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**INVENTEK SYSTEMS**  
**ISM4334x-M4G-L44**  
**Embedded Serial-to-WiFi Module**  
**eS-WiFi™**  
**802.11 a/b/g/n, Bluetooth 4.0, NFC**

**Data Sheet**

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**Inventek Systems LLC.**

**Model: ISM4334x-M4G-L44**

**FCC ID: O7P-341**

**IC: 10147A-341**

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 UNDESIRE  
OPERATION.



# 1 GENERAL DESCRIPTION

The Inventek ISM4334x-M4G-L44 is an embedded wireless internet connectivity module that operates in the 2.4 & 5.0 GHz spectrum. The Wi-Fi module's hardware consists of an ARM Cortex M4 host processor, Broadcom BCM43341/0 Dual-Band (2.4 GHz / 5 GHz) 802.11 a/b/g/n MAC/Baseband/Radio with Integrated Bluetooth 4.0 and NFC support. The module has two antenna options, an on board dual band chip 2.4 & 5 GHz or an U.FL connector for external 2.4 & 5 GHz antenna.

There are two versions of the module offered, one that supports NFC (ISM43341-M4G-L44) and one that does not (ISM43340-M4G-L44).

The module provides UART 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. The module hardware can be used with Inventek's AT Command set (IWIN) or with Broadcom's WICED™ SDK3.1.2 or later.

Inventek's IWIN, AT command set, allows you to quickly establish connectivity for your wireless product, minimizing development time, testing routines and certification. The low cost, small foot print (14.5 mm x 34 mm) and ease of design-in make it ideal for a range of embedded applications.

## ***Hardware Features:***

- Uses BCM43341/0 Broadcom Leading Edge Radio Device.
- Includes STM32F405 ST Cortex M4 Microcontroller.
- 2.4 GHz and 5.0 GHz Bands.
- Bluetooth 4.0 including BLE Support.
- 2.4 & 5 GHz Chip Antenna on module.
- U.FL Connector for external 2.4 GHz & 5GHz Antenna
- Configurable using AT commands.
- Host interface: UART, SPI.
- 44-Pin and L44+10 Land Grid Array Footprint
- 14.7mm x 34mm x 2.5 mm
- 5 GPIO's and 5 ADC's (SPI uses ADC Pins)
- Input Voltage: 3.3 V
- NFC option for ISM43341-M4G-L44.
- Low power operation with built-in low power modes.
- Proven Interoperability ... Connects with other vendor's a/b/g/n Access Points in the Wireless LAN.

**Firmware Features:**

- IWIN- AT command Set/ API's for any External Host
- Hardware Supported by Broadcom WICED™ SDK 3.5.2 or later.
- Secure Wi-Fi authentication WEP-128, WPA-PSK (TKIP), WPA2-PSK.
- WiFi-BT SmartBridge based on WICED™ SDK.
- Fully contained TCP/IP stack minimizing host CPU requirements.
- Network features: ICMP (Ping), ARP, DHCP, TCP, UDP.
- SSL3.0/TLS1.0/1.1/1.2 Security Library.
- Cloud Agents: AWS IoT, Arrayent, and Lowes Iris...
- Configuration Webpage for Connecting to Networks
- Support for Web Service API for iOS and Android that allows easy connection with no web browser required.
- AP Auto-Channel Selection Algorithm in Congested and Overlapping Signal Environments
- Wi-Fi Protected Setup (WPS) Support
- SoftAP and Client Modes – Simultaneous Support
- Support for up to Four Simultaneous Sockets
- Supports up to 3 Connected Clients in SoftAP Mode
- Domain Name System –DNS Support
- mDNS Multicast Support
- Bootloader for Module Updates

