# INVENTEK SYSTEMS

# ISM43362-M3G-L44

# eS-WiFi™

# (embedded Serial-to-WiFi)

## 802.11 b/g/n + MCU + Certified Antenna

# Module Data Sheet



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# 1 GENERAL DESCRIPTION

The Inventek ISM43362-M3G-L44 is an embedded Serial WiFi (**eS-WiFi™**), wireless Internet Connectivity device. The Wi-Fi module hardware consists of an STM M3 Cortex host processor, integrated antenna (or optional external antenna) and Cypress Wi-Fi device. The module provides UART, USB and SPI interfaces enabling connection to an embedded design. The Wi-Fi module requires no operating system and has a completely integrated TCP/IP Stack that only requires Inventek's **IWIN** (Inventek Wireless Interoperability Network),AT commands to establish connectivity for your wireless product, minimizing development time, testing routines and certification. The low cost, small foot print (14.5 mm x 30 mm) and ease of design-in make it ideal for a range of embedded applications. The module hardware can be used with Inventek's **IWIN** AT Command set or with Cypress's WICED™ SDK.

***Summary of Key Features:***

- 802.11 b/g/n compliant based on Cypress MAC/Baseband/Radio device.
- Fully contained TCP/IP stack minimizing host CPU requirements.
- Configurable using **IWIN** AT commands.
- Host interface: UART, SPI, or USB-HID.
- Network features: ICMP (Ping), ARP, DHCP,TCP, UDP.
- Low power operation (3.3V supply) with built-in low power modes.
- Secure Wi-Fi authentication WEP-128, WPA-PSK (TKIP), WPA2-PSK.
- Proven Interoperability … Connects with other vendor's b/g/n Access Points in the Wireless LAN.
- Supported by Cypress WICED™ SDK.

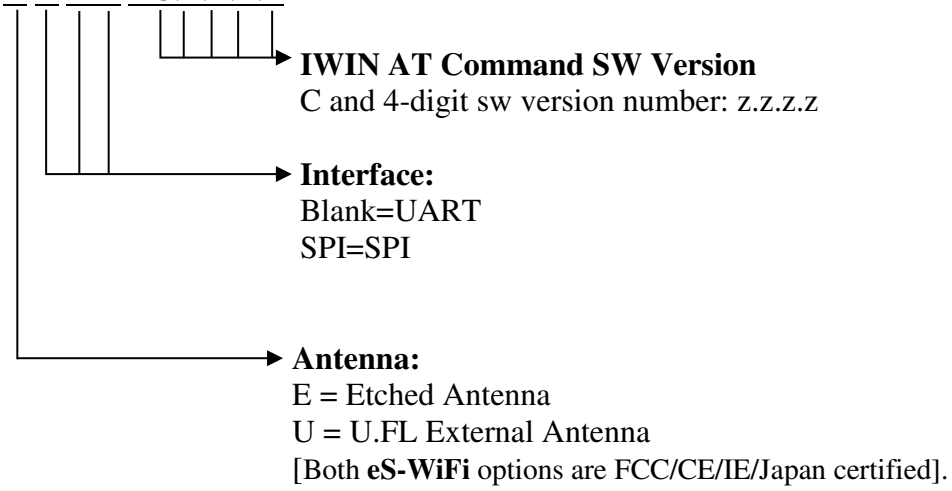
***Typical Applications:***

- PDA, Pocket PC, computing devices.
- Building automation and smart energy control.
- Industrial sensing and remote equipment monitoring.
- Warehousing, logistics and freight management.
- PC and gaming peripherals.
- Printers, scanners, alarm and video systems.
- Medical applications including patient monitoring and remote diagnostics.

# 2 PART NUMBER DETAIL DESCRIPTION

## *2.1 Ordering Information*

ISM43362-M3G-L44-X X X X – C.Z.Z.Z.Z




| Evaluation Boards | | | |
|---|---|---|---|
| **eS-WiFi**-43362 EVB | Inventek **eS-WiFi** (**e**mbedded **S**erial **Wi-Fi**), Evaluation Board, USB cable, with ISM43362-M3G-L44 module. | • USB Com. Port (UART) & JTAG<br>• USB to **eS-WiFi** | ISM43362-M3G-L44 Evaluation Board |
| **ISMART**-43362 EVB | Inventek **ISMART** (**I**nventek **S**ystems **M**odule **AR**duino **T**est), EVB with ISM43362-M3G-L44 module. | • USB Com. Port (UART) & JTAG | ISM43362-M3G-L44 Evaluation Board |

# 3 GENERAL FEATURES

- Based on the Cypress BCM43362 MAC/Baseband/Radio device.
- Supports Cypress WICED SDK.
- CPU ARM Cortex™-M3 32-bit RISC core from ST Microelectronics.
- Host UART, SPI, or USB-HID interface.
- IEEE 802.11n D7.0 -OFDM-72.2 Mbps -single stream w/20 MHz, Short GI
- IEEE 802.11g (OFDM 54 Mbps)
- IEEE 802.11b (DSSS 11Mbps)
- IEEE 802.11i (Security)
    - WPA (Wi-Fi Protected Access) –PSK/TKIP
    - WPA2 (Wi-Fi Protected Access 2)- AES/CCMP/802.1x Authentication
- Inputs +3.3 V tolerant
- 5 GPIO, 5 ADC (Note: SPI interface utilizes ADC pins.)
- The devices operate from a 3.0 to 3.6 V power supply.
- -40 to +85 °C temperature range.
- Power-saving mode allows the design of low-power applications.
- Lead Free Design which is compliant with ROHS requirements.
- EMI/EMC Metal Shield for best RF performance in noisy environments and to accommodate for lower RF emissions/signature for easier FCC compliance.
- FCC/CE Compliance Certification.

## *3.1 Limitations*

Inventek Systems products are not authorized for use in safety-critical applications (such as life support) where a failure of the Inventek Systems product would reasonably be expected to cause severe personal injury or death.

## *3.2 Regulatory Compliance*

CE FCC

| Regulator | Status |
|---|---|
| FCC | 07P-362 |
| IC | 10147A-362 |
| RoHS | Compliant |

## *3.3 FCC and IC User's Manual Statements:*

OEM INSTRUCTIONS:

This module is limited to OEM installation only.

OEM integrators must ensure that the end-user has no manual instructions to remove or install the module.. OEM's must comply with FCC marking regulation part 15 declaration of conformity (Section 2.925(e)).

This module is to be installed only in mobile or fixed applications (Please refer to FCC CFR 47 Part 2.1091(b) for a definition of mobile and fixed devices).

Separate approval is required for all other operating configurations, including portable configurations with respect to FCC CFR 47 Part 2.1093, and different antenna configurations.

The antennas used with this module must be installed to provide a separation distance of at least 20cm from all persons, and must not be co-located or transmit simultaneously with any other antenna or transmitter, except in accordance with FCC multi transmitter product procedures.

The ISM43362 Module has been designed to operate with the following antennas and gains. Use with other antenna types or with these antenna types at higher gains is strictly prohibited.

| Manufacturer | Type of Antenna | Model | Gain dB | Type of Connector |
|---|---|---|---|---|
| Inventek | U.FL port Antenna | W24P-U | 2.15 | Unique Connector |
| Inventek | Trace Antenna | NA | 0 | Permanent integral |

**FCC 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.*

Note: 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.*

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

A clearly visible label is required on the outside of the user's (OEM) enclosure stat the following text:

Contains FCC ID: O7P-362
Contains IC: 10147A-362

This transmitter module has been certified for FCC Part 15 operation; when installed in a host device, the host manufacturer is responsible for making sure that the host device with the transmitter installed continues to be compliant with Part 15B unintentional radiator requirements

Industry Canada User's Manual Statements:

IC RSS-210/RSS-Gen Notices-

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 this device.

L'opèration est soumise aux deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interfèrences et (2) cet apparial doit accepter toute interfèrence, y compris les interfèrences qui peuvent causer un mauvis fonctionment de l'appareil.

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.

Sous la règlementation d'Industrie Canada, ce transmetteur radio ne peut fonctionner en utilisant une antenne d'un type et un maximum (ou moins) gain approuvèes pour l'èmetteur par Industrie Canada. Pour rèduire le risqué d'interference aux autres utilisateures, le type d'antenne et son gain doivent être choisis de manière que la puissance isotrpe rayonnèe èquivalente (PIRE) ne dèpasse pas ce qui est nècessaire pour une communication rèussie.

The radio transmitter has been approved by Industry Canada to operate with the antenna types listed above with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet èmetteur de radio a ètè approuvè par Industrie Canada pour fonctionner avec les types d'antennes ènumèrèes ci-dessus avec le gain maximal admissible et impèdance d'antenna requise pour chaque type d'antenne indiquè. Types d'antennes ne figurant pas dans cette liste, ayant un gain supèrieur au gain maximum indiquè pour ce type, sont strictement interdites pour l'utilisation avec cet appareil.

# 4 COMPLEMENTARY DOCUMENTATION

## 4.1 Inventek Systems

- Evaluation Boards: http://www.inventeksys.com/products-page/wifi-eval-kits/ism43362-m3x-evb-e-wi-fi-evaluation-board/
  - ISM43362-M3G-L44 **eS-WiFi** Data Sheet
  - **eS-WiFi** EVB Quick Start Guide
  - **eS-WiFi** EVB User's Manual
  - **eS-WiFi** EVB PC Demo software (includes EVB Drivers and Firmware)
  - **eS-WiFi** EVB Demo Software Help
  - **ISMART** Arduino EVB option.
- **IWIN** AT Command Set
  - AT Command Set User's Manual
  - AT Command Set Quick Reference Guide
  - AT Command Sample scripts (E-mail, Cloud..)
- Firmware
- OrCAD Schematic Symbol
- PADS Land Pattern
- FCC Test Report

# 5 SPECIFICATIONS

## 5.1 Module Architecture

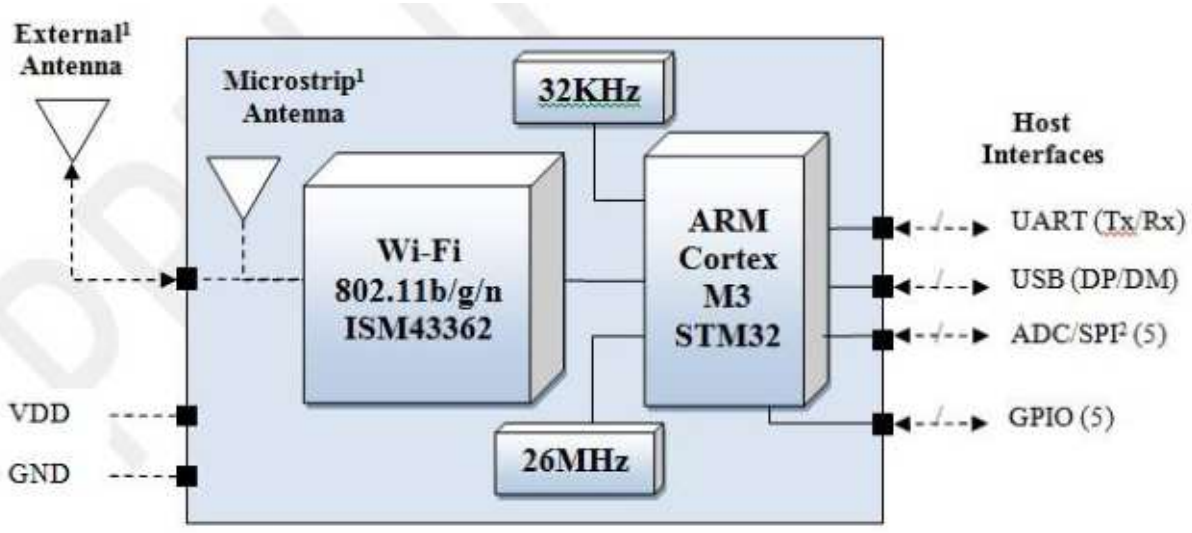



**Figure 1 Inventek's ISM43362-M3 General Block Diagram**

Note: 1. Antenna Options: Integrated microstrip antenna or U.FL connector for an external antenna.
2. ADC1-ADC5 can also be used as SPI port

