Wireless 2 Wireless

WLAN SiP (System in Package) W2CBW0015W

Preliminary Product Datasheet

Revision 1.23
May 17, 2013

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Revision History:

Revision	Revision Date	Originator	Changes
0.1	10/24/2011	WJL	First production data-sheet version
0.2	05/15/2012	DDS	Removed all references to Bluetooth, Updated reference schematics and Ordering Information
0.3	05/22/2012	DDS	Added shield dimensions and shield landing pattern
0.4	06/05/2012	DDS	Corrected shield landing pattern figure
0.5	06/06/2012	DDS	Added Tray and Tape & Reel Orientation figures
1.0	06/13/2012	DDS	Corrected text
1.1	07/26/2012	DDS	Updated dimensions for shield solder landing pads
1.2	10/10/2012	DDS	Updated Ref. Schematic for Evaluation Board
1.21	02/19/2013	DDS	Added certifications: RoHS, GREEN, REACH
1.23	05/17/2013	DDS	Removed SDIO SPI references

1 General Description

This specification provides a general guideline on the performance and integration of W2CBW0015W, a complete wireless subsystem featuring full 802.11 b/g/n WLAN. The W2CBW0015W device was designed to simplify the process of adding wireless access to systems without lengthy design cycles or complex RF design. A set of regulatory certifications will also be provided, simplifying the certification process for your end product and further reducing valuable time-to-market. Based on world-class silicon from Wi2Wi partner Marvell, the W2CBW0015W has been fully optimized for throughput and receive sensitivity via careful design practices. State-of-the art software development resources are available to create drivers for unique processors and operating systems if needed, or to optimize the wireless subsystem to fit your application.

Specified maximum and minimum limits presented herein are those guaranteed when the unit is integrated into Wi2Wi's W2CBW0015-Dev(1/2) Development System. These limits are to serve as representative performance characteristics of the W2CBW0015W when properly designed into a customer's product. Wi2Wi makes no warranty, implied or otherwise specified, with respect to customer's design and performance characteristics presented in this specification.

2 Features

- Extended Temperature Operation: -30°C to +85°C
- Compact design for easy integration: 9.5mm x 9.5mm x 1.4mm
- 81 Pad LGA surface mount package
- WLAN technology based on Marvell's 88W8787
- Single antenna design for WLAN
- Operates in 2.4 GHz ISM band
- RoHS, GREEN, REACH Compliant
- WLAN Specific Features
    - SDIO 1.1 Interfaces
    - 802.11s Mesh Networking
    - 802.11h Dynamic Frequency Selection
    - 802.11e Quality of Service
    - 50-Ohm antenna launch
    - Support for Linux and Android operating systems
    - 1, 2, 5.5 and 11 Mbps data rates for 802.11b (DSSS/CCK modulation)
    - 6, 9, 12, 18, 24, 36, 48 and 54 Mbps data rates for 802.11g (OFDM modulation)
    - 72 Mbps, 150 Mbps data rates for 802.11n (OFDM modulation)

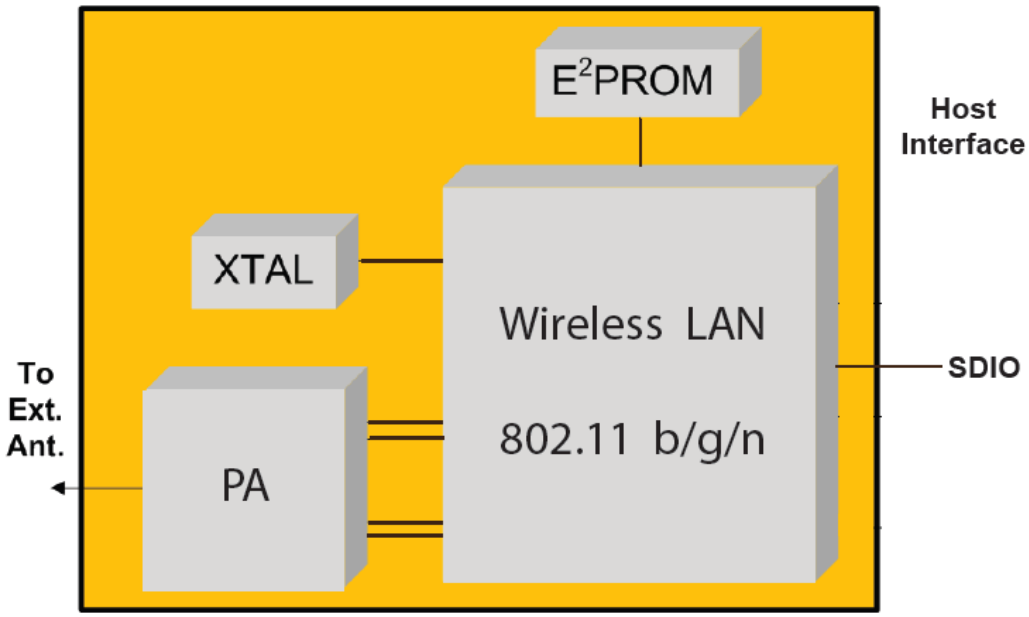
3 System Description

W2CBW0015W is a complete SiP solution that uses Marvell 88W8787 to implement 802.11 b/g/n. It includes all the components needed to operate the radio. It preserves the characteristics from the Marvell chipset while providing optimized system level functionality and performance.

3.1 Block Diagram

Figure 1 shows the block diagram of W2CBW0015W.

Figure 1: Block Diagram



3.2 Pad Description

Table 1: Pad Description

Pin	Pin Name	Type	Supply	Description
A1	RES_A1	NC	NC	Reserved Pin, No Connection Recommended
A2	RES_A2	NC	NC	Reserved Pin, No Connection Recommended
A3	RES_A3	NC	NC	Reserved Pin, No Connection Recommended
A4	RES_A4	NC	NC	Reserved Pin, No Connection Recommended
A5	GND_A5	Ground		Ground
A6	RES_A6	NC	NC	Reserved Pin, No Connection Recommended
A7	RES_A7	NC	NC	Reserved Pin, No Connection Recommended
A8	GND_A8	Ground		Ground
A9	RES_A9	NC	NC	Reserved Pin, No Connection Recommended
B1	3V_IN_B1	Power	HOST_PWR	Host Power (3.3V)
B2	3V_IN_B2	Power	HOST_PWR	Host Power (3.3V)
B3	3V_IN_B3	Power	HOST_PWR	Host Power (3.3V)
B4	RES_B4	NC	NC	Reserved Pin, No Connection Recommended
B5	RES_B5	NC	NC	Reserved Pin, No Connection Recommended
B6	GND_B6	Ground		Ground
B7	WF_LED	O	VIO	LED Indicator for Wi-Fi
B8	RES_B8	NC	NC	Reserved Pin, No Connection Recommended