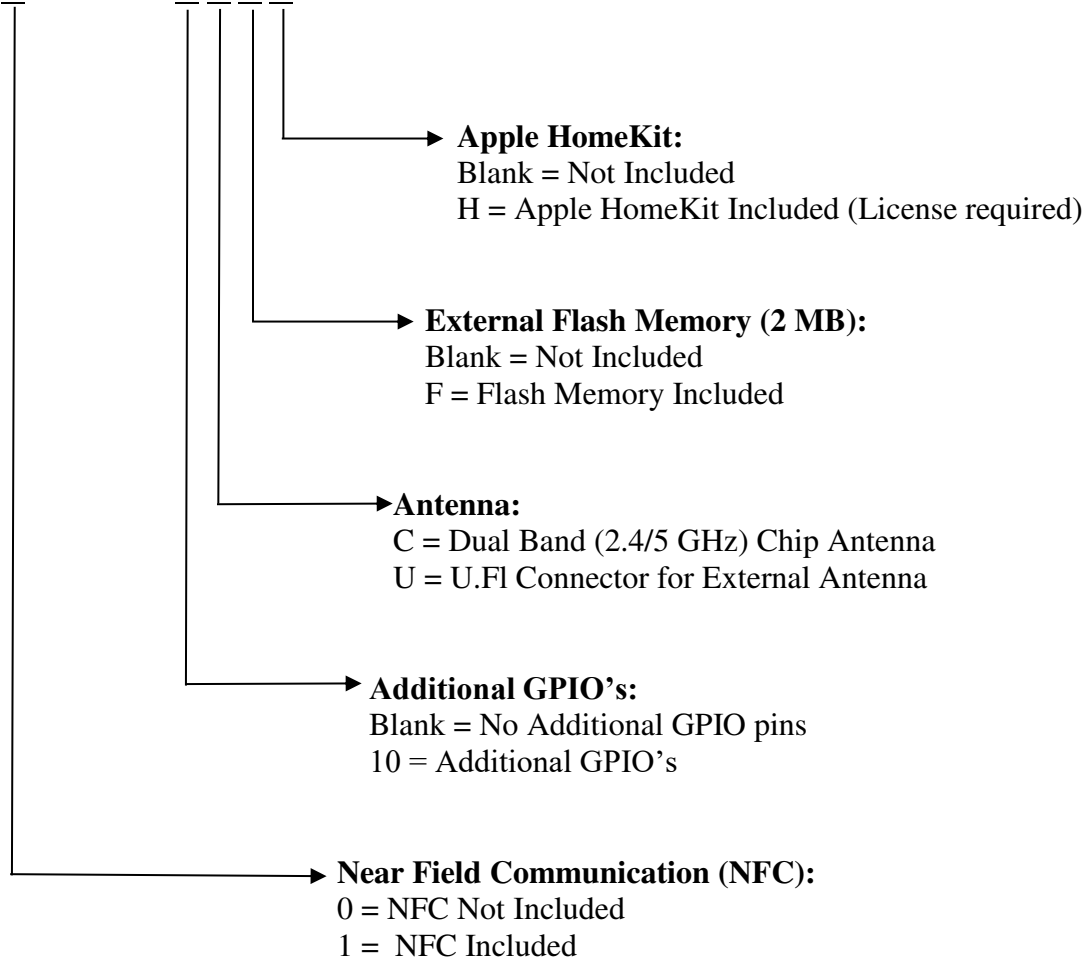
**Typical Applications:**

- 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

ISM4334X-M4G-L44-X X X X



Evaluation Boards/ USB Dongles			
ISM43341/0-M4G-EVB	Evaluation Board, USB cable, with ISM43341/0-M4G-L44, Quick Start Guide	UART	ISM43340-M4G-EVB-C ISM43341-M4G-EVB-C
ISM430-USB	Wi-Fi/BT USB dongle	USB	ISM430-USB
ISM431-USB	Wi-Fi/BT & NFC USB dongle	USB	ISM430-USB

## 3 CERTIFICATIONS

### 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	O7P-341
IC	10147A-341
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 ISM43340/1 Modules 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.

<b>Manufacturer</b>	<b>Type of Antenna</b>	<b>Model</b>	<b>Gain dBi</b>	<b>Type of Connector</b>
Inventek	U.FL port Antenna	W2.4-5P-U	2.6 (@ 2.4 GHz) 3.3 (@ 5 GHz)	U.FL
Inventek	Chip Antenna	AA077	1.4 (@ 2.4 GHz) 2.3 (@ 5 GHz)	Chip

**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-341

Contains IC: 10147A-341

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

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**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'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 utilisatrices, 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.

