Inventek Systems

ISM43362-M3G-L44
Embedded Serial-to-Wi-Fi Module
eS-WiFi™
802.11 b/g/n
Preliminary Data Sheet

Table of Contents

1 GENERAL DESCRIPTION

The Inventek ISM43362-M3G-L44 is an embedded (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 Broadcom Wi-Fi MAC/Baseband/Radio 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 complete integrated TCP/IP Stack that only requires 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 AT Command Set or Broadcom's WICED™ SDK.

Summary of Key Features:

- 802.11 b/g/n compliant based on Broadcom MAC/Baseband/Radio device.
- Fully contained TCP/IP stack minimizing host CPU requirements.
- Configurable using AT commands.
- Supported by Broadcom WICED™ SDK.
- Host interface: UART, SPI, or USB.
- 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.

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

Device	Description	Ordering Number
ISM43362-M3G-L44	802.11 Module, STM32F205 (1 Meg), UART and SPI I/O, Internal Etched Antenna	ISM43362-M3G-L44-E
ISM43362-M3G-L44	802.11 Module, STM32F205 (1 Meg), UART and SPI I/O, External U.FL Connector	ISM43362-M3G-L44-U
ISM43362-M3-EVB-E	Evaluation Board, USB cable, with ISM43362-M3G-L44-E, Quick Start Guide	ISM43362-M3G-EVB-E

3 GENERAL FEATURES

- Based on the Broadcom BCM43362 MAC/Baseband/Radio device.
- Supports Broadcom WICED SDK.
- CPU ARM Cortex™-M3 32-bit RISC core from ST Microelectronics.
- Host UART, SPI or USB 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 I/O utilizes ADC Pins.)
- The devices operate from a 2.0 to 3.6 V power supply.
- -35 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 Certified (In process).

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

Regulator	Status
FCC	In Process
CE	In Process
RoHS	Compliant

3.3 FCC User's Manual Statements (In Process):

Antenna Installation requirements-*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.*

Manufacturer	Type of Antenna	Model	Gain dB	Type of Connector
Inventek	U.FL port Antenna	W24-SSMA-M	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 equipme nt 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.

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

3.4 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 the device.

L'opération est soumise aux deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement 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 réglementation d'Industrie Canada, ce transmetteur radio ne peut fonctionner en utilisant une antenne d'un type et un maximum (ou moins) gain approuvées pour l'émetteur par Industrie Canada. Pour réduire le risque d'interférence aux autres utilisateurs, le type d'antenne et son gain doivent être choisis de manière que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas ce qui est nécessaire pour une communication réussie.

This radio transmitter 6546A-VN3104034R5 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 émetteur de radio 6546A-VN3104034R5 a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérées ci-dessus avec le gain maximal admissible et impédance d'antenne requise pour chaque type d'antenne indiqué. Types d'antennes ne figurent pas dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdites pour l'utilisation avec cet appareil.

4 COMPLEMENTARY DOCUMENTATION

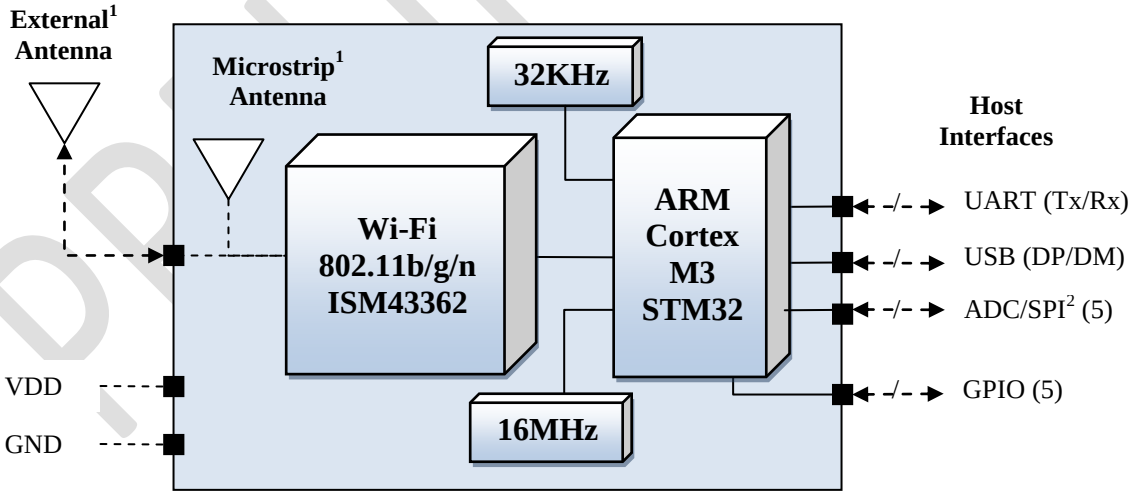
4.1 Inventek Systems

- Evaluation Board
  - ISM43362-M3G-EVB Evaluation Board Specification
  - EVB User's Guide
  - Quick Start Guide
  - eS-WiFi Demo software (includes EVB Drivers and Firmware)
- At Command Set
  - AT Command Set User's Manual
  - AT Command Set Quick Reference Guide
- Firmware
- OrCAD Schematic Symbol
- PADS Land Pattern
- ISM43362 specification and Product Brief
- FCC Test Report (In Process)

5 SPECIFICATIONS

5.1 Module Architecture

Figure 1 Inventek's ISM43362-M3G General Block Diagram



Notes: 1. Antenna Options: Integrated microstrip antenna or U.FL connector for an external antenna.
2. ADC0-ADC4 pins may also be configured as SPI host interface.

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 GPS Module are as follow:

