solution for a combination of Wi-Fi 802.11b/g/n technologies with Microcontroller Processor. The module is specifically developed for embedded system devices.

## Features

- Single-band 2.4GHz IEEE 802.11b/g/n
- Integrated ARM Cortex-M4™ CPU with on-chip memory enables running IEEE802.11 firmware that can be field-upgraded with future features.
  - CPU clock up to 100MHz.
  - 2MB on-board SPI flash.
  - 1MB on-chip flash.
  - 256KB internal SRAM.
- Low power sleep/stop/standby modes support.
- Peripherals
  - Up to 25 GPIOs.
  - Serial wire debug(SWD) debug interface.
  - UART flow control, SPI, Quad-SPI, I2C.
- Full SDK for customer application development.
- On-board PCB antenna, U.F.L connector, also pad#41 for external antenna(optional).
- Lead-Free / RoHS
- Single power supply voltage 3.3V.
- Security:
  - Hardware WAPI acceleration engine
  - AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
  - WPA™ – and WPA2™ - (Personal) support for powerful encryption and authentication

## Block Diagram

A simplified block diagram of the module is depicted in the figure below.



# General Specification

## General Specification

Model Name	iWM438
Product Description	Wi-Fi 802.11b/g/n + BLE 4.1 + MCU Module
Dimension	16 mm x 32 mm x 3.1mm ±0.5mm
MCU main flash memory	1MB
External flash	2MB
Module Interface	SPI/UART/I2C/SWD
Ambient temperature	-20°C to 70°C
Storage temperature	-40°C to 85°C
Humidity	Operating Humidity 10% to 95% Non-Condensing Storage Humidity 5% to 95% Non-Condensing

## Voltage

### Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VDD_3V3	Power supply for SIP Module	-0.4	3.7	V

### Recommended Operating Ratings

Symbol	Min.	Typ.	Max.	Unit
VDD_3V3	3.0	3.3	3.6	V

# WiFi RF Specification

## RF Specification

Conditions : VDD=3.3V ; Temp:25°C

Feature	Description
WLAN Standard	IEEE 802.11b/g/n, WiFi compliant
Frequency Range	2.400 GHz ~ 2.484 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz : Ch1 ~ Ch13
Modulation	802.11b : CCK, DQPSK, DBPSK 802.11 g/n : OFDM /64-QAM, 16-QAM, QPSK, BPSK
Output Power	802.11b /11Mbps : 15 dBm ± 2 dB , typical @ EVM ≤ -9dB
	802.11g /54Mbps : 13 dBm ± 2 dB , typical @ EVM ≤ -25dB
	802.11n /65Mbps : 12 dBm ± 2 dB , typical @ EVM ≤ -28dB
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -85dBm, typical
	- MCS=1 PER @ -84dBm, typical
	- MCS=2 PER @ -82dBm, typical
	- MCS=3 PER @ -80dBm, typical
	- MCS=4 PER @ -77dBm, typical
	- MCS=5 PER @ -73dBm, typical
	- MCS=6 PER @ -71dBm, typical
	- MCS=7 PER @ -69dBm, typical
Receive Sensitivity (11g) @10% PER	- 6Mbps PER @ -86dBm, typical
	- 9Mbps PER @ -85dBm, typical
	- 12Mbps PER @ -85dBm, typical
	- 18Mbps PER @ -83dBm, typical
	- 24Mbps PER @ -81dBm, typical
	- 36Mbps PER @ -78dBm, typical
	- 48Mbps PER @ -73dBm, typical
	- 54Mbps PER @ -72dBm, typical
Receive Sensitivity (11b) @8% PER	- 1Mbps PER @ -90dBm, typical
	- 2Mbps PER @ -89dBm, typical
	- 5.5Mbps PER @ -88dBm, typical
	- 11Mbps PER @ -85dBm, typical
Data Rate	802.11b : 1, 2, 5.5, 11Mbps
	802.11g : 6, 9, 12, 18, 24, 36, 48, 54Mbps
Data Rate (20MHz, Long GI,800ns)	802.11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps
Data Rate (20MHz ,short GI,400ns)	802.11n: 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65,72.2Mbps

Maximum Input Level	802.11b : -10 dBm
	802.11g/n : -20 dBm
Antenna Reference	On board ANT :Small antennas with 0~2 dBi peak gain Option :One U.F.L connector for external antenna Option :ANT output pin