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 émetteur de radio 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 indiquée. Types d'antennes ne figurant pas dans cette liste, ayant un gain supérieur au gain maximum indiquée pour ce type, sont strictement interdites pour l'utilisation avec cet appareil.

## 4 COMPLEMENTARY DOCUMENTATION

### 4.1 Inventek Systems

- Evaluation Board Documentation
  - ISM43340/1-M4G-EVB Evaluation Board Specification
  - EVB User's Guide
  - Quick Start Guide
  - eS-WiFi Demo software (includes EVB Drivers and Firmware)
- IWIN AT Command Set Documentation
  - IWIN AT Command Set User's Manual
  - IWIN AT Command Set Quick Reference Guide
  - IWIN AT Command Sample Scripts Firmware
- OrCAD Schematic Symbol
- PADS Land Pattern
- FCC Test Report

## 5 SPECIFICATIONS

### 5.1 Module Architecture

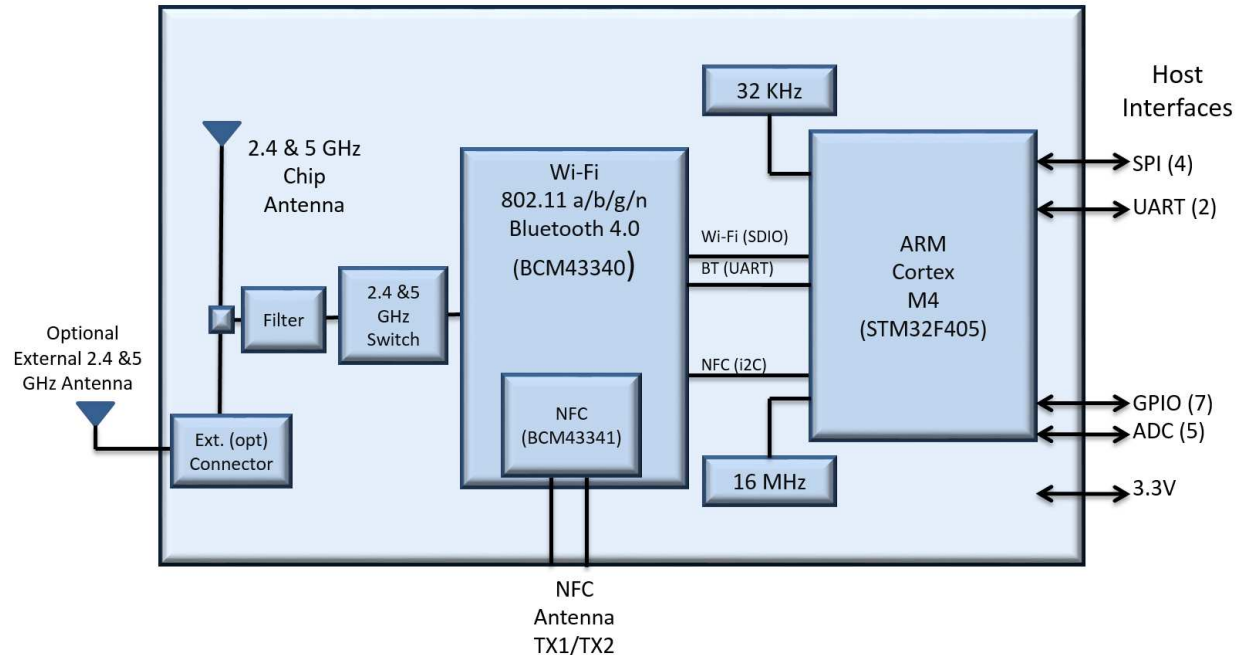


Figure 1 Inventek's ISM4334x-M4G-L44 General Block Diagram

**Note:** ( ) Indicates number of pins

## 5.2 External Antenna Connections

ISM4334x-M4G-L44-CU 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:

Items	Description
	<b>ISM4334x-M4G-L44-CU</b>
Length	34.22 mm (-/+0.5 mm)
Width	14.70 mm (-/+0.5 mm)
Height	2.5 ± 0.2 mm
Package	44 pin LGA (w/ +10 pin option)

## 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 ISM4334x-M4G 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 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