## 5.2 External Antenna Connections

ISM43362-M3G-L44-U module is designed for use with an external antenna via a connection using the U.FL connector.

| Item | Description |
|---|---|
| Connector | U.FL series |
| Manufacturer | I-PEX Co., Ltd. |
| Part No. | 20279-001E-01 |
| Height | 1.25 mm |
| Width | 2 mm |
| DC | 3.0 – 5.0 V |

**Table 1 On-Board Antenna Connector**

## 5.3 Mechanical Specifications

The Physical dimensions of this eS-WiFi Module are as follow:

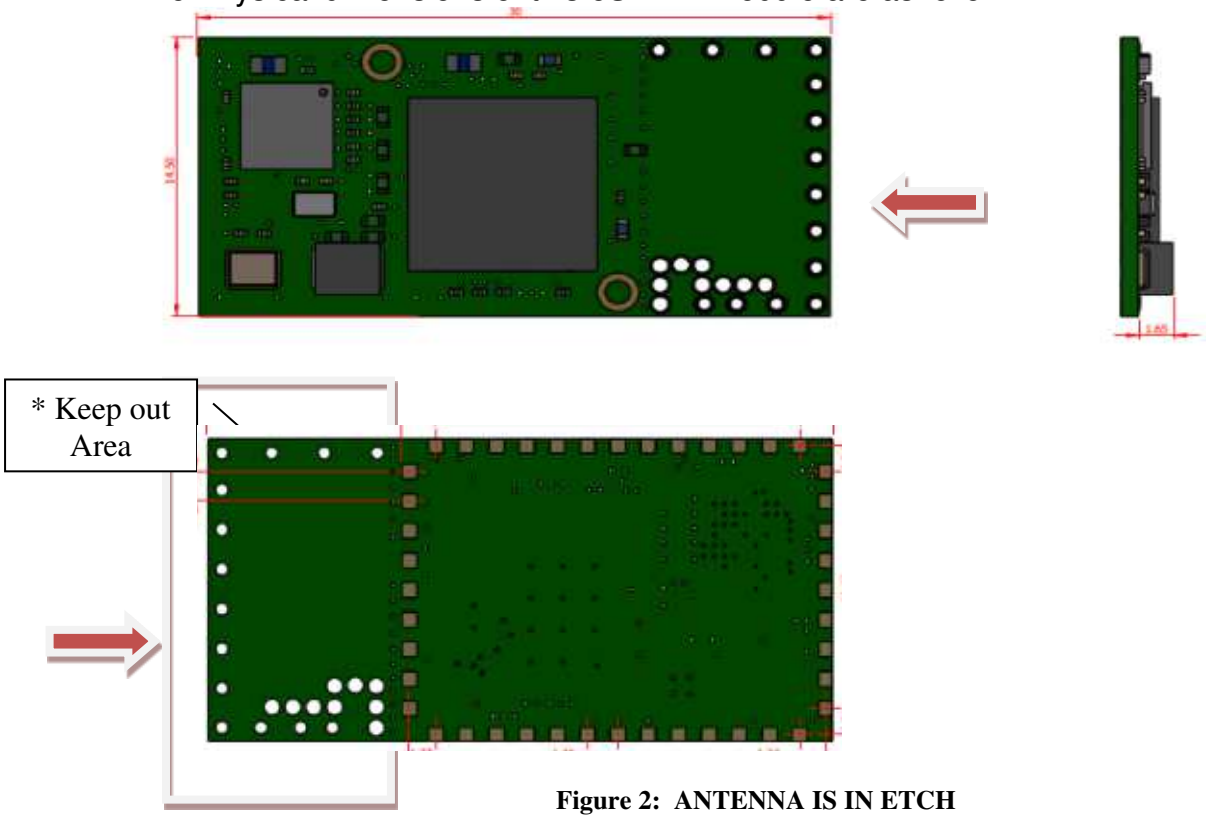



**Figure 2: ANTENNA IS IN ETCH**

”Keep out” area should ideally have the antenna hanging off the side of the PCB for best performance. If you do not hang the antenna off the PCB, ensure no PCB ground planes or traces are placed under the antenna (keep out area). Surrounding metal will affect the antenna performance. The ISM43362-M3G-L44- U and -E have the same footprint. Inventek recommends a 9mm ”Keep Out” on all three sides.
* External Antenna does not require “keep out” area

| Items | Description<br><br>ISM43362-M3G-L44-E /U |
|---|---|
| Length | 30 mm (-/+0.5 mm) |
| Width | 14.7 mm (-/+0.5 mm) |
| Height | 2.5 ± 0.2 mm |
| Package | 44 pin LGA |

## *5.4 Environmental Specifications*

| Item | Description |
|---|---|
| Operating temperature range | -40 deg. C to +85 deg. C |
| Storage temperature range | -40 deg. C to +85 deg. C |
| Humidity | 95% max non-condensing |

Note 1: The ISM43362-M3G supports a functional operating range of -40°C to +85°C. However the optimal RF performance specified in this data sheet is only guaranteed for temperatures from -10°C to +65°C

# 6 HARDWARE ELECTRICAL SPECIFICATIONS

### 6.1.1 Absolute Maximum Ratings

| Symbol | Description | Min | Max | Unit |
|---|---|---|---|---|
| VDD | Input supply Voltage | -0.4 | 3.7 | V |
| VBAT | Battery Backup | -0.4 | 3.6 | V |

### 6.1.2 Recommended Operating Ratings

| Symbol | Min. | Typ. | Max. | Unit. |
|---|---|---|---|---|
| VDD | 3.0 | 3.3 | 3.6 | V |
| VBAT | 3.0 | 3.3 | 3.6 | V |

# 7 POWER CONSUMPTION

### 7.1.1 Power Management Modes

| Power Management Modes | Description | Current | IWIN AT Commands |
|---|---|---|---|
| WiFi On/Off | MCU is powered on, but WiFi radio can be powered off | 37 mA | ZP=3,0 -Stop<br>ZP=3,1 -Start |
| WiFi Power Save On/Off | After you join a network, Power Save mode can be entered. The unit will automatically wake up when data is ready. AP will buffer data | 50 mA<br>(160 mA burst of not more than 5ms) | ZP=1,0 -Off<br>ZP=1,1 -ON |
| WiFi Beacon listen Skip MCU Sleep | You can extend beacon time to save additional power while sleeping the MCU | Beacon set to 1, ~7.2mA<br>Beacon set to 1, ~4.7mA<br>Beacon set to 1, ~4.2mA<br>One Second Sleep | ZP=2,1; ZP=6<br>ZP=2,5;ZP=6<br>ZP=2,10;ZP=6 |
| Stop Mode | | 10 mA | |

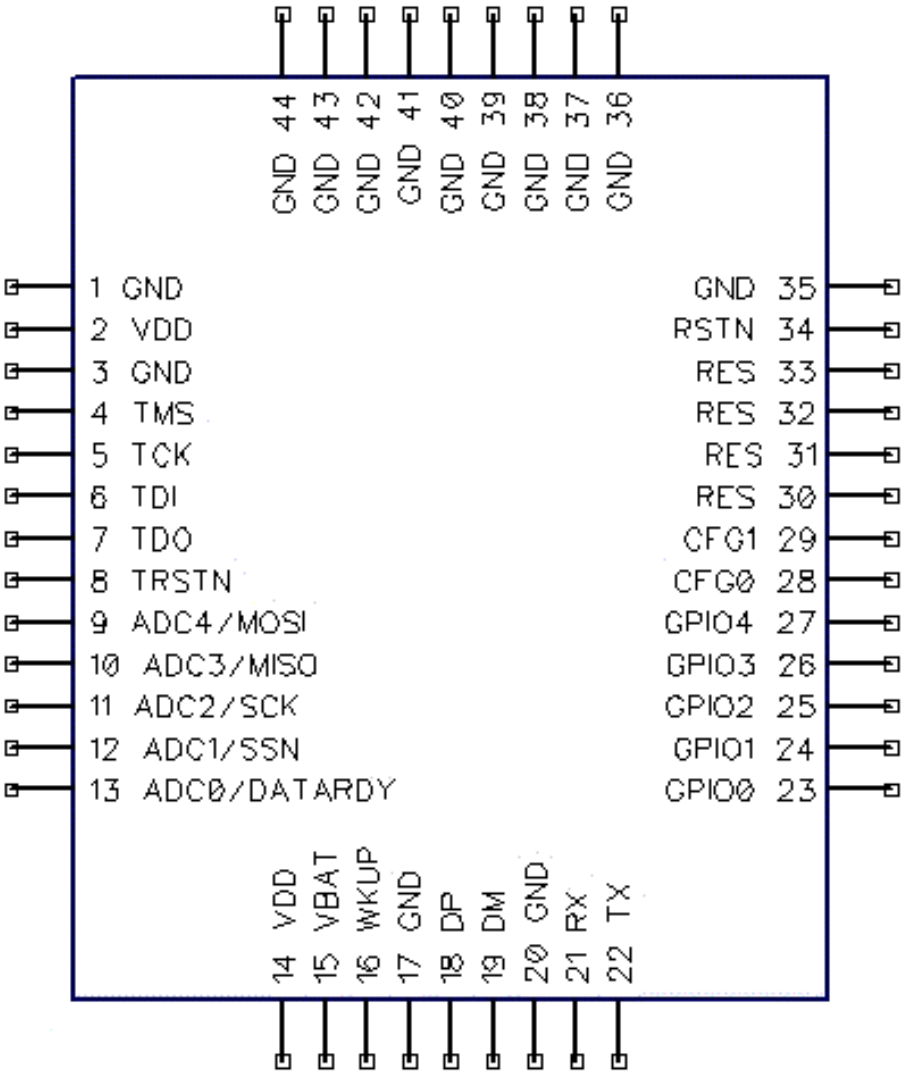
**Note:**
Typical current when WiFi is connected to a network is 110 mA. During transmit the maximum current can reach 340 mA burst of not more than 5ms.
Power Save mode does not work when in Access mode. In order to save power, **IWIN** AT Commands, ZP=2 and ZP=6, can be used to allow the MCU to sleep and reduce the beacon intervals by turning the radio on/off at a duty cycle.

The eS-WiFi modules support multiple power saving modes. Please see the power savings application note for more detailed information**. For power critical applications please contact Inventek for alternative low power modes.**

### 7.1.2 Stop Mode

Stop Mode is initiated by software and exited by the an input on the Wakeup pin. (Wakeup pin is 3.3 volt tolerant). The wakeup pin is an external interrupt pin that on the rising edge will cause the module to exit stop mode. It is an edge trigged input. It is critical to have no glitch on this line.