B9	RES_B9	NC	NC	Reserved Pin, No Connection Recommended
C1	3V_IN_C1	Power	HOST_PWR	Host Power (3.3V)
C2	3V_IN_C2	Power	HOST_PWR	Host Power (3.3V)
C3	3V_IN_C3	Power	HOST_PWR	Host Power (3.3V)
C4	3V_IN_C4	Power	HOST_PWR	Host Power (3.3V)
C5	GND_C5	Ground		Ground
C6	PWDET_2G	NC	NC	Reserved Pin, No Connection Recommended
C7	RES_C7	NC	NC	Reserved Pin, No Connection Recommended
C8	CLK_REQ	NC	NC	Reserved Pin, No Connection Recommended
C9	RES_C9	NC	NC	Reserved Pin, No Connection Recommended
D1	3V_IN_D1	Power	HOST_PWR	Host Power (3.3V)
D2	3V_IN_D2	Power	HOST_PWR	Host Power (3.3V)
D3	GND_D3	Ground		Ground
D4	RES_D4	NC	NC	Reserved Pin, No Connection Recommended
D5	GND_D5	Ground		Ground
D6	GND_D6	Ground		Ground
D7	W1_CNTL	O	VIO	Power management device programming interface control
D8	VIO_D8	Power	VIO	3.3V or 1.8V Power Supply
D9	RES_D9	NC	NC	Reserved Pin, No Connection Recommended
E1	3V_IN_E1	Power	HOST_PWR	Host Power (3.3V)
E2	LNA_EN_2	O	VDD30	RF Control 6: Power Down Output Low
E3	SD_D3	I/O	VIO	SDIO 4-bit mode: Data line bit [3] SDIO 1-bit mode: Not used
E4	RES_E4	NC	NC	Reserved Pin, No Connection Recommended
E5	RES_E5	NC	NC	Reserved Pin, No Connection Recommended
E6	RES_E6	NC	NC	Reserved Pin, No Connection Recommended
E7	GND_E7	Ground		Ground
E8	VIO_E8	Power	VIO	3.3V or 1.8V Power Supply
E9	RES_E9	NC	NC	Reserved Pin, No Connection Recommended
F1	SW_TX2	NC	NC	Reserved Pin, No Connection Recommended
F2	SW_RX2	NC	NC	Reserved Pin, No Connection Recommended
F3	RESETn	I	VIO	Reset (active low); Minimum pulse width of 100ns needed to reset the device
F4	RES_F4	NC	NC	Reserved Pin, No Connection Recommended
F5	GND_F5	Ground		Ground
F6	SCLK	I/O	VIO	Serial interface clock output for EEPROM
F7	RES_F7	NC	NC	Reserved Pin, No Connection Recommended
F8	SD_D0	I/O	VIO	SDIO 4-bit mode: Data line bit [0] SDIO 1-bit mode: Data line
F9	SD_D2	I/O	VIO	SDIO 4-bit mode: Data line bit [2] or Read Wait (optional) SDIO 1-bit mode: Not used
G1	RES_G1	NC	NC	Reserved Pin, No Connection Recommended
G2	ECSn	O	VDD30	EEPROM chip select output, active low for SPI EEPROM, active high for Micro wire EEPROM

G3	RES_G3	NC	NC	Reserved Pin, No Connection Recommended
G4	RES_G4	NC	NC	Reserved Pin, No Connection Recommended
G5	RES_G5	NC	NC	Reserved Pin, No Connection Recommended
G6	GND_G6	Ground		Ground
G7	RES_G7	NC	NC	Reserved Pin, No Connection Recommended
G8	SD_CLK	I/O	VIO	SDIO 4-bit mode: Clock input SDIO 1-bit mode: Clock input
G9	SD_CMD	I/O	VIO	SDIO 4-bit mode: Command/response(input/output) SDIO 1-bit mode: Command line (input/output)
H1	GND_H1	Ground		Ground
H2	GND_H2	Ground		Ground
H3	GND_H3	Ground		Ground
H4	3V_IN_H4	Power	HOST_PWR	Host Power (3.3V)
H5	3V_IN_H5	Power	HOST_PWR	Host Power (3.3V)
H6	RES_H6	NC	NC	Reserved Pin, No Connection Recommended
H7	SDA	I/O	VIO	Serial interface data output for EEPROM
H8	VIO_H8	Power	VIO	3.3V or 1.8V Power Supply
H9	SLEEP_CLK	I	VIO	Sleep clock; Supply 32.768 kHz clock to this pin to avoid hang-up
J1	GND_J1	Ground		Ground
J2	2.4G_ANT	RF	VIO	2.4 GHz WLAN/BT Antenna
J3	GND_J3	Ground		Ground
J4	3V_IN_J4	Power	HOST_PWR	Host Power (3.3V)
J5	3V_IN_J5	Power	HOST_PWR	Host Power (3.3V)
J6	RES_J6	NC	NC	Reserved Pin, No Connection Recommended
J7	PDn	I	VIO	Full power down (active low) 0 for full power down 1 for normal mode
J8	GND_J8	Ground		Ground
J9	SD_D1	I/O	VIO	SDIO 4-bit mode: Data line bit [1] SDIO 1-bit mode: Interrupt

4 Electrical Characteristics

Table 2: Electrical Characteristics

Parameter	Test Condition	MIN	TYP	MAX	UNITS
Absolute Maximum Ratings					
Storage Temperature		-40		85	°C
Supply Voltage		-	3.0	4.2	V
Recommended Operating Conditions					
Operating Temperature		-30		85	°C
Supply Voltage		2.7	3.0	3.3	V

802.11b Current Consumption					
Initialization Current		115	135	150	mA
Continuous Transmit Mode	@11Mbps	230	245	260	mA
Continuous Receive Mode	@11Mbps	120	130	145	mA
IEEE 802.11 Power Save Mode		4	5	6	mA
Deep Sleep		1	1.3	1.5	mA
802.11b RF System Specifications					
Transmit Power Output		14	15	16	dBm
Receive Sensitivity	1 Mbps, 8% PER	-	-96	-91	dBm
	2 Mbps, 8% PER	-	-94	-89	dBm
	5.5 Mbps, 8% PER	-	-91	-86	dBm
	11 Mbps, 8% PER	-	-86	-82	dBm
Maximum Receive Level	PER<8%	-	IEEE Compliant	-	dBm
Transmit Frequency Offset	Low, Middle, High Channels	-	±15	-	
Spectral Mask	Max. TX Power	-	-40@fc±11MHz	-	dBc
		-	-60@fc±22MHz	-	
Error Vector Magnitude	Max. TX Power @ 11Mbps	-	-33	-25	dB
Carrier Suppression	Max. TX Power	-28	-25	-21	dBc
Adjacent Channel Rejection	Desired channel is 3dB above sensitivity, 11 Mbps, PER<8%	-	48	-	dBc
802.11g Current Consumption					
Initialization Current		115	135	150	mA
Continuous Transmit Mode	@54Mbps	225	240	255	mA
Continuous Receive Mode	@54Mbps	120	130	145	mA
IEEE 802.11 Power Save Mode		4	5	6	mA
Deep Sleep		1	1.3	1.5	mA
802.11g RF System Specifications					
Transmit Power Output		11	12	13	dBm
Receive Sensitivity	6 Mbps, 10% PER	-	-90	-86	dBm
	9 Mbps, 10% PER	-	-88	-84	dBm
	12 Mbps, 10% PER	-	-86	-82	dBm
	18 Mbps, 10% PER	-	-84	-79	dBm
	24 Mbps, 10% PER	-	-81	-77	dBm
	36 Mbps, 10% PER	-	-78	-74	dBm
	48 Mbps, 10% PER	-	-75	-71	dBm
	54 Mbps, 10% PER	-	-72	-68	dBm
Maximum Receive Level	PER<10%	-	IEEE Compliant	-	dBm
Transmit Frequency Offset	Low, Middle, High Channels	-	±15	-	PPM
Spectral Mask	Max. TX Power	-	-30@fc±11MHz	-	dBc

		-	-40@fc±20MHz	-	
		-	-50@fc±30MHz	-	
Error Vector Magnitude	Max. TX Power @ 54Mbps	-	-30	-25	dB
Carrier Suppression	Max. TX Power	-28	-25	-19	dBc
Adjacent Channel Rejection	Desired channel is 3dB above sensitivity, 54Mbps, PER<10%	-	15	-	dBc
802.11n Current Consumption					
Initialization Current		115	135	150	mA
Continuous Transmit Mode	15 dBm, 20 MHz, 72.2 Mbps, MCS7	220	235	250	mA
Continuous Transmit Mode	15 dBm, 40 MHz, 150 Mbps, MCS7	230	245	260	mA
Continuous Receive Mode	15 dBm, 20 MHz, 72.2 Mbps, MCS7	200	215	230	mA
Continuous Receive Mode	15 dBm, 40 MHz, 150 Mbps, MCS7	200	215	230	mA
IEEE 802.11 Power Save Mode		4	5	6	mA
Deep Sleep		1	1.3	1.5	mA
802.11n RF System Specifications					
Transmit Power Output		14	15	16	dBm
Receive Sensitivity	20 MHz, 72.2 Mbps, MCS7, 10% PER	-	-68	-64	dBm
	40 MHz, 150 Mbps, MCS7, 10% PER	-	-64	-60	dBm
Maximum Receive Level	PER<10%	-	IEEE Compliant	-	dBm
Transmit Frequency Offset	Low, Middle, High Channels	-	±15	-	PPM
Spectral Mask	Max. TX Power	-	-30@fc±11MHz	-20	dBc
Error Vector Magnitude	Max. TX Power @ 50Mbps	-30	-28	-26	dB
Carrier Suppression	Max. TX Power	-29	-25	-20	dBc
Adjacent Channel Rejection	Desired channel is 3 dB above sensitivity, 72.2 Mbps, PER<10%	-	15	-	dBc
	Desired channel is 3 dB above sensitivity, 150 Mbps, PER<10%	-	15	-	dBc

** Current measured at the 3.3V input to the test board, which has a voltage regulator for 3.3V to 1.8V conversion.

5 WLAN External Host Interfaces

For connection to a host processor, W2CBW0015W supports the Secure Digital Input Output (SDIO) interface.