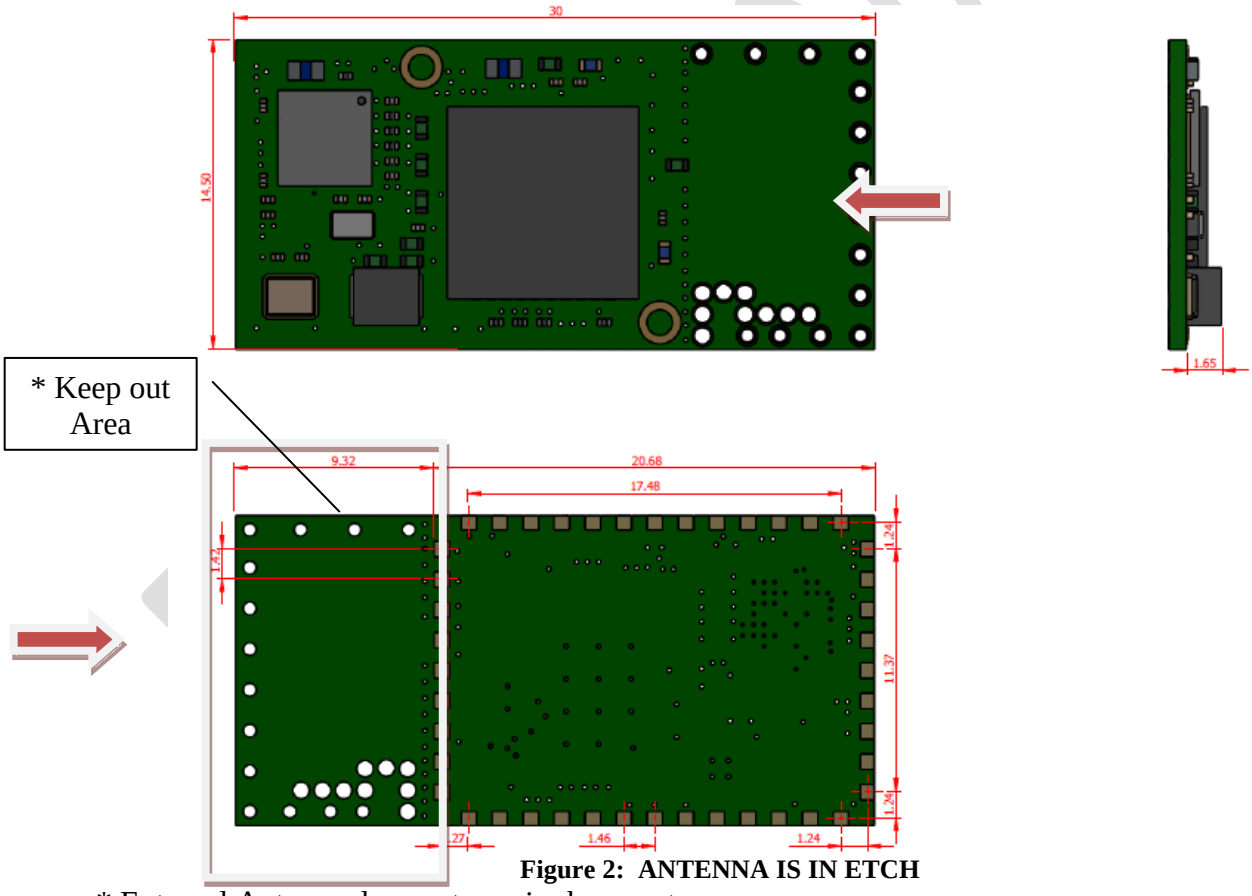


Figure 2: ANTENNA IS IN ETCH

* External Antenna does not require keep out area
* Keep out area should ideally have the antenna hanging off the side of the PCB for best performance.
*The ISM43362-M3G-L44 U and E have the same footprint.

Items	Description ISM43362-M3G-L44-E /U
Length	30 mm (-/+0.5 mm)
Width	14.5 mm (-/+0.5 mm)
Height	2.5 ± 0.2 mm
Package	44 pin LGA

5.4 Environmental Specifications

Item	Description
Operating temperature range	-35 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-M3X supports a functional operating range of -35°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

6.2 Power Consumption

6.2.1 Estimated Power Consumption

Mode/Description	802.x	Voltage	Typ. (RMS)	Max.	Unit
Running Full Power[1]	/n	3.3V	110		mA
Running in Power Save Mode	/n	3.3V	55	110[1]	mA
Wi-Fi Radio Off	b/g/n		30		mA
Stop Mode[2]			2		mA

Note:
[1]During transmit the maximum can reach 340 mA burst of not more than 5ms.
[2]Available in Firmware release C1.3 or later only.

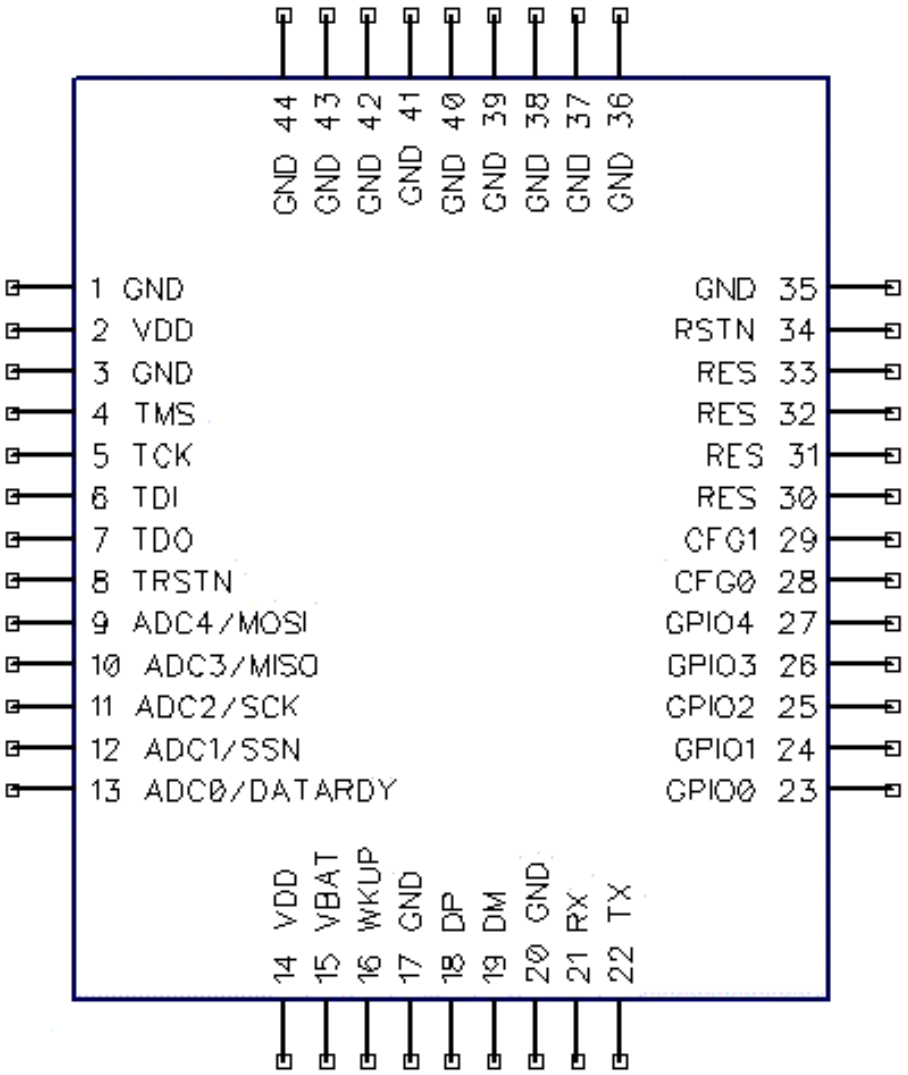
The eS-WiFi modules support multiple power saving modes. Please see the power savings application note for more detailed information

6.2.2 Stop Mode

Stop Mode is initiated by software using an AT command and exited by the rising edge 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.

7 Pin out


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
14 VDD
15 VBAT
16 WKUP
17 GND
18 DP
19 DM
20 GND
21 RX
22 TX
23 GPIO0
24 GPIO1
25 GPIO2
26 GPIO3
27 GPIO4
28 CFG0
29 CFG1
30 RES
31 RES
32 RES
33 RES
34 RSTN
35 GND
36 GND
37 GND
38 GND
39 GND
40 GND
41 GND
42 GND
43 GND
44 GND

7.1.1 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	RES	Reserved
5	I/O	RES	Reserved
6	I/O	RES	Reserved
7	I/O	RES	Reserved
8	I/O	RES	Reserved
9	I	ADC 4 / SPI_MOSI	ADC Input Pins Note: ADC0-ADC4 can be used as SPI port. (Refer to Table 7.1.2)
10	I	ADC 3 / SPI_MISO	
11	I	ADC 2 / SPI_SCK	
12	I	ADC 1 / SPI_NSS	
13	I	ADC 0/ DATARDY	
14	I	VDD	3.3V
15	I	VBAT	3.3V
16	0	Wakeup	(Refer to Section 6.3.2)
17	G	GND	Ground
18	I	DP	USB Data Plus (Refer to Table 7.1.2)
19	I/O	DM	USB Data Minus (Refer to Table 7.1.2)
20	G	GND	Ground
21	I/O	RX	UART Receive (Refer to Table 7.1.2)
22	I/O	TX	UART Transmit (Refer to Table 7.1.2)
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 7.1.2)
29	I	CFG1	Configuration Pin 1 (Refer to Table 7.1.2)
30	O	RES	Reserved
31	I	RES	Reserved
32	I	RES	Reserved
33	I	BOOT 0	Reserved
34	I	RSTN	Reset
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

7.1.2 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

8 AC CHARACTERISTICS

Serial interfaces supported:

8.1 UART

8.1.1 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).