### Power Consumption

Conditions: VDD=3.3V ; Temp:25°C

Mode	Description	Min.	Typ.	Max.	Unit
802.11B	TX 11Mbps @ 15 dBm		310		mA
	RX 11Mbps @ -85dBm Payload length 1000Bytes		60		mA
802.11G	TX 54Mbps @ 13 dBm		250		mA
	RX 54Mbps @ -72dBm Payload length 1000Bytes		60		mA
802.11N	TX 65Mbps @ 12 dBm		250		mA
	RX 65Mbps @ -69dBm Payload length 1000Bytes		60		mA
<b>Low power consumption</b>					
Mode		<b>Typ.</b>			
MCU(SLEEP), WIFI(idle)		9.5mA			
MCU(STOP),DTIM 1		3.4mA			
MCU(STOP),DTIM 3		3mA			
MCU(STOP), WIFI(off)		1.1mA			
MCU(STANDBY), WIFI(off)		120uA			

## BLE RF Specification

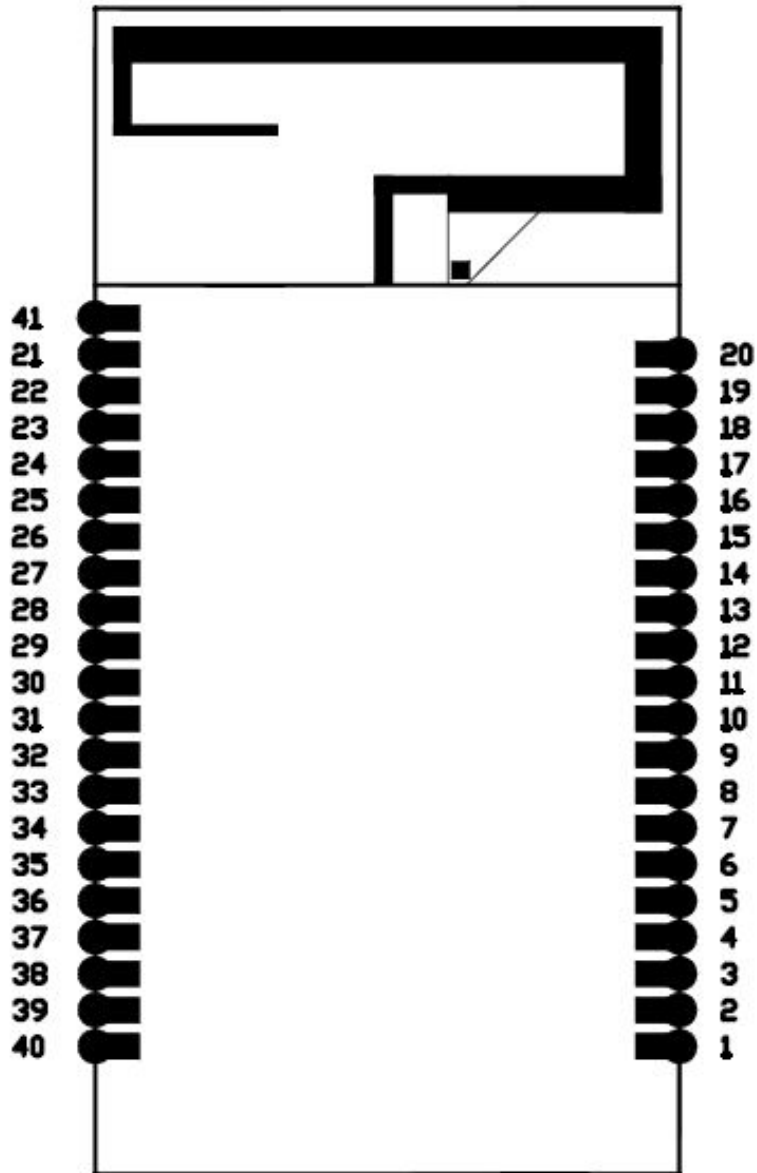
<b><i>RF Specification</i></b>			
	<b>Min.</b>	<b>Typical.</b>	<b>Max.</b>
Output Power		8dBm	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-88 dBm	-70 dBm
Modulation Char: delta f1 average	225kHz	255kHz	275kHz
Modulation Char: delta f2 max.	185kHz		
Modulation Char: ratio	0.8	0.95	



# Pin Assignments

## PCB Pin Outline

(TOP View)



## Pin Description

This is original define. More alternative function mapping refers to STM32F412X datasheet. Warning: For all the NC pins, please keep it floating and do not connect to ground.