The host processor must support SDIO (SD is not sufficient). If the selected processor does not have an integrated SDIO controller, then an external SDIO bridge can be used (e.g. SDIO-PCI Bridge for interfacing with a processor that only supports a PCI interface).

Please contact your sales representative if your processor does not support SDIO interface.

5.1 SDIO Interface

W2CBW0015W supports SDIO device interface that conforms to the industry standard SDIO Full-Speed card specification and allows a host controller using the SDIO bus protocol to access the WLAN device. The SDIO interface contains interface circuitry between an external SDIO bus and the internal shared bus.

W2CBW0015W acts as a device on the SDIO bus. The SDIO device interface main features include:

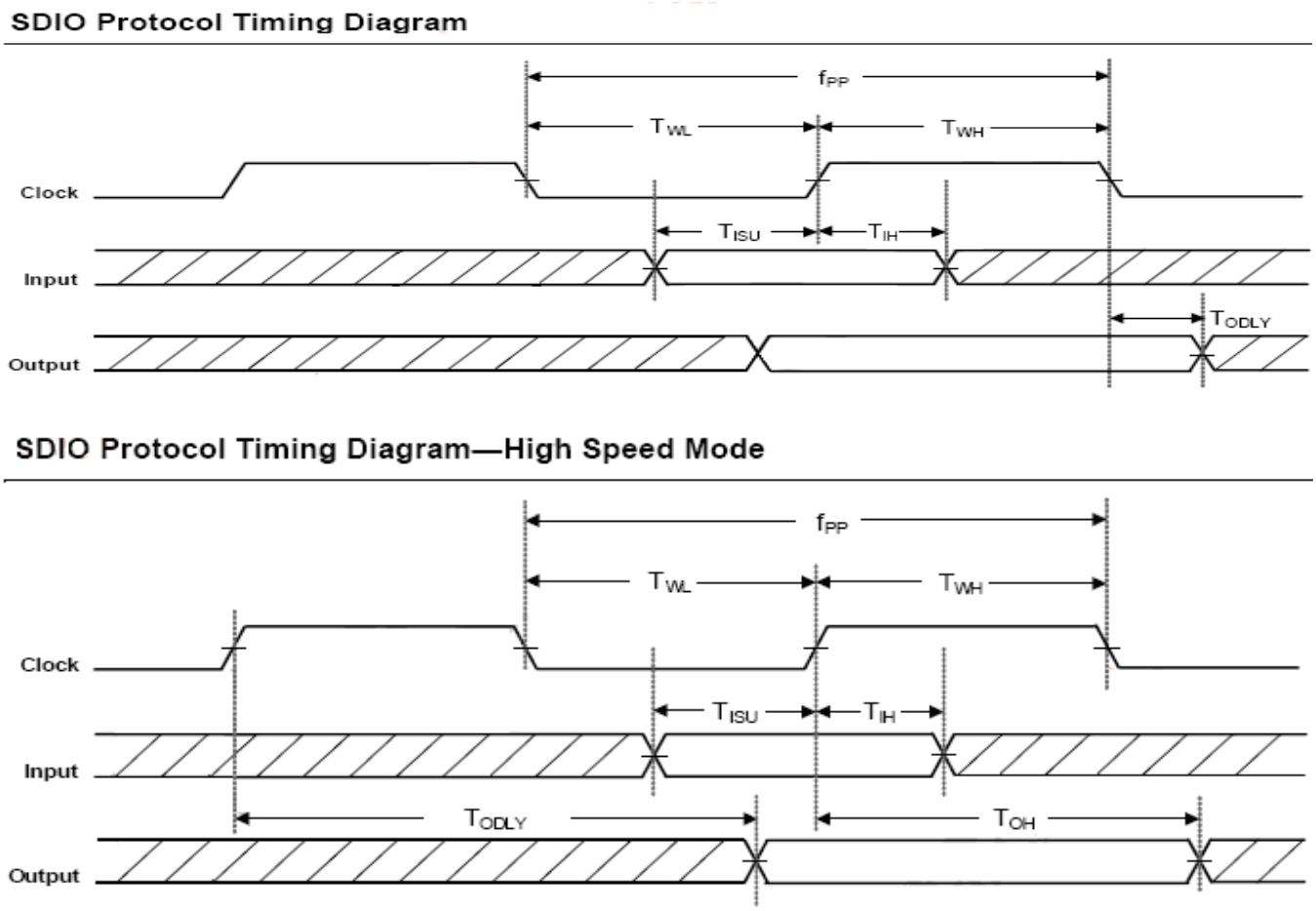
- Support for 1-bit SDIO, and 4-bit SDIO transfer modes at the full clock range of 0 to 50 MHz
- Special interrupt register for information exchange
- Allows card to interrupt host

Table 3: SDIO Pin Map

W2CBW0019 Pin Name	Signal Name	Type	Description
SD_D3	DAT 3	I/O	SDIO 4-bit mode: Data line bit [3] SDIO 1-bit mode: Not used
SD_D2	DAT 2	I/O	SDIO 4-bit mode: Data line bit [2] or Read Wait (optional) SDIO 1-bit mode: Read Wait (optional)
SD_D1	DAT 1	I/O	SDIO 4-bit mode: Data line bit [1] SDIO 1-bit mode: Interrupt
SD_D0	DAT 0	I/O	SDIO 4-bit mode: Data line bit [0] SDIO 1-bit mode: Data line
SD_CMD	CMD	I/O	SDIO 4-bit mode: Command/Response SDIO 1-bit mode: Command Line
SD_CLK	CLK	I/O	SDIO 4-bit mode: Clock SDIO 1-bit mode: Clock

5.2 SDIO Protocol Timing Diagrams

Figure 2: SDIO Protocol Timing



***Note**: The SDIO-SPI CS Signal timing is identical to all other SDIO inputs*

Table 4: SDIO Timing Data

Symbol	Parameter	Condition	Min	Typ	Max	Units
f_{pp}	Clock Frequency	Normal	0	--	25	MHz
		High speed	0	--	50	MHz
T_{WL}	Clock Low Time	Normal	10	--	--	Ns
		High speed	7	--	--	Ns
T_{WH}	Clock High Time	Normal	10	--	--	Ns
		High speed	7	--	--	Ns
T_{ISU}	Input Setup Time	Normal	5	--	--	Ns
		High speed	6	--	--	

T_{IH}	Input Hold Time	Normal	5	--	--	Ns
		High speed	2	--	--	
T_{ODLY}	Output Delay Time	--	0	--	14	Ns
T_{OH}	Output Hold Time	High speed	2.5	--	--	Ns

***Note**: Over full range of values specified in the Recommended Operating Conditions unless otherwise specified*

6 Antenna and Clock

W2CBW0015W has a single antenna interface, for WLAN. This interface is 50 Ohm impedance. W2CBW0015W has an internal crystal oscillator with 38.4 MHz frequency and requires an external sleep clock; this is used in low power modes.

