INVENTEK SYSTEMS

ISM4343-WBM-L151 SiP and
ISM4343-WBM-L54 Module

eS-WiFi™

(embedded Serial-to-WiFi)

Wi-Fi, BT & Arm Cortex M4

Combo SiP and Module Options

2.4 GHz 802.11 b/g/n + 5.1 BT/BLE + Cortex M4

Data Sheet

Table of Contents

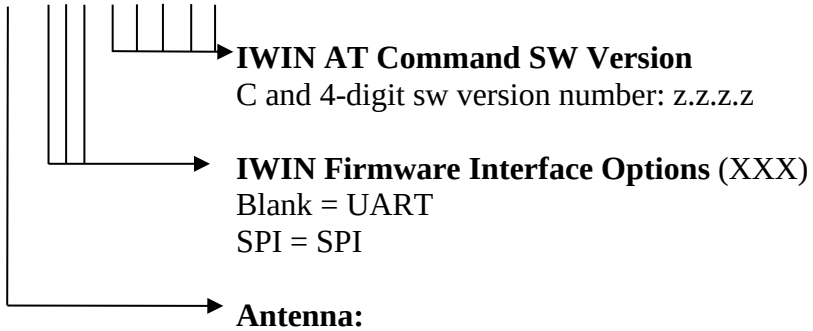
1 DETAIL DESCRIPTION

Device	Description	Ordering Number
ISM4343-WBM-L151	Wi-Fi + BT/BLE + Cortex M4 10 x 10 mm 151 Pad SIP	ISM4343-WBM-L151
ISM4343-WBM-L54-C	Wi-Fi + BT/BLE + Cortex M4 14.5 x 34mm 54 Pad LGA Module with Onboard Antenna	See 1.1 Below
ISM4343-WBM-L54-U	Wi-Fi + BT/BLE + Cortex M4 Module 14.5 x 34mm 54 Pad LGA Module with Connector for External Antenna	See 1.1 Below
ISM4343-WBM-L151-EVB	2.4 Wi-Fi + BT/BLE SIP EVB (Evaluation Board)	ISM4343-WBM-L151-EVB
ISMART4343-C	2.4 Wi-Fi + BT/BLE Shield Evaluation Board	ISMART4343-C
Note: This product supports the Inventek IWIN AT Commands or the Cypress WICED SDK. JTAG is recommended for reflashing during firmware development. JTAG or OTA can be used for firmware updates during production.		

1.1 Ordering Information for Inventek IWIN Firmware

All modules and SiPs are shipped with the latest AT Command production released firmware. If a specific firmware revision is required, it should be specified as outlined below. The latest firmware can be found at https://www.inventeksys.com/iwin/firmware/:

ISM4343-WBM-L54 or L151-X-XXX- C Z.Z.Z.Z



IWIN AT Command SW Version
C and 4-digit sw version number: z.z.z.z

IWIN Firmware Interface Options (XXX)
Blank = UART
SPI = SPI

Antenna:
C = 2.4 GHz Chip Antenna
U = U.FL Connector for External Antenna

If no firmware revision is specified, then the latest production firmware at time of shipment will be programmed. When ordering a firmware revision that is not the latest please contact Inventek for the minimum order quantity and leadtime.

2 OVERVIEW

The Inventek ISM4343-WBM-L151 SiP (10x10mm) and ISM4343-WBM-L54 module (15x34mm) offer a single-band IEEE 802.11 b,g,n-compliant MAC/PHY, and BT/BLE 5.1 radio. Channel bandwidth of 20MHz is supported for IEEE 802.11 b,g,n traffic with integrated ST Micro STM32F412 Cortex M4 MCU that runs the TCP/IP stack.

This data sheet contains pinout information for both the ISM4343-WBM-L151 SiP and ISM4343-WBM-L54 module. The module includes either a chip antenna or U.FL connector for an external antenna. The SiP does not include an antenna. Please refer to Inventek's Layout Guidelines for the certified reference design information.

The ISM4343-WBM-L151 SiP integrates the Wi-Fi/BT radio, Cortex M4 microcontroller, clocks and an additional 2MB of Flash into a small form factor 10x10 mm LGA Module. The ISM4343-WBM-L151 802.11 b/g/n enables wireless connectivity to the simplest existing sensor products with minimal engineering effort. The ISM4343-WBM-L151 reduces development time, lowers manufacturing costs, saves board space, simplifies certification compliance, and minimizes customer RF expertise required during development of target applications.

The ISM4343-WBM-L54 module combines the ISM4343-WBM-L151 SiP with two separate antenna options, an on-board single band 2.4 GHz chip antenna or a U.FL connector for an external 2.4GHz antenna. Inventek certified the W24P-U PCB antenna for use with the ISM4343-WBM-L151 SiP and ISM4343-WBM-L54-U module. The module's foot print (14.5 mm x 34 mm) and ease of design-in make it ideal for a range of embedded applications.

The ISM4343 SiP and Module use Cypress Semiconductor's CYW4343 highly integrated single chip combo radio solution. The CYW4343 has integrated power amplifiers, LNAs and T/R switches for the 2.4 GHz WLAN band.

The ISM4343 SiP and module include an ST Micro STM32F412 Cortex M4 MCU with 256KB of RAM and 1 MB of Flash. SPI and UART interfaces enable easy connection to an embedded design. The ISM4343-WBM-L151 SiP and module require no operating system. The ISM4343 SiP and module support Inventek's IWIN AT commands or the Cypress' WICED Platform SDK.

The ISM4343 is compatible with the BT Low Energy operating mode, which provides a dramatic reduction in the power consumption of the BT radio and baseband. The primary application for this mode is to provide support for low data rate devices, such as sensors and remote controls.

The ISM4343 implements the highly sophisticated Enhanced Collaborative Coexistence algorithms and hardware mechanisms, allowing for an extremely collaborative BT coexistence scheme along with coexistence support for external radios such as cellular

and LTE, GPS, and Ultra-Wideband. An independent, high-speed UART is provided for the BT host interface.

3 FEATURES

The ISM4343 SiP and module support the following WLAN, BT & MCU functions:

- STM32 ARM 32-bit Cortex™-M4 with a frequency up to 100 MHz
  - 1 Mbyte of MCU internal Flash
  - 256KByte of SRAM
  - ADC, I2C, I2S, GPIO, Timers
- Single-band 2.4 GHz b/g/n, 802.11b, 802.11g, 802.11n (single stream)
  - IEEE 802.11b 1 – 11 Mbps
  - IEEE 802.11g 6 – 54 Mbps
  - IEEE 802.11n (2.4 GHz) 7.2 – 150Mbps
- 2 Mbytes of additional SPI Flash (Connected to SPI 1 internally on the SiP)
- 32KHz RTC, 26MHz and 37.4 MHz clocks on board the SiP.
- Host serial interface for UART and SPI
- WICED compatibility
- On-chip WLAN driver execution supporting IEEE 802.11 functionality
- Advanced 1x1 802.11n features:
  - Full/Half Guard Interval
  - Frame Aggregation
  - Space Time Block Coding (STBC)
  - Low Density Parity Check (LDPC) Encoding
- Hardware Encryption WEP, WPA/WPA2
- Modulation Modes include:
  - Wi-Fi: CCK and OFDM with BPSK, QPSK, 16 QAM, 64QAM, 256QAM
  - BT: Dual-mode classic BT and Classic Low Energy operation
- Concurrent BT and WLAN operation
- Supports a single 2.4 GHz antenna shared between WLAN and BT
- BT host digital interface (can be used concurrently with above interface):
  - UART (up to 4 Mbps)
- BT v5.1 with integrated Class 1 PA
- BT 2.1+EDR, BT 3.0, BT 4.2, BT5.1 (BT Low Energy)

- ECI – enhanced coexistence support, ability to coordinate BT SCO transmissions around WLAN receives
- I²S/PCM for BT audio
- HCI high-speed UART (H4, H4 +, H5) transport support
- BT SmartAudio® technology improves voice and music quality to headsets
- BT low power inquiry and page scan

- BT Low Energy (BLE) support
- BT Packet Loss Concealment (PLC)
- BT Wide Band Speech (WBS)
- Operating Temperature: -40℃ to 85℃

The BBC supports all BT 4.0 features, with the following benefits:

- Dual-mode classic BT and classic Low Energy (BT and BLE) operation.
- Low Energy Physical Layer
- Low Energy Link Layer
- Enhancements to HCI for Low Energy
- Low Energy Direct Test mode
- AES encryption

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	Complete
FCC	O7P-4343
IC	10147A-4343
RoHS	Compliant

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 ISM4343 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	Chip Antenna	W245-SC	1.4	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-4343
Contains IC: 10147A-4343

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.Inventek is obtaining FCC, IC, and CE modular transmitter certifications for the ISM4343-WBM-L151 Module. These certifications can be used to the advantage of any manufacturer developing a product using these devices. In order to take full advantage of the certifications, developers must follow the antenna design/layout guidelines exactly as shown in the datasheet. For FCC compliance, products will still need to go through verification testing or have a declaration of conformance according to 47 CFR Chapter 1, part 15, subpart B.

The testing required for both verification and declaration of conformance is specified in sections 15.107 and 15.109. The official documents can be obtained from the U.S Government Printing Office online. U.S. Government Printing Office CFR 47. There are some changes allowed to the reference design which do not require any testing beyond the verification or declaration of conformance.

If it is desired to add a connector or U.FL connector in the RF path, or change the antenna to one of the same types (chip) with equal or less gain, they can do so without refiling. Other changes such as a different antenna, or adding an antenna diversity switch will require filing for a class 2 permissive change. Any class 2 permissive changes must be performed under Inventek's grant, and therefore must be done in cooperation with Inventek. In addition to this document, Inventek recommends verifying the schematic board design with Inventek Engineering once the schematic is complete for further review and validation.

4 COMPLEMENTARY DOCUMENTATION

4.1 EVB

- Evaluation Board Specification
- EVB User's Guide
- Design Guidelines

5 BLOCK DIAGRAM

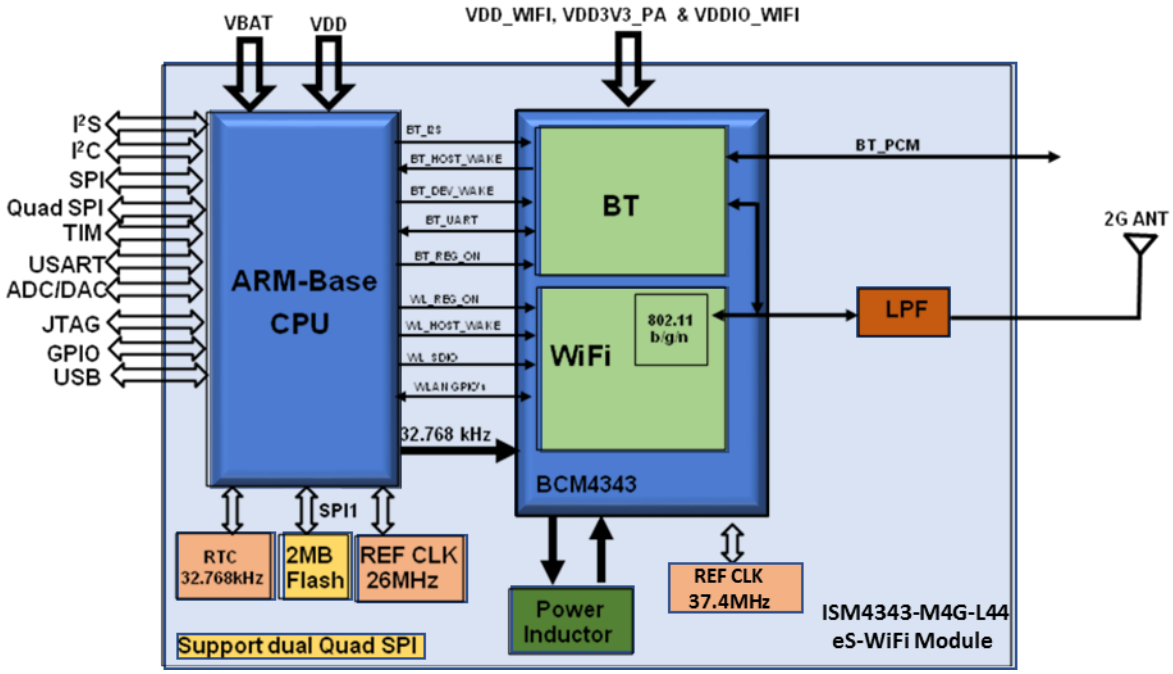


Figure 1 :
ISM4343-WBM-L151 has no antenna
ISM4343-WBM-L54 has Onboard Antenna or U.FL for an External Antenna.

- **ADC**: Analog to Digital Converter
- **I2C**: Intelligent Interface Controller
- **SPI**: Serial Peripheral Interface
- **Quad SPI**: Quad Serial Peripheral Interface
- **USART**: Universal Synchronous/Asynchronous Receiver Transmitters

6 HOST INTERFACES

The Inventek Serial to Wi-Fi modules are designed to be used in embedded IoT applications and to connect sensors directly to the module or SiP and develop a project on the module using the available microcontroller and memory resources using the Cypress WICED software development kit. Inventek provides a patch for the Cypress SDK to setup the basic I/O configuration.

Alternatively, Inventek offers an AT Command set called IWIN that allows communication to the module over UART or SPI interfaces using simple commands. The module becomes a black box that handles the TCP/IP stack and all the wireless communications. The UART and SPI sections below detail how to communicate to the Inventek serial-to-Wi-Fi modules using the IWIN firmware.