### 6.2 Recommended Operating Ratings

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

**Note:** If a separate VBAT supply is not being used, then ties VBAT and VDD together.

### 6.3 Power Consumption

Mode	Description	Typical	Max	Unit
Radio Off	ST Powered	27	-	mA
Radio On	Not Connected to Network	34	-	mA
Radio On	Connected to Network	88	340 <sup>[1]</sup>	mA
Power Save Mode	Connected to Network	38	-	mA
Radio On	BT Smartbridge	90	340 <sup>[1]</sup>	mA
NFC Read/Write	Active Field Between NFC Antenna and Tag	220	-	mA
Absolute Max	Worst Case	-	560 <sup>[2]</sup>	mA

**Note:**

<sup>[1]</sup> Wi-Fi On, and connected to a network: Max 120 mA (340 mA burst of less than 5 ms)

<sup>[2]</sup> Worst case power consumption represents active Bluetooth, Wi-Fi, and NFC.

## 7 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 0)
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 (O)	
14	I	VDD	3.3V
15	I	VBAT	3.3V
16	I	Wakeup	Host Wakeup
17	G	GND	Ground
18	I	DP	USB Data Plus
19	I/O	DM	USB Data Minus
20	G	GND	Ground
21	I/O	RX	UART Receive (Refer to section 9.1 )
22	I/O	TX	UART Transmit (Refer to section 9.1 )
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	NFC TX2	NFC Antenna ( No connect for ISM43340)
29	I	NFC TX1	NFC Antenna ( No connect for ISM43340)
30	I/O	RES	GPIO, see section 7.1
31	I/O	RES	GPIO, see section 7.1

Pin No.	Type	Pin Definition	Descriptions
32	I/O	RES	GPIO, see section 7.1
33	I	BOOT 0	Enable On-Board Microcontroller Boot Loader (See STM32F405 BOOT0 specification)
34	I	RSTN	Reset (See STM32F405 NRST specification )
35	G	GND	Ground
36	G	GND	Ground
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 Reserved Pins

Pins currently available for designs using the WICED-SDK only.

Pin No.	Type	Pin Definition	Descriptions
30	I/O	GPIO15	Alternate Function: STM32F405, PB15
31	I/O	GPIO14	Alternate Function: STM32F405, PB14
32	I/O	GPIO13	Alternate Function: STM32F405, PB13

### 7.2 +10 Pins

Pins currently available for designs using the WICED-SDK only.

Pin No.	Type	Pin Definition	Descriptions
45	I/O	GPIOA	Alternate Function: STM32F405, PA2
46	I/O	GPIOB	Alternate Function: STM32F405, PA1
47	I/O	GPIOC	Alternate Function: STM32F405, PB10
48	I/O	GPIOD	Alternate Function: STM32F405, PC3
49	I/O	GPIOE	Alternate Function: STM32F405, PB11
50	I/O	GPIOF	Alternate Function: STM32F405, PB12
51	I/O	GPIOG	Alternate Function: STM32F405, PE11
52	I/O	GPIOH	Alternate Function: STM32F405, PE12
53	I/O	GPIOJ	Alternate Function: STM32F405, PE13
54	I/O	GPIOK	Alternate Function: STM32F405, PE14

## 8 FIRMWARE UPDATES 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:

<http://www.digikey.com/product-detail/en/MDL-ADA2/726-1193-ND/1986451>

\*JTAG Firmware Update Note can be found at [www.inventeksys.com](http://www.inventeksys.com)

## 9 SERIAL HOST INTERFACES AVAILABLE

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

### 9.1 UART

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

#### 9.1.1 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).

#### 9.1.2 Flow Control

The eS-WiFi module doesn't require or support Flow Control, so Flow Control should be implemented.