# 8 PIN OUT


GND 44
GND 43
GND 42
GND 41
GND 40
GND 39
GND 38
GND 37
GND 36
1 GND
2 VDD
3 GND
4 TMS
5 TCK
6 TDI
7 TDO
8 TRSTN
9 ADC4/MOSI
10 ADC3/MISO
11 ADC2/SCK
12 ADC1/SSN
13 ADC0/DATARDY
GND 35
RSTN 34
RES 33
RES 32
RES 31
RES 30
CFG1 29
CFG0 28
GPIO4 27
GPIO3 26
GPIO2 25
GPIO1 24
GPIO0 23
14 VDD
15 VBAT
16 WKUP
17 GND
18 DP
19 DM
20 GND
21 RX
22 TX

### 8.1.1 Detailed Pin Description

| Pin No. | Type | Pin Definition | Descriptions |
|---|---|---|---|
| 1 | G | GND | Ground |
| 2 | I | VDD | 3.3V |
| 3 | G | GND | Ground |
| 4 | I/O | TMS | JTAG |
| 5 | I/O | TCK | JTAG |
| 6 | I/O | TDI | JTAG |
| 7 | I/O | TD0 | JTAG |
| 8 | I/O | TDRSTN | JTAG |
| 9 | I/O | ADC 4 / SPI_MOSI | ADC Input Pins or SPI Host Interface (Refer to SPI Section 10.2) |
| 10 | I/O | ADC 3 / SPI_MISO | |
| 11 | I/O | ADC 2 / SPI_SCK | |
| 12 | I/O | ADC 1 / SPI_SSN | |
| 13 | I/O | ADC 0 (I)/ DATARDY (0) | |
| 14 | I | VDD | 3.3V |
| 15 | I | VBAT | 3.3V |
| 16 | I | Wakeup | (Refer to Section 7.1.2) |
| 17 | G | GND | Ground |
| 18 | I | DP | USB Data Plus (Refer to Table 8.1.2) |
| 19 | I/O | DM | USB Data Minus (Refer to Table 8.1.2 ) |
| 20 | G | GND | Ground |
| 21 | I/O | RX | UART Receive (Refer to section 10.1 ) |
| 22 | I/O | TX | UART Transmit (Refer to section 10.1 ) |
| 23 | I/O | GPIO 0 | General Purpose Interface Pins |
| 24 | I/O | GPIO 1 | |
| 25 | I/O | GPIO 2 | |
| 26 | I/O | GPIO 3 | |
| 27 | I/O | GPIO 4 | |
| 28 | I | CFGO | Configuration Pin 0 (Refer to Table 8.1.2 ) |
| 29 | I | CFG1 | Configuration Pin 1 (Refer to Table 8.1.2 ) |
| 30 | O | RES | Reserved |
| 31 | I | RES | Reserved |
| 32 | I | RES | Reserved |
| 33 | I | BOOT 0 | Enable On Board Micro Boot Loader |
| 34 | I | RSTN | Reset (See STM32F205 NRST specification ) |
| 35 | G | GND | Ground |
| 36 | G | GND | Ground |

| | | | |
|---|---|---|---|
| **Pin No.** | **Type** | **Pin Definition** | **Descriptions** |
| 37 | G | GND | Ground |
| 38 | G | GND | Ground |
| 39 | G | GND | Ground |
| 40 | G | GND | Ground |
| 41 | G | GND | Ground |
| 42 | G | GND | Ground |
| 43 | G | GND | Ground |
| 44 | G | GND | Ground |

### 8.1.2 Configuration Pins:

| CFGO | CFG1 | Internally Pulled High |
|---|---|---|
| 1 | 1 | UART ( NC) |
| 1 | 0* | SPI |
| 0* | 1 | USB VCP |
| 0* | 0* | USB HID |

*Requires a 10K ohm pull down

Note: These pins are not used in the currently available production firmware. Modules are preprogrammed with separate and specific firmware that supports either UART, SPI or USB HID. In future versions of the firmware these pins will be used to select the host interface type.

# 9 FIRMWARE UPGRADES DURING DEVELOPMENT

We recommend using a JTAG 10 pin header or directly connecting to the JTAG pins on the module for updating. Use the ST-Link to flash the ST micro.

Below are links to the ST-Link and JTAG header at Digikey:
STLink:
http://www.digikey.com/product-detail/en/ST-LINK%2FV2/497-10484-ND/2214535

The 10 to 20 pin JTAG adapter is Digi-Key PN 726-1193-ND:
https://www.digikey.com/products/en?keywords=726-1193-ND

*JTAG Firmware Update Note can be found at www.inventeksys.com

# 10 SERIAL HOST INTERFACES AVAILABLE

UART, SPI and USB-HID host interfaces are supported and unique firmware is required for each interface.

## 10.1 UART

A universal asynchronous receiver / transmitter (UART) with 3.3v logic levels is available.

### 10.1.1 Data Mode

When the eS-WiFi module is interfaced serially, the serial interface needs to be configured for 8 bit data, no parity, and one stop bit -- (8-n-1).

### 10.1.2 Flow Control

The eS-WiFi module and WICED do not require or support Flow Control, so Flow Control should not be implemented.

### 10.1.3 Supported Baud Rates

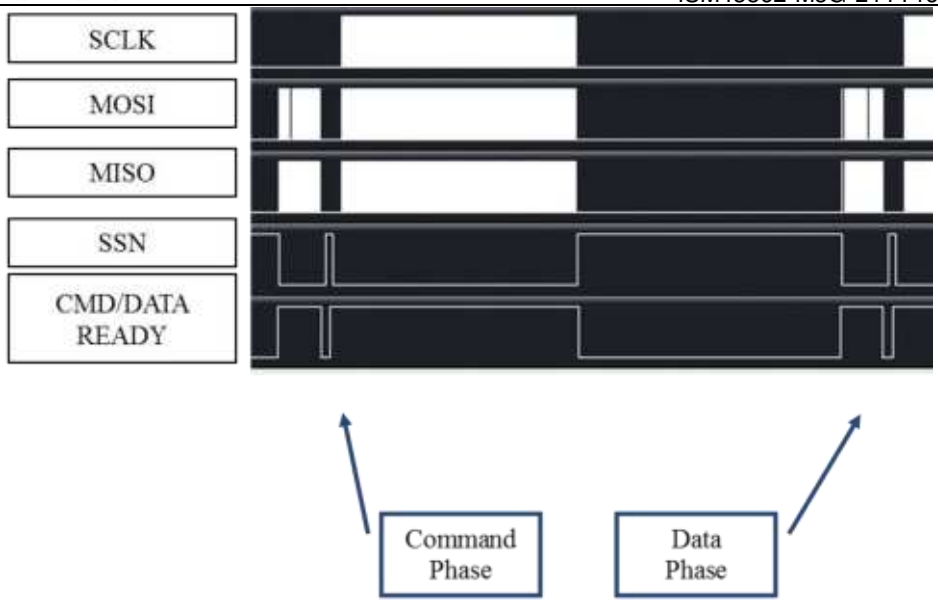
The eS-WiFi module uses USART1 (PA9 and PA10 of the STM32F205) and the following serial baud rates are supported: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 1152000, 1382400, 1612800, 1834200, 2073600. USART1 can be run at higher rates but have not been tested with the **IWIN** AT command set.

### 10.1.4 Default Serial Configuration

The eS-WiFi module is shipped with the default serial configuration of 115200 baud, 8 data bits, no party, and 1 stop bits.

## 10.2 SPI (Serial Peripheral Interface Bus)

The **eS-WiFi** module supports SPI (Contact Inventek for specific firmware.)




**SPI Slave Interface:**
Clock rate: 20MHz max.
Width: 16-bit
Mode: 0
Endian: Little

Note: All commands to the eS-WiFi module must be post-padded with 0x0A (Line Feed) to an even number of bytes.
All data from eS-WiFi module will be post-padded with 0x15(NAK) to an even number of bytes.

### 10.2.1 SPI Communication Overview:

With the exception of initial cursor, all communication with the module happens synchronously. In other words, the SPI Master must always poll for every asynchronous event.

A typical command flow is provided flow. This is an example using the Direct Connect Soft AP with a TCP communication server.

| SPI Master | SPI Slave (eS-WiFi) | Description |
|---|---|---|
| | "\r\n> " | Prompt |
| "AS=0,ABC\r\x0A" | "\r\n\r\nOK\r\n> " | Set Access Point SSID |
| "AD\r\ x0A" | "\r\n\r\nOK\r\n> " | Start AP - Direct Mode |
| "P1=0\r\ x0A" | "\r\n\r\nOK\r\n> " | Set TCP Protocol |
| "P4=2000\r" | "\r\n\r\nOK\r\n> " | Set TCP Port |
| "P5=1\r\ x0A" | "\r\n\r\nOK\r\n> " | Start TCP COMM Server |
| "MR\r\ x0A" | "\r\n[SOMA]...[EOMA]\r\nOK\r\n> " | Read Messages |

Note: [SOMA] - Start of Message Asynchronous, [EOMA] - End Of Message Asynchronous

The SPI communication is always 16-bit and can be sustained up to 20MHz. The eS-WiFi module after power up or reset will raise CMD/DATA READY pin to signal that the first Data Phase has started. In this mode, the SPI Host must fetch the cursor. As provided by the example above, this is the only time host needs fetch data from slave without issuing a command.

The Host will initiate a SPI cycle (lower SSN) and clock out 0x0A (Line Feed) until the CMD/DATA READY pin lowers signaling the end of the Data Phase. The data received will be 0x0d (CR) 0x0A (LF) 0x3E (>) 0x20 (SP).

The next rising edge of the CMD/DATA READY pin signals the Command Phase.

### 10.2.2 SPI Command Phase:

The Command Phase indicates the eS-WiFi module is ready to accept an **IWIN** AT Command. The command must include all delimiters and data for the command.

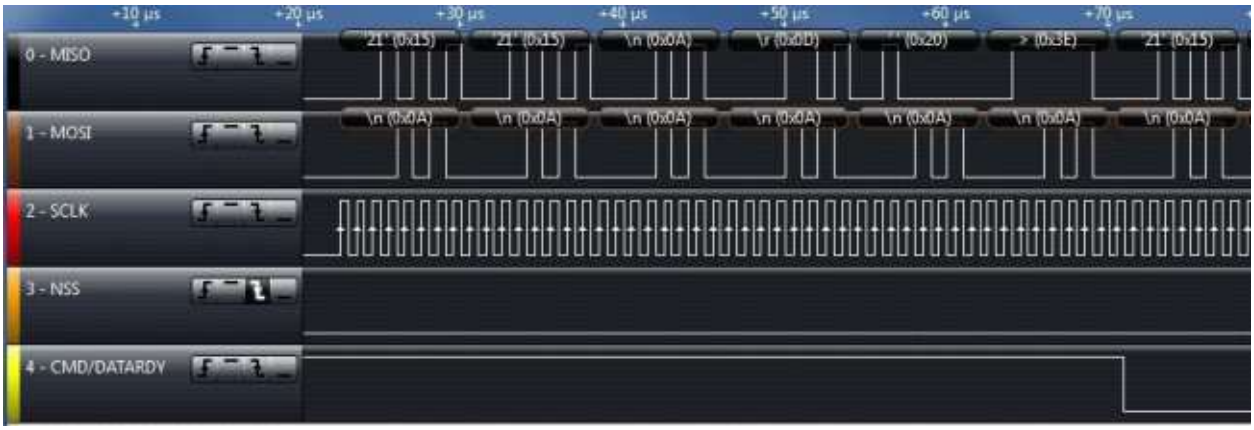
Ex. S3=0010\r0123456789
The command must also be sent as one continuous SPI cycle, that is SSN must stay low for the complete command, delimiters, and data.