8.1.2 2.1.2 Flow Control

The eS-WiFi module doesn't require or support Flow Control, so Flow Control should be 'None'

8.1.3 2.1.3 Supported Baud Rates

The eS-WiFi module supports the following serial baud rates:
1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 1152000, 1382400, 1612800, 1834200, 2073600

8.1.4 Default Serial Configuration

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

8.2 2.2 USB (Universal Serial Bus)

The eS-WiFi module supports USB (Contact Inventek for firmware)

8.3 2.3 SPI (Serial Peripheral Interface Bus)

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

8.4 GPIO

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

8.5 ADC's

One 12-bit analog-to-digital converter is available and reference the AT Command Set User manual to configure.

9 Wi-Fi RF Specification

9.1.1 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 802.11b : CCK, DQPSK, DBPSK
Output Power	802.11b /11Mbps : 15 dBm± 1.5 dB
	802.11g /54Mbps: 15 dBm ± 1.5 dB @ EVM ≤ -25dB
	802.11n /72Mbps: 13 dBm ± 1.5 dB@ EVM ≤ -28dB
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

10 Antenna Patterns

10.1 External Antenna

The U.FL antenna is in process to pass FCC and CE. The part number is W24-SSMA-M. It is a 2.4 GHz straight SMA Male antenna and we sell an adapter that plugs directly on the eS-Wifi- to SMA (U.FL – SMA Adapter).

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

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

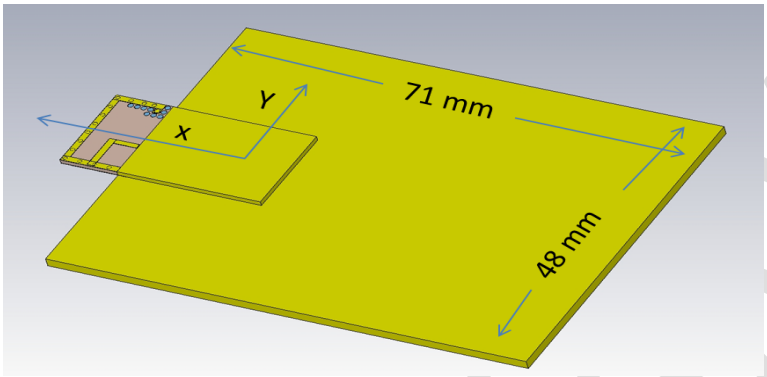
The U.FL antenna that will be used for FCC and CE certified can be found on the Inventek Website.

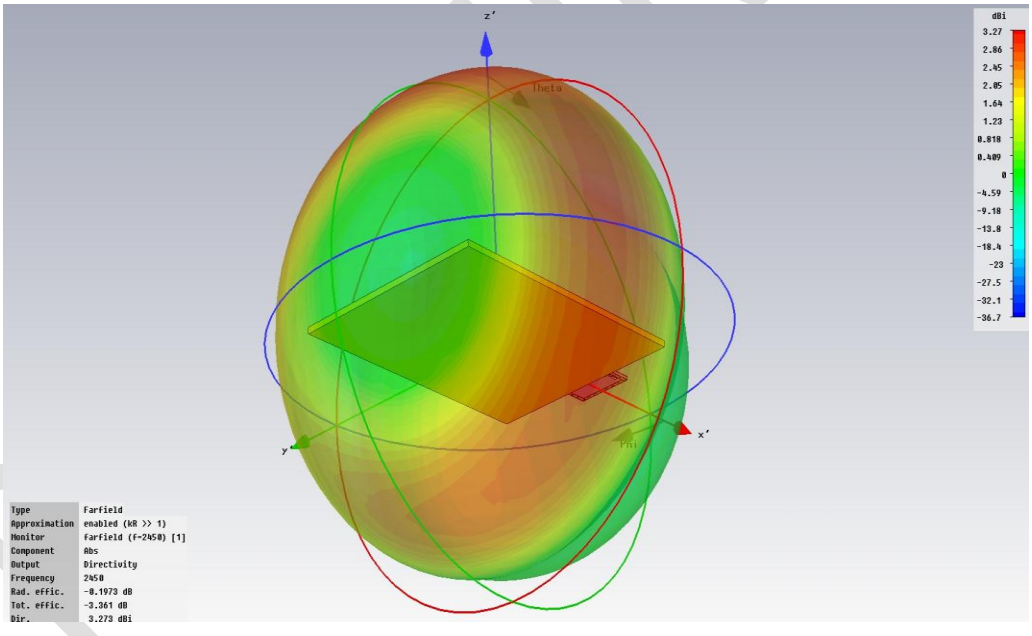
Wi-Fi 2.4Ghz SMA Male

W24-SSMA-M

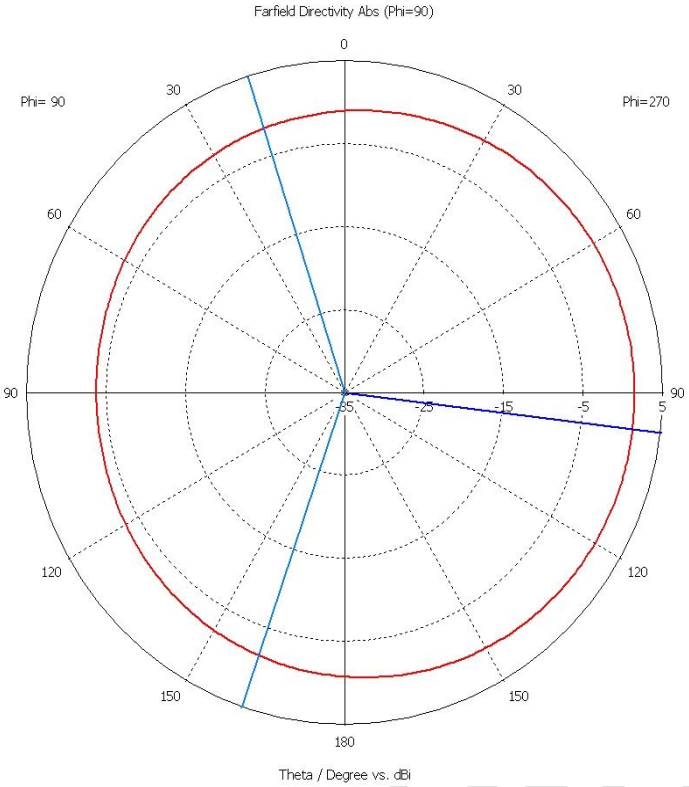
10.2 PCB Etch antenna gain on the evaluation board

The eS-WiFi PCB etch antenna performance is shown below. This etch antenna will be FCC and CE certified and the radiation patterns shown below are based on simulation using our evaluation boards that has a ground plane 71 x 48mm.