6.1 UART Interface

The ISM4343-WBM-L151 shares a single UART for BT. The UART is a standard 4-wire interface (RX, TX, RTS and CTS) with adjustable baud rates from 9600 baud to 4.0 Megabaud. The interface features an automatic baud rate detection capability that returns a baud rate selection. Alternatively, the baud rate may be selected through a vendor-specific UART HCI command.

The UART has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support EDR. Access to the FIFO is conducted through the AHB interface through either DMA or the CPU. The UART supports the BT 4.0 UART HCI specification: H4, a custom Extended H4 and H5. The default baud rate is 115.2 Kbaud.

The UART supports the 3-wire H5 UART transport, as described in the BT specification ("Three-wire UART Transport Layer"). Compared to H4, the H5 UART transport reduces the number of signal lines required by eliminating the CTS and RTS signals.

The ISM4343-WBM-L151 UARTs operate correctly with the host UART as long as the combined baud rate error of the two devices is within ±2%.

Desired Rate	*Actual Rate*	*Error (%)*
921600	923077	0.16
460800	461538	0.16
230400	230796	0.17
115200	115385	0.16
57600	57692	0.16
38400	38400	0.00
28800	28846	0.16
19200	19200	0.00
14400	14423	0.16
9600	9600	0.00

Table 1: Example of Common Baud Rates

6.2 UART Pins

The eS-WiFi module and SiP support a 3.3v logic level, UART host interface when using the IWIN AT Command Firmware or WICED SDK.

UART Pins to connect when using the ISM4343-WBM-L151 SiP:

Pin	Description	STM32F412
31	USART1_RX	PA10
30	USART1_TX	PA9

UART Pins to connect when Using the ISM4343-WBM-L54 Module:

Pin	Description	STM32F412
21	USART1_RX	PA10
22	USART1_TX	PA9

6.2.1 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) using the IWIN AT Command firmware.

6.2.2 Flow Control

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

6.2.3 Supported Baud Rates

The eS-WiFi module supports the following serial baud rates.
The AT Command 'U2' is used to set the baud rate.
Basic Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 1152000, 1382400, 1612800, 1834200, 2073600, 2304000, 2764800, 3686400, 3916800

6.2.4 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.

6.3 SPI (Serial Peripheral Interface Bus) – USES STM32F412 SPI4

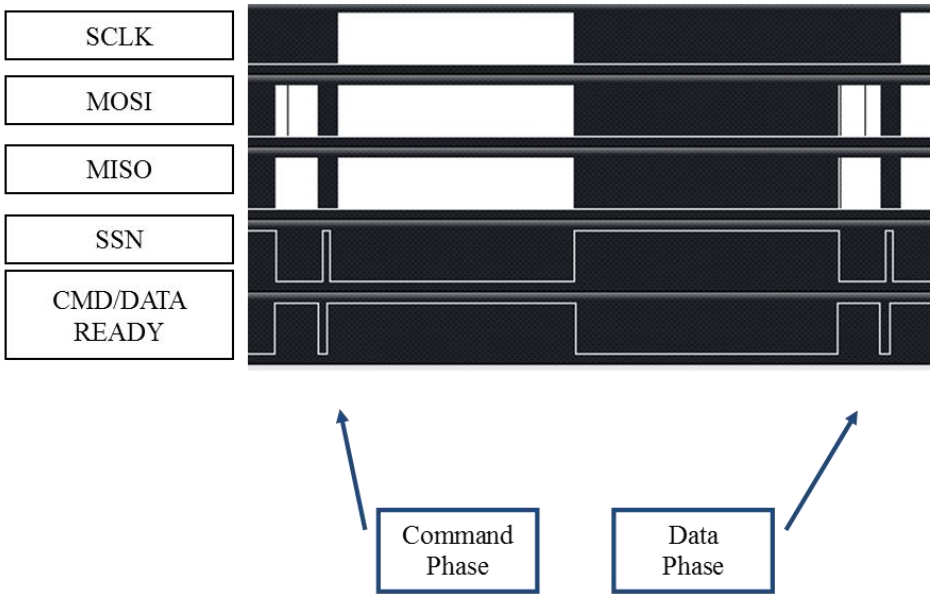
The eS-WiFi module supports a custom SPI host interface with the IWIN SPI Firmware. The IWIN AT Command firmware for a SPI host interface is connected to SPI 4 bus on the module and is designed to utilize a command / data ready signal to help maximize Wi-Fi data throughput.
The IWIN firmware uses SPI 4 for the interface and requires use of this Data Ready pin. The additional Flash on the SiP is connected to SPI 1 so it should not be used for the AT Command SPI connection. SPI1 Pins are 8, 74, 75 and 76.

SPI4 Pins to connect when using the ISM4343-WBM-L151 SiP:

Pin	Description	STM32F412
11	MICRO_SPI4_NSS	PE11
12	MICRO_SPI4_SCK	PE12
13	MICRO_SPI4_MISO	PE13
14	MICRO_SPI4_MOSI	PE14
122	CMD_Data Ready	PA3

SPI4 Pins to connect when Using the ISM4343-WBM-L54 Module:

Pin	Description	STM32F412
51	SPI4_NSS	PE11
52	SPI4_SCK	PE12
53	SPI4_MISO	PE13
54	SPI4_MOSI	PE14
13	CMD_Data Ready	PA3



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.

6.3.1 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.

6.3.2 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).

6.3.3 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.

6.3.4 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.

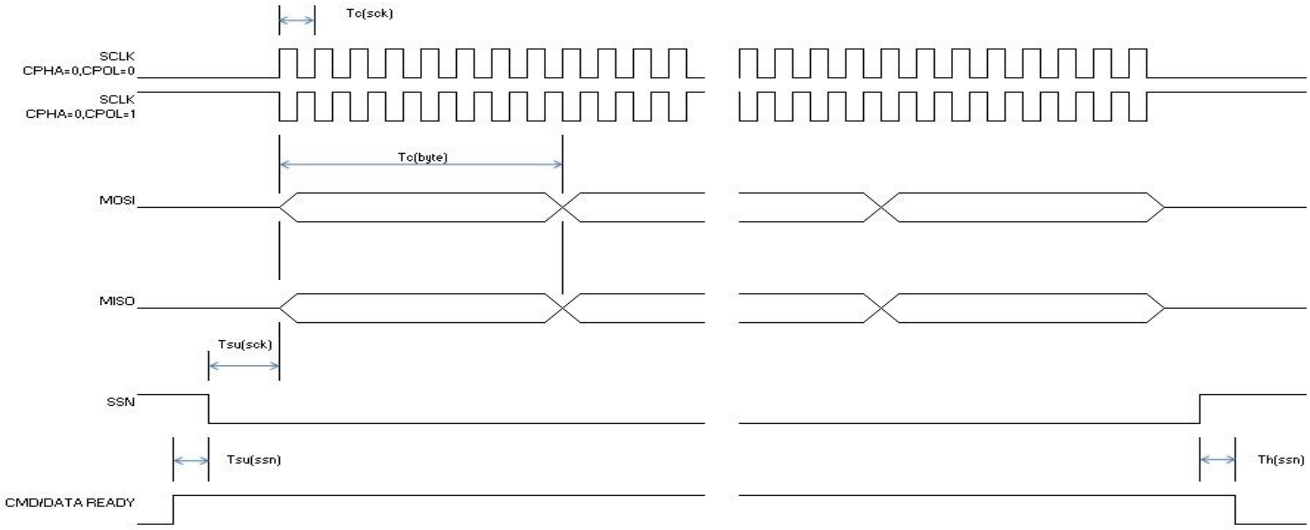
6.3.5 SPI Asynchronous Messages:

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.

6.3.6 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	

6.3.7 I2S Timer Interface Characteristics

Symbol	Parameter	Conditions	Min	Max	Unit
f_{MCK}	I2S Main clock output	-	256x8K	256xFs(2)	MHz
f_{CK}	I2S clock frequency	Master data: 32 bits	-	64xFs	MHz
		Slave data: 32 bits	-	64xFs	
D_{CK}	I2S clock frequency duty cycle	Slave receiver	30	70	%
$t_{v(WS)}$	WS valid time	Master mode	0	7	ns
$t_{h(WS)}$	WS hold time	Master mode	1.5	-	
$t_{su(WS)}$	WS setup time	Slave mode	1.5	-	
$t_{h(WS)}$	WS hold time	Slave mode	3	-	
$t_{su(SD\_MR)}$	Data input setup time	Master receiver	1	-	
$t_{su(SD\_SR)}$		Slave receiver	2.5	-	
$t_{h(SD\_MR)}$	Data input hold time	Master receiver	7	-	
$t_{h(SD\_SR)}$		Slave receiver	2.5	-	
$t_{v(SD\_ST)}$	Data output valid time	Slave transmitter (after enable edge)	-	20	
$t_{v(SD\_MT)}$		Master transmitter (after enable edge)	-	6	
$t_{h(SD\_ST)}$	Data output hold time	Slave transmitter (after enable edge)	8	-	
$t_{h(SD\_MT)}$		Master transmitter (after enable edge)	2	-	

1. Guaranteed by characterization, not tested in production.
2. The maximum value of 256 x Fs is 50 MHz (APB1 maximum frequency).

Note: Refer to the I2S section of RM0383 reference manual for more details on the sampling frequency (Fs). f_{MCK}, f_{CK}, and D_{CK} values reflect only the digital peripheral behavior. The value of these parameters might be slightly impacted by the source clock accuracy. D_{CK} depends mainly on the value of ODD bit. The digital contribution leads to a minimum value of (I2SDIV / (2 x I2SDIV + ODD) and a maximum value of (I2SDIV + ODD) / (2 x I2SDIV + ODD). F_S maximum value is supported for each mode/condition.

6.4 ISM4343-WBM-L54-U External Antenna Connections

ISM4343-WBM-L54-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

On-Board Antenna Connector

6.5 ISM4343-WBM-L54-U/C Mechanical Specifications

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

Items	Description ISM4343-WBM-L54-CU
Length	34.22 mm (-/+0.5 mm)
Width	14.70 mm (-/+0.5 mm)
Height	2.5 ± 0.2 mm
Package	54 pin LGA

6.6 FIRMWARE UPGRADES

A JTAG 10 pin header or directly connecting to the JTAG pins on the **eS-WiFi** module for updating is recommended. Use the ST-Link to flash the ST micro.

See the below link to Inventek's Firmware Upgrade Options:
https://www.inventeksys.com/iwin/firmware-upgrades/

6.7 ISM4343-WBM-L54-U/C Pinout 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 Interface. These SPI pins are also connected internally to the 2MB SPI Flash. Use SPI4 (pins 51, 52, 53, 54) for the AT Command SPI bus interface. (Refer to SPI Section 6.3 for operation)
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	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
22	I/O	TX	UART Transmit
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	DNC	No connect for ISM4343
29	I	DNC	No connect for ISM4343
30	I/O	RES	GPIO, see section
31	I/O	RES	GPIO, see section

Pin No.	Type	Pin Definition	Descriptions
32	I/O	RES	GPIO, see section
33	I	BOOT 0	Enable On-Board Microcontroller Boot Loader (See STM32F412 BOOT0 specification)
34	I	RSTN	Reset (See STM32F412 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

- ***Reserved Pins***

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

Pin No.	Type	Pin Definition	Descriptions
30	I/O	GPIO15	Alternate Function: STM32F412, PB15
31	I/O	GPIO14	Alternate Function: STM32F412, PB14
32	I/O	GPIO13	Alternate Function: STM32F412, PB13

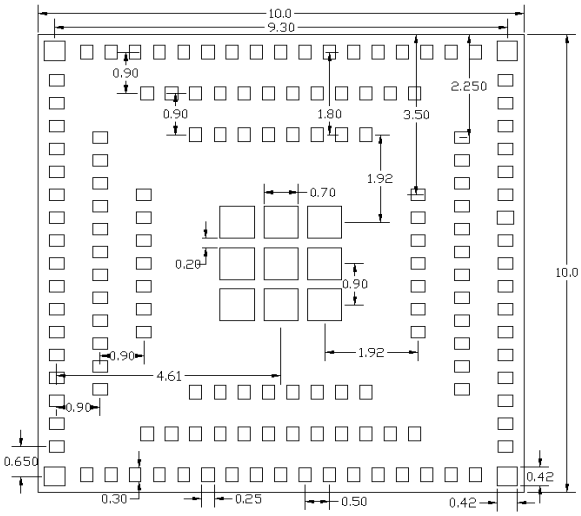
- ***+10 Pins Internal Pads***

Pins currently available for designs using the WICED-SDK and SPI4 with AT Commands.