The Host will initiate a SPI cycle (lower SSN) and clock out the command, delimiters and associated data and raise the NSS signal to indicated that the all data has be sent. As result of the NNS raising the eS-WiFi module will lower the CMD/DATA READY pin to signal the end Command Phase.

The data that will be clocked back to the Host will be 0x15 (NAK).

### 10.2.3 SPI Endian Example:

The data is in little endian (0x15 0x15 0x0A 0x0D 0x20 0x3E) and needs to be converted back to big endian with the leading 0x15's removed. Please remember that this is a 16-bit interface so the endian conversion is done one 16-bit at a time.



The endian requirement extends to the command being sent to the module. So a “I?\r\x0A” command would be sent as 0x3F 0x49 0x0A 0x0D.



### 10.2.4 SPI Data Phase:

The Data Phase indicates the eS-WiFi module has data ready for the Host to read. The eS-WiFi module will raise CMD/DATA READY and the Host will initiate a SPI cycle (lower SSN) and clock out 0x0A (Line Feed) until the CMD/DATA READY pin lowers signaling the end of the Data Phase.

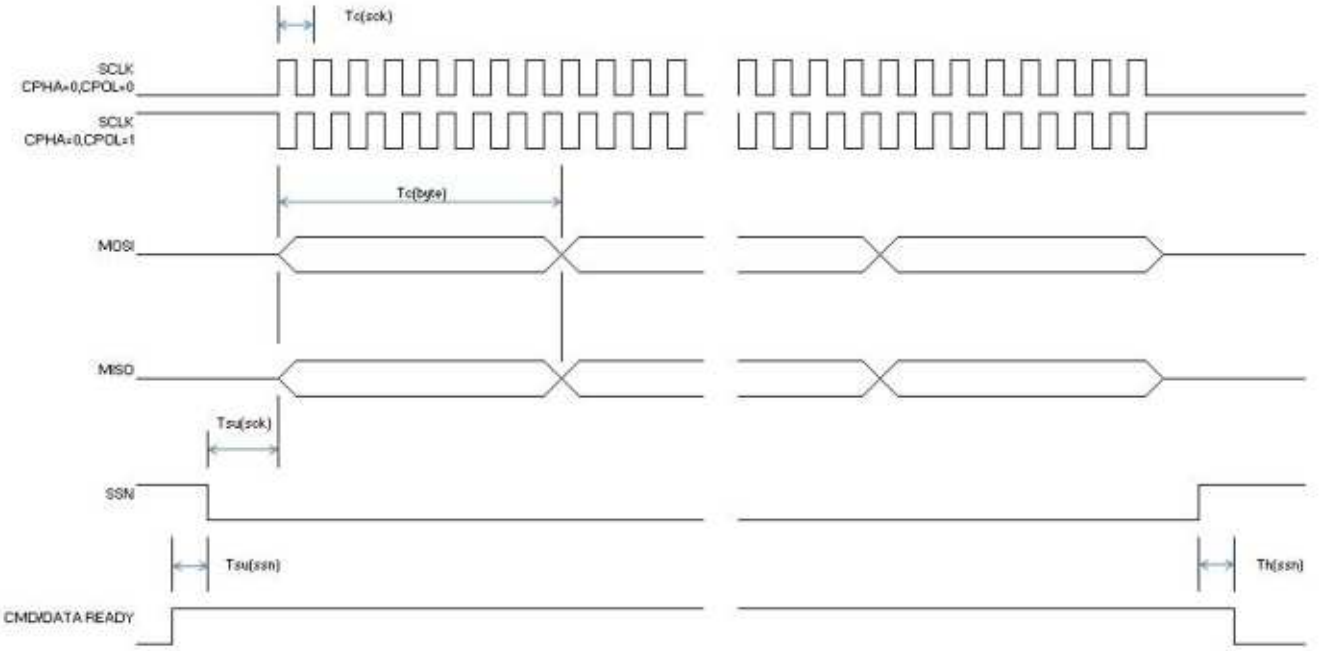
### 10.2.5 SPI Asynchronous Messages:

There are certain situations in which the eS-WiFi will issue asynchronous messages:

- Soft AP (AO/AD Commands), when a device connects to the Soft AP a DHCP assigned message will issued.
  Ex. [DHCP ] Assigned 00:00:00:00:00:00 has 192.168.10.100
- TCP/UDP Communication Servers (P5=1), when a client connects to the server a connected message will be issued.
  Ex. [TCP SVR] Waiting on connection...
  [TCP SVR] Accepted 192.168.10.100:2000
  [UDP SVR] Accepted 192.168.10.100:2000

With the SPI host interface being synchronous the Host must poll for these messages. This can be done by using the MR (Message Read) command or when a Communication connection the issuing of a R0 command will read all asynchronous message and the result of the R0 command. The asynchronous messages are delineated by the Start Of Message Asynchronous ([SOMA]) and End Of Message Asynchronous ([EOMA]) markers.

### 10.2.6 SPI AC Characteristics:




| Symbol | Min. | Typ. | Max. |
|---|---|---|---|
| **Tf(sck)** | | | 20 MHz |
| **Tc(sck)** | 50 ns | | |
| **Tsu(sck)** | | 15 us | |
| **Tc(byte)** | | 8 * Tc(sck) | |
| **Tsu(ssn)** | | 4 us | |
| **Th(ssn)** | | 3 us | |

## *10.3 USB*

The eS-WiFi module supports a USB HID interface. (Contact Inventek for specific firmware.)

## *10.4 GPIO*

Each of the GPIO pins can be configured by the **IWIN** AT command set as Button, LED, Digital input or Digital output. The outputs are 3.3V CMOS and reference the **IWIN** AT Command Set User manual to configure.

## *10.5 ADC's*

One 12-bit analog-to-digital converter is available. Reference the **IWIN** AT Command Set User's manual for configuration.

# 11 Wi-Fi RF SPECIFICATION

### 11.1.1 RF Specification

Conditions: VDD=3.3V; VDDIO=3.3V; TEMP: 25°C

| Feature | Description |
|---|---|
| WLAN Standard | IEEE 802.11b/g/n, Wi-Fi compliant |
| Frequency Range | 2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band) |
| Number of Channels | Ch1 ~ Ch14 |
| Modulation | 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK<br>802.11b : CCK, DQPSK, DBPSK |
| *Output Power | 802.11b /11Mbps : 18* dBm ± 1.5 dB |
| | 802.11g /54Mbps: 18* dBm ± 1.5 dB |
| | 802.11n /72Mbps: 18* dBm ± 1.5 dB |
| Receive Sensitivity (11n,20MHz) @10% PER | - MCS=0 PER @ -86 dBm, typical |
| | - MCS=1 PER @ -85 dBm, typical |
| | - MCS=2 PER @ -85 dBm, typical |
| | - MCS=3 PER @ -84 dBm, typical |
| | - MCS=4 PER @ -80 dBm, typical |
| | - MCS=5 PER @ -78 dBm, typical |
| | - MCS=6 PER @ -72 dBm, typical |
| | - MCS=7 PER @ -69 dBm, typical |
| Receive Sensitivity (11g) @10% PER | - 6Mbps PER @ -89 dBm, typical |
| | - 9Mbps PER @ -88 dBm, typical |
| | - 12Mbps PER @ -88 dBm, typical |
| | - 18Mbps PER @ -87 dBm, typical |
| | - 24Mbps PER @ -83 dBm, typical |
| | - 36Mbps PER @ -80 dBm, typical |
| | - 48Mbps PER @ -75 dBm, typical |
| | - 54Mbps PER @ -72 dBm, typical |
| Receive Sensitivity (11b) @10% PER | - 1Mbps PER @ -93 dBm, typical |
| | - 2Mbps PER @ -91 dBm, typical |
| | - 5.5Mbps PER @ -89 dBm, typical |
| | - 11Mbps PER @ -87 dBm, typical |
| Data Rates | 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 : -10 dBm |

*Maximum output power can be set to 20 dBM ± 1.5 dB with firmware modifications.

# 12 ANTENNA PATTERNS

## *12.1 External Antenna*

The Inventek U.FL PCB antenna has passed FCC and CE testing. The part number is W24P-U. It is a 2.4 GHz PCB antenna with a U.FL connector.

The eS-Wifi family of Wi-Fi products comes with two different antenna offerings:

| | |
|---|---|
| ISM43362-M3G-L44-E | PCB Etched Antenna |
| ISM43362-M3G-L44-U | U.FL connector for external antenna |

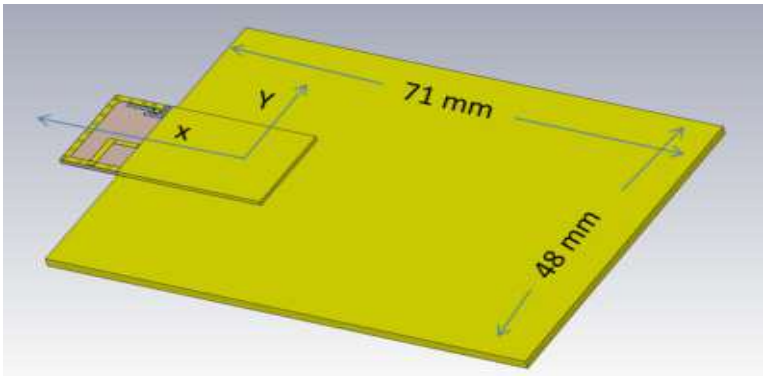
The Inventek W24P-U PCB antenna is FCC and CE certified and can be found on the Inventek Website.

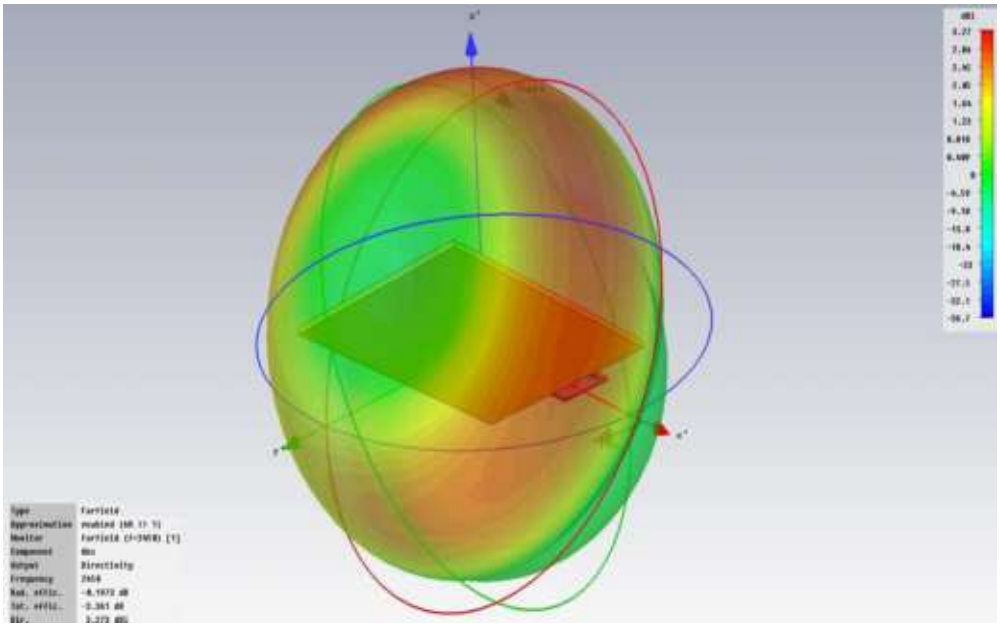


Inventek has also certified an external Rubber Antenna with a length of approximately 9 inches and 5 dB of gain that has certification for FCC, IC and CE. Please contact Inventek for further details.