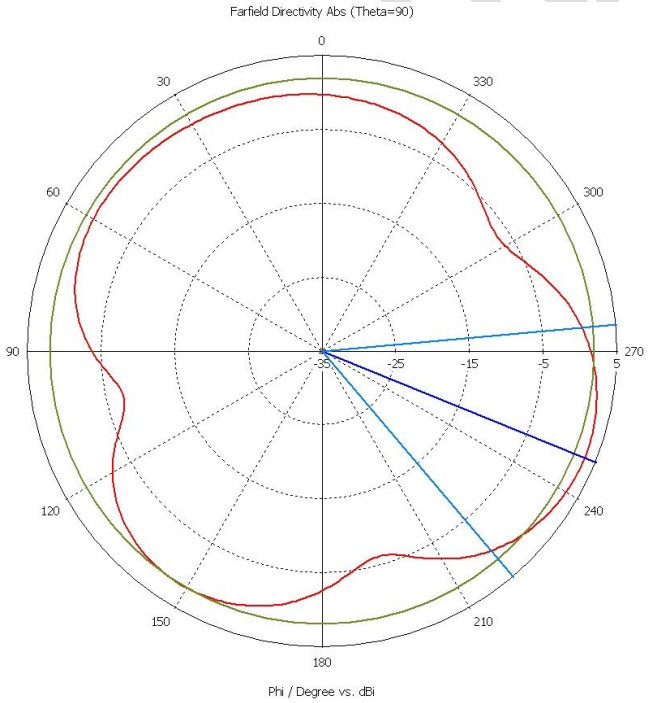


10.3 Farfield Directivity



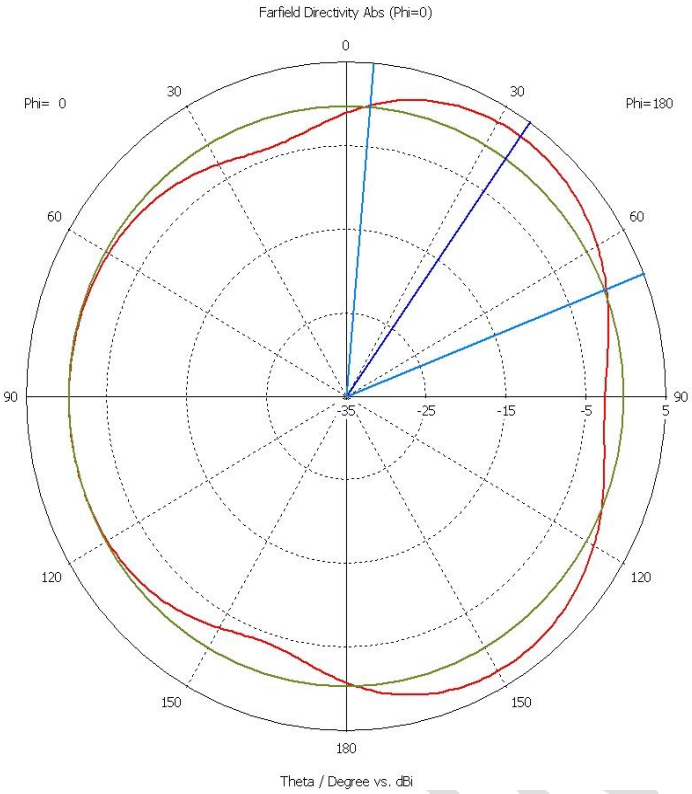
farfield (f=2450) [1]

Frequency = 2450
Main lobe magnitude = 1.4 dBi
Main lobe direction = 97.0 deg.
Angular width (3 dB) = 216.7 deg.



farfield (f=2450) [1]

Frequency = 2450
Main lobe magnitude = 3.3 dBi
Main lobe direction = 248.0 deg.
Angular width (3 dB) = 54.8 deg.
Side lobe level = -1.5 dB



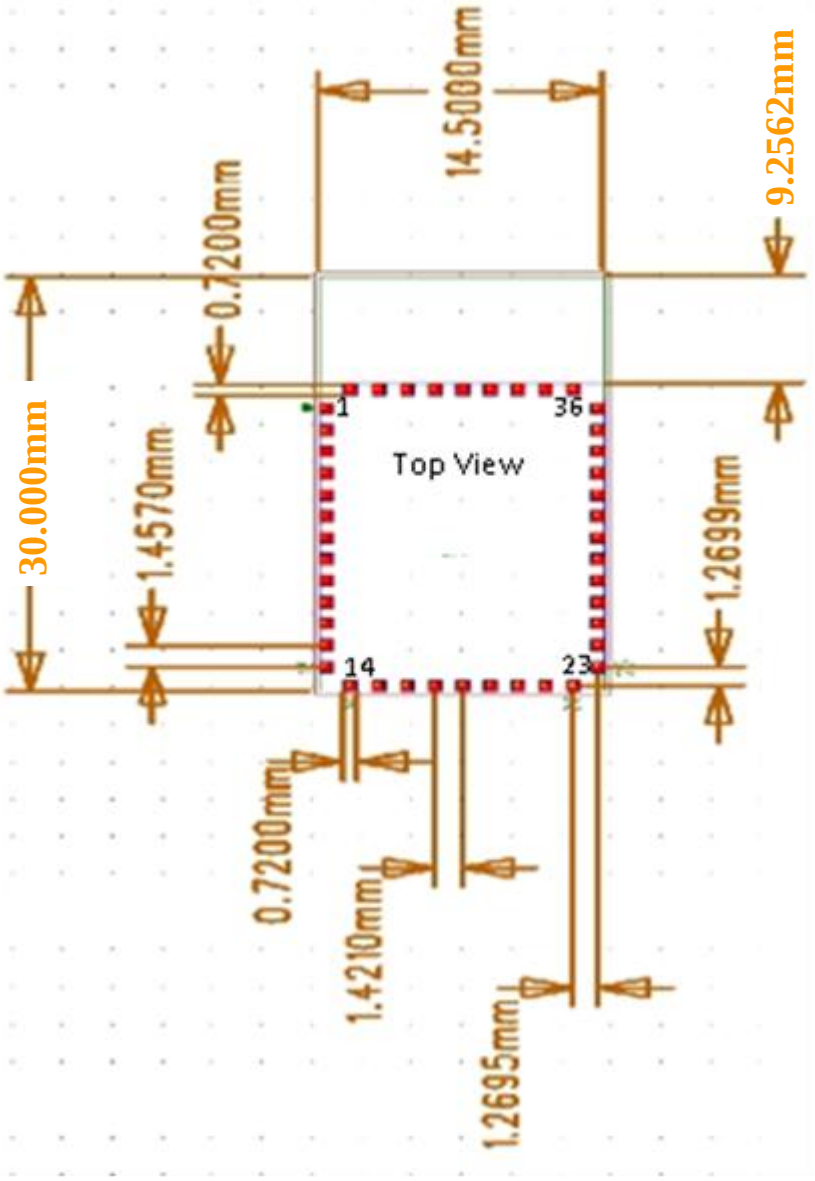
11 On Board Processor

The eS-WiFi module uses an ST Microcontroller, F205 family processor.
See the STM32F205 specification from ST Microelectronics for UART, SPI (Slave Mode) and USB Device.