#### 9.1.3 Supported Baud Rates

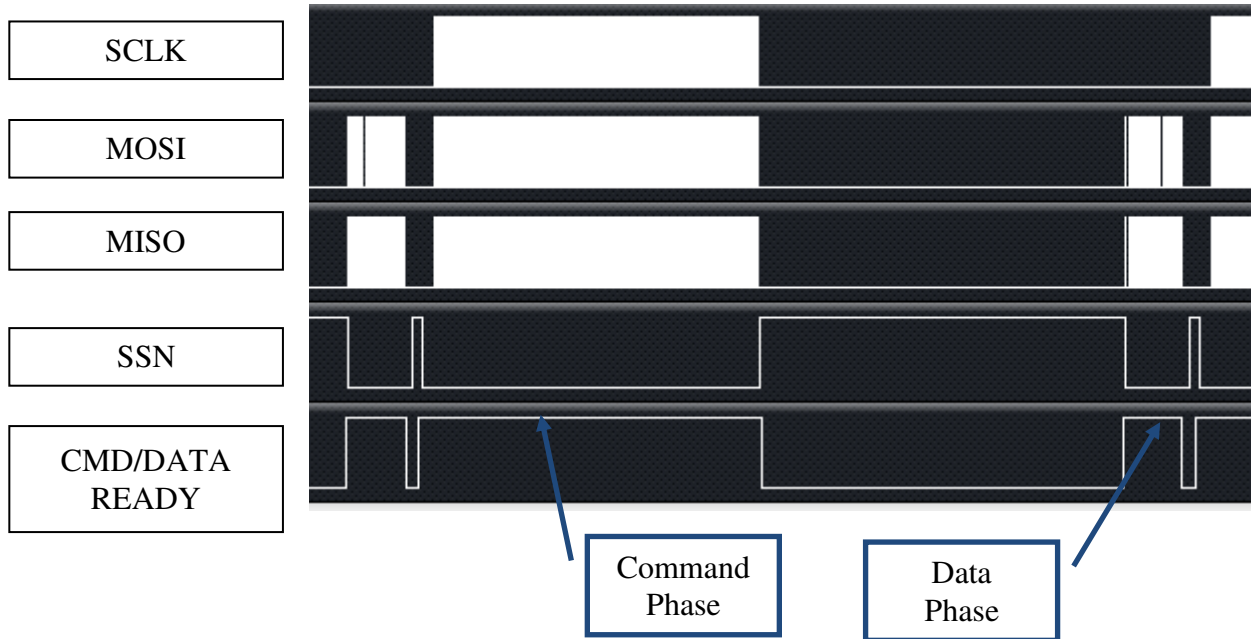
The eS-WiFi module uses USART1 (PA9 and PA10 of the STM32F405) and the following serial baud rates are supported: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 1152000, 1382400, 1612800, 1834200, 2073600, 2304000, 2764800, 3686400, 3910800. Please note that higher baud read does not always correlate to higher throughput.

#### 9.1.4 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.

### 9.1.5 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.

### 9.1.6 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.

### 9.1.7 SPI Command Phase:

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

Ex. S3=0010\r0123456789

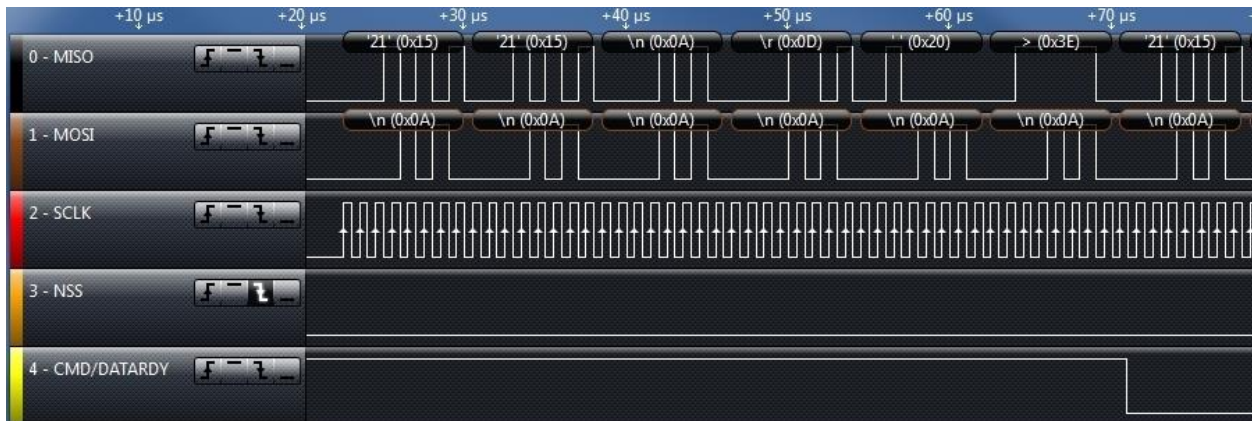
The command must also be sent as one continuous SPI cycle, that is SSN must stay low for the complete command, delimiters, and data.