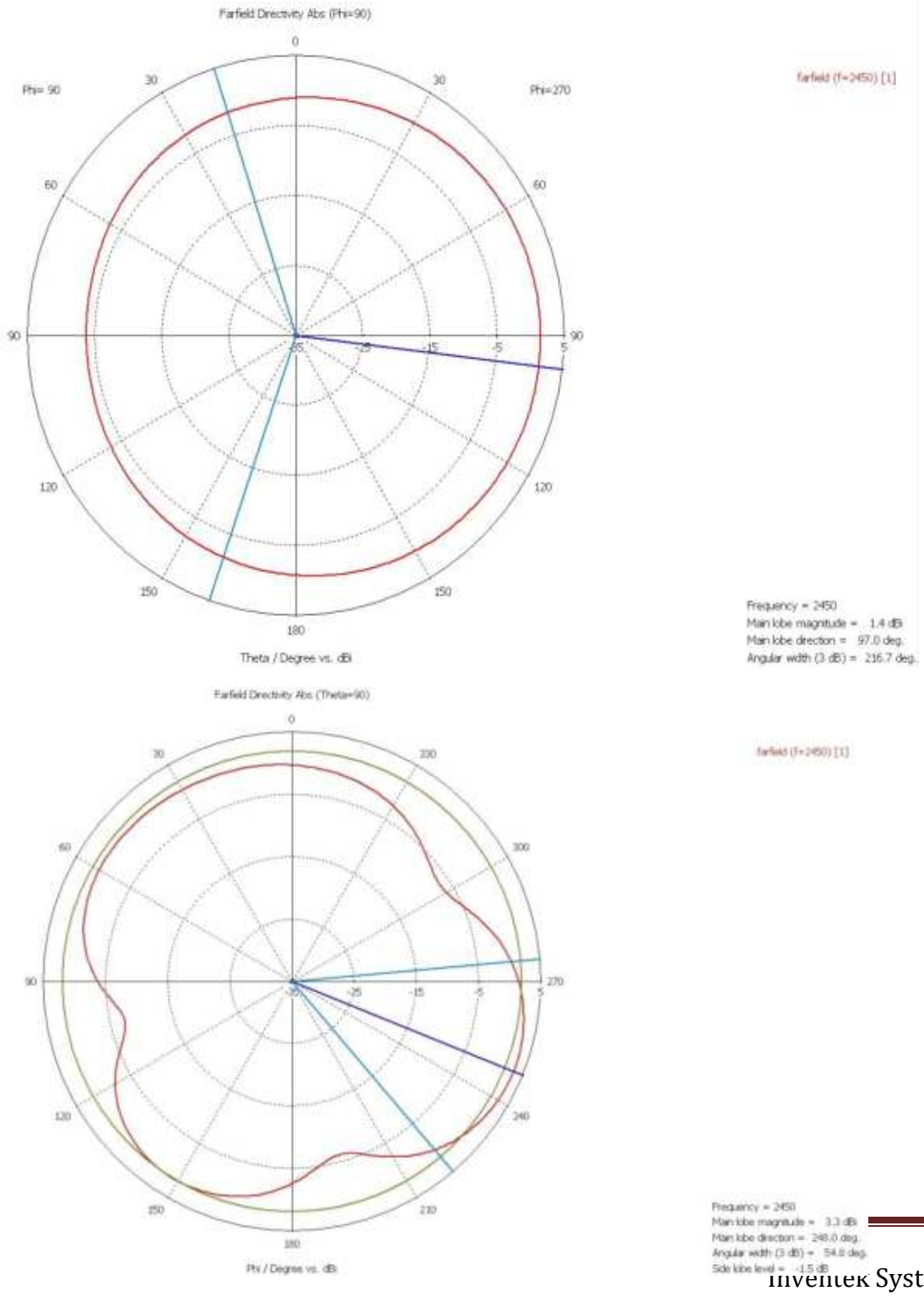
## 12.2 PCB Etch Antenna Gain on the Evaluation Board

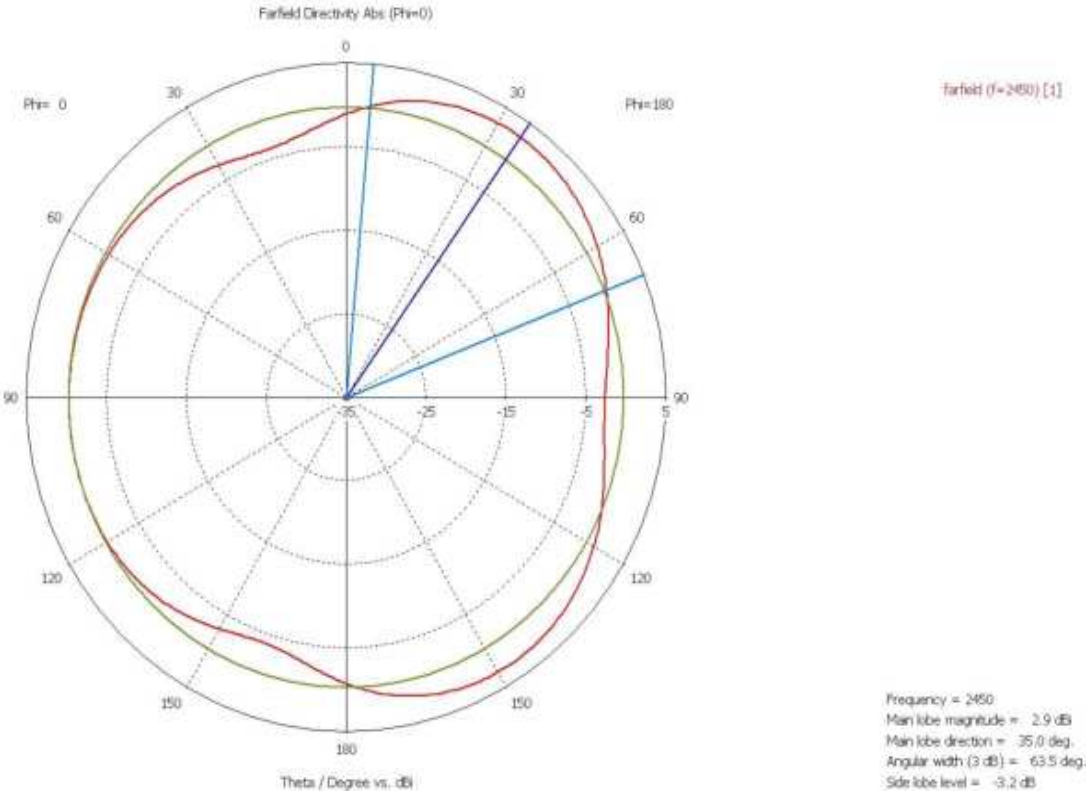
The eS-WiFi PCB etched antenna performance is shown below. This etched antenna is FCC and CE certified and the radiation patterns shown below are based on simulation using evaluation boards that have a ground plane with dimensions of 71mm x 48mm.



## 12.3 Far field Directivity






# 13 ON BOARD PROCESSOR

Reference the STM32F205 specification from ST Microelectronics for UART, SPI (Slave Mode) and USB Device.

http://www.st.com/en/microcontrollers/stm32f2-series.html?querycriteria=productId=SS1575

# 14 ISM43362-M3G-L44 FOOTPRINT

## *14.1 Module's dimensions top view (mm)*

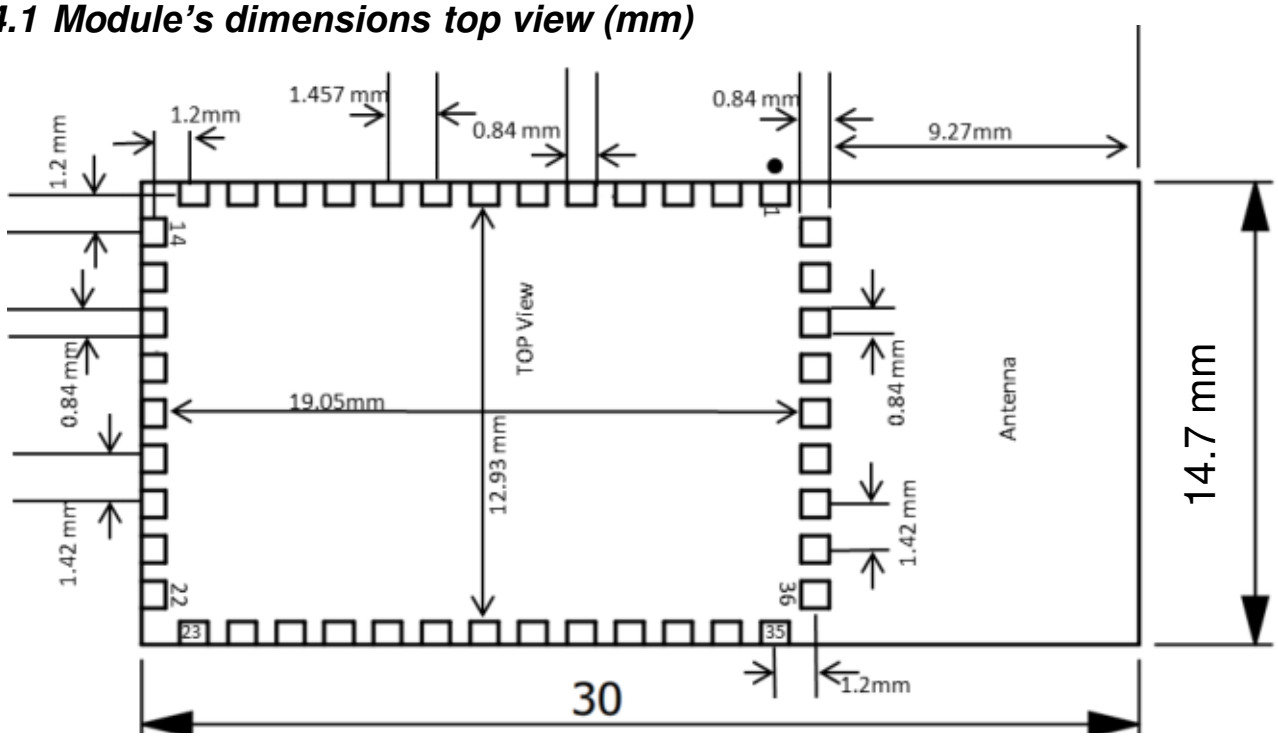



**Figure 3 Module Dimensions- Top View**

.