6.1 Wireless LAN

Wi2Wi provides the end user driver needed for operating WLAN using W2CBW0015W. This driver is specific to the operating system, processor and host bus – it cannot be used for any other processors, operating systems or host buses. Since the operating system and platform matrix is quite large, it is not possible to have all the combinations off the shelf. Please contact your sales representative for driver availability for your platform.

The following is a brief description of the driver features along with the processors, operating systems and host buses.

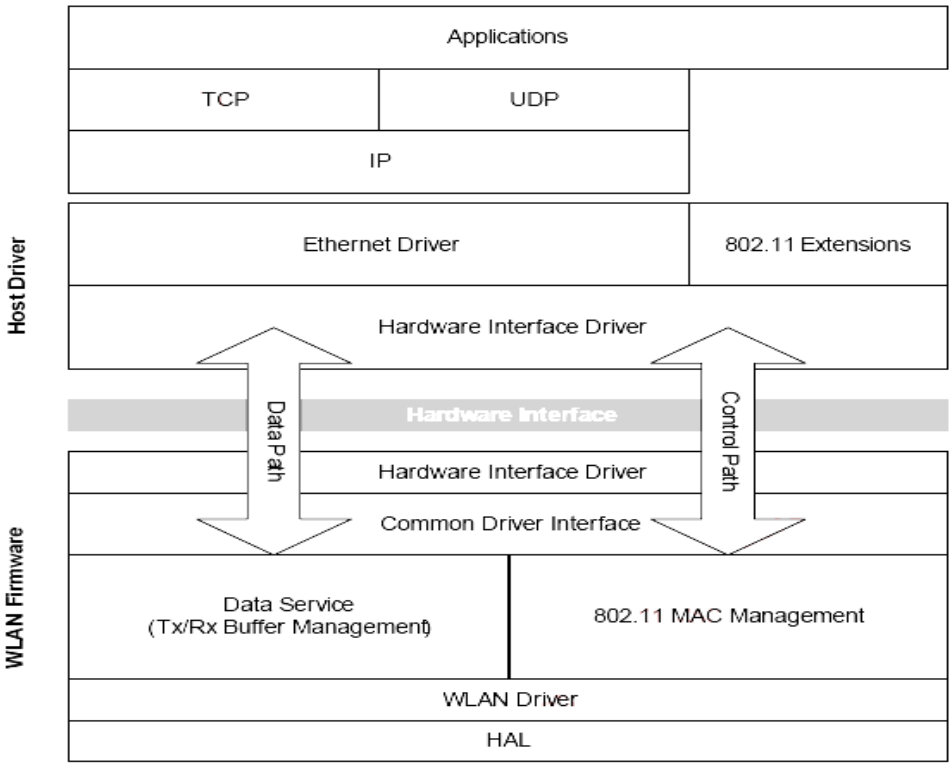
- Key Features
  - Mesh networking support with special firmware
  - IEEE power save mode
  - Deep sleep mode
  - Infrastructure and Ad-hoc mode
  - Rate adaptation
  - WEP encryption (64 bit/128 bit)
  - WPA/WPA2 TKIP security
  - Bluetooth coexistence
- Operating System Support
  - Linux
  - Android
- Platform Support
  - Intel x86
  - Marvell PXA270, PXA300, PXA310, PXA320, Kirkwood
  - TI OMAP 3530
  - i.MX51
- Host Buses
  - SDIO

In addition to the end user driver, Wi2Wi also provides engineering tools used for testing and certification.

7 WLAN Software Architecture

A simplified view of the overall WLAN software architecture is illustrated in the figure below. It is partitioned between the host processor and the WLAN firmware that resides on the Wi2Wi SiP.

Figure 3: Software Architecture



7.1 Host Processor

The TCP/IP stack, Ethernet Driver and the 802.11 extensions reside on the host processor. The Hardware Interface SDIO Driver is partitioned between the host and the firmware on the Wi-Fi.

The WLAN firmware for the Wi-Fi is downloaded through the selected host SDIO interface by the Hardware Interface Driver at power up.

Once the firmware is downloaded, the Data Path and the Control Path between the host and Wi-Fi are established, and information can flow between the two devices.