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).

### 9.1.8 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.



### 9.1.9 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.

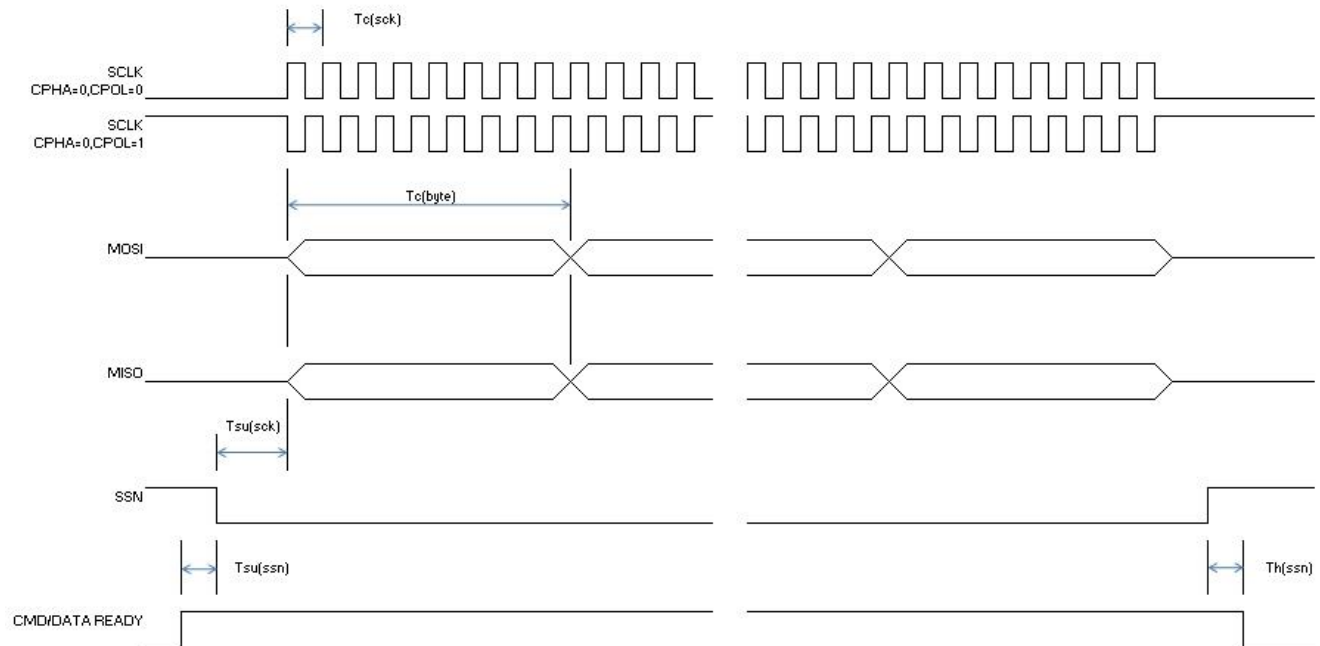
### 9.1.10 SPI Asynchronous Messages:

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.

### 9.1.11 SPI AC Characteristics:



Symbol	Min.	Typ.	Max.
$T_f(\text{sck})$			20 MHz
$T_c(\text{sck})$	50 ns		
$T_{su}(\text{sck})$		15 us	
$T_c(\text{byte})$		$8 * T_c(\text{sck})$	
$T_{su}(\text{ssn})$		4 us	
$T_h(\text{ssn})$		3 us	

## 9.2 USB

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

## 9.3 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.

## 9.4 ADC's

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

## 10 Wi-Fi RF SPECIFICATION

### 10.1 RF Specification

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

#### 10.1.1 2.4 GHz Band

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 : 17* dBm ± 1.5 dB
	802.11g /54Mbps: 17* dBm ± 1.5 dB
	802.11n /72Mbps: 16* 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