## *14.2 PCB recommended footprint top view (mm)*

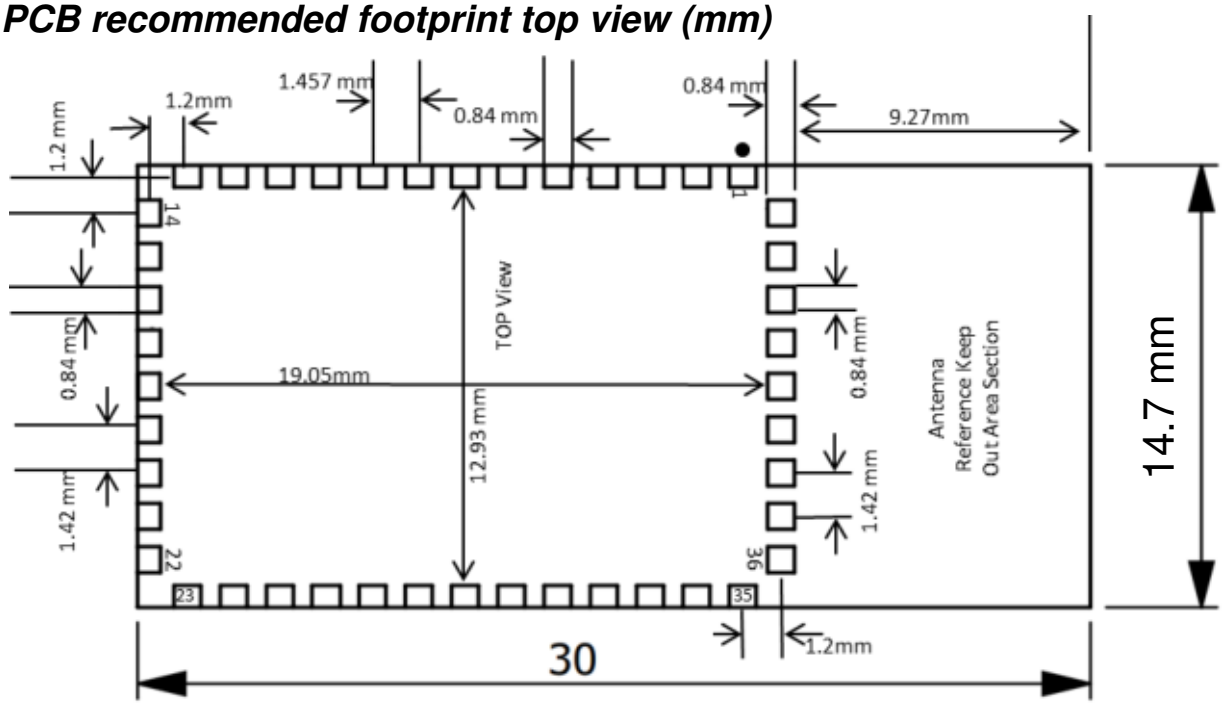
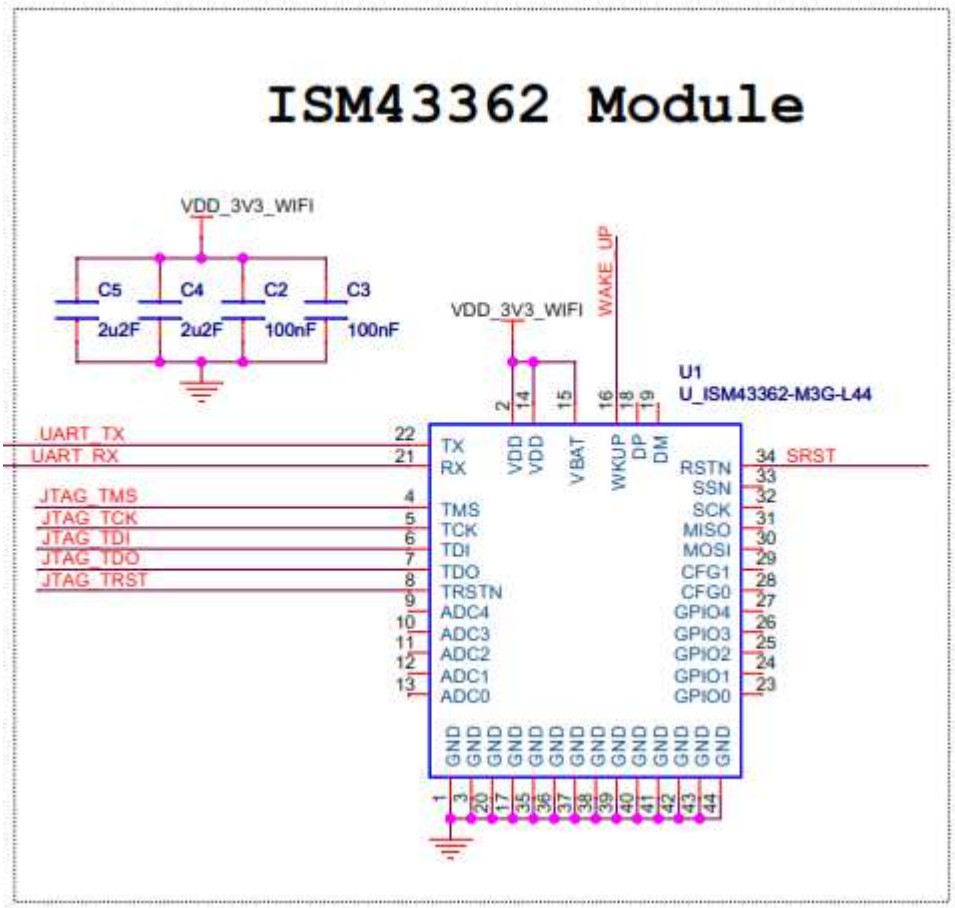



**Figure 4 PCB Recommended Foot print - Top View**

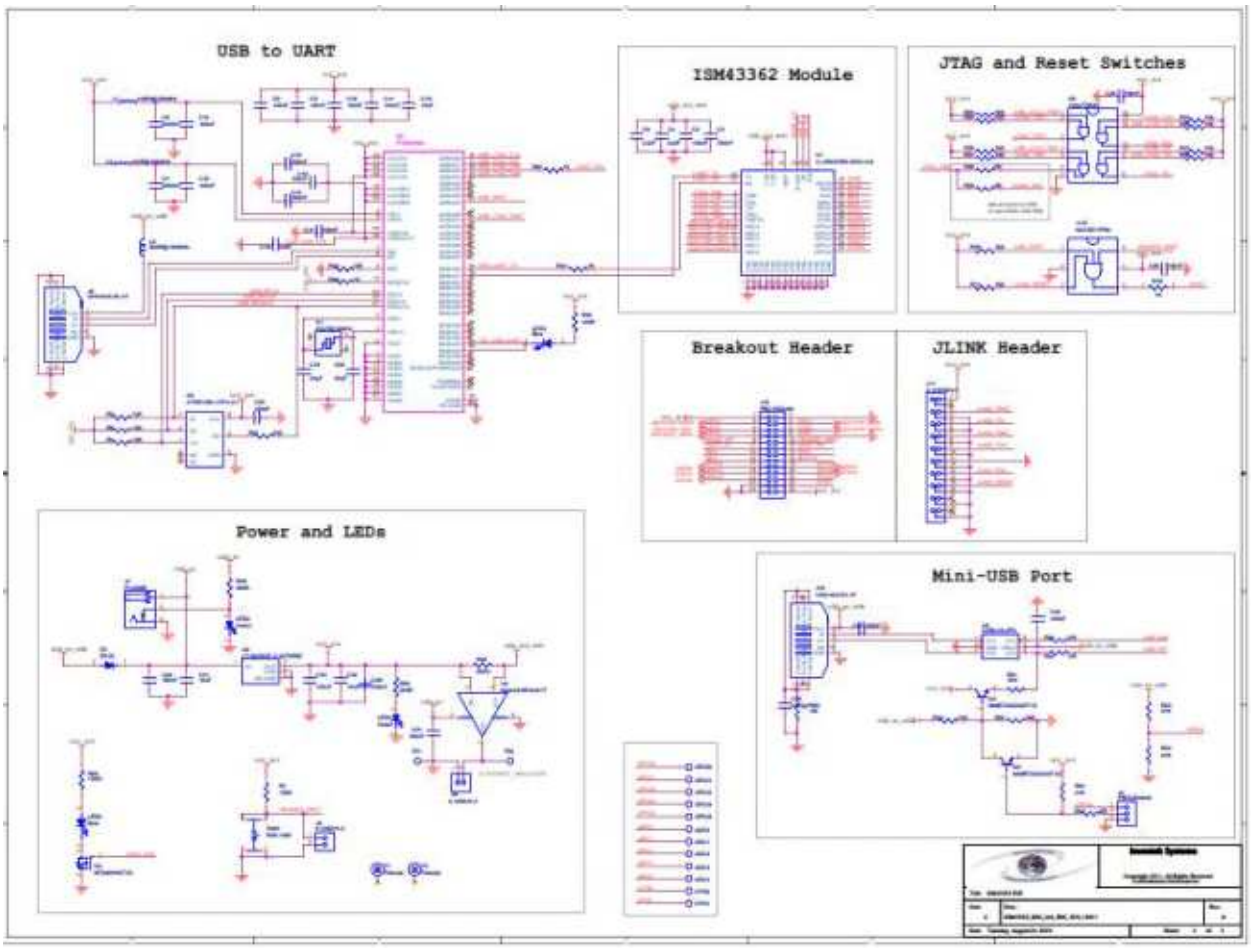
# 15 TYPICAL APLLICATION CIRCUIT

This is the minimum number of wires required to be connected to a host microcontroller for operation in UART mode. It is recommended that the JTAG and BOOT0 lines are also brought out for future firmware upgrades.