8 Reference Schematics

Figure 4: Box Diagram

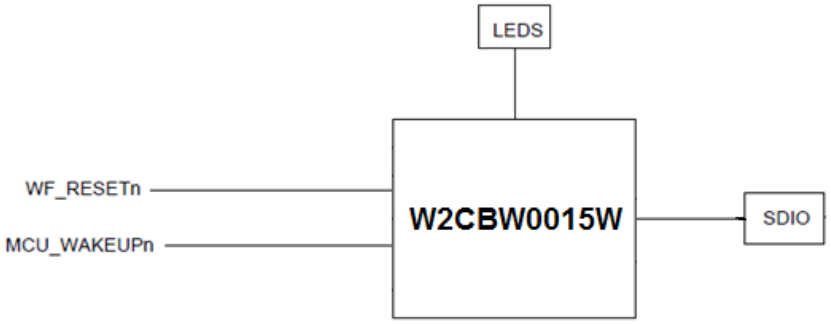


Figure 5: Top View of Pads

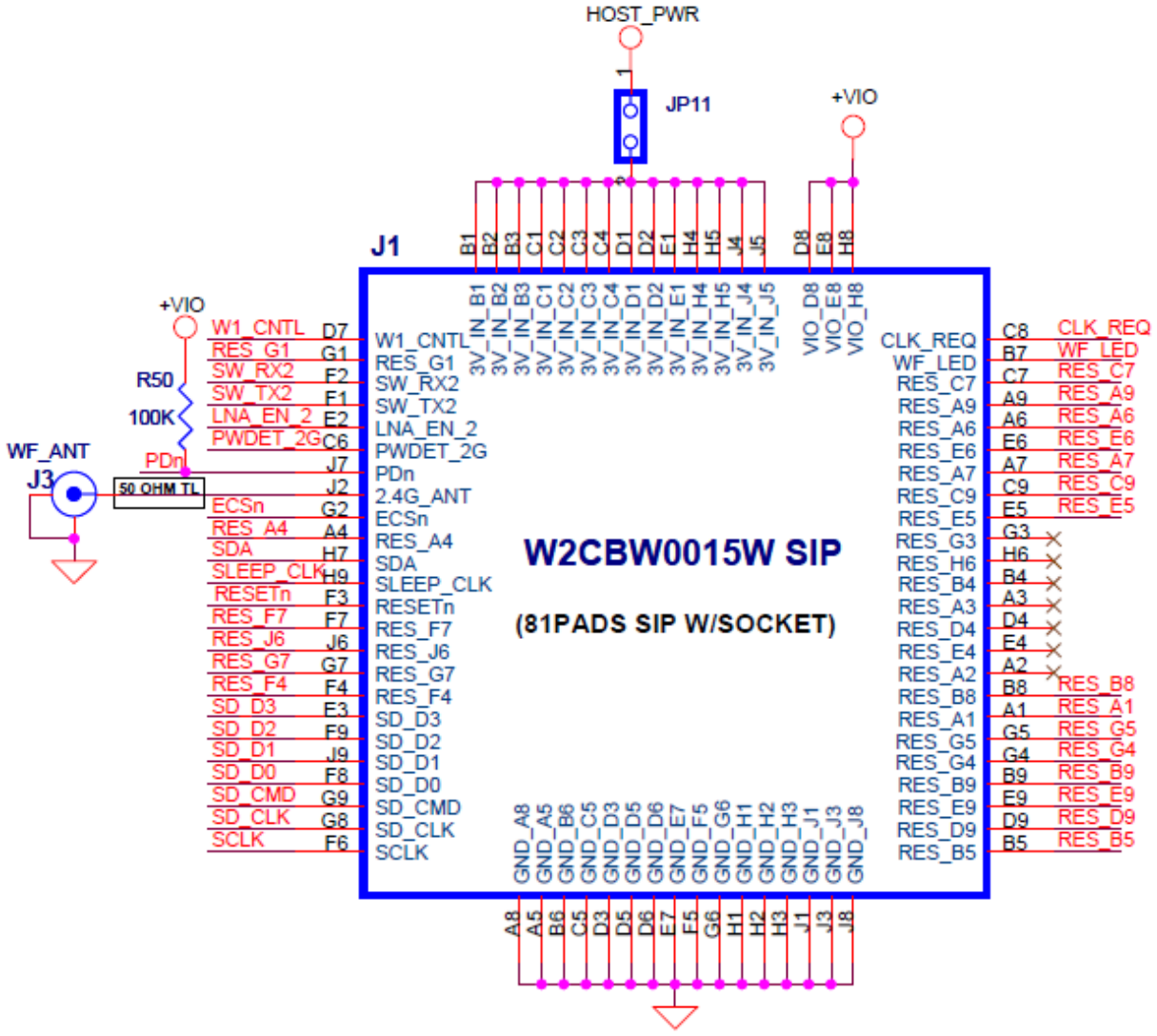
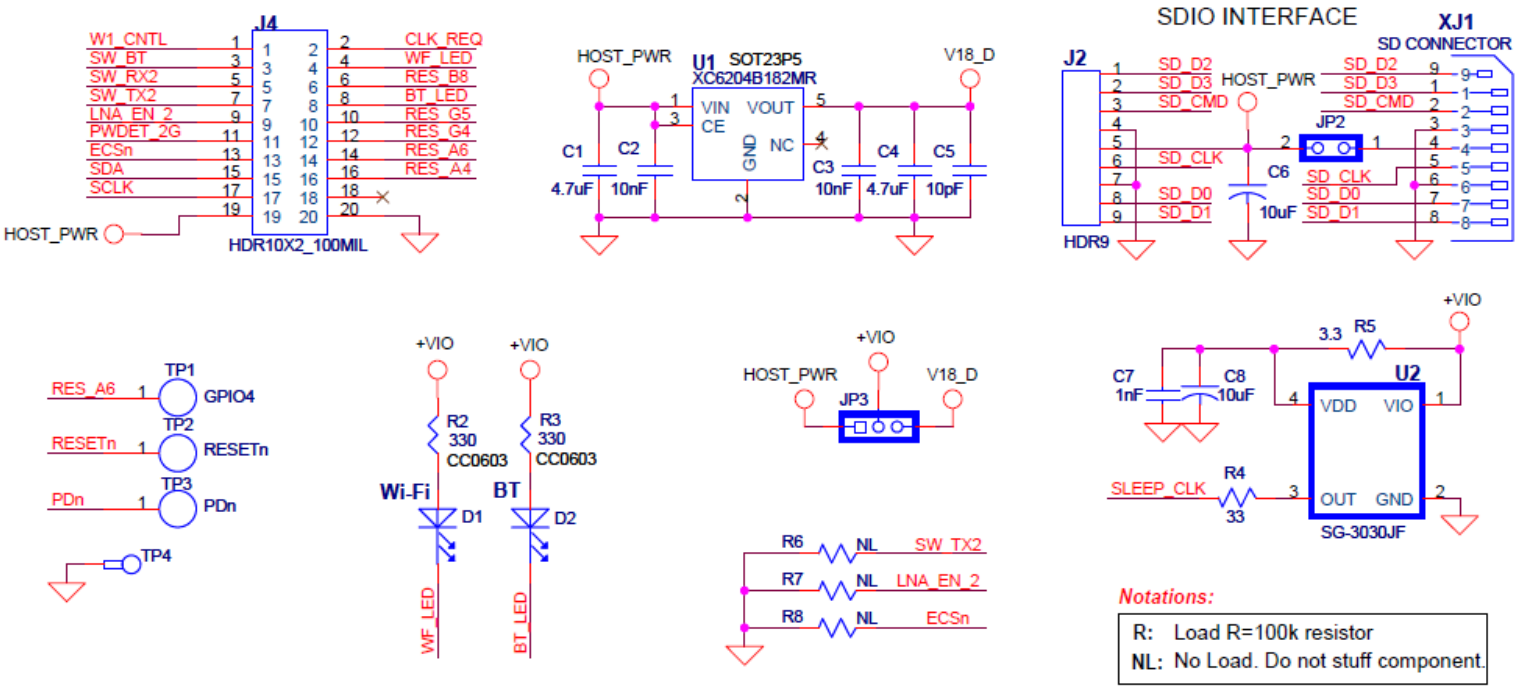


Figure 6: Initialization Configuration



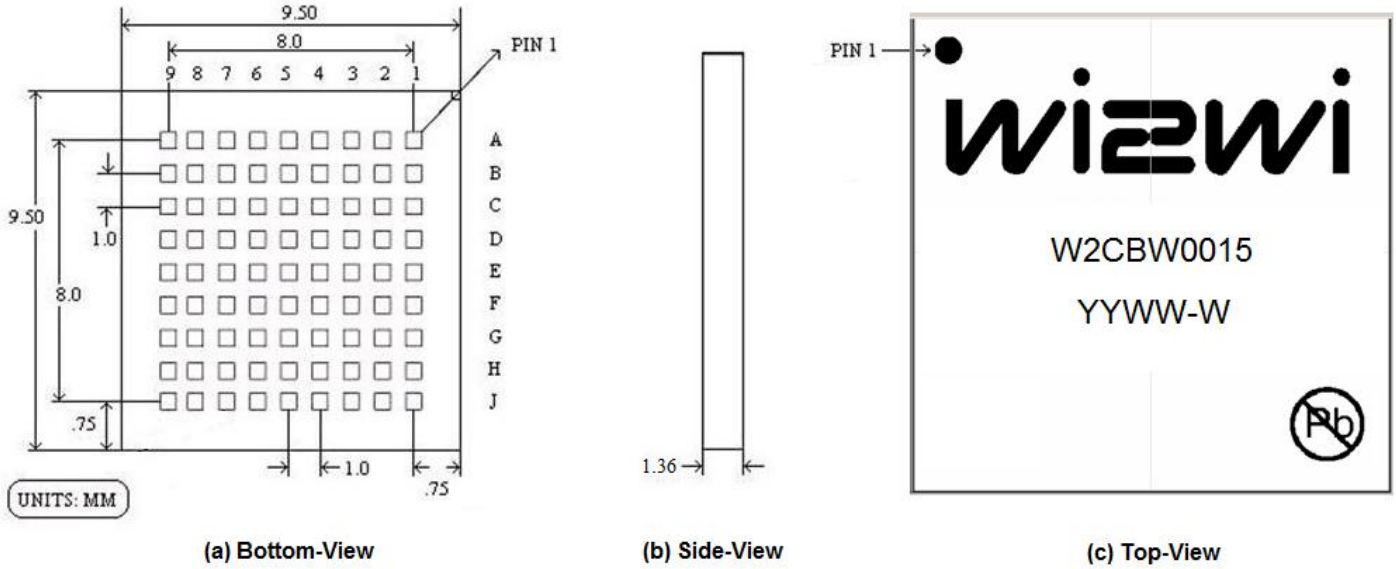
9 Manufacturing Notes

9.1 Physical SiP Dimensions and Pad Locations

- Physical Size: 9.5 mm x 9.5 mm x 1.36 mm LGA
- LGA Pad Size: 0.4 mm x 0.4 mm
- Solder Mask Defined (SMD) Opening: 0.33 mm x 0.33 mm
- Recommended PCB Pad Size: 0.4 mm x 0.4mm
- Pad Pitch: 1.0 mm
- Pad Grid Array: 9 x 9

In the Top View, 'YY' indicates Year, 'WW' indicates Work Week, 'W' indicates WLAN only.