http://www.st.com/internet/mcu/product/245089.jsp

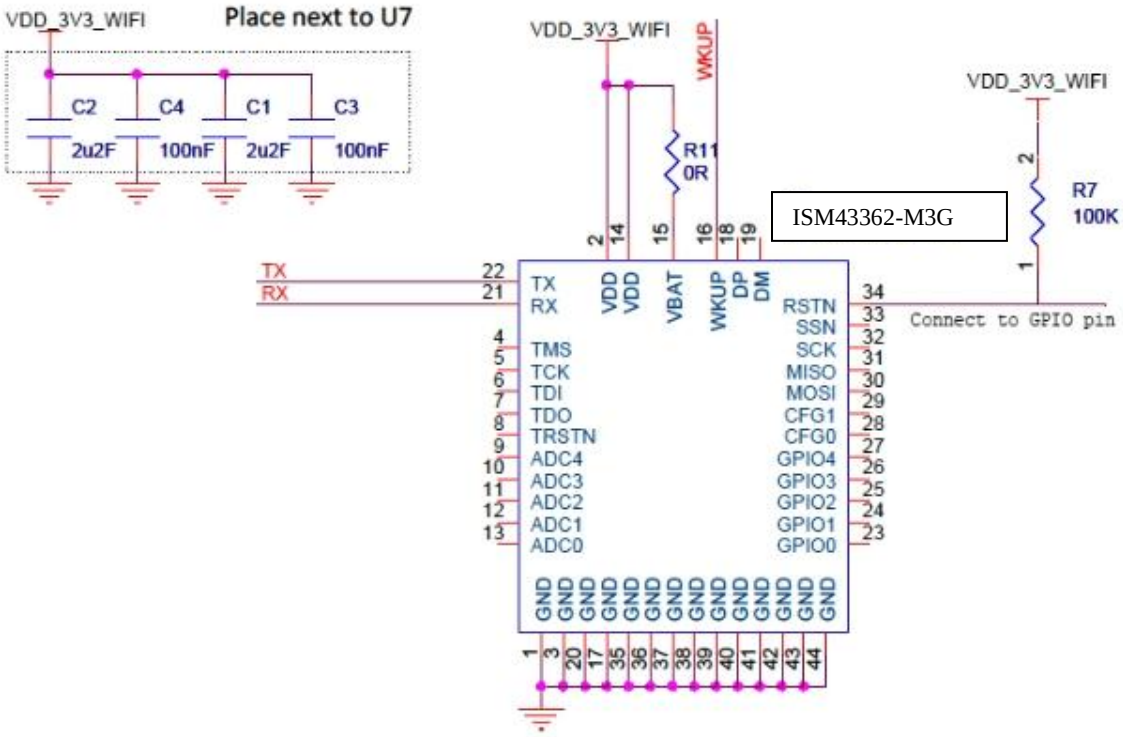
12 ISM43362-M3G-L44 FOOTPRINT

12.1 Module's package dimensions (mm)

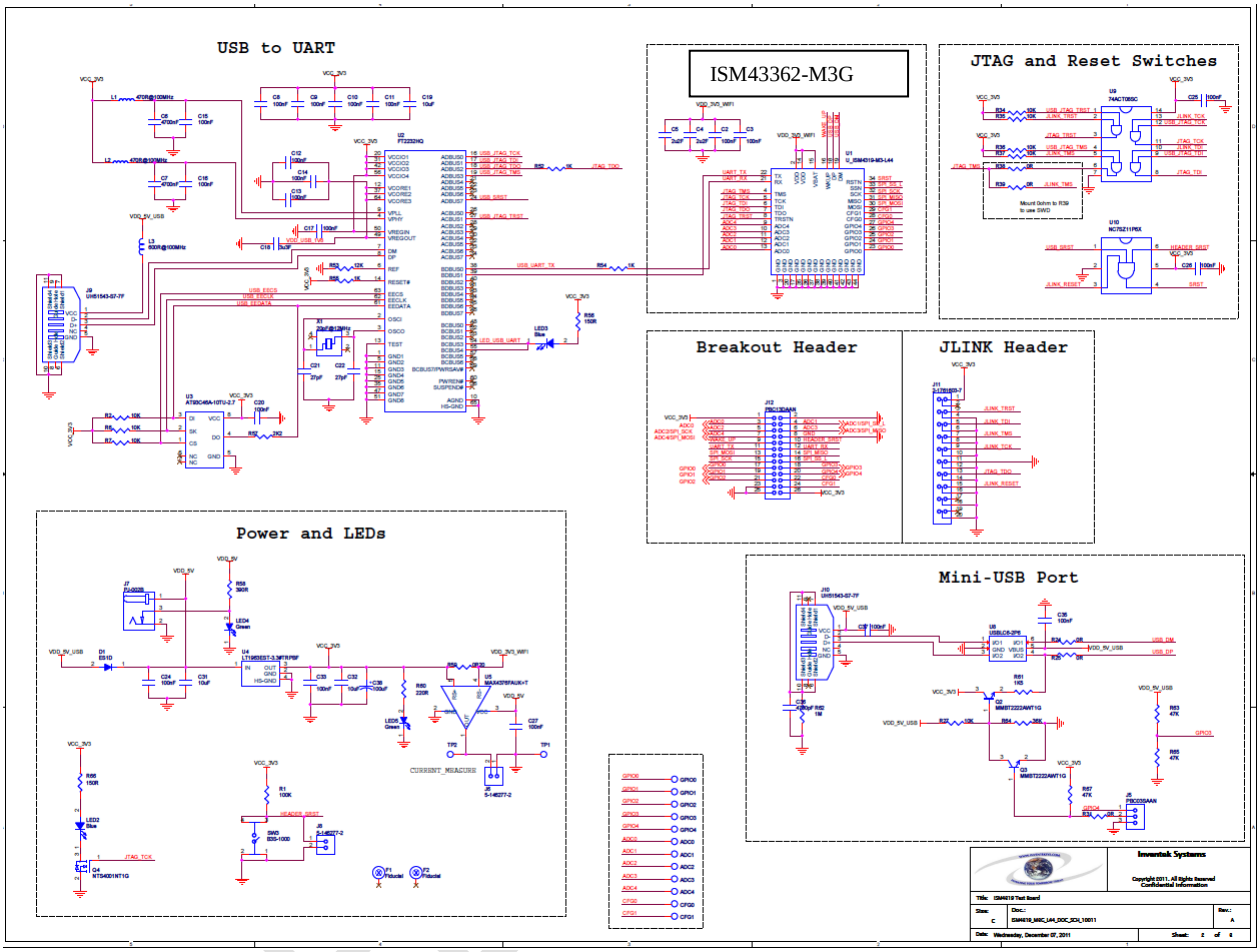


13 Typical Application Circuit

This is the minimum number of wires required to be connected to your microcontroller for operation in UART mode. You may also want to bring out the JTAG lines for firmware upgrades.