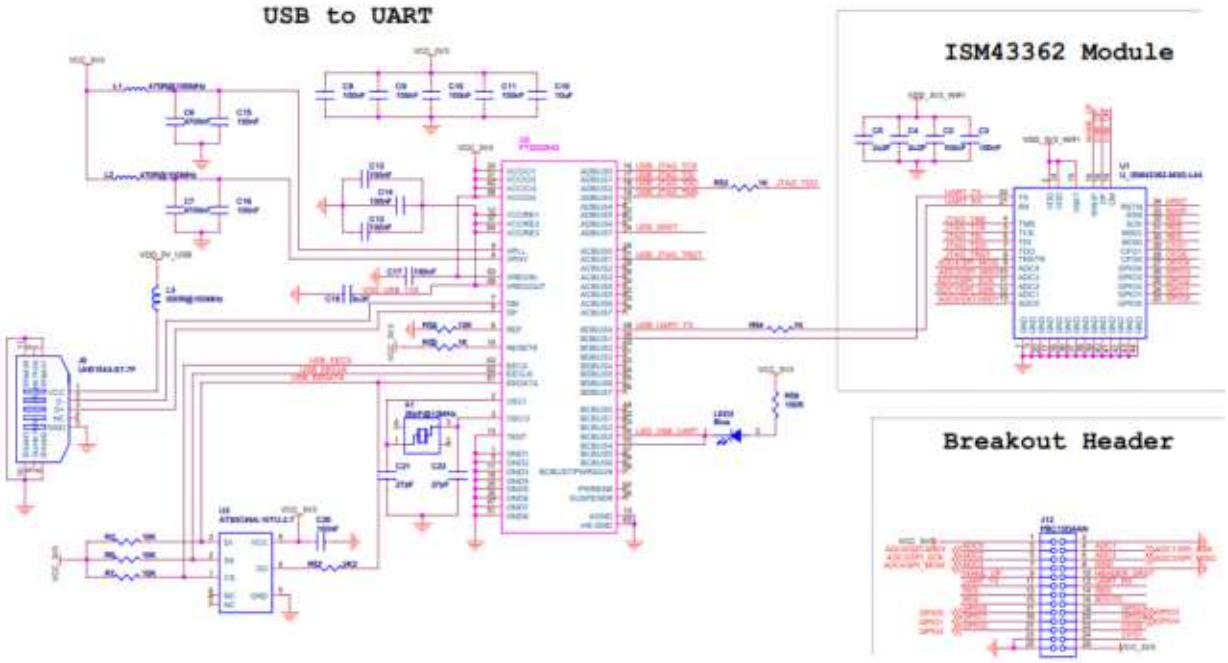

**NOTE: Please place a 10-15uF Bulk CAP as close to the module as possible to VDD_3V3_WIFI**

## 15.1 Reference Schematic (EVB)

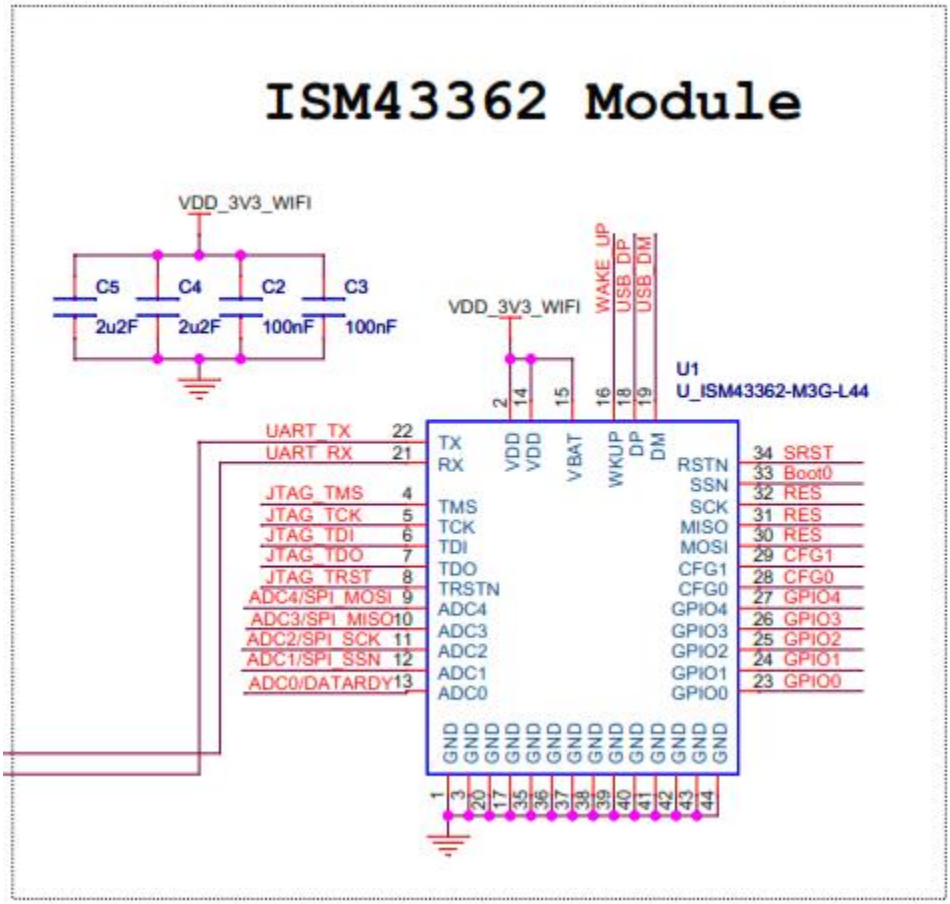


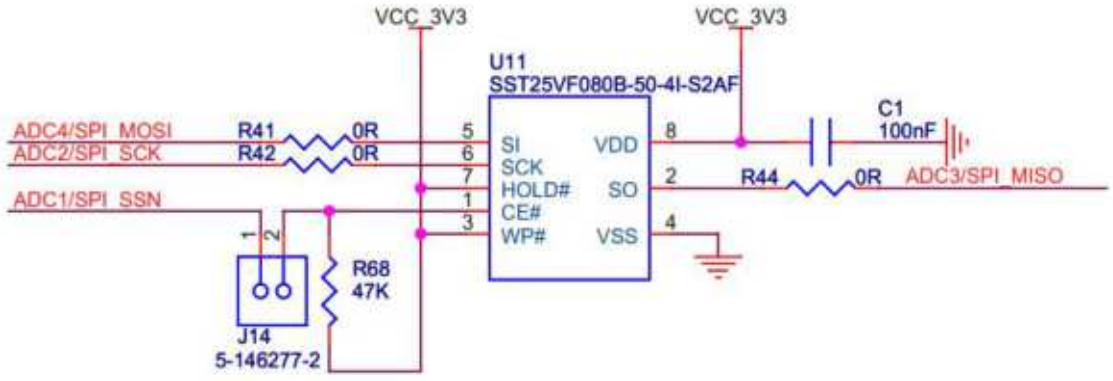

Typical application circuits please refer to schematic below. For a *.pdf version please visit the ISM43362 **eS-WiFi** evaluation board website:
http://3225fd3789f8922a800865fd.mdeb1esylkbkqnmp3v.maxcdn-edge.com/wp-content/uploads/ISM43362_EVB_Schematic.pdf