Pin No.	Type	Pin Definition	Descriptions
45	I/O	GPIOA	Alternate Function: STM32F412, PA2
46	I/O	GPIOB	Alternate Function: STM32F412, PA1
47	I/O	GPIOC	Alternate Function: STM32F412, PB10
48	I/O	GPIOD	Alternate Function: STM32F412, PC3
49	I/O	GPIOE	Alternate Function: STM32F412, PB11
50	I/O	GPIOF	Alternate Function: STM32F412, PB12
51	I/O	GPIOG / SPI4_NSS	Alternate Function: STM32F412, PE11
52	I/O	GPIOH / SPI4 SCK	Alternate Function: STM32F412, PE12
53	I/O	GPIOJ / SPI4 MISO	Alternate Function: STM32F412, PE13
54	I/O	GPIOK / SPI4 MOSI	Alternate Function: STM32F412, PE14

7 ISM4343-WBM-L151 Pinout Description

7.1 Module Pin Number Sequence Definition



Top View

Pin Number	Pin Name	type	Description	Mapping for STM32F412 Packaged Datasheet
1	ANT	I/O	RF transmitter output and RF receiver input	
2	GND	-	Ground	
3	VDD_3V3_Wifi_PA	PI	Wi-Fi PA power supply	
4	VDD_3V3_Wifi_PA	PI	Wi-Fi PA power supply	
5	GND	-	Ground	
6	VDD_3V3_5	PI	DC supply for MCU and I/O	
7	GND	-	Ground	
8	MICRO_SPI1_MOSI	I/O	MCU_SPI_MOSI	PA7
9	QUADSPI_CLK	I/O	QUADSPI_CLK	PB1
10	GND	-	Ground	
11	MICRO_SPI4_NSS	I/O	MCU_SPI4_NSS	PE11
12	MICRO_SPI4_SCK	I/O	MCU_SPI4_SCK form MCU	PE12
13	MICRO_SPI4_MISO	I/O	MCU_SPI4_MISO	PE13
14	MICRO_SPI4_MOSI	I/O	MCU_SPI4_MOSI	PE14
15	GND	-	Ground	
16	NC	-	Floating	
17	NC	-	Floating	

18	GND	-	Ground	
19	NC	-	Floating	
20	BT_GPIO_3	I/O	WPT_INTb to wireless charging PMU	
21	MICRO_SPI2_MISO	I/O	MICRO_SPI2_MISO	PB14
22	MICRO_SPI2_MOSI	I/O	MICRO_SPI2_MOSI	PB15
23	GND	-	Ground	
24	VDD_3V3_3	PI	DC supply for MCU and I/O	
25	GND	-	Ground	
26	NC	-	Floating	
27	GND	-	Ground	
28	VDD3V3_WiFi_IO	PI	DC supply for WIFI and I/O	
29	GND	-	Ground	
30	MICRO_USART1_TX	I/O	MCU_USART1_TX	PA9
31	MICRO_USART1_RX	I/O	MCU_USART1_RX	PA10
32	MICRO_USART1_CTS	I/O	MCU_USART1_ CTS	PA11
33	MICRO_USART1_RTS	I/O	MCU_USART1_ RTS	PA12
34	GND	-	Ground	
35	MICRO_JTAG_TMS	I/O	MCU_JATG_TMS	PA13
36	GND	-	Ground	
37	MICRO_JTAG_TCK	I/O	MCU_JATG_TCK	PA14
38	MICRO_JTAG_TDI	I/O	MCU_JATG_TDI	PA15
39	GND	-	Ground	
40	NC	-	Floating	
41	GND	-	Ground	
42	VDD3V3_WiFi	PI	Wi-Fi power supply	
43	VDD3V3_WiFi	PI	Wi-Fi power supply	
44	GND	-	Ground	
45	MICRO_JTAG_TDO	I/O	MCU_JATG_TDO	PB3
46	MICRO_JTAG_TRSTN	I/O	MCU_JATG_RSTN	PB4
47	GND	-	Ground	
48	VDD_3V3_2	PI	DC supply for MCU and I/O	
49	GND	-	Ground	
50	QUADSPI_BK1_IO3	I/O	QUADSPI_BK1_IO3	PF6
51	GND	-	Ground	
52	NC	-	NC	
53	NC	-	NC	
54	GND	-	Ground	
55	BT_PCM_CLK	I/O	PCM clock; can be master	
56	NC	-	Floating	

57	BT_HOST_WAKE	O	BT_HOST_WAKE	
58	GND	-	Ground	
59	VBAT	PI	Power supply for backup circuitry when VDD is not present	
60	GND	-	Ground	
61	GND	-	Ground	
62	NC	-	Floating	
63	NC	-	Floating	
64	GND	-	Ground	
65	VDD_3V3	PI	DC supply for MCU and I/O	
66	GND	-	Ground	
67	QUADSPI_BK1_IO1	I/O	QUADSPI_BK1_IO1	PF9
68	QUADSPI_BK1_IO2	I/O	QUADSPI_BK1_IO2	PF7
69	MICRO_I2S2_SD	I/O	MICRO_I2S2_SD	PC3
70	GND	-	Ground	
71	GND	-	Ground	
72	GND	-	Ground	
73	GND	-	Ground	
74	MICRO_SPI1_NSS	I/O	MCU_SPI_NSS	PA4
75	MICRO_SPI1_SCK	I/O	MCU_SPI_SCK form MCU	PA5
76	MICRO_SPI1_MISO	I/O	MCU_SPI_MISO	PA6
77	GND	-	Ground	
78	QUADSPI_BK2_IO3	I/O	QUADSPI_BK2_IO3	PC5
79	BOOT1/ QUADSPI_CLK	I/O	BOOT1/ QUADSPI_CLK	PB2
80	QUADSPI_BK2_IO0	I/O	QUADSPI_BK2_IO0	PE7
81	QUADSPI_BK2_IO1	I/O	QUADSPI_BK2_IO1	PE8
82	MICRO_I2C2_SCL	I/O	MICRO_I2C2_SCL	PB10
83	MICRO_I2C2_SDA	I/O	MICRO_I2C2_SDA	PB11
84	MCIRO_SPI2_NSS	I/O	MCIRO_SPI2_NSS	PB12
85	MCIRO_SPI2_SCK	I/O	MCIRO_SPI2_SCK	PB13
86	MICRO_GPIO_27	I/O	MCU_GPIO	PD8
87	MICRO_GPIO_25	I/O	MCU_GPIO	PD10
88	NC	-	Floating	
89	NC	-	Floating	
90	VDD_USB	PI	VDD for USB	
91	GND	-	Ground	
92	MICRO_I2S2_MCK/ MICRO_USART6_TX	I/O	MICRO_I2S2_MCK/ MICRO_USART6_TX	PC6
93	MICRO_I2S2_CK/ MICRO_USART6_RX	I/O	MICRO_I2S2_CK/ MICRO_USART6_RX	PC7
94	GND	-	Ground	
95	NC	-	Floating	

96	NC	-	Floating	
97	NC	-	Floating	
98	NC	-	Floating	
99	GND	-	Ground	
100	NC	-	Floating	
101	GND	-	Ground	
102	MICRO_I2C1_SCL	I/O	MICRO_I2C1_SCL	PB6
103	MICRO_I2C1_SDA	I/O	MICRO_I2C1_SDA	PB7
104	BOOT0	O	Normal operation if connected to ground at power up.	BOOT0
105	NC	-	Floating	
106	MICRO_GPIO_0	I/O	MCU_GPIO	PE3
107	QUADSPI_BK2_NCS	I/O	QUADSPI_BK2_NCS	PC11
108	MICRO_GPIO_30	I/O	MCU_GPIO	PE0
109	NC	-	Floating	
110	NC	-	Floating	
111	MICRO_I2S_DI	I/O	MICRO_I2S_DI	PE5
112	GND	-	Ground	
113	GND	-	Ground	
114	GND	-	Ground	
115	GND	-	Ground	
116	GND	-	Ground	
117	MICRO_RST_N	I/O	MCU_RST_N	NRST
118	QUADSPI_BK1_IO0	I/O	QUADSPI_BK1_IO0	PF8
119	MICRO_WKUP	I/O	MCU_WKUP	PA0
120	GND	-	Ground	
121	MICRO_ADC_IN2	I/O	MCU_ADC_IN_2	PA2
122	SPI 4 data Ready	I/O	MCU_ADC_IN_3	PA3
123	GND	-	Ground	
124	QUADSPI_BK2_IO2	I/O	QUADSPI_BK2_IO2	PC4
125	MICRO_GPIO_5	I/O	MCU_GPIO	PB0
126	RF_SW_CTRL	I/O	Antenna diversity control signal	
127	NC	-	Floating	
128	MICRO_GPIO_16	I/O	MCU_GPIO	PE15
129	BT_GPIO_4	I/O	BSC_SDA to/from wireless charging PMU.	
130	BT_GPIO_5	I/O	BSC_SCL from wireless charging PMU.	
131	NC	-	Floating	
132	GND	-	Ground	
133	QUADSPI_BK1_NCS	I/O	QUADSPI_BK1_NCS	PG6
134	GND	-	Ground	
135	GND	-	Ground	

136	NC	-	Floating	
137	MICRO_GPIO_26	I/O	MCU_GPIO	PD1
138	NC	-	Floating	
139	NC	-	Floating	
140	NC	-	Floating	
141	NC	-	Floating	
142	MICRO_GPIO_28	I/O	MCU_GPIO	PB8
143	MICRO_I2S2_WS	I/O	MICRO_I2S2_WS	PB9
144	BT_PCM_SYNC	I/O	PCM Sync; can be master(output) or slave (input)	
145	BT_PCM_OUT	O	PCM data output	
146	BT_PCM_IN	I	PCM data input sensing	
147	PC13	I/O		PC13
148	GND	-	Ground	
149	GND	-	Ground	
150	MICRO_ADC_IN1	I/O	MCU_ADC_IN_1	PA1
151	GND	-	Ground	

8 ISM4343-WBM-L151 ELECTRICAL SPECIFICATIONS

8.1 Absolute Maximum Ratings

⚠ **Caution!** The absolute maximum ratings indicate levels where permanent damage to the device can occur, even if these limits are exceeded for only a brief duration. Functional operation is not guaranteed under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the device.

Rating	*Symbol*	*Value*	*Unit*
Power Supply	MAX	+4.0	V
Storage Temp	Celsius	-40 to +85	Degrees
Voltage Ripple	Ripple Voltage	+/- 2%	Max value not to exceed Operating Voltage
Power Supply Absolute Maximum Rating	VBAT	0 to 4	V
Power Supply Absolute Maximum Rating	VDD 3V3_1	0 to 4	V
Power Supply Absolute Maximum Rating	VDD 3V3_2	0 to 4	V
Power Supply Absolute Maximum Rating	VDD 3V3_3	0 to 4	V
Power Supply Absolute Maximum Rating	VDD 3V3_WiFi	0 to 6	V
Power Supply Absolute Maximum Rating	VDD 3V3_WiFi_PA	0 to 6	V
Power Supply Absolute Maximum Rating	VDDIO_WiFi	0 to 4	V

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

Table 3: Absolute Maximum Ratings

8.2 Environmental Ratings

Characteristic	*Value*	*Units*	*Conditions/Comments*
Ambient Temperature (Ta)	-40 to +85	°C	* Functional operation
Storage Temperature	-40 to +125	°C	-
Relative Humidity (Non Condensing, relative humidity)	Less than 60	%	Storage
	Less than 85	%	Operation

Table 4: Environmental Ratings

8.3 ISM4343 Operating Conditions and DC Characteristics

⚠ **Caution!** Functional operation is not guaranteed outside of the limits shown in Table 5 and operation outside these limits for extended periods can adversely affect long-term reliability of this devices.

ISM4343-WBM-L151	*Symbol*	*Min*	*Typical*	*Max*	*Unit*
MCU VBAT Voltage	VBAT	2.0	3.3	3.6	V
GPIO I/O Supply	VDD3V3_1	2.4	3.3	3.6	V
GPIO I/O Supply	VDD3V3_2	2.4	3.3	3.6	V
GPIO I/O Supply	VDD3V3_3	2.4	3.3	3.6	V
Wi-Fi Voltage	VDD_3V3_WIFI	3.0	3.3	3.6	V
Wi-Fi PA Voltage	VDD_3V3_WIFI_PA	3.0	3.3	3.6	V
MCU With Wi-Fi	VDDIO_WIFI	3.0	3.3	3.6	V
***ISM4343-WBM-L54**	***Symbol***	***Min***	***Typical***	***Max***	***Unit***
VBAT Voltage	VBAT	***3.0***	3.3	3.6	V
VDD	VDD	3.0	3.3	3.6	V

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

Table 5: Recommended Operating Conditions and DC Characteristics

8.4 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 [1]	mA
Power Save Mode	Connected to Network	38	-	mA
Radio On	Smart bridge	90	340[1]	mA
Absolute Max	Worst Case	-	560[2]	mA

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

[2] Worst case power consumption represents active Wi-Fi

9 RF SPECIFICATIONS

9.1 BT RF Specifications

Parameter	Conditions	Min	Typical	Max	Unit
Note: The specifications in this table are measured at the Chip port output unless otherwise specified:					
General					
Frequency Range	-	2402	-	2480	MHz
RX sensitivity	GFSK, 0.1% BER, 1 Mbps	-	-93.5	-	dBm
	π/4-DQPSK, 0.01% BER, 2 Mbps	-	-95.5	-	dBm
	8-DPSK, 0.01% BER, 3 Mbps	-	-89.5	-	dBm
Input IP3	-	-16	-	-	dBm
Maximum input at antenna	-	-	-	-20	dBm

Table 6: BT Receiver RF Specifications

Parameter	Conditions	Min	Typical	Max	Unit
General					
Frequency Range		2402	-	2480	MHz
Basic rate (GFSK) Tx power at BT	-	4.0	8.0	-	dBm
QPSK Tx Power at BT		7.0	9.0	-	dBm
8PSK Tx Power at BT		7.0	9.0	-	dBm
Power control step		2	4	6	dB

Table 7: BT Transmitter RF Specifications

Parameter: BT	Condition	Min	Typical	Max	Unit
Condition: 25 Deg. C, includes Wi-Fi and BT					
Tx Mode	3DH5		35		mA
Rx Mode	3DH5		16		mA

Table 8: BT Current Consumption (M4 MCU not calculated)

Parameter: BT Low Energy	Condition	Min	Typical	Max	Unit
Condition: 25 Deg. C, includes both Wi-Fi and BT					
Tx Mode	Transmitter and baseband are both operating, 100%		35		mA
Rx Mode	Receiver and baseband are both operating, 100%		16		mA

Table 9: BLE Current Consumption (M4 MCU not calculated)

9.2 WLAN RF Specifications

The ISM4343-WBM-L151 includes an integrated single-band direct conversion radio that supports the 2.4 GHz band.