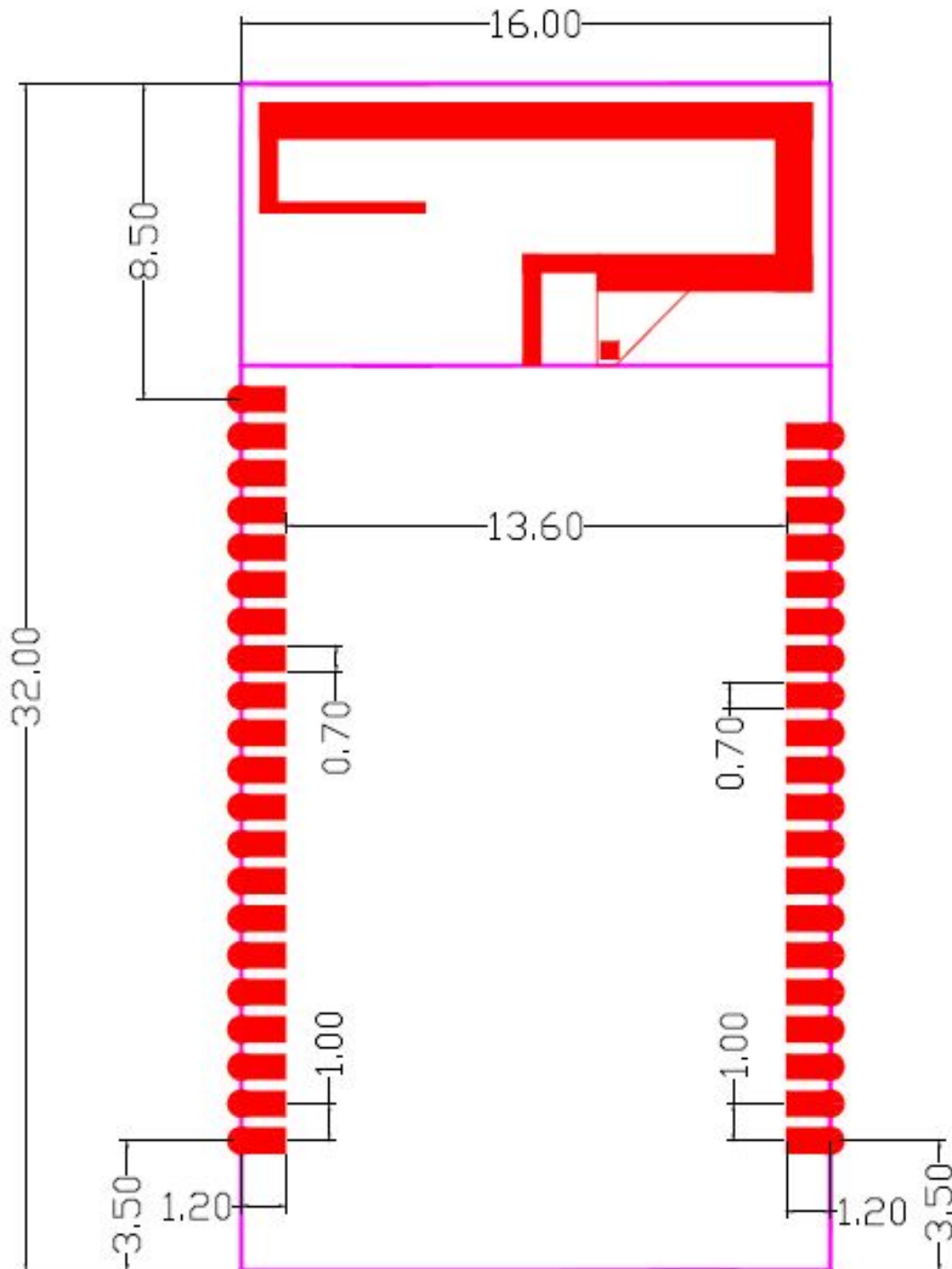
No	Name	Type	Description
1	BOOT0	-	Boot configuration option (default: Floating, DO NOT connect)
2	PC6	I/O	GPIO PIN
3	PC0	I/O	GPIO PIN
4	SPI2_MOSI/PC3	I/O	SPI_MOSI
5	SPI2_NSS/PB12	I/O	SPI_NSS
6	SPI2_SCK/PC7	I/O	SPI_SCK
7	SPI2_MISO/PC2	I/O	SPI_MISO
8	USART2_TX/PA2	I/O	Debug_UART_TX
9	QSPI_BK1_IO3/PA1	I/O	QSPI_IO3
10	VBAT	I	MCU operating voltage input (power supply for RTC, external clock, 32 kHz oscillator and backup registers (through power switch) when VDD is not present.)
11	LPO	I	External low power clock input (32.768KHz) (default: internal low power clock)
12	USART2_RX/PA3	I/O	Debug_UART_RX
13	MICRO_RST_N	I/O	MCU Reset
14	WAKE_UP/PA0	I/O	External Wake up
15	NC	I	No function (default: Floating, DO NOT connect)
16	NC	I	No function (default: Floating, DO NOT connect)
17	I2C1_SCL/PB8	I/O	I2C_SCL
18	I2C2_SDA/PB9	I/O	I2C_SDA
19	PB7	I/O	GPIO PIN
20	GND	-	Ground
21	GND	-	Ground
22	NC	-	No function (default: Floating, DO NOT connect)
23	NC	-	No function (default: Floating, DO NOT connect)
24	PA10	I/O	GPIO PIN