Figure 7: Physical Dimensions and Pad Locations

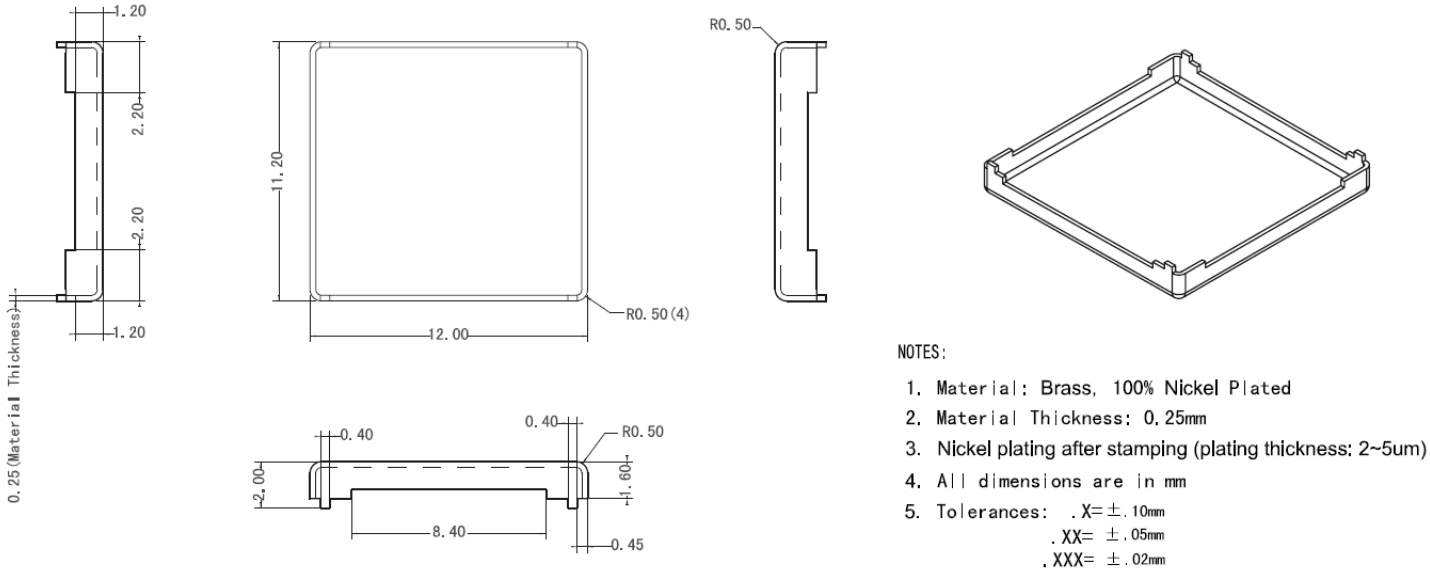


(a) Bottom-View (b) Side-View (c) Top-View

9.2 Physical Shield Dimensions

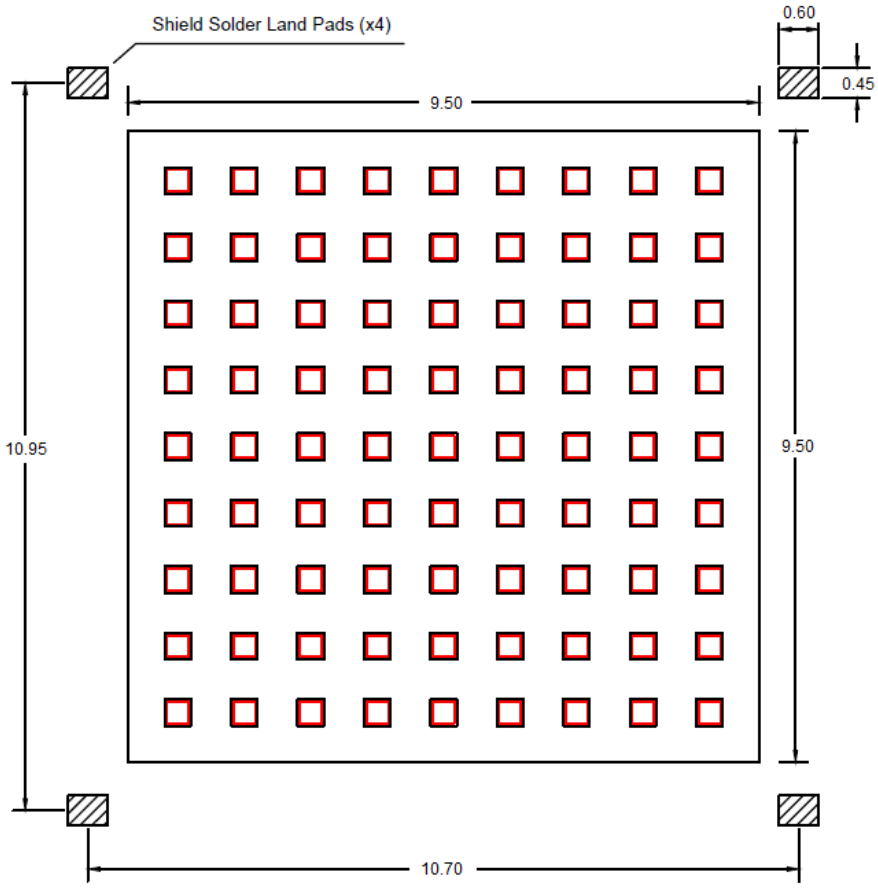
It is recommended that W2CBW0015W be covered with a shield for optimal performance. The recommended dimensions for the shield are shown in Figure 8. (Other shield dimensions can also be used depending on the system requirements). The shields provided by Wi2Wi are RoHS compliant.