2.4 GHz Band General RF Specifications

Features	Description
WLAN Standards	IEEE 802 Part 11b/g/n (802.11b/g/n single stream n)
Antenna Port	Support Single Antenna for WiFi
Frequency Band	2.400 – 2.484 GHz (2.4 GHz ISM Band)
Number of selectable Sub channels	14 channels
Modulation	OFDM, DSSS (Direct Sequence Spread Spectrum), DBPSK, DQPSK, CCK , 16QAM, 64QAM, 256QAM
Supported rates	1,2, 5.5,11,6,9,12,24,36,48,54 Mbps & HT20 MCS 0~7
Maximum receive input level	- 10dBm (with PER < 8%@11 Mbps) - 20dBm (with PER < 10%@54 Mbps) - 20dBm (with PER < 10%@MCS7)
Output Power	17dBm @ 802.11b 13dBm @ 802.11g 12dBm @ 802.11n 10dBm @ 802.11n (256QAM)
Carrier Frequency Accuracy	+/- 20ppm (crystal: 26MHz +/-10ppm in 250C)

Item	Conditions	Min	Typical	Max	Unit
Tx/Rx switch time	Including TX ramp down	-	-	5	µs
Rx/Tx switch time	Including TX ramp up	-	-	2	µs
Power-up and power-down ramp time	DSSS/CCK Modulations	-	-	<2	µs

Table 10: 2.4 GHz Band General RF Specifications (default voltage is 3.3V)

WLAN 2.4 GHz Receiver Performance Specification

Parameter	Condition/Notes	Min	Typical	Max	Unit
Frequency Range	-	2400	-	2500	MHz
RX sensitivity (8% PER for 1024 octet PSDU)[a]	1 Mbps DSSS	-	-97.9	-	dBm
	2 Mbps DSSS	-	-96.9	-	dBm
	5.5 Mbps DSSS	-	-92.5	-	dBm
	11 Mbps DSSS	-	-90.7	-	dBm
RX sensitivity (10% PER for 1024 octet PSDU)[a]	6 Mbps OFDM	-	-92.7	-	dBm
	9 Mbps OFDM	-	-91.4	-	dBm
	12 Mbps OFDM	-	-89	-	dBm
	18 Mbps OFDM	-	-87.4	-	dBm
	24 Mbps OFDM	-	-84.4	-	dBm
	36 Mbps OFDM	-	-81.7	-	dBm
	48 Mbps OFDM	-	-78.3	-	dBm
	54 Mbps OFDM	-	-77.1	-	dBm
RX sensitivity (10% PER for 4096 octet PSDU)[a],[b] Defined for default perameters: GF, 800 ns GI, and non-STBC.	20 MHz channel spacing for all MCS rates (GF)				
	MCS0	-	-92.6	-	dBm
	MCS 1	-	-89.6	-	dBm
	MCS 2	-	-87.3	-	dBm
	MCS 3	-	-84.7	-	dBm
	MCS 4	-	-82	-	dBm
	MCS 5	-	-78.4	-	dBm
	MCS 6	-	-76.9	-	dBm
	MCS 7	-	-75	-	dBm
RX sensitivity (10% PER for 4096 octet PSDU)[a],[b] Defined for default parameters: GF, 800 ns GI, and non-STBC.	40 MHz channel spacing for all MCS rates (GF)				
	MCS0	-	-91	-	dBm
	MCS 1	-	-87.5	-	dBm
	MCS 2	-	-85.5	-	dBm
	MCS 3	-	-83	-	dBm
	MCS 4	-	-80	-	dBm
	MCS 5	-	-.75	-	dBm
	MCS 6	-	-73.5	-	dBm

	MCS 7	-	-72	-	dBm
RX sensitivity (10% PER for 4096 octet PSDU)[a],[c] Defined for default parameters: Mixed mode- 800n ns GI, and non-STBC.	20 MHz channel spacing for all MCS rates (Mixed mode)				
	MCS0	-	-91	-	dBm
	MCS 1	-	-87.9	-	dBm
	MCS 2	-	-85.5	-	dBm
	MCS 3	-	-82.8	-	dBm
	MCS 4	-	-79.9	-	dBm
	MCS 5	-	-76.2	-	dBm
	MCS 6	-	-74.6	-	dBm
	MCS 7	-	-72.6	-	dBm
RX sensitivity (10% PER for 4096 octet PSDU)[a],[b] Defined for default parameters: GF, 800 ns GI, and non-STBC.	40 MHz channel spacing for all MCS rates (Mixed mode)				
	MCS0	-	-89.0	-	dBm
	MCS 1	-	-85.4	-	dBm
	MCS 2	-	-83.2	-	dBm
	MCS 3	-	-80.6	-	dBm
	MCS 4	-	-77.4	-	dBm
	MCS 5	-	-72.3	-	dBm
	MCS 6	-	-70.6	-	dBm
	MCS 7	-	-69.0	-	dBm

Table 11: WLAN 2.4 GHz Receiver Performance Specifications

802.11 b Receiver					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Receiver minimum input level sensitivity (PER< 8 %)	1Mbps	-80*	-93		dBm
	2Mbps	-80*	-91		dBm
	5.5Mbps	-76*	-89		dBm
	11Mbps	-76*	-86		dBm
Receiver maximum input level sensitivity (PER< 8 %)	1/2/5.5/11 Mbps	-10*			dBm

Table 12: WLAN 2.4 GHz 802.11b Receiver Performance Specifications

802.11g Receiver					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Receiver minimum input level sensitivity (PER<10 %)	6Mbps	-82*	-88		dBm
	9Mbps	-81*	-87		dBm
	12Mbps	-79*	-85		dBm
	18Mbps	-77*	-83		dBm
	24Mbps	-74*	-80.5		dBm
	36Mbps	-70*	-78.5		dBm
	48Mbps	-66*	-74		dBm
	54Mbps	-65*	-72		dBm
Receiver maximum input level (PER<10%)	6/9/12/18/24/36/48/54	-20*			dBm

Table 13: WLAN 2.4 GHz 802.11g Receiver Performance Specifications

802.11n Receiver					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Receiver minimum input level sensitivity (PER<10 %)	HT20, MCS0	-82*	-87.5		dBm
	HT20, MCS1	-79*	-84		dBm
	HT20, MCS2	-77*	-82		dBm
	HT20, MCS3	-74*	-80.5		dBm
	HT20, MCS4	-70*	-77		dBm
	HT20, MCS5	-66*	-72		dBm
	HT20, MCS6	-65*	-71		dBm
	HT20, MCS7	-64*	-70		dBm
	256-QAM R=3/4		-68		dBm
	256-QAM R=5/6		-66		dBm
Receiver maximum input level (PER<10%)	MSC0~MSC7	-20*			dBm

Table 14: WLAN 2.4 GHz 802.11n Receiver Performance Specifications

WLAN 2.4 GHz Transmitter Performance Specification

802.11b Transmit					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Transmit output power level	1M/2M/5.5M/11M		17		dBm
Transmit center frequency tolerance		-20	0	20	ppm
Transmit spectrum mask	Fc-22MHz<F<Fc-11MHz & Fc+11MHz<F<Fc+22MHz(1/2/5.5/11Mbps; channel 1~13)			-30*	dBr
	F<Fc-22MHz & F>Fc+22MHz(1/2/5.5/11Mbps; channel 1~13)			-50*	dBr
Transmit power -on	10% ~ 90 %		0.3	2*	us
Transmit power -down	90% ~ 10 %		1.5	2*	us
Transmit modulation accuracy	1/2/5.5/11 Mbps		-17	-10	dB

Table 15: WLAN 2.4 GHz 802.11b Transmit Performance Specifications

802.11g Transmit					
Item	Condition	Min.	Typ.	Max.	Unit
Transmit output power level	6M/9M/12M/18M/24M/36M/48M/54M		13		dBm dBm dBm
Transmit center frequency tolerance		-20	0	20	ppm
Transmit modulation accuracy	6Mbps			-5*	dB
	9Mbps			-8*	dB
	12Mbps			-10*	dB
	18Mbps			-13*	dB
	24Mbps			-16*	dB
	36Mbps			-19*	dB
	48Mbps			-22*	dB
	54Mbps			-25*	dB
	@ 11MHz			-20*	dBr

Transmit spectrum mask	@ 20MHz			-28*	dBr
	@ 30MHz			-40*	dBr

Table 16: WLAN 2.4 GHz 802.11g Transmit Performance Specifications

802.11n Transmit					
Item	Condition	Min.	Typ.	Max.	Unit
Transmit output power level	HT20 MCS 0~7		12		dBm
	HT20 MCS 7 (Turboqam)		10		dBm
Transmit center frequency tolerance		-20	0	20	ppm
Transmit modulation accuracy	HT20, MCS0~7			-27*	dB
	HT20 MCS 7 (Turboqam)			-32*	dB
Transmit Spectrum mask	@ 11MHz			-20*	dBr
	@ 20MHz			-28*	dBr
	@ 30MHz			-40*	dBr

Table 17: WLAN 2.4 GHz 802.11m Transmit Performance Specifications

BT Transmitter Performance Specification

Parameter	Mode and Condition	Min.	Typ.	Max.	Unit
Transmitter Section					
Frequency Range		2402		2480	MHz
Output power	GFSK		10		dBm
	QPSK		6		dBm
	BPSK		6		dBm
Power control step		2	4	8	dB
Lo performance					
Initial carrier frequency tolerance			±25	±75	kHz
Lock Time			72		µs
Frequency Drift					
DH1 packet			± 8	± 25	kHz
DH3 packet			± 8	± 40	kHz

DH5 packet			± 8	± 40	kHz
Drift rate			5	20	kHz/50µs
Frequency Deviation					
00001111 sequence in payload[a]		140	155	175	kHz
10101010 sequence in payload[b]		115	140		kHz
Channel spacing			1		MHz

- This pattern represents an average deviation in payload.
- Pattern represents the maximum deviation in payload for 99.9% of all frequency deviations.

Table 18: BT Transmit Performance Specifications

Parameter	Mode and Condition	Min.	Typ.	Max.	Unit
Receiver Section					
Frequency Range		2402		2480	MHz
Output power	GFSK,0.1% BER, 1Mbps		-91		dBm
	π/4-DQPSK,0.01% BER, 2Mbps		-93		dBm
	8-DPSK, 0.01% BER, 3Mbps		-87		dBm
Input IP3		-16			dBm
Maximum input				-20	dBm

Table 19: BT Receiver Performance Specifications

Parameter	Mode and Condition	Min.	Typ.	Max.	Unit
Frequency Range		2402		2480	MHz
RX Sense[a]	GFSK,0.1% BER, 1Mbps		-94		dBm
TX Power			8		dBm
Mod char: delta f1 average		225	225	275	kHz
Mod char: delta f2 max[b]		99.9			%
Mod char: ratio		0.8	0.95		%

- The BT tester is set so that Dirty TX is on.
- At least 99.9% of all delta F2 max. Frequency values recorded over 10 packets must be greater than 185kHz.

Table 20: BLE RF Performance Specifications

9.3 ISM4343-WBM-L54-U External Antenna

The Inventek U.FL PCB antenna is certified for FCC, IC and CE. The part number is W24P-U. It is a single band 2.4 GHz PCB antenna with a U.FL connector.

The Inventek W24P-U PCB antenna datasheet can be found on the Inventek Website.

9.4 Environmental Specifications

Item	Description
Operating temperature range	-40 deg. C to +85 deg. C
Storage temperature range	-40 deg. C to +125 deg. C
Humidity (Non-Condensing, relative humidity)	Less than 60% max for Storage Less than 85% max for Operation

Note 1: The ISM4343-WBM-L151 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