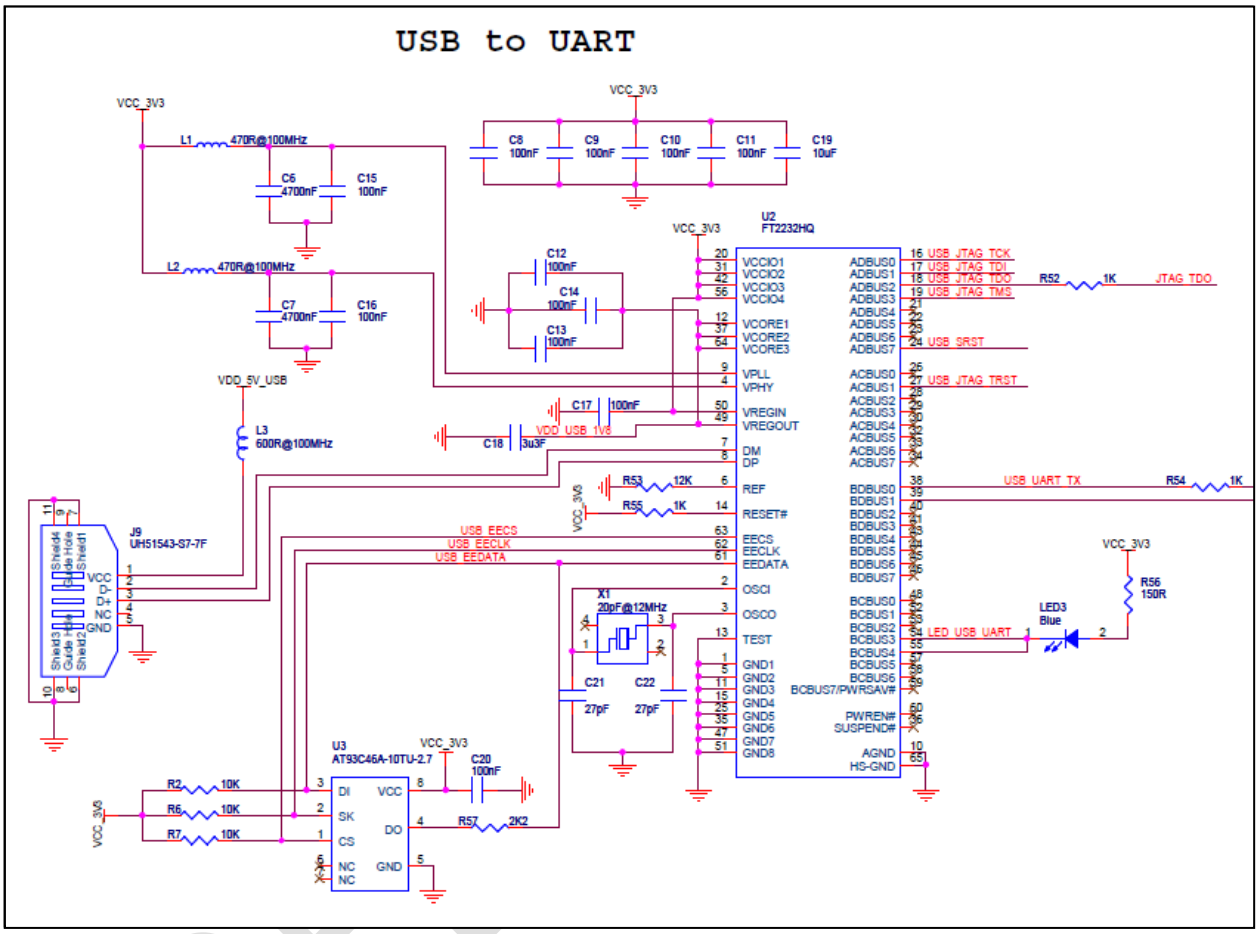


13.1 Reference Schematic (EVB)



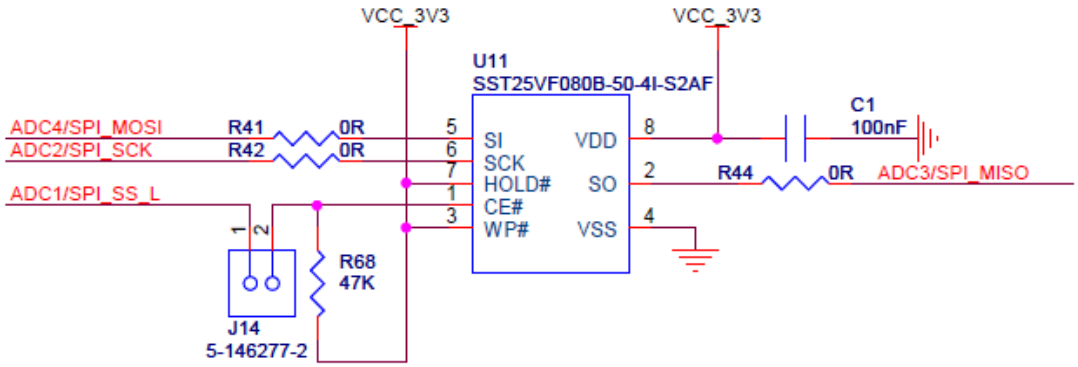
Note: Second USB port J10 is not installed on the evaluation boards. Please contact Inventek if you want to use USB or SPI mode.
Typical application circuits please refer to schematic below. For a *.pdf version please visit the Wi-Fi evaluation board website, www.Inventeksys.com.