Figure 8: Physical Shield Dimensions



9.3 Shield Landing Pattern

Figure 9: Landing Pattern



9.4 Tray Orientation

Figure 10: IC Orientation on Tray

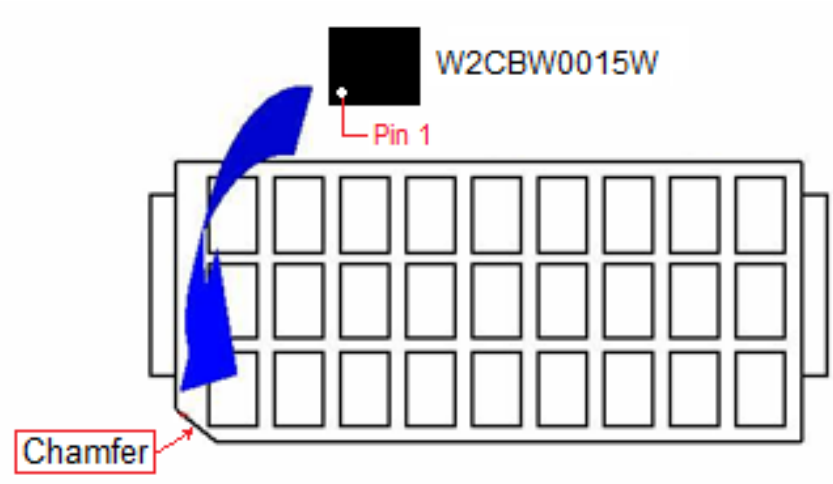
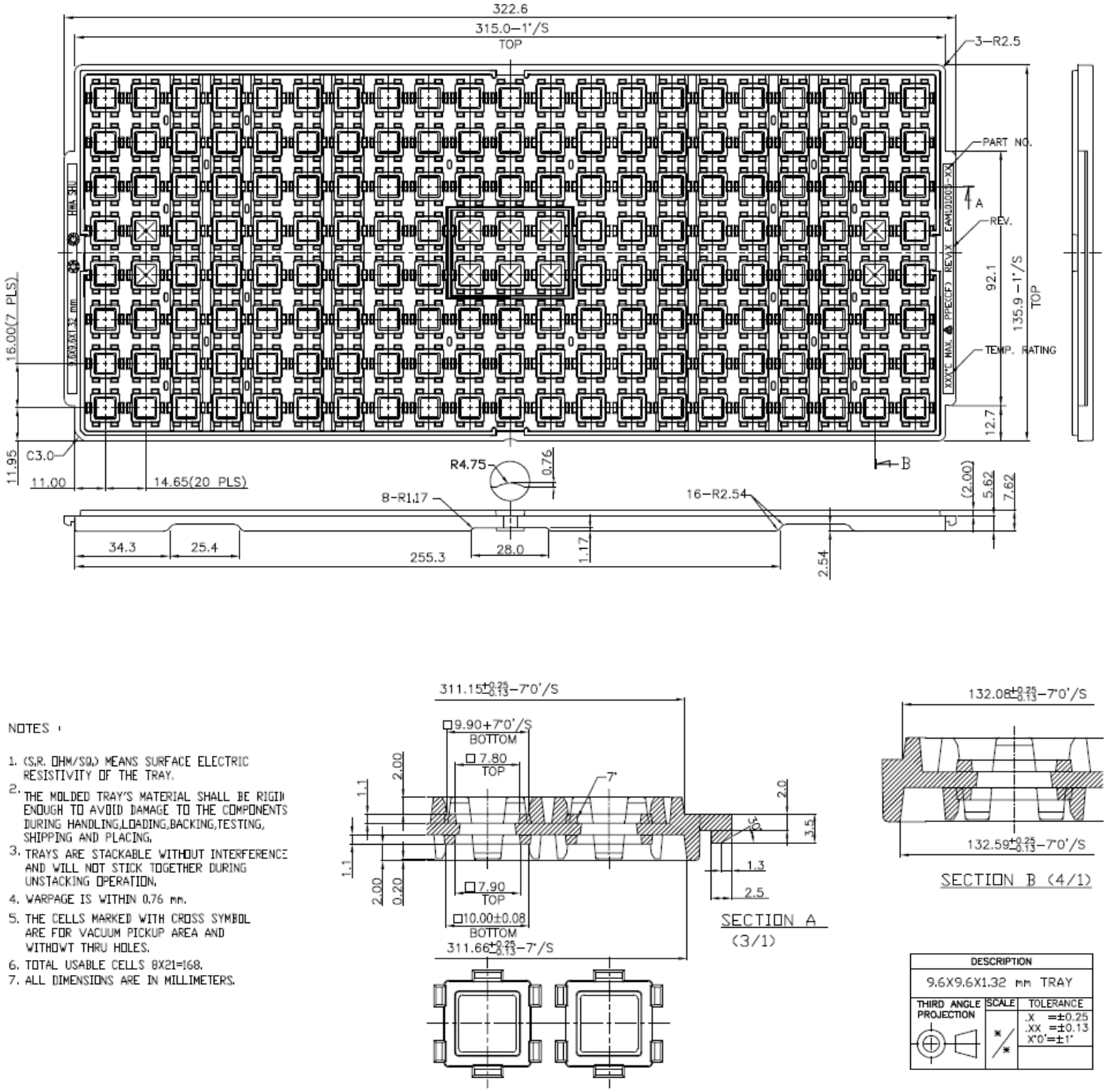


Figure 11: Carrier Tray Package Outline Drawing



9.5 Tape and Reel Orientation

Figure 12: IC Orientation on Tape and Reel

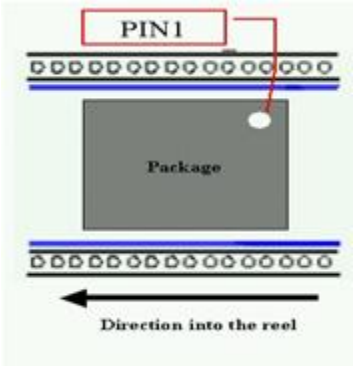


Figure 13: Leader and Trailer

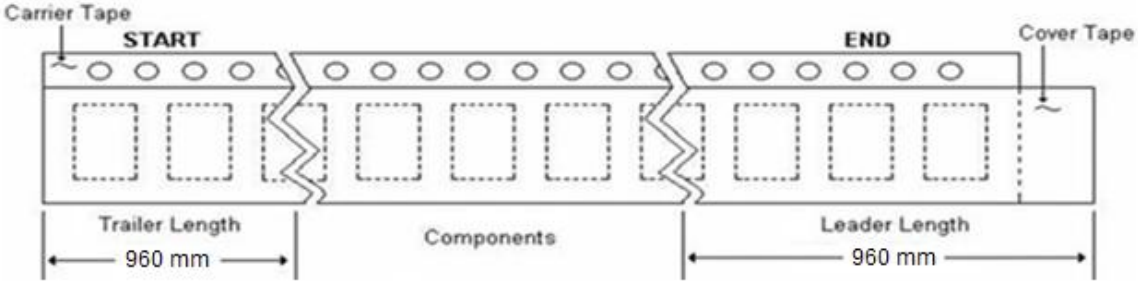
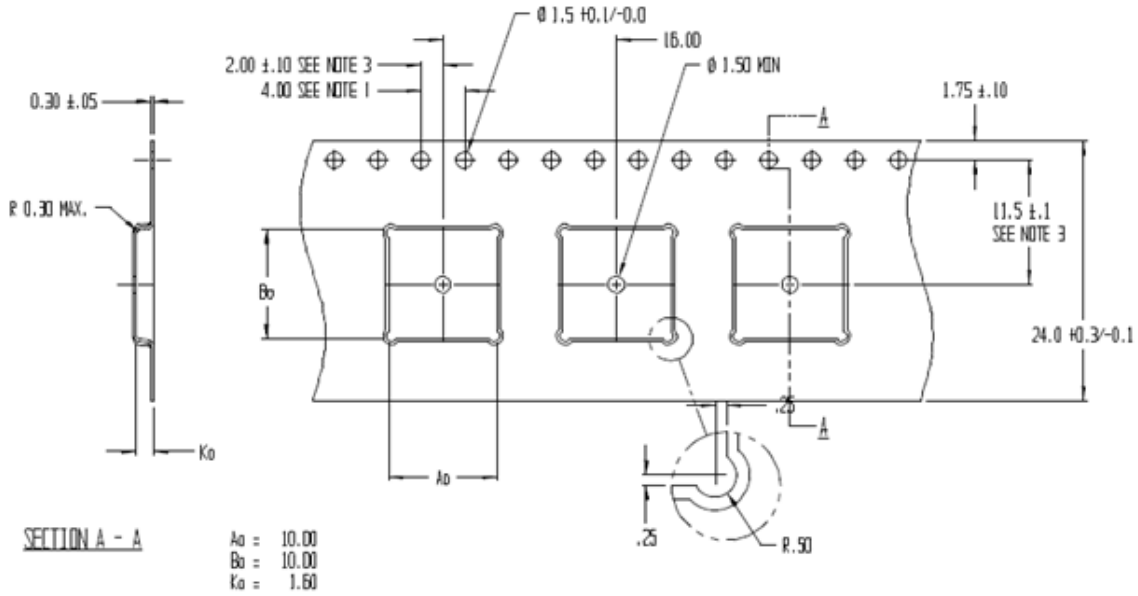


Figure 14: Carrier Tape Package Outline Drawing



9.6 Storage and Baking Instructions

W2CBW0015W is an MSL-4 grade part. After opening the bag, the parts should be:

a. Stored as per J-STD-033 standard
b. Mounted within 72 hours of factory conditions (≤ 30°C, 60% RH)
c. If the parts have been exposed in transit, they should be baked per J-STD-033 standard for 24 hours at 125°C