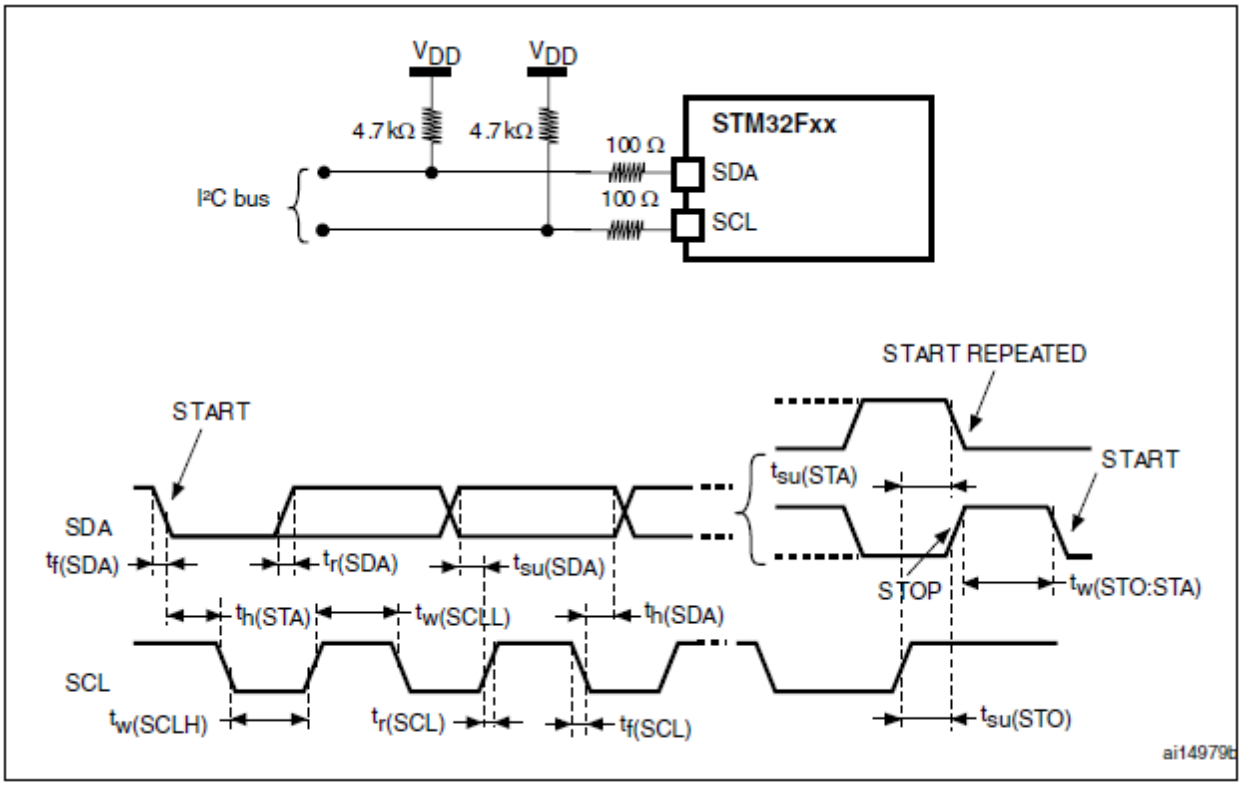
10 Additional Information

10.1 Communications Interfaces

10.1.1 I2C Interface Characteristics

Symbol	Parameter	Standard mode I^2C(1)		Fast mode I^2C(1)(2)		Unit
		Min	Max	Min	Max	
$t_{w(SCLL)}$	SCL clock low time	4.7	-	1.3	-	µs
$t_{w(SCLH)}$	SCL clock high time	4.0	-	0.6	-	
$t_{su(SDA)}$	SDA setup time	250	-	100	-	ns
$t_{h(SDA)}$	SDA data hold time	0	3450(3)	0	900(4)	
$t_{r(SDA)}$ $t_{r(SCL)}$	SDA and SCL rise time	-	1000	-	300	
$t_{f(SDA)}$ $t_{f(SCL)}$	SDA and SCL fall time	-	300	-	300	
$t_{h(STA)}$	Start condition hold time	4.0	-	0.6	-	µs
$t_{su(STA)}$	Repeated Start condition setup time	4.7	-	0.6	-	
$t_{su(STO)}$	Stop condition setup time	4.0	-	0.6	-	µs
$t_{w(STO:STA)}$	Stop to Start condition time (bus free)	4.7	-	1.3	-	µs
t_{SP}	Pulse width of the spikes that are suppressed by the analog filter for standard fast mode	0	50(5)	0	50(5)	µs
C_b	Capacitive load for each bus line	-	400	-	400	pF

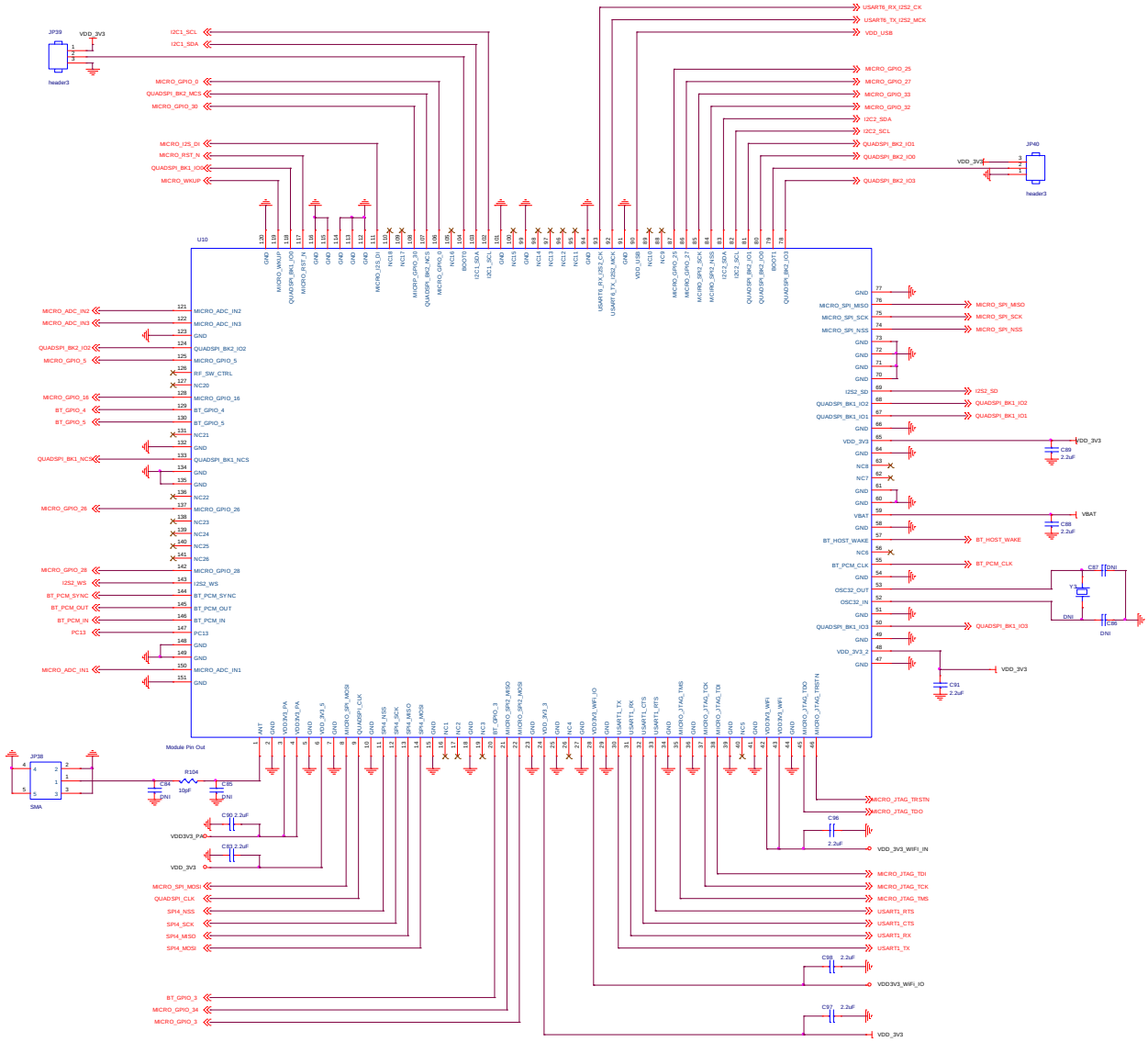
1. Guaranteed by design, not tested in production.
2. fPCLK1 must be at least 2 MHz to achieve standard mode I2C frequencies. It must be at least 4MHz to achieve fast mode I2C frequencies, and a multiple of 10 MHz to reach the 400 kHz maximum I2C fast mode clock.
3. The device must internally provide a hold time of at least 300ns for the SDA signal in order to bridge the undefined region of the falling edge of SCL.
4. The maximum data hold time has only to be met if the interface does not stretch the low period of SCL signal.



1. Measurement points are done at CMOS levels: $0.3V_{DD}$ and $0.7V_{DD}$.

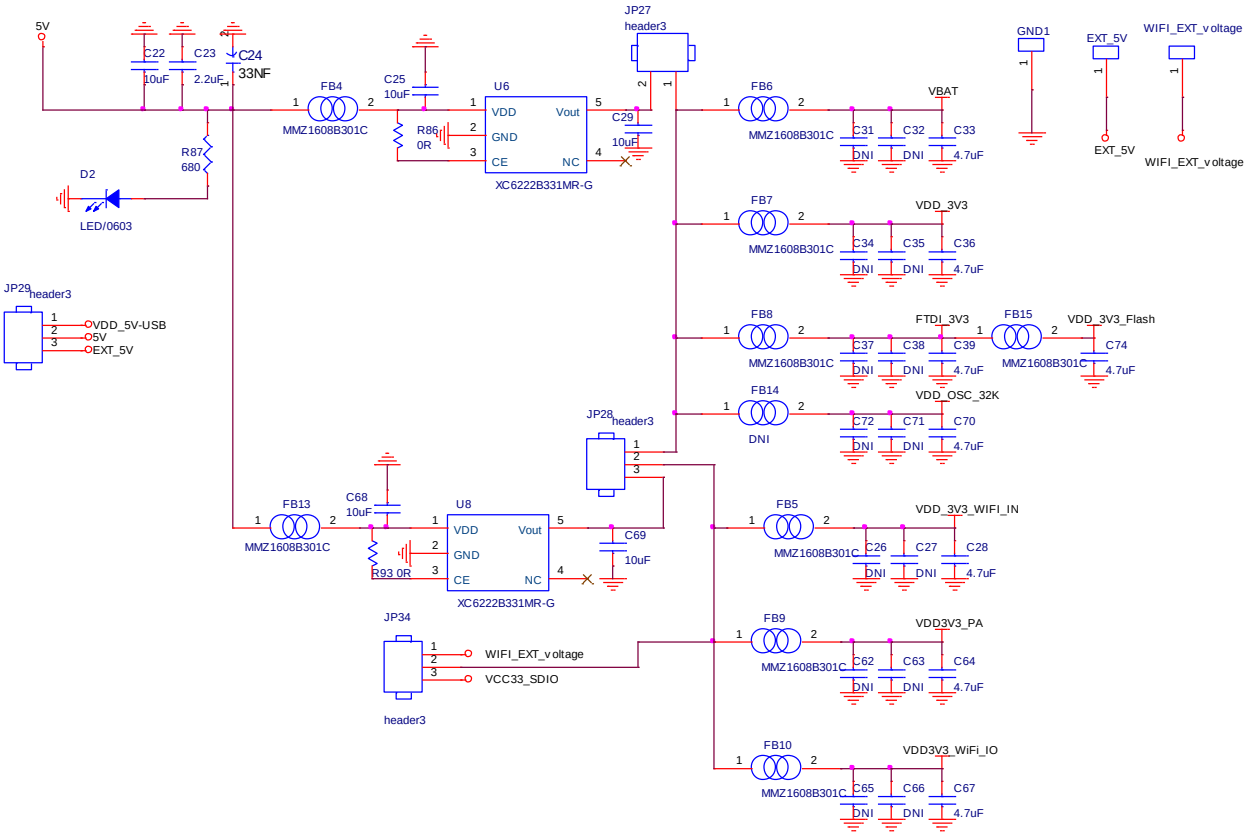
11 ISM4343-WBM-L151 Hardware Design Recommendations

11.1 Application Circuit – Single Antenna



Reference Matching circuit:
1. RF trace impedance control: 50ohm.
2. See Inventek for reference schematic for antenna
3. **Do not Connect Xtal pins 52 and 53**

11.2 ISM4343-WBM-L151 Application Circuit –Power Supply



12 ISM4343-WBM-L151 DC POWER CONDITIONING AND DISTRIBUTION

Appropriate DC voltages are conditioned using the external power IC. Detailed performance specifications for the combo module and external power ICs are available in their respective device specifications as below.

12.1 Power Conditioning

Symbol	Parameter	Min	Typ	Max	Unit
VBAT	MCU VBAT Voltage	2.0	3.3	3.6	V
VDD3V3_1	GPIO I/O Supply	2.4	3.3	3.6	V
VDD3V3_2	GPIO I/O Supply	2.4	3.3	3.6	V
VDD3V3_3	GPIO I/O Supply	2.4	3.3	3.6	V
VDD_3V3_WIFI	WiFi Voltage	3.0	3.3	3.6	V
VDD_3V3_WIFI_PA	WiFi PA Voltage	3.0	3.3	3.6	V
VDDIO_WIFI	MCU With WiFi	3.0	3.3	3.6	V

Each regulator output must be connected directly to its recommended output capacitor per the Power source. All the power supply pins should be decoupled.
Additional filtering and bypassing of the RF supply voltages

13 ISM4343-WBM-L151 PCB LAYOUT GUIDELINES

13.1 DC Power

Use wide traces for power supply lines. Know the maximum currents being carried on each power supply trace, and make the trace widths proportionate to the current (especially for long trace lengths). Where possible, fill large areas with copper to distribute the highest currents. These measures minimize IR drops, line inductance, and switching transients.
• Use several plated via holes to connect power supply traces between layers. The number of vias used should be proportional to the current being routed.
• Avoid loops in the supply distribution traces. Current-carrying loops are essentially antennas radiating electromagnetic fields that may corrupt transceiver performance or cause regulatory electromagnetic interference (EMI) test failures.
• High current traces should be kept as short as possible and devices on the same supply should be fed from a ‘star point’ rather than ‘daisy-chained’.
• Avoid loop in the VDD supply and clock supply traces, VDD supply traces and clock supply traces to be independent where possible.

13.2 Antenna port RF signal

General guidelines for routing RF signals of WLAN/BT antenna port. RF signals require controlled-impedance lines to minimize mismatch losses and efficiently transfer energy from source to load. The line impedance depends upon several variables — trace width and thickness, co-planar ground spacing, height of dielectric material between the trace and ground plane(s), and dielectric constant of the PCB material. Given the PCB material selected, the geometry of the micro-strip, strip-line, or co-planar grounded waveguide (CGW) elements must be designed properly to provide the desired 50-Ω impedance. Design of micro-strip, strip-line, and CGW elements is well documented and supported in many microwave software applications.