13.2 USB to UART

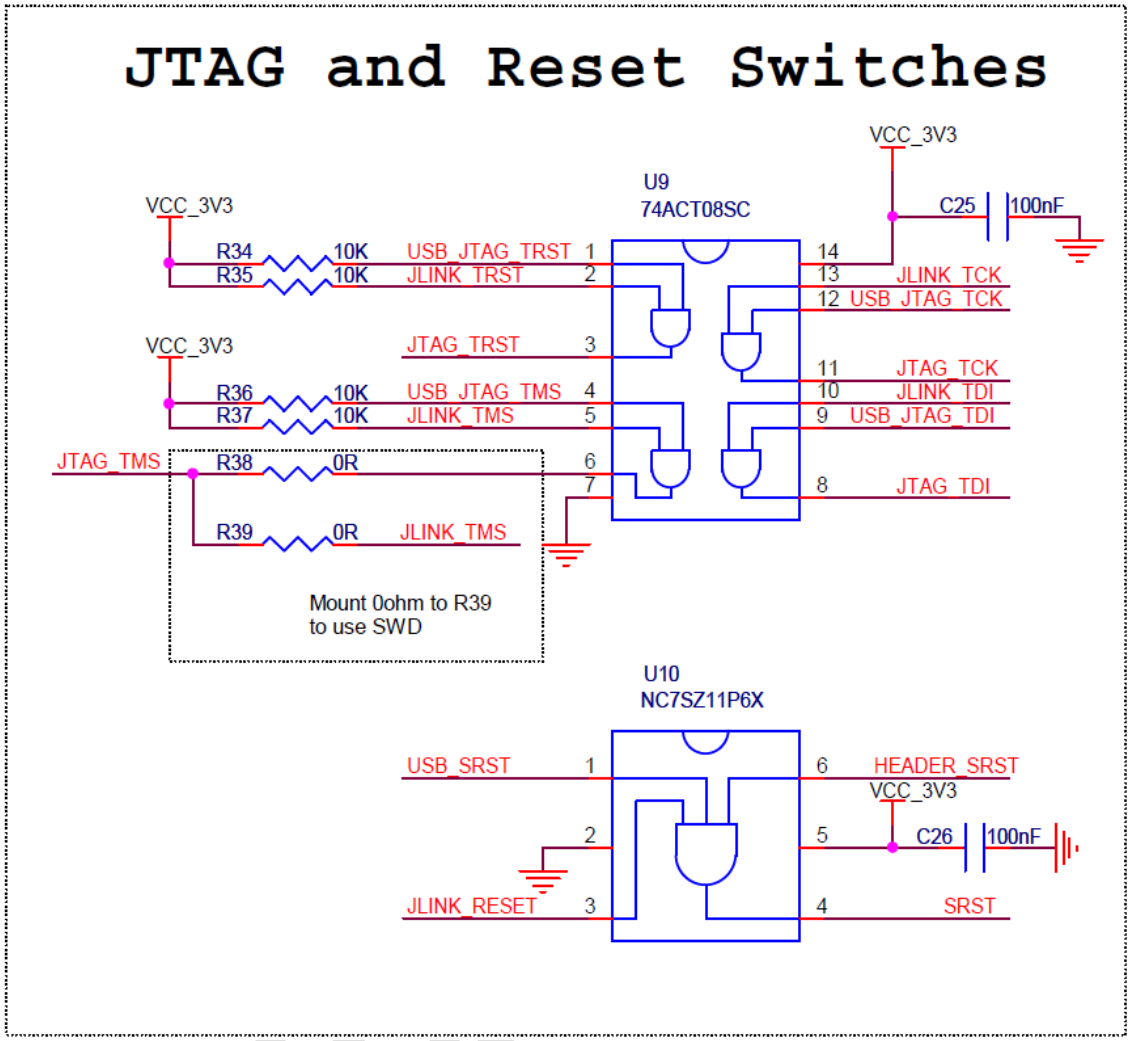


13.3 EXTERNAL FLASH FOR OVER THE AIR UPGRADE

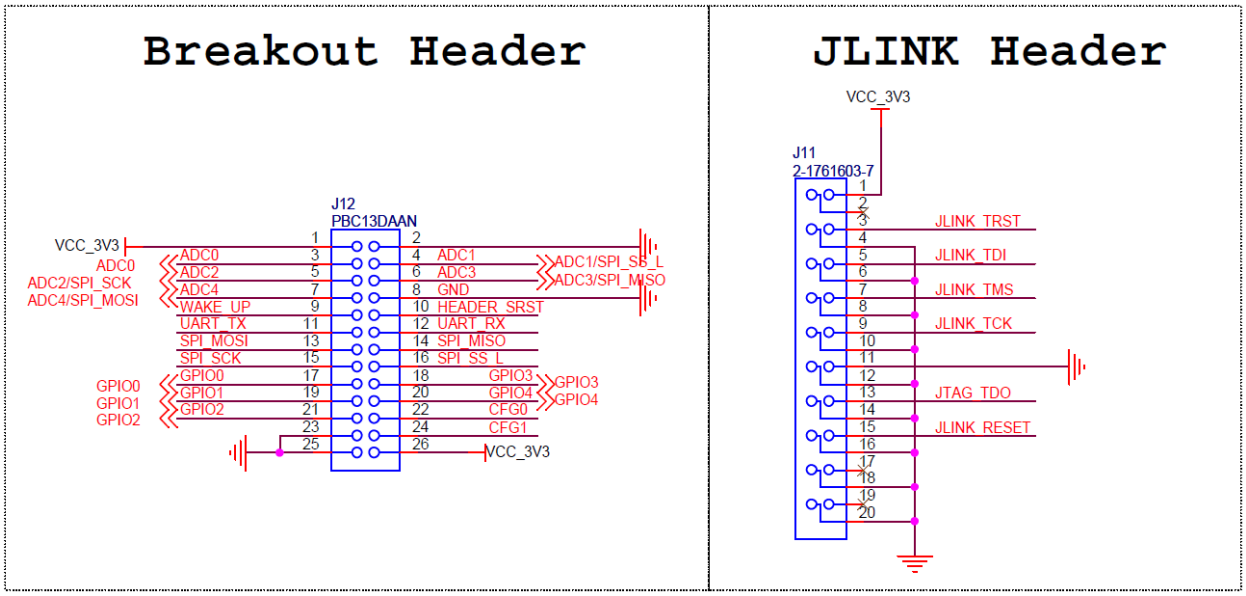
(In development, please contact Inventek)