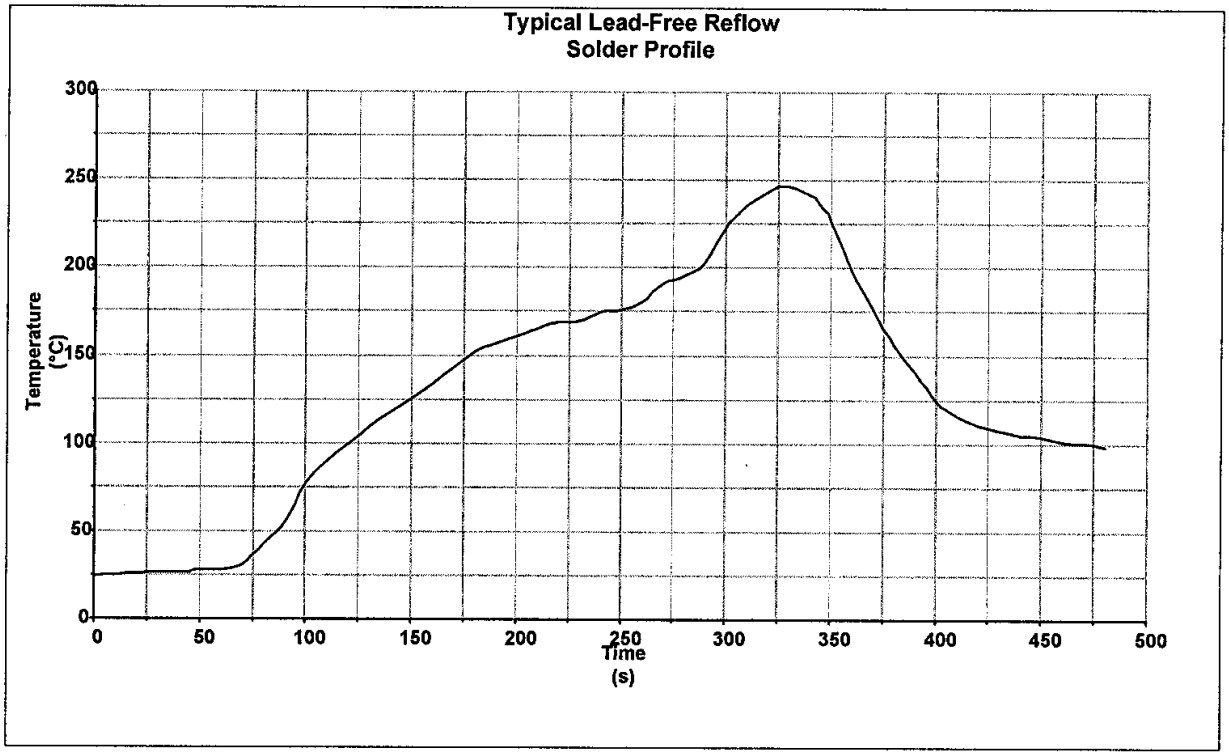
Please follow JEDEC specifications for baking these units on Tape and Reel.

9.7 Recommended Reflow Profile

Assembly Guidelines:

1. Follow solder paste manufacturers recommended profile.
2. The profile illustrated in JESD-020 and below is for reference only.

Figure 15: Recommended Reflow Profile



Key features of the profile:

- Initial Ramp = 1-2.5°C/Sec to 175°C +/- 25°C equilibrium
- Equilibrium = 60-180 seconds
- Ramp to Maximum (Peak) temperature (245°C-260°C) = 3°C/sec max.

10 Disclaimers

Wi2Wi, Inc. PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE MANAGING DIRECTOR OF Wi2Wi, Inc.

The definitions used herein are:
a) Life support devices or systems are devices which (1) are intended for surgical implant into the body, or (2) support or sustain life and whose failure to perform when properly used in accordance with the instructions for use provided in the labeling can reasonably be expected to result in a significant injury to the user. b) A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Wi2Wi does not assume responsibility for use of any of the circuitry described; no circuit patent licenses are implied and Wi2Wi reserves the right, at any time without notice, to change the said circuitry and specifications.

10.1 Data Sheet Status

Wi2Wi, Inc. reserves the right to change the specification without prior notice in order to improve the design and supply the best possible product. Updated information and release notes will be made available on www.wi2wi.com. Please check with Wi2Wi Inc. for the most recent data before initiating or completing a design.

11 Ordering Information

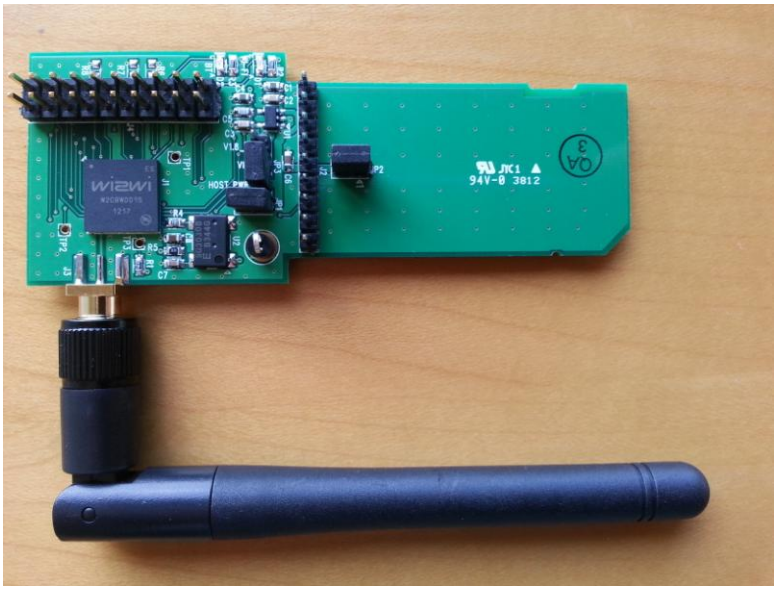
Part Order Number	Description
W2CBW0015W-T	Packed and shipped in Trays
W2CBW0015W-TR	Packed and shipped on Tape and Reel
W2CBW0015 Dev-1	Development Kit without Beagle Board
W2CBW0015 Dev-2	Development Kit with Beagle Board
W2CBW0015-SHLD	Surface mount shield for W2CBW0015W

11.1 Development Kit

- W2CBW0015 Dev-1: W2CBW0015 (802.11 b/g/n + BT) Evaluation board

  This Dev-Kit is designed for a quick evaluation with customer's host processor. The host machine must have a SDIO interface. This Dev-Kit also includes a 2.4 GHz RF antenna, Win-7 and Linux drivers, and user-guides for WiFi and BT tests.

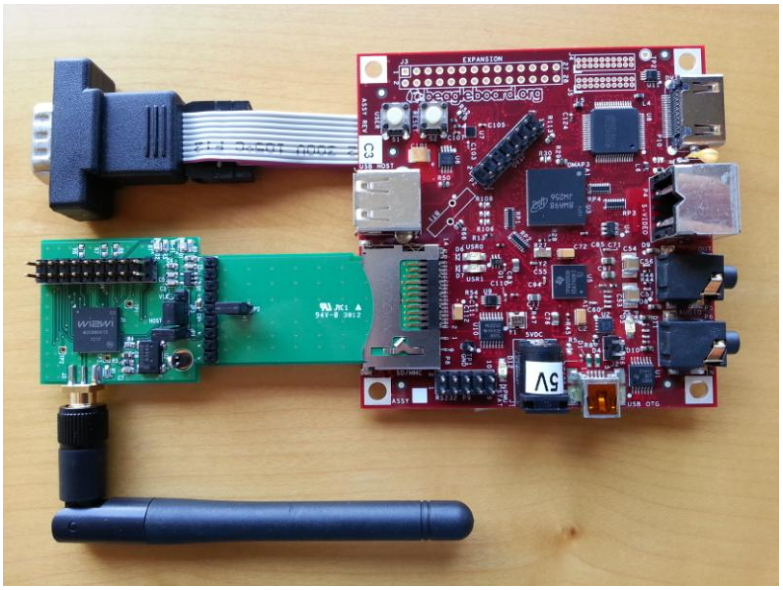
Figure 16: W2CBW0015 Dev-1



- W2CBW0015 Dev-2: W2CBW0015 (802.11 b/g/n + BT) Evaluation board + Beagle board

  This Dev-Kit is a complete system solution (Radio + Host) for customer evaluation. The Beagle board is a Linux-only-based host with SDIO interface, and has pre-loaded Linux-based WiFi and BT drivers for ease of evaluation. The Beagle board can be controlled by a serial console, by connecting it to a host machine using a serial cable (provided). This Dev-Kit also includes a 2.4 GHz RF antenna, Win-7 and Linux drivers, and user-guides for WiFi and BT tests.

Figure 17: W2CBW0015 