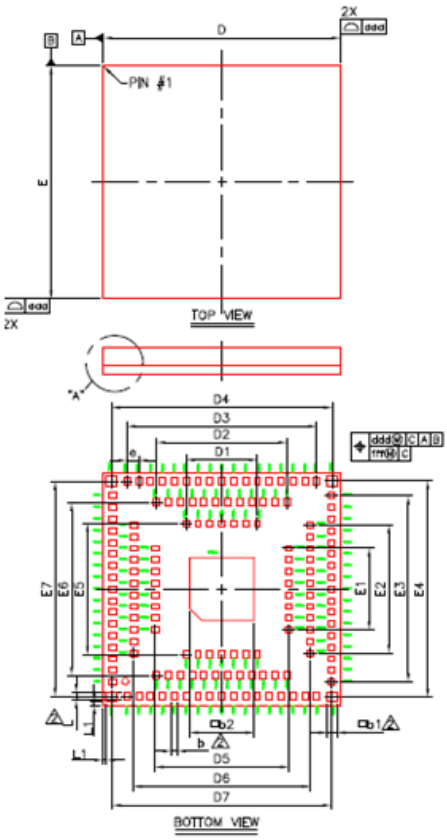
Additional RF-specific PCB design guidelines include:
• Keep the RF traces on the component sides (top or bottom layer) using micro-strip or CGW techniques where possible.
• Screen these traces to avoid electromagnetic interference.
• Use internal layers with strip-line techniques if necessary.
• Maintain continuous ground below micro-strip traces, beside CGW traces, and above and below strip-line traces.
• Keep traces short and direct, to minimize loss and undesired coupling.
• Front-end losses increase the system noise figure — keep traces before the first gain stage as short as possible and use low-loss capacitors and inductors.

• Clear internal layer (or layers) of metal. This improves micro-strip, CGW, and strip-line geometries, allowing wider traces.
• Fill the areas along both sides of traces with ground to improve isolation, but provide adequate clearance to minimize co-planar capacitance and leakage. These ground-filled areas are integral to CGW designs.
• Use several ground vias along both sides of the signal traces to connect RF ground-fill areas to the internal RF ground plane.
• Avoid crossing RF traces if possible.

14 ISM4343-WBM-L151 Mechanical Specification

The following paragraphs provide the requirements for the size, weight.
The size and thickness of the ISM4343-WBM-L151 Module is 10mm (W) x 10mm (L) x 1.2mm (H): (Tolerance: +/- 0.1mm)

Mechanical Dimension
Dimension: 10 x 10 x 1.2 mm3

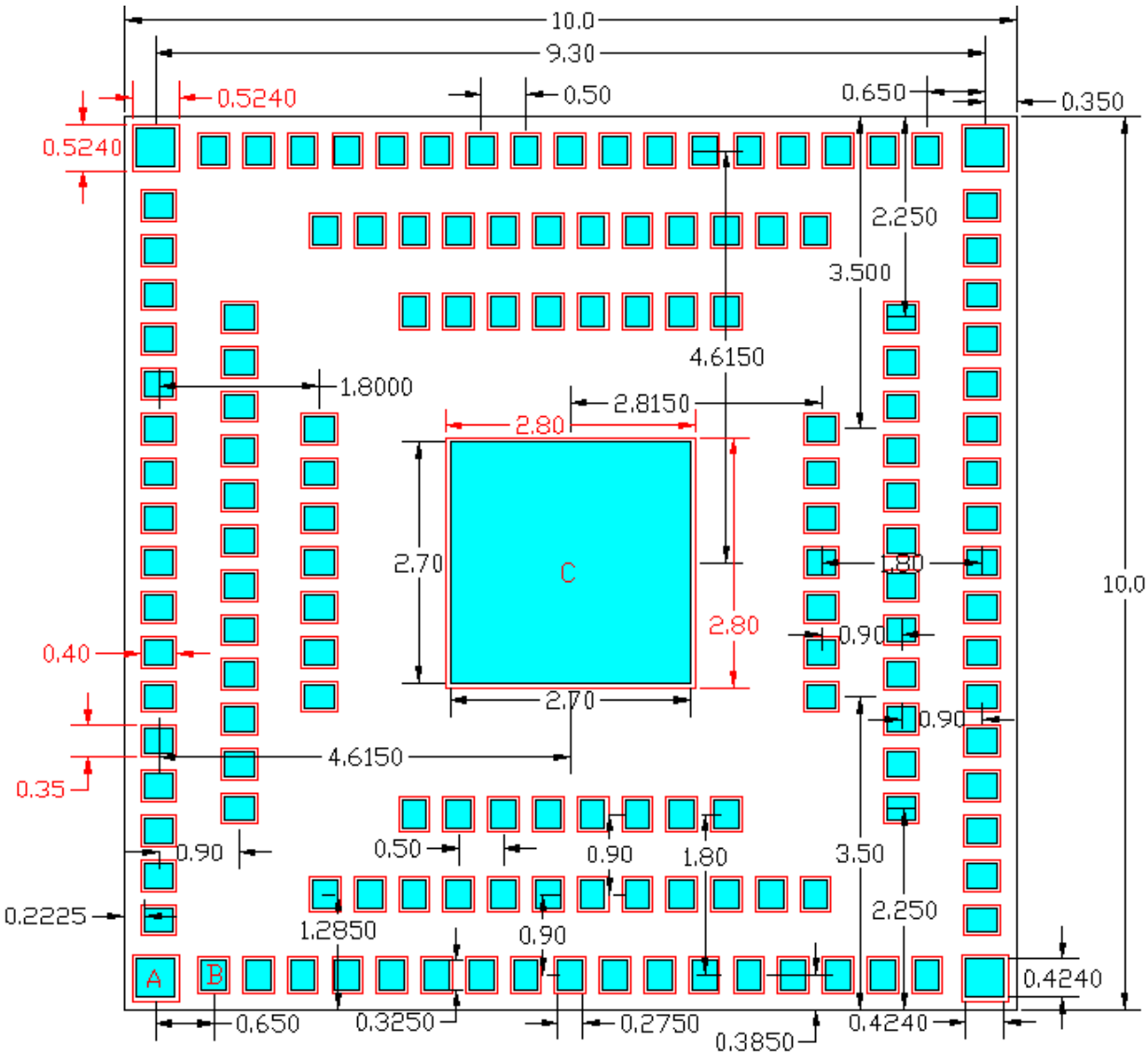


Symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.14	1.20	1.26	0.045	0.047	0.050
c	0.35	0.40	0.44	0.014	0.016	0.017
D	9.90	10.00	10.10	0.390	0.394	0.398
E	9.90	10.00	10.10	0.390	0.394	0.398
D1	---	3.00	---	---	0.118	---
E1	---	3.50	---	---	0.138	---
D2/E2	---	5.50	---	---	0.217	---
D3/E3	---	8.00	---	---	0.315	---
D4/E4	---	9.30	---	---	0.366	---
D5/E5	---	5.63	---	---	0.222	---
D6/E6	---	7.43	---	---	0.293	---
D7/E7	---	9.23	---	---	0.363	---
e	---	0.50	---	---	0.020	---
b	0.20	0.25	0.30	0.008	0.010	0.012
L	0.25	0.30	0.35	0.010	0.012	0.014
b1	0.37	0.42	0.47	0.015	0.017	0.019
L1	---	0.14	---	---	0.006	---
b2	2.65	2.70	2.75	0.104	0.106	0.108
aaa		0.15			0.006	
bbb		0.10			0.004	
ddd		0.15			0.006	
fff		0.05			0.002	

NOTE:
1. CONTROLLING DIMENSION : MILLIMETER
2. DIMENSION b,b1,b2,L IS MEASURED AT THE MAXIMUM OPENING DIAMETER, PARALLEL TO PRIMARY DATUM C.

14.1 ISM4343-WBM-L151 Recommended PCB Footprint (Bottom View)

Dimension Measurement
Unit: mm



Note:

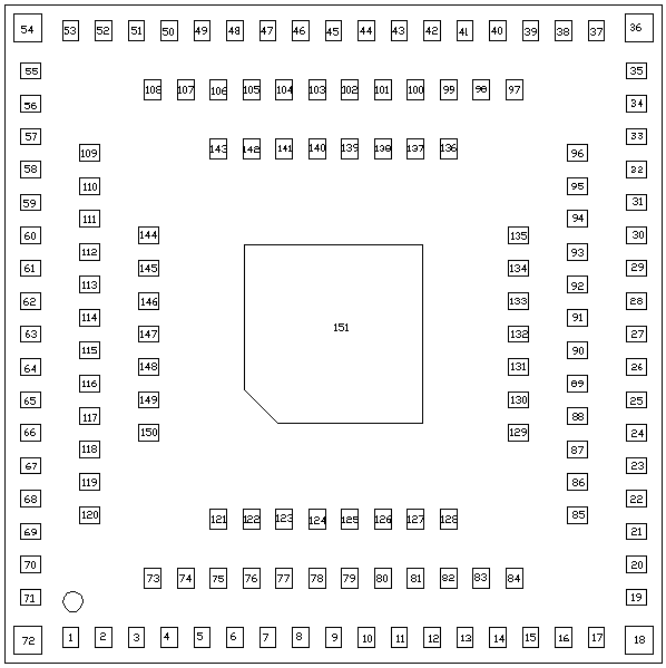
1. Please use Un-Solder Mask to design the Module Footprint.
2. There are three types pad size in the Module.

- Type A: Pad size: 0.424 x 0.424mm2 & Solder Mask size: 0.524 x 0.524 mm2
- Type B: Pad size: 0.275 x 0.325mm2 & Solder Mask size: 0.35 x 0.4 mm2
- Type C: Pad size: 2.7 x 2.7mm2 & Solder Mask size: 2.8 x 2.8 mm2

14.2 ISM4343-WBM-L151 Recommended PCB Footprint (Top View)

The X-Y Central Location Coordinates
Unit: mm (Drawn dimensions with chip 0,0 at bottom right corner)

Top View



(0,0)

PIN NUMBER	PAD Size (mm)	Solder Mask Size (mm)	PIN_X(mm)	PIN_Y(mm)
1	0.275 x 0.325	0.35 x 0.4	-9	0.385
2	0.275 x 0.325	0.35 x 0.4	-8.5	0.385
3	0.275 x 0.325	0.35 x 0.4	-8	0.385
4	0.275 x 0.325	0.35 x 0.4	-7.5	0.385
5	0.275 x 0.325	0.35 x 0.4	-7	0.385
6	0.275 x 0.325	0.35 x 0.4	-6.5	0.385
7	0.275 x 0.325	0.35 x 0.4	-6	0.385
8	0.275 x 0.325	0.35 x 0.4	-5.5	0.385
9	0.275 x 0.325	0.35 x 0.4	-5	0.385
10	0.275 x 0.325	0.35 x 0.4	-4.5	0.385
11	0.275 x 0.325	0.35 x 0.4	-4	0.385
12	0.275 x 0.325	0.35 x 0.4	-3.5	0.385
13	0.275 x 0.325	0.35 x 0.4	-3	0.385
14	0.275 x 0.325	0.35 x 0.4	-2.5	0.385