### 10.1.2 5 GHz Band

Feature	Description
WLAN Standard	802.11a/n, WIFI Compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5 GHz Band)
Channels	36~48, 52~64, 100~144, 149 ~165
Modulation	802.11a/n OFDM
Output Power	802.11a 19 dBm $\pm$ 1.5 dB
	802.11n 19 dBm $\pm$ 1.5 dB
Receive Sensitivity (11a, 20 Mhz channel spacing for all rates) @10% PER	6 Mbps OFDM PER @ -90.5 dBm, typical
	9 Mbps OFDM PER @ -90.5 dBm, typical
	12 Mbps OFDM PER @ -87.5 dBm, typical
	18 Mbps OFDM PER @ -85.5 dBm, typical
	24 Mbps OFDM PER @ -82.5 dBm, typical
	36 Mbps OFDM PER @ -80.5 dBm, typical
	48 Mbps OFDM PER @ -76.5 dBm, typical
	54 Mbps OFDM PER @ -73.5 dBm, typical
Receive Sensitivity (11n, 20 Mhz channel spacing for all rates) @10% PER	MCS 0 PER @ -90.5 dBm, typical
	MCS 1 PER @ -86.5 dBm, typical
	MCS 2 PER @ -84.5 dBm, typical
	MCS 3 PER @ -82.5 dBm, typical
	MCS 4 PER @ -78.5 dBm, typical
	MCS 5 PER @ -73.5 dBm, typical
	MCS 6 PER @ -71.5 dBm, typical
	MCS 7 PER @ -70.5 dBm, typical
Data Rate 20MHz, 800ns GI	802.11a/n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps
Data Rate 20MHz, 400ns GI	802.11a/n : 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65,72.2Mbps
Maximum Receive Level @5.24 GHz	@ 6, 9, 12 Mbps -29.5 dBm
	@ 18, 24,36,48,54 Mbps -29.5 dBm

## 11 ANTENNA

### 11.1 External Antenna

The Inventek U.FL PCB antenna is certified for FCC, IC and CE. The part number is W2.4-5P-U. It is a dual band 2.4/5 GHz PCB antenna with a U.FL connector.

The Inventek W2.4-5P-U PCB antenna datasheet can be found on the Inventek Website.



### 11.2 Mechanical Specifications

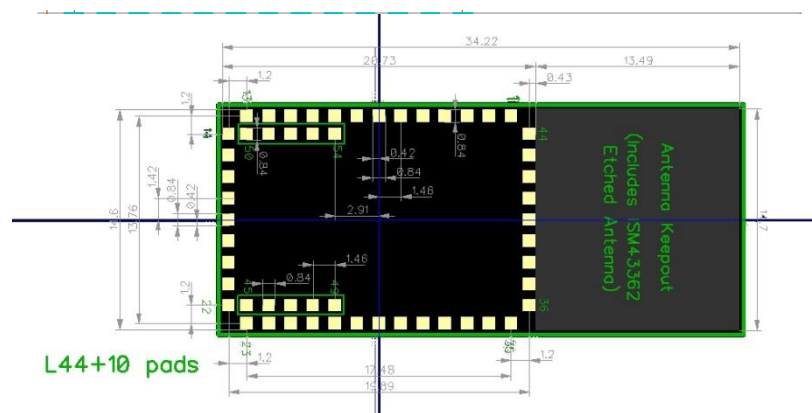


Figure 2: Chip Antenna Keep out Area

”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 ground planes or traces are placed under the antenna (keep out area). Surrounding metal will affect the antenna performance. The external antenna does not require “keep out” area

## 12 ON BOARD PROCESSOR

The eS-WiFi includes an ST Microelectronic’s, STM32F405 MCU.

ISM43341-M4G-L44	STM32F405 (1 MB), Flash Microcontroller
ISM43340-M4G-L44	STM32F405 (1 MB), Flash Microcontroller

Please refer to the STM32F405 specification from ST Microelectronics for further information about the UART and SPI (Slave Mode) interfaces.

<http://www.st.com/web/en/resource/technical/document/datasheet/DM00037051.pdf>