25	SWD_TCK/PA14	I/O	SWD_TCK
26	SWD_TMS/PA13	I/O	SWD_TMS
27	UART1_RTS /PA12	I/O	UART_RTS
28	QSPI_BK1_IO1/PC10	I/O	QSPI_IO1
29	UART1_RX /PB3	I/O	UART_RX
30	UART1_TX /PA15	I/O	UART_TX
31	QSPI_CLK/PB2	I/O	QSPI_CLK
32	QSPI_BK1_NCS/PB6	I/O	QSPI_NCS
33	QSPI_BK1_IO2/PC8	I/O	QSPI_IO2
34	QSPI_BK1_IO0/PC9	I/O	QSPI_IO0
35	UART1_CTS /PA11	I/O	UART_CTS
36	PB1	I/O	GPIO PIN
37	PB0	I/O	GPIO PIN
38	PB15	I/O	GPIO PIN
39	VDD_3V3	V	Power supply input
40	VDD_3V3	V	Power supply input
41	ANT	O	RF OUTPUT(option)

## Dimensions

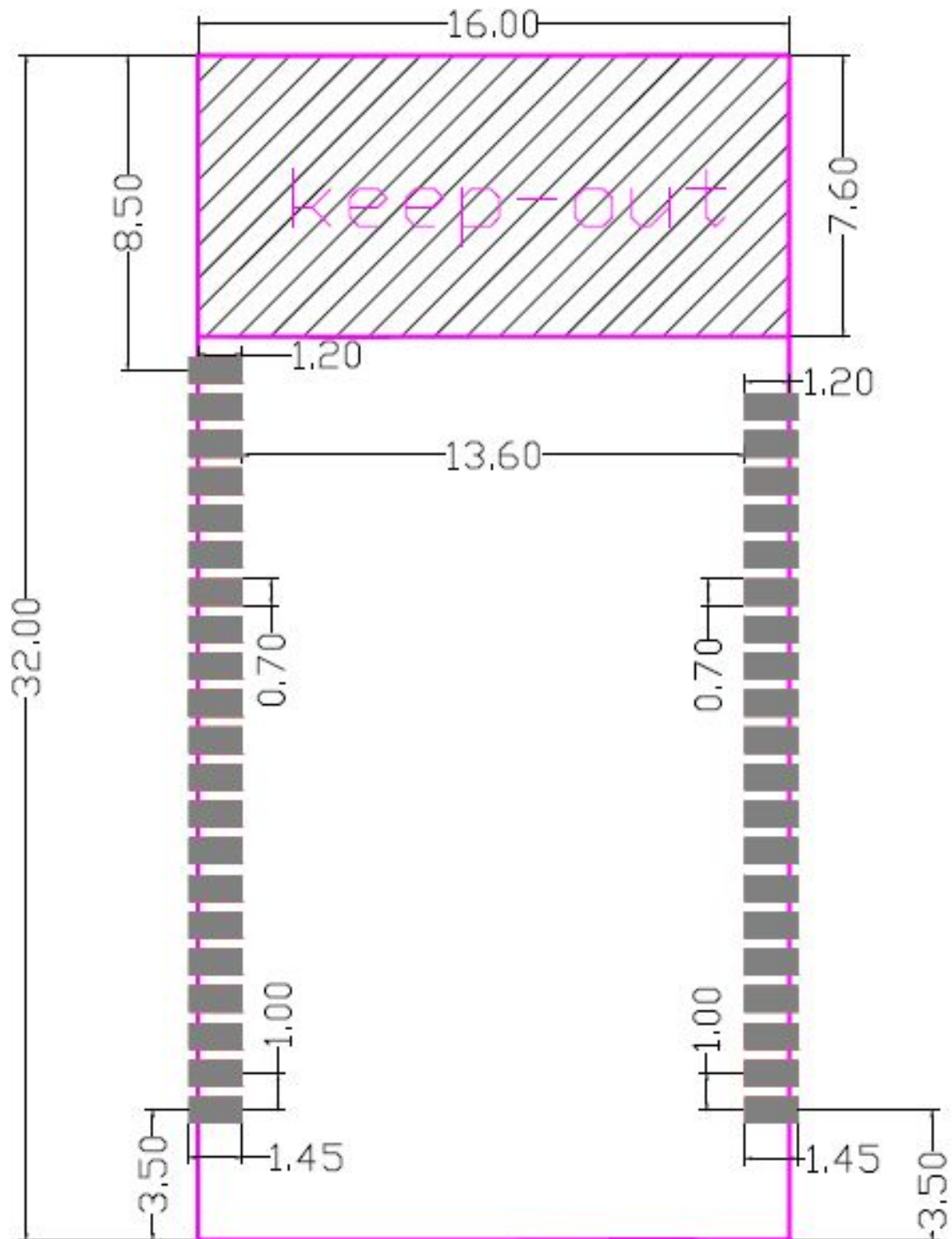
### Physical Dimensions

(TOP View) Unit:mm

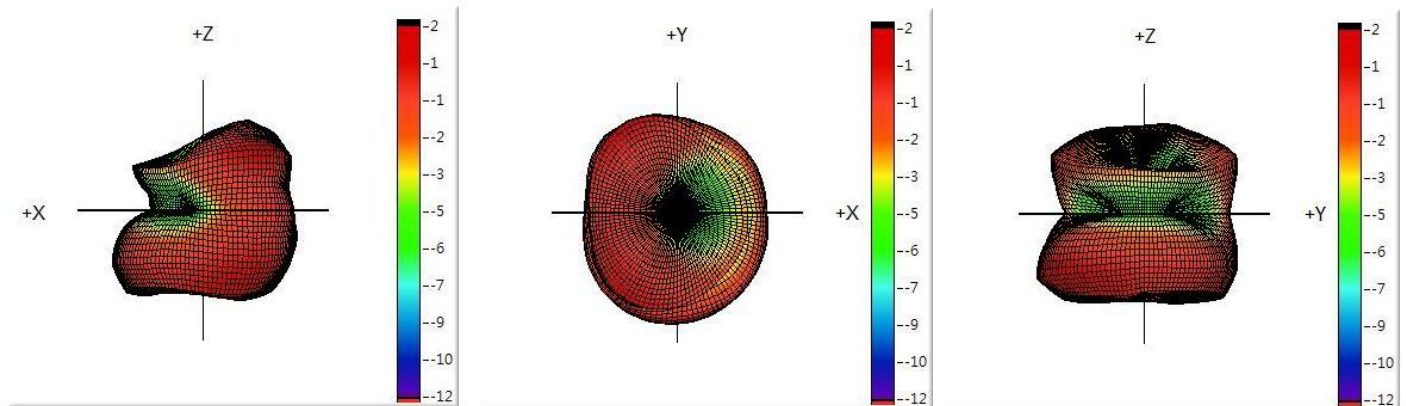


## Layout Recommendation

(TOP View) Unit:mm



## PCB Antenna Pattern and Gain



3D Peak Gain: 2.0 dBi

### Certification

This module is approved by FCC with ID: 2AH2IWM438. To use this module, please put an exterior label with wording "Contains FCC ID: 2AH2IWM438" on your product.

### Statement

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.

#### Federal Communication Commission Interference Statement

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 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.

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

**FCC Radiation Exposure Statement** 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.

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

## Revision History

Date	Revision	Changes
Sep. 2017	1	Initial release