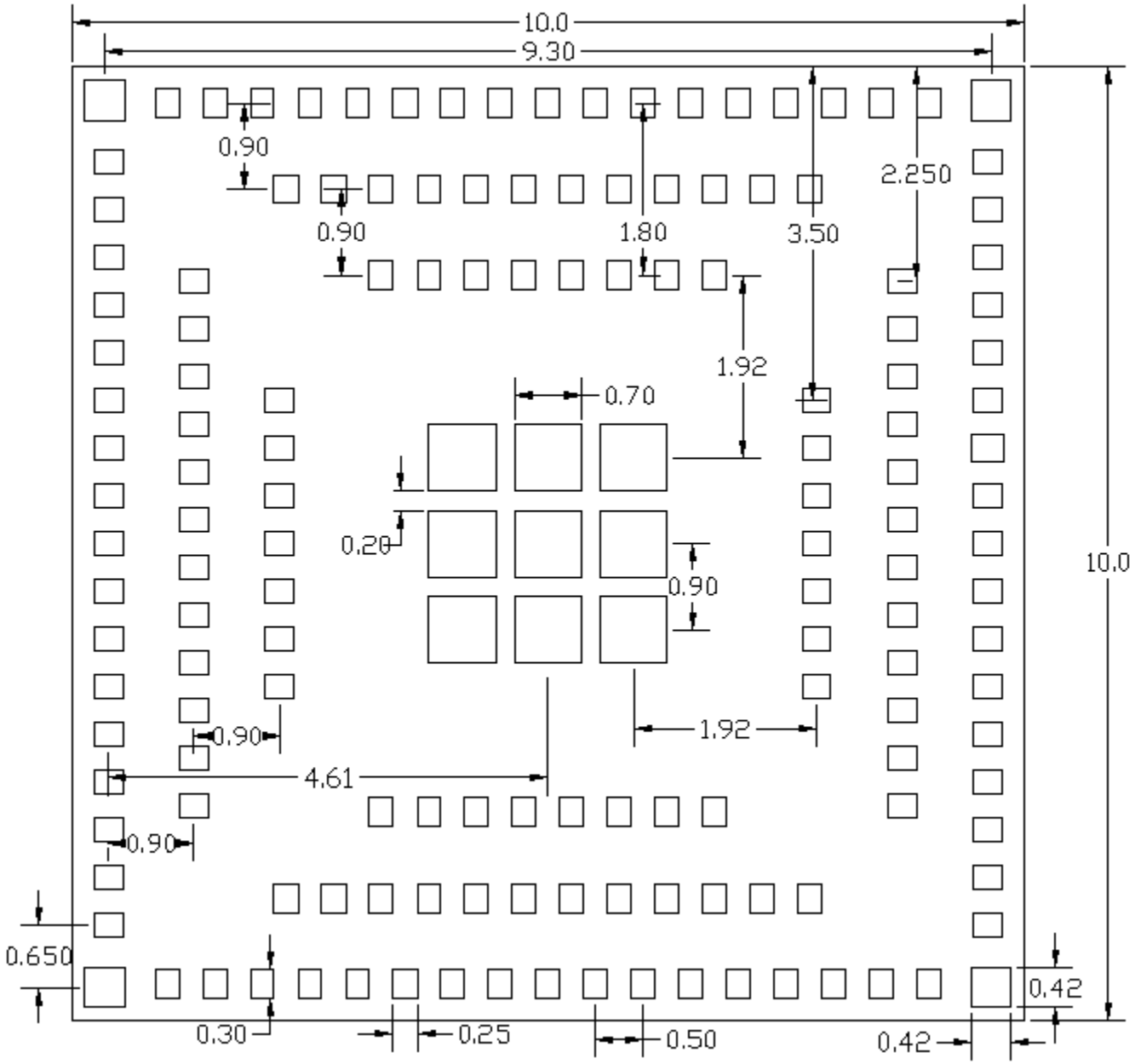
15	0.275 x 0.325	0.35 x 0.4	-2	0.385
16	0.275 x 0.325	0.35 x 0.4	-1.5	0.385
17	0.275 x 0.325	0.35 x 0.4	-1	0.385
18	0.424 x 0.424	0.524 x 0.524	-0.35	0.35
19	0.325 x 0.275	0.4 x 0.35	-0.385	1
20	0.325 x 0.275	0.4 x 0.35	-0.385	1.5
21	0.325 x 0.275	0.4 x 0.35	-0.385	2
22	0.325 x 0.275	0.4 x 0.35	-0.385	2.5
23	0.325 x 0.275	0.4 x 0.35	-0.385	3
24	0.325 x 0.275	0.4 x 0.35	-0.385	3.5
25	0.325 x 0.275	0.4 x 0.35	-0.385	4
26	0.325 x 0.275	0.4 x 0.35	-0.385	4.5
27	0.325 x 0.275	0.4 x 0.35	-0.385	5
28	0.325 x 0.275	0.4 x 0.35	-0.385	5.5
29	0.325 x 0.275	0.4 x 0.35	-0.385	6
30	0.325 x 0.275	0.4 x 0.35	-0.385	6.5
31	0.325 x 0.275	0.4 x 0.35	-0.385	7
32	0.325 x 0.275	0.4 x 0.35	-0.385	7.5
33	0.325 x 0.275	0.4 x 0.35	-0.385	8
34	0.325 x 0.275	0.4 x 0.35	-0.385	8.5
35	0.325 x 0.275	0.4 x 0.35	-0.385	9
36	0.424 x 0.424	0.524 x 0.524	-0.35	9.65
37	0.275 x 0.325	0.35 x 0.4	-1	9.615
38	0.275 x 0.325	0.35 x 0.4	-1.5	9.615
39	0.275 x 0.325	0.35 x 0.4	-2	9.615
40	0.275 x 0.325	0.35 x 0.4	-2.5	9.615
41	0.275 x 0.325	0.35 x 0.4	-3	9.615
42	0.275 x 0.325	0.35 x 0.4	-3.5	9.615
43	0.275 x 0.325	0.35 x 0.4	-4	9.615
44	0.275 x 0.325	0.35 x 0.4	-4.5	9.615
45	0.275 x 0.325	0.35 x 0.4	-5	9.615
46	0.275 x 0.325	0.35 x 0.4	-5.5	9.615
47	0.275 x 0.325	0.35 x 0.4	-6	9.615
48	0.275 x 0.325	0.35 x 0.4	-6.5	9.615
49	0.275 x 0.325	0.35 x 0.4	-7	9.615

50	0.275 x 0.325	0.35 x 0.4	-7.5	9.615
51	0.275 x 0.325	0.35 x 0.4	-8	9.615
52	0.275 x 0.325	0.35 x 0.4	-8.5	9.615
53	0.275 x 0.325	0.35 x 0.4	-9	9.615
54	0.424 x 0.424	0.524 x 0.524	-9.65	9.65
55	0.325 x 0.275	0.4 x 0.35	-9.615	9
56	0.325 x 0.275	0.4 x 0.35	-9.615	8.5
57	0.325 x 0.275	0.4 x 0.35	-9.615	8
58	0.325 x 0.275	0.4 x 0.35	-9.615	7.5
59	0.325 x 0.275	0.4 x 0.35	-9.615	7
60	0.325 x 0.275	0.4 x 0.35	-9.615	6.5
61	0.325 x 0.275	0.4 x 0.35	-9.615	6
62	0.325 x 0.275	0.4 x 0.35	-9.615	5.5
63	0.325 x 0.275	0.4 x 0.35	-9.615	5
64	0.325 x 0.275	0.4 x 0.35	-9.615	4.5
65	0.325 x 0.275	0.4 x 0.35	-9.615	4
66	0.325 x 0.275	0.4 x 0.35	-9.615	3.5
67	0.325 x 0.275	0.4 x 0.35	-9.615	3
68	0.325 x 0.275	0.4 x 0.35	-9.615	2.5
69	0.325 x 0.275	0.4 x 0.35	-9.615	2
70	0.325 x 0.275	0.4 x 0.35	-9.615	1.5
71	0.325 x 0.275	0.4 x 0.35	-9.615	1
72	0.424 x 0.424	0.524 x 0.524	-9.65	0.35
73	0.275 x 0.325	0.35 x 0.4	-7.75	1.285
74	0.275 x 0.325	0.35 x 0.4	-7.25	1.285
75	0.275 x 0.325	0.35 x 0.4	-6.75	1.285
76	0.275 x 0.325	0.35 x 0.4	-6.25	1.285
77	0.275 x 0.325	0.35 x 0.4	-5.75	1.285
78	0.275 x 0.325	0.35 x 0.4	-5.25	1.285
79	0.275 x 0.325	0.35 x 0.4	-4.75	1.285
80	0.275 x 0.325	0.35 x 0.4	-4.25	1.285
81	0.275 x 0.325	0.35 x 0.4	-3.75	1.285
82	0.275 x 0.325	0.35 x 0.4	-3.25	1.285
83	0.275 x 0.325	0.35 x 0.4	-2.75	1.285
84	0.275 x 0.325	0.35 x 0.4	-2.25	1.285
85	0.325 x 0.275	0.4 x 0.35	-1.285	2.25

86	0.325 x 0.275	0.4 x 0.35	-1.285	2.75
87	0.325 x 0.275	0.4 x 0.35	-1.285	3.25
88	0.325 x 0.275	0.4 x 0.35	-1.285	3.75
89	0.325 x 0.275	0.4 x 0.35	-1.285	4.25
90	0.325 x 0.275	0.4 x 0.35	-1.285	4.75
91	0.325 x 0.275	0.4 x 0.35	-1.285	5.25
92	0.325 x 0.275	0.4 x 0.35	-1.285	5.75
93	0.325 x 0.275	0.4 x 0.35	-1.285	6.25
94	0.325 x 0.275	0.4 x 0.35	-1.285	6.75
95	0.325 x 0.275	0.4 x 0.35	-1.285	7.25
96	0.325 x 0.275	0.4 x 0.35	-1.285	7.75
97	0.275 x 0.325	0.35 x 0.4	-2.25	8.715
98	0.275 x 0.325	0.35 x 0.4	-2.75	8.715
99	0.275 x 0.325	0.35 x 0.4	-3.25	8.715
100	0.275 x 0.325	0.35 x 0.4	-3.75	8.715
101	0.275 x 0.325	0.35 x 0.4	-4.25	8.715
102	0.275 x 0.325	0.35 x 0.4	-4.75	8.715
103	0.275 x 0.325	0.35 x 0.4	-5.25	8.715
104	0.275 x 0.325	0.35 x 0.4	-5.75	8.715
105	0.275 x 0.325	0.35 x 0.4	-6.25	8.715
106	0.275 x 0.325	0.35 x 0.4	-6.75	8.715
107	0.275 x 0.325	0.35 x 0.4	-7.25	8.715
108	0.275 x 0.325	0.35 x 0.4	-7.75	8.715
109	0.325 x 0.275	0.4 x 0.35	-8.715	7.75
110	0.325 x 0.275	0.4 x 0.35	-8.715	7.25
111	0.325 x 0.275	0.4 x 0.35	-8.715	6.75
112	0.325 x 0.275	0.4 x 0.35	-8.715	6.25
113	0.325 x 0.275	0.4 x 0.35	-8.715	5.75
114	0.325 x 0.275	0.4 x 0.35	-8.715	5.25
115	0.325 x 0.275	0.4 x 0.35	-8.715	4.75
116	0.325 x 0.275	0.4 x 0.35	-8.715	4.25
117	0.325 x 0.275	0.4 x 0.35	-8.715	3.75
118	0.325 x 0.275	0.4 x 0.35	-8.715	3.25
119	0.325 x 0.275	0.4 x 0.35	-8.715	2.75
120	0.325 x 0.275	0.4 x 0.35	-8.715	2.25
121	0.275 x 0.325	0.35 x 0.4	-6.75	2.185

122	0.275 x 0.325	0.35 x 0.4	-6.25	2.185
123	0.275 x 0.325	0.35 x 0.4	-5.75	2.185
124	0.275 x 0.325	0.35 x 0.4	-5.25	2.185
125	0.275 x 0.325	0.35 x 0.4	-4.75	2.185
126	0.275 x 0.325	0.35 x 0.4	-4.25	2.185
127	0.275 x 0.325	0.35 x 0.4	-3.75	2.185
128	0.275 x 0.325	0.35 x 0.4	-3.25	2.185
129	0.325 x 0.275	0.4 x 0.35	-2.185	3.5
130	0.325 x 0.275	0.4 x 0.35	-2.185	4
131	0.325 x 0.275	0.4 x 0.35	-2.185	4.5
132	0.325 x 0.275	0.4 x 0.35	-2.185	5
133	0.325 x 0.275	0.4 x 0.35	-2.185	5.5
134	0.325 x 0.275	0.4 x 0.35	-2.185	6
135	0.325 x 0.275	0.4 x 0.35	-2.185	6.5
136	0.275 x 0.325	0.35 x 0.4	-3.25	7.815
137	0.275 x 0.325	0.35 x 0.4	-3.75	7.815
138	0.275 x 0.325	0.35 x 0.4	-4.25	7.815
139	0.275 x 0.325	0.35 x 0.4	-4.75	7.815
140	0.275 x 0.325	0.35 x 0.4	-5.25	7.815
141	0.275 x 0.325	0.35 x 0.4	-5.75	7.815
142	0.275 x 0.325	0.35 x 0.4	-6.25	7.815
143	0.275 x 0.325	0.35 x 0.4	-6.75	7.815
144	0.325 x 0.275	0.4 x 0.35	-7.815	6.5
145	0.325 x 0.275	0.4 x 0.35	-7.815	6
146	0.325 x 0.275	0.4 x 0.35	-7.815	5.5
147	0.325 x 0.275	0.4 x 0.35	-7.815	5
148	0.325 x 0.275	0.4 x 0.35	-7.815	4.5
149	0.325 x 0.275	0.4 x 0.35	-7.815	4
150	0.325 x 0.275	0.4 x 0.35	-7.815	3.5
151	2.7 x 2.7	2.8 x 2.8	-5	5

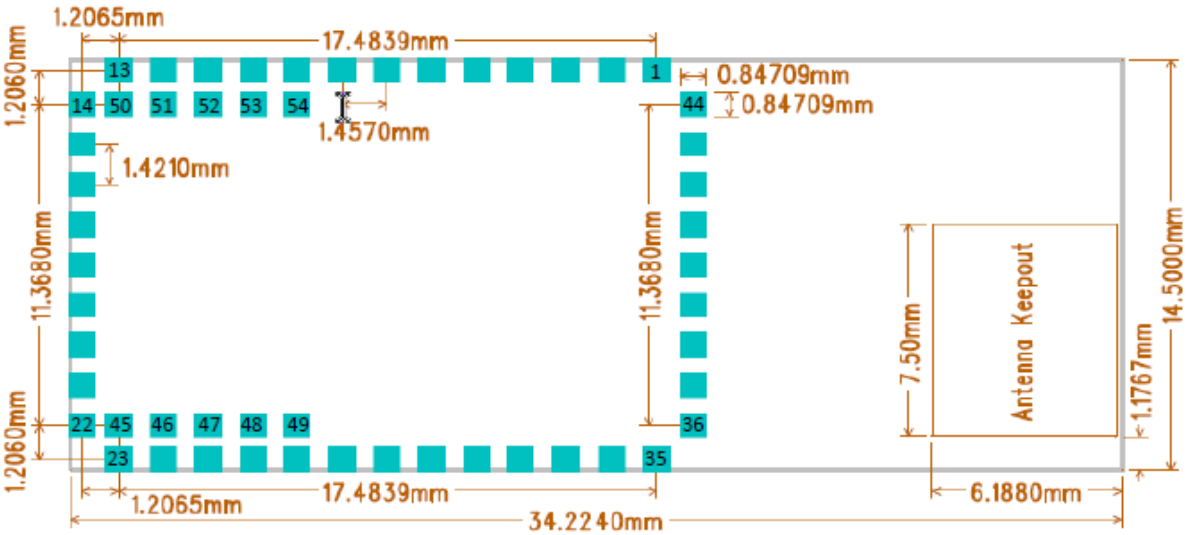
14.3 ISM4343-WBM-L151 Recommend Stencil: Unit: mm



15 ISM4343-WBM-L54 Mechanical Specifications

15.1 ISM4343-WBM-L54 Dimensions top view (mm)

The ISM4343-WBM-L54 module is footprint compatible with Inventek's standard 44 pin LGA footprint minus the extra 10 inside pads (Pins 45-54).