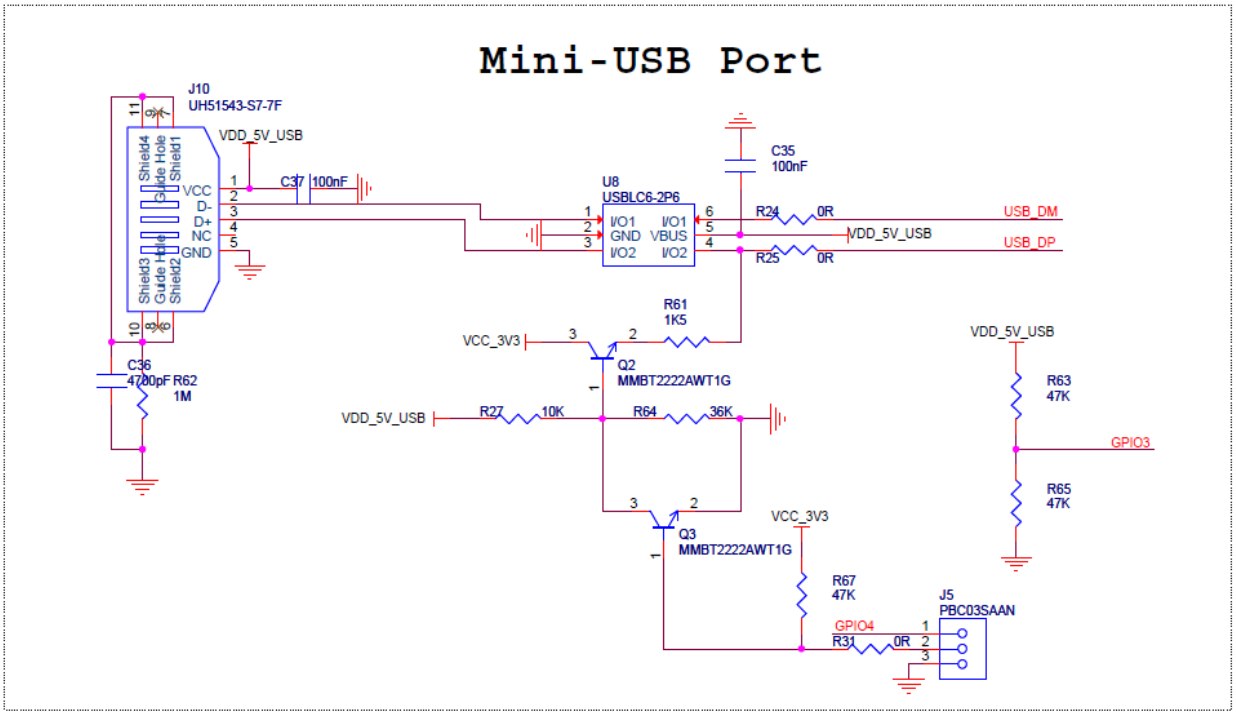
13.4 JTAG and Reset Connections



13.5 eS-WiFi Programming Options



13.6 eS-WiFi USB Direct Connection Option



14 Product Compliance Considerations

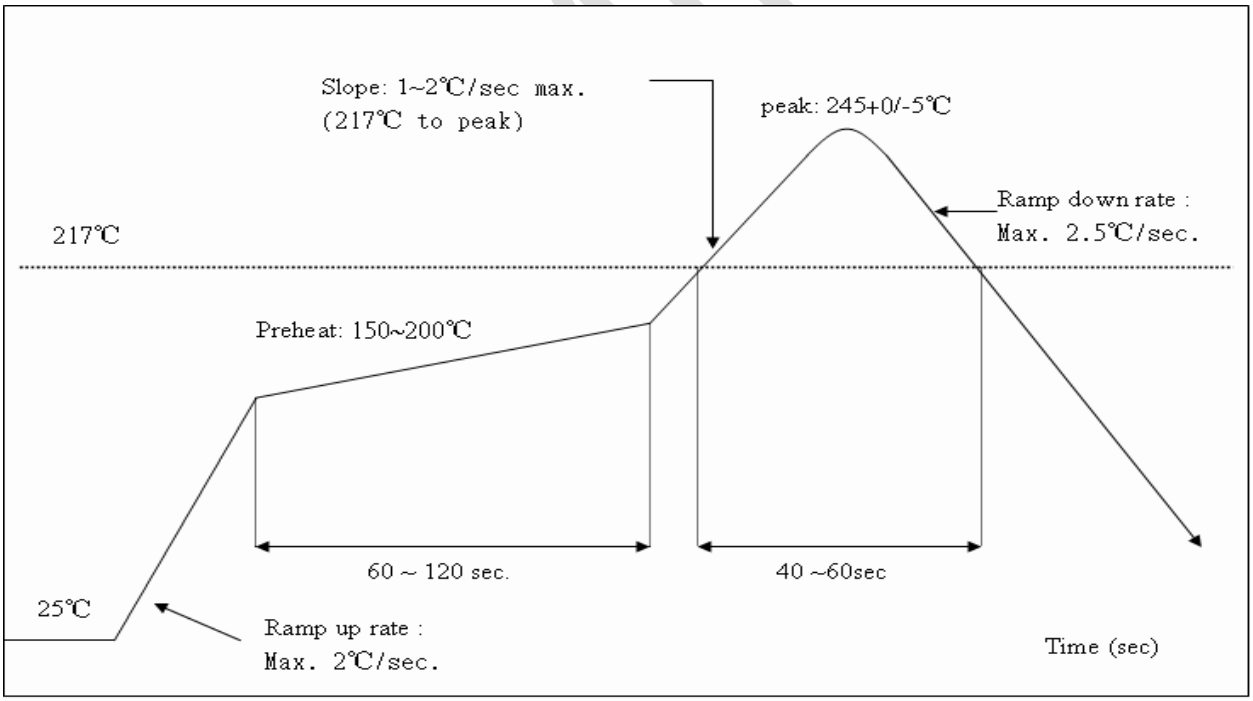
RoHS: Restriction of Hazardous Substances (RoHS) directive has come into force since 1st July 2006 all electronic products sold in the EU must be free of hazardous materials, such as lead. Inventek is fully committed to supporting RoHS requirements and focusing on a continuously high level of product 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: FCC/CE testing is in process.

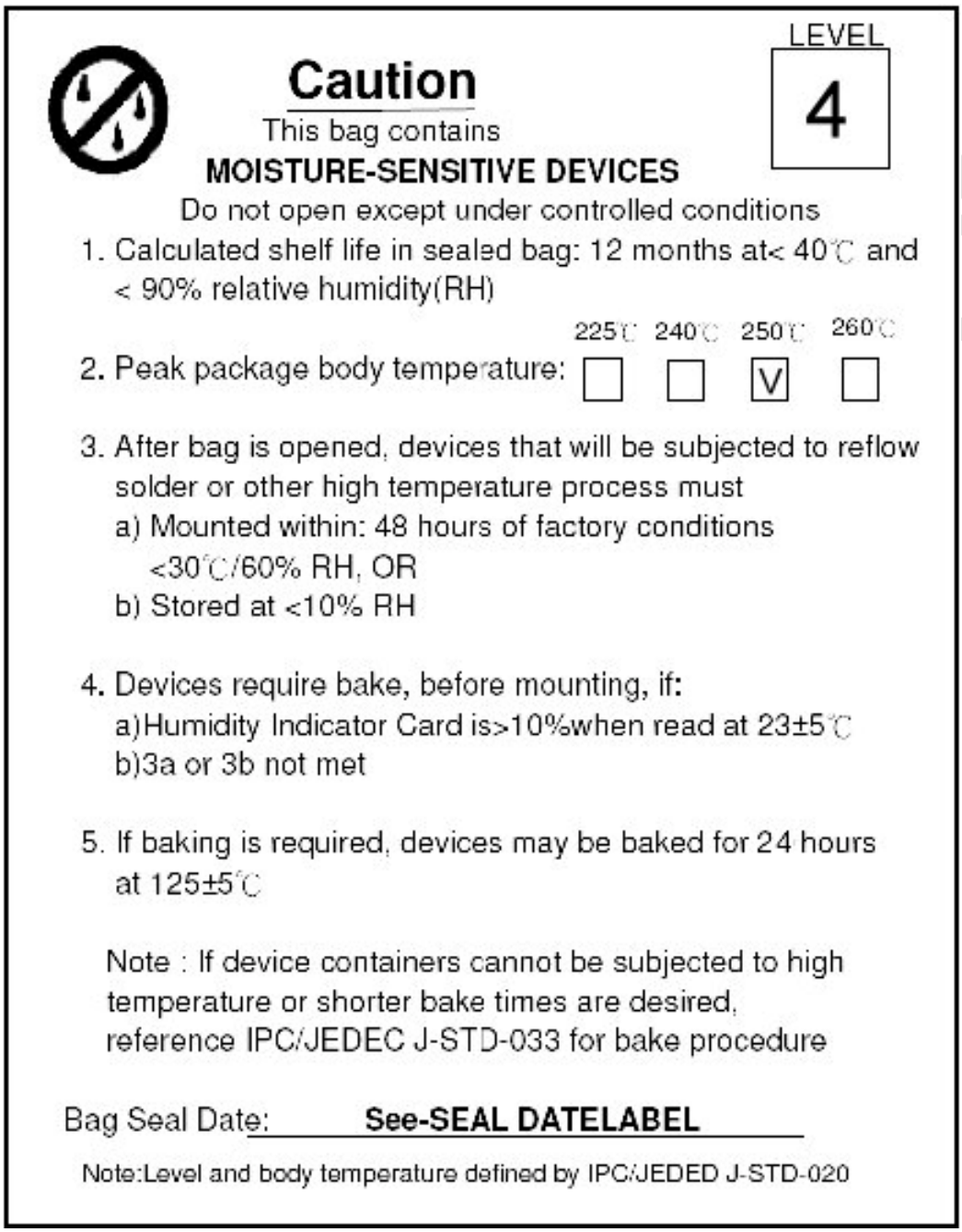
15 Reflow Profile

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



16 Packaging Information

16.1 MSL Level / Storage Condition



LEVEL 4

Caution

This bag contains

MOISTURE-SENSITIVE DEVICES

Do not open except under controlled conditions

1. Calculated shelf life in sealed bag: 12 months at< 40℃ and < 90% relative humidity(RH)

2. Peak package body temperature: 225℃ ☐ 240℃ ☐ 250℃ ☑ 260℃ ☐

3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
   a) Mounted within: 48 hours of factory conditions <30℃/60% RH, OR
   b) Stored at <10% RH

4. Devices require bake, before mounting, if:
   a)Humidity Indicator Card is>10%when read at 23±5℃
   b)3a or 3b not met

5. If baking is required, devices may be baked for 24 hours at 125±5℃

Note : If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: **See-SEAL DATELABEL**

Note:Level and body temperature defined by IPC/JEDED J-STD-020

16.2 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 cycle 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 things 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.

17 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
2/12/2013	FMT	1.1	Updated Ref. Schematic

18 CONTACT INFORMATION

Inventek Systems
2 Republic Road
Billerica Ma, 01862
Tel: 978-667-1962
Sales@inventeksys.com

www.inventeksys.com