## 15.2 USB to UART

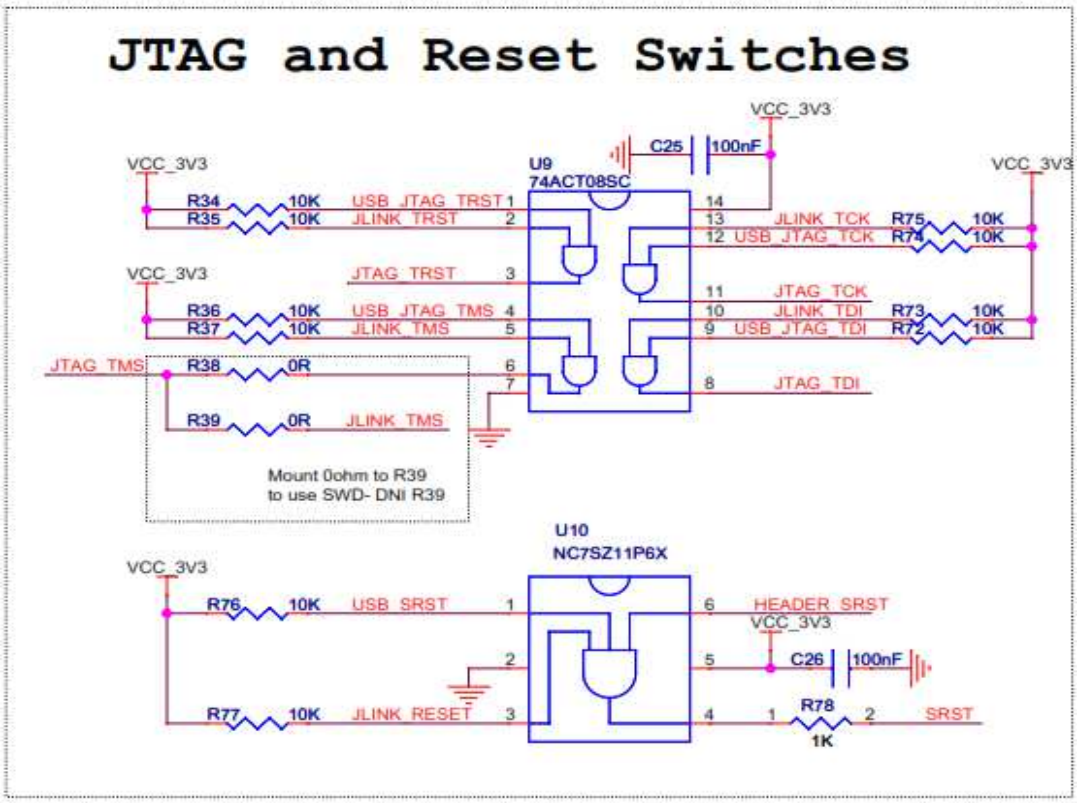


## 15.3 Connecting Microcontroller to eS-WiFi UART

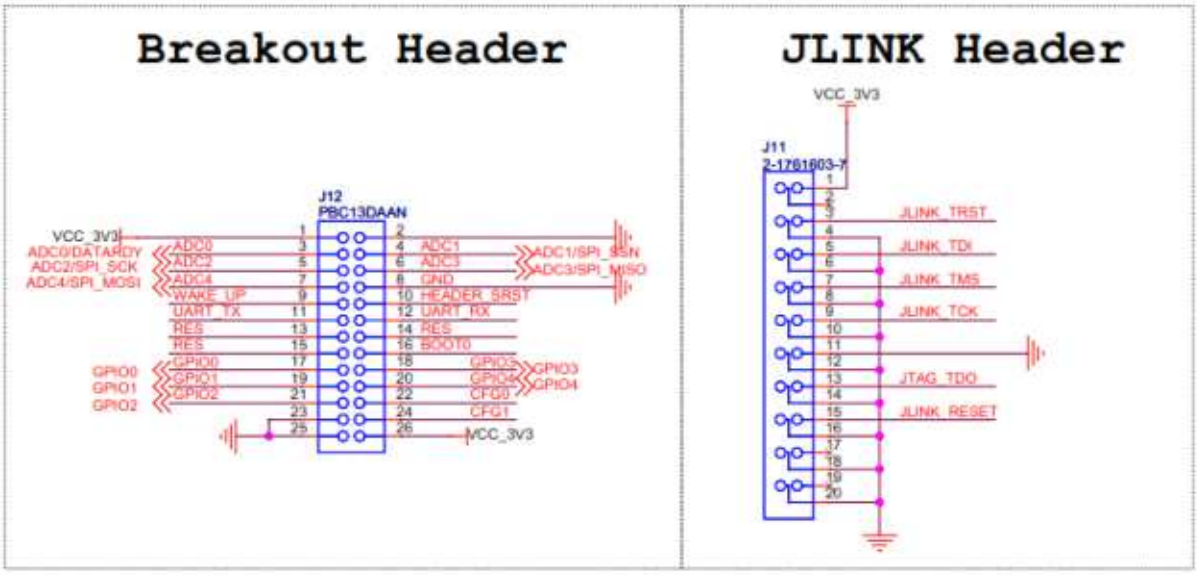


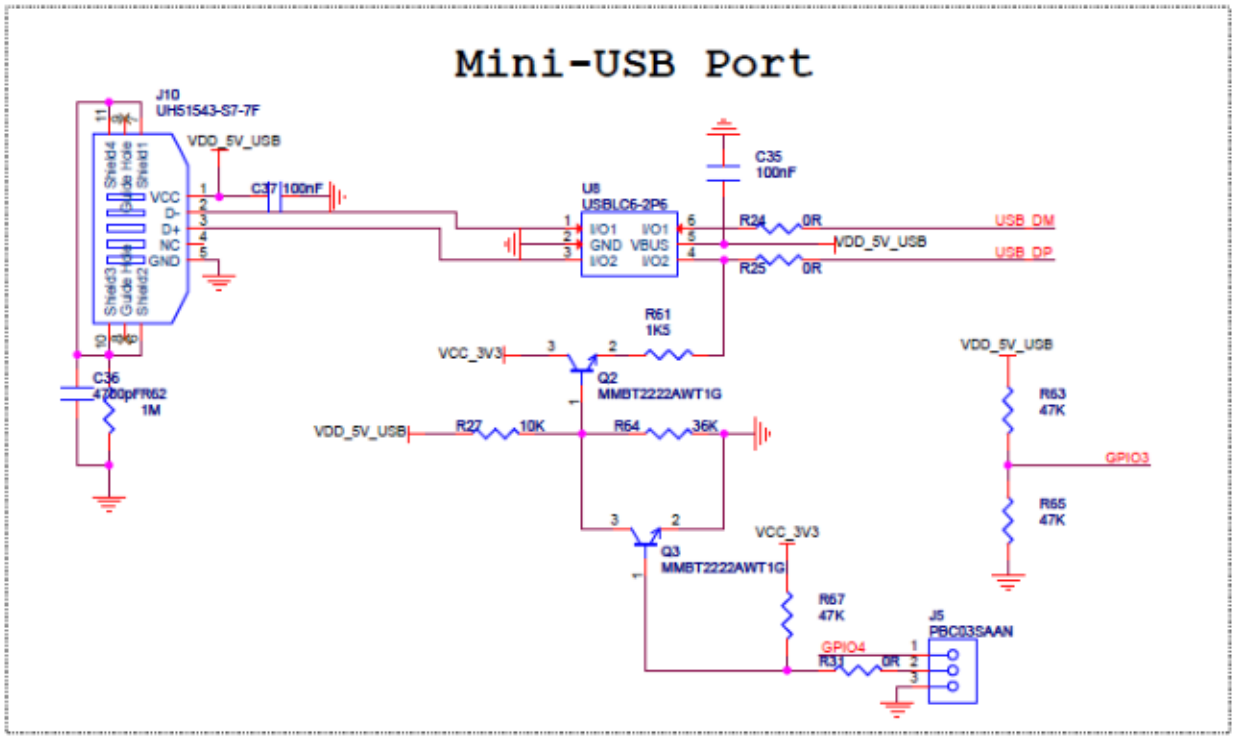
## 15.4 JTAG and Reset Connections



## 15.5 eS-WiFi Programming Options




## 15.6 eS-WiFi USB Direct Connection Option



# 16 PRODUCT COMPLIANCE CONSIDERATIONS

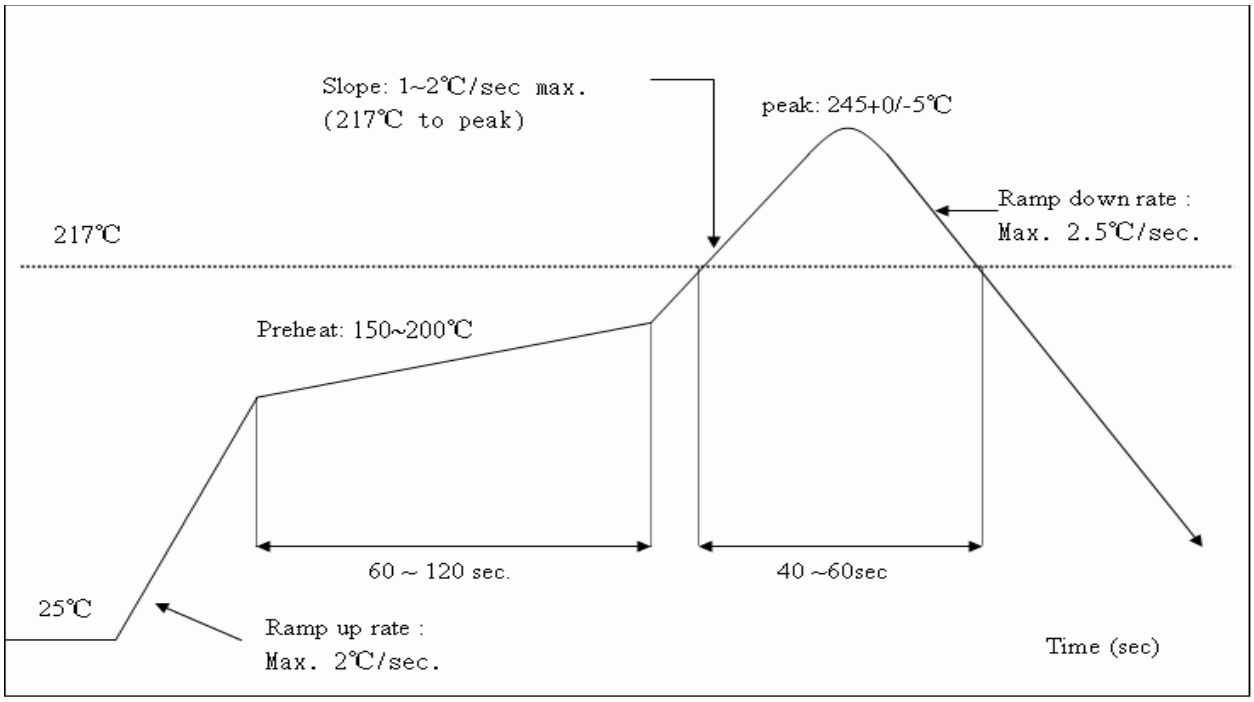
**RoHS**: Restriction of Hazardous Substances (RoHS) directive has come into force since 1st July 2006 all electronic products sold in the EU must be free of hazardous materials, such as lead. Inventek is fully committed to being one of the first to introduce lead-free products while maintaining backwards compatibility and focusing on a continuously high level of product and manufacturing quality.

**EMI/EMC:** The Inventek module design embeds EMI/EMC suppression features and accommodations to allow for higher operational reliability in noisier (RF) environments and easier integration compliance in host (OEM) applications.

**FCC/CE:** The module will be in compliance test for FCC/CE

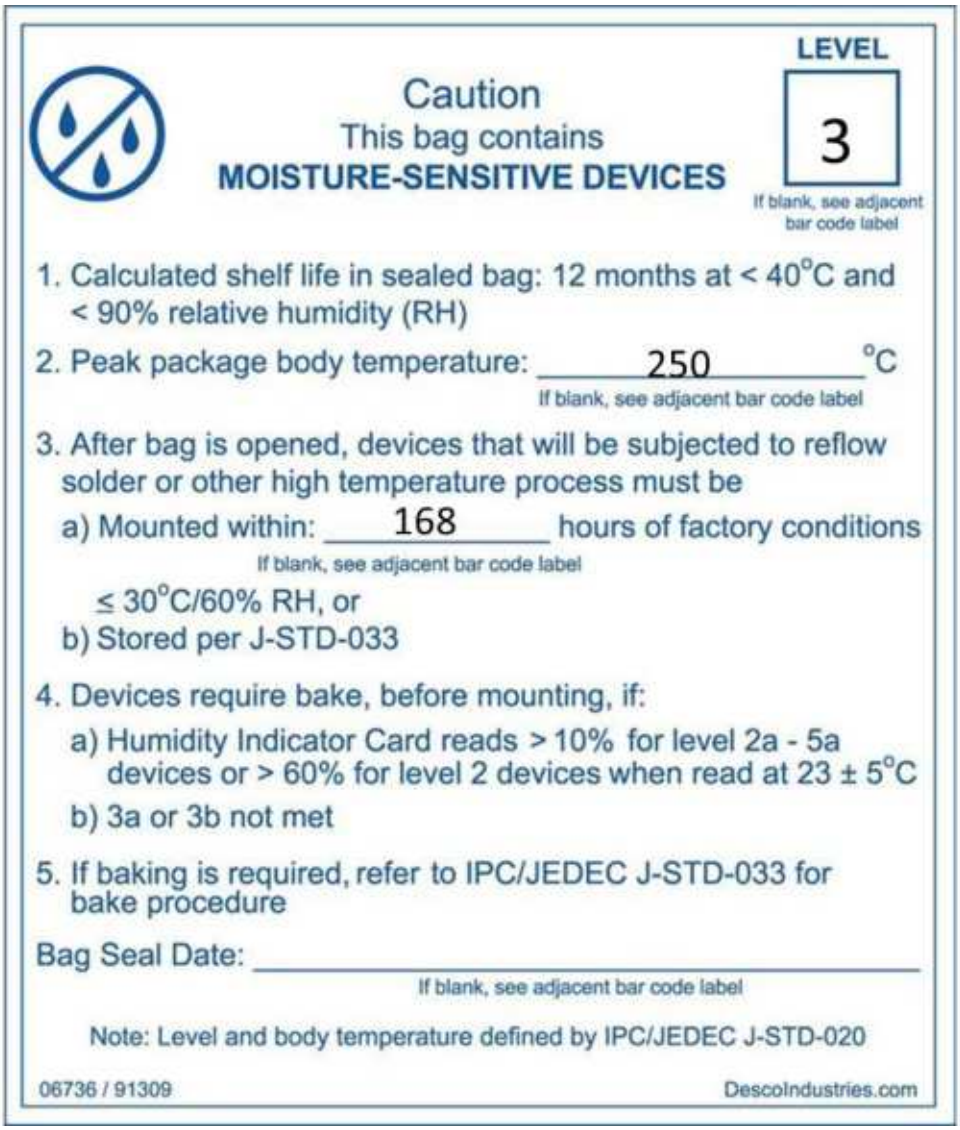
# 17 REFLOW PROFILE

- Reference the IPC/JEDEC standard.
- Peak Temperature: <250°C
- Number of Times: ≤2 times



# 18 PACKING INFORMATION

## *18.1 MSL Level / Storage Condition*



## 18.2 Device baking requirements prior to assembly

***Boards must be baked prior to rework or assembly to avoid damaging moisture sensitive components during localized reflow. The default bake cycles is 24 hours at 125C.***
Maintaining proper control of moisture uptake in components is critical.
Before opening the shipping bag and attempting solder reflow, you should maintain a minimal out-of-bag time and ensure the highest possible package reliability for the final product.

## Module's Assembly Instructions

**Board Placement:** The ISM43362-M3G-L44 has an optional on board Wi-Fi antenna. The board is designed to be a stuffing option. If you elect to use the on-board antenna, then board placement is critical in your system. Several key items to consider when placing the module are:

- Ensure that the antenna portion of the design is placed so that the antenna has no ground plane under, above or near the antenna. Ideally, the antenna requires clear sky for optimal performance. If you have shields or other material around the antenna, please test for interference and loss of signal strength.

# 19 REVISION CONTROL

| | |
|---|---|
| Document : ISM43362-M3G-L44 | Wi-Fi module |
| External Release | DOC-DS-20023 |

| Date | Author | Revision | Comment |
|---|---|---|---|
| 8/15/2012 | FMT | 1.0 | Preliminary |
| 2/11/2013 | FMT | 1.1 | Updated Ref. Schematic |
| 5/5/2013 | FMT | 2.0 | Updated SPI |
| 7/24/13 | FMT | 2.1 | Added FCC, updated Temperature ,SPI,UART |
| | | | |
| 8/27/2013 | FMT | 3.0 | Updated SPI information and reference schematic Update |
| 9/18/2013 | FMT | 3.1 | Update Ref Schematic |
| | | | |
| 10/17/13 | FMT | 3.2 | Footprint Updated |
| 8/8/2014 | KMT | 3.3 | Power settings updated, added Boot 0 description |
| 10/29/2014 | FMT | 3.3.1 | Fig. 4 update |
| 11/4/2015 | KMT | 3.3.2 | Updated Mechanical Dimensions |
| | | | |
| 1/17/2017 | RLB | 4 | Added Rubber Antenna |
| 4/11/17 | AS | 4.1 | Added I/F and SW Version to Ordering P/N |
| 5/30/17 | AS | 4.2 | 10-15uF Bulk Cap to VDD_3V3 |
| 10/30/17 | FMT | 4.2.1 | MSL Level Add |

# 20 CONTACT INFORMATION

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Sales@inventeksys.com

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