15.2 ISM4343-WBM-L54 Module's Dimensions Top View (mm)

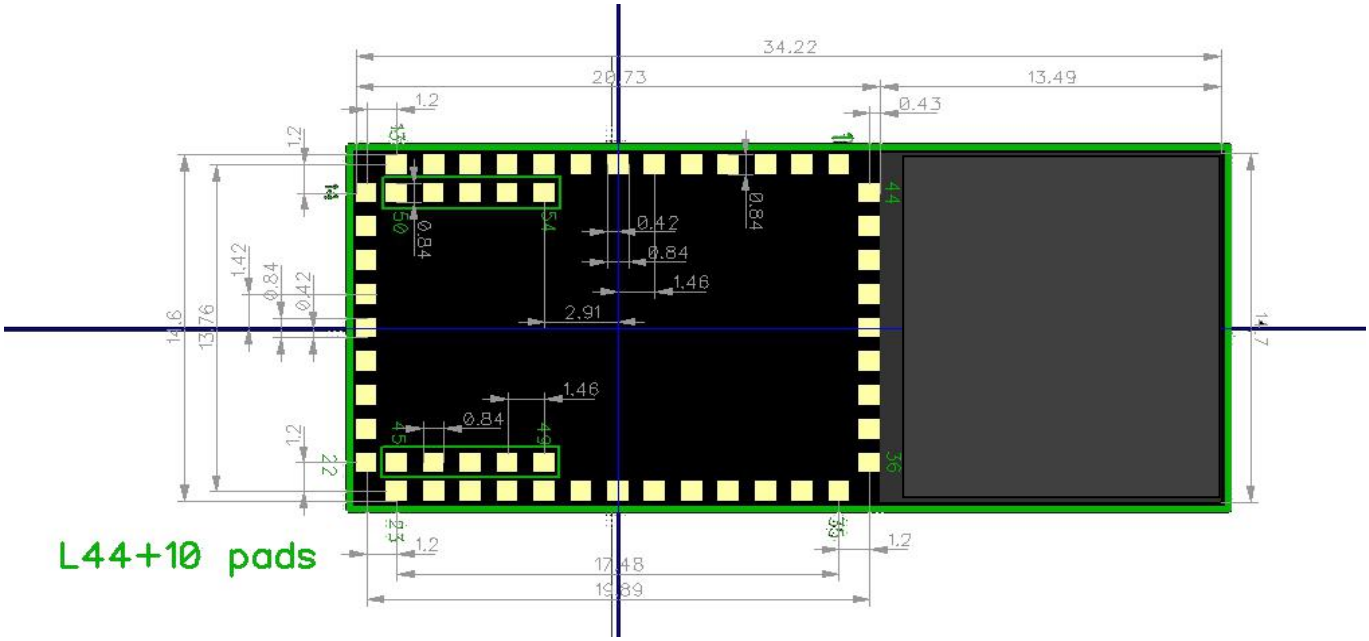
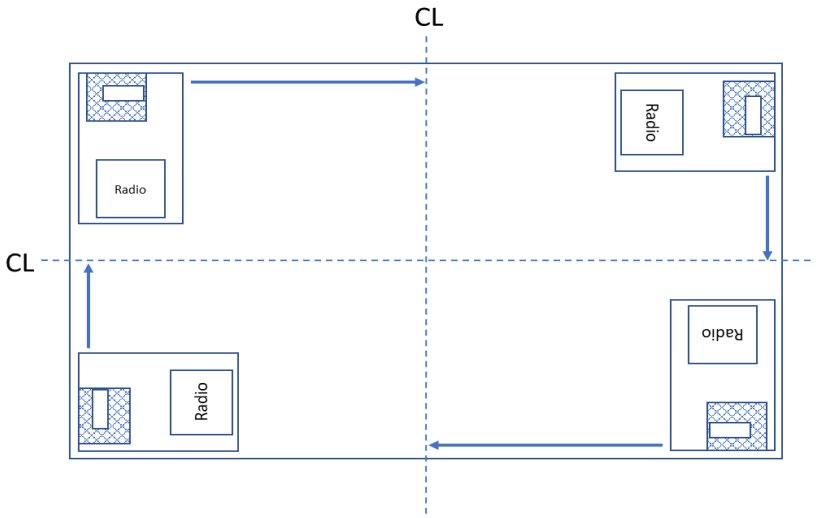


Figure 2 Module Dimensions - Top View

16 ISM4343-WBM-L54 Antenna Keep-Out Area

There should be no copper (ground or traces) in the antenna keep-out area shown in Section 15.1.
In all cases the keep-out area must be placed as close to the PCB board edge as possible.
The keep out area should be extended to the edge of the PCB board.
If the Module or SiP/Antenna cannot not be placed in a corner it can be moved along the edge of the PCB board toward the center line (but exceeding it).



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 FR4 or ground planes or traces are placed under the antenna (keep out area). Surrounding metal will affect the antenna performance. Inventek recommends a 9mm clearance on all three sides. The external antenna does not require “keep out” area.

17 On Board OTA Flash

The ISM4343-WBM-L151 and ISM4343-WBM-L54 includes 2 MB SPI flash for OTA.

Standard Product	
ISM4343-WBM-L151	2 MB Flash
ISM4343-WBM-L54	2 MB Flash

Internal Flash Part Number: Macronix MX25L1633.

17 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.

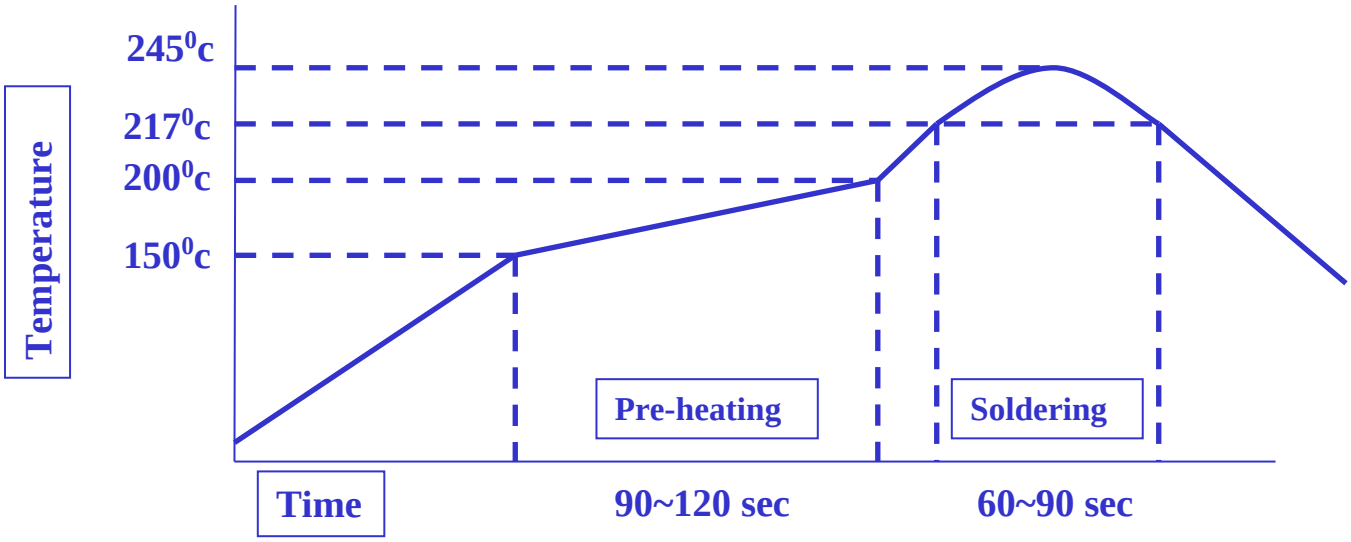
FCC/CE: THIS DEVICE IS CERTIFIED AND OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS.

(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND

(2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

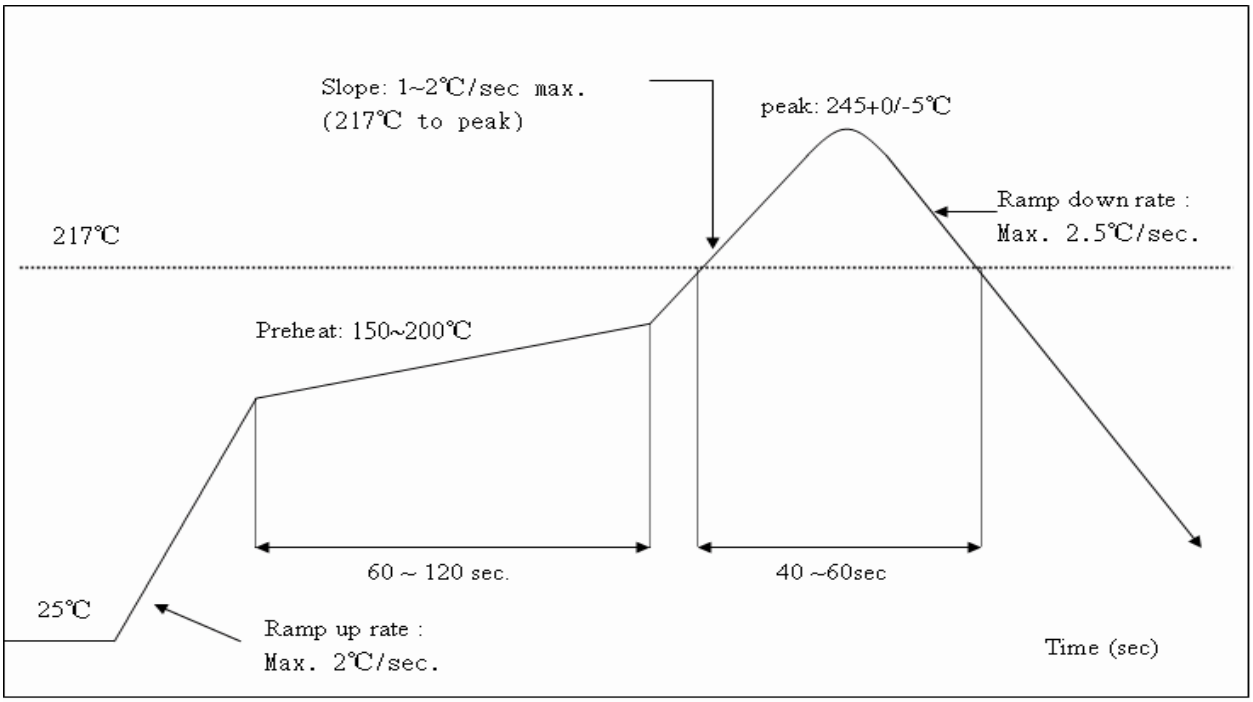
18 ISM4343-WBM-L151 Reflow Profile

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



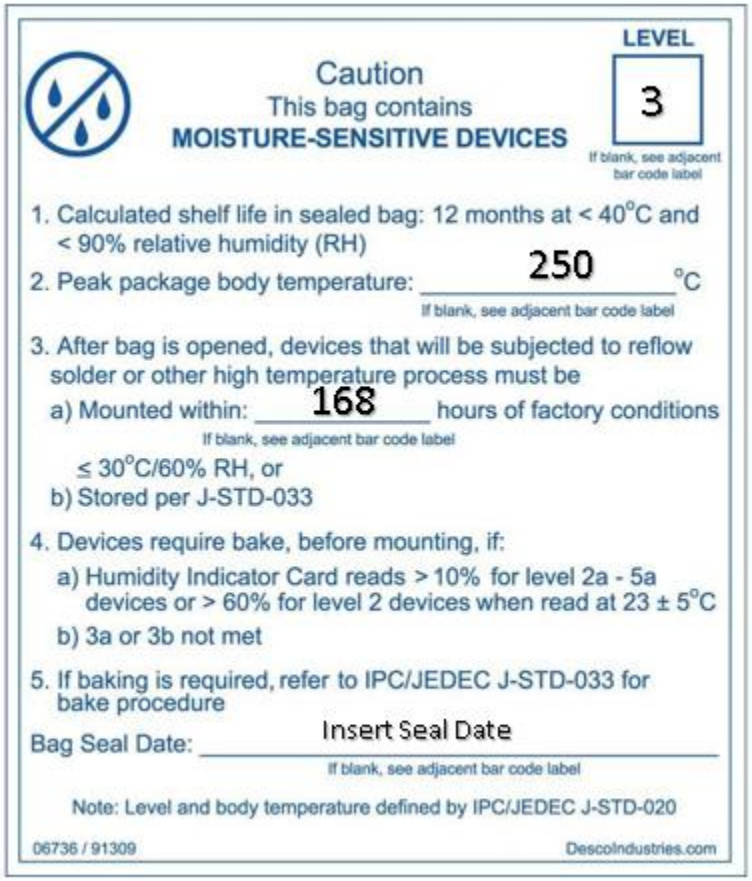
19 ISM4343-WBM-L54 Reflow Profile

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



20 Packaging Information

20.1 MSL Level / Storage Condition



20.2 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.

21 Revision Control

Document: ISM4343-WBM-L151	Wi-Fi + BT/BLE + Cortex M4 Module
External Release	DOC-DS-20074-3.0

Date	Author	Revision	Comment
1/15/2015	AS	1	Preliminary
12/17/2015	AS	1.1	Released
5/30/2017	AS	1.2	Diagram Updates
8/22/2017	KT	2	Part Number change / Formatting updates
4/12/2018	AS	2.1	Removed External Clock Option
1/14/2019	MT	3.0	Added EMC certifications & SPI Spec
9/8/2019	RB	3.1	Corrected SPI4 Pins for ISM4343-WBM-L54 Added L54 Pin Locations Added Keep-Out Area Recommendations
4/1/2021	RB	3.2	Added BT/BLE 5.1
5/17/2021	SP	3.3	Corrected Pinout for pins 45-54.

22 CONTACT INFORMATION

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

www.inventeksys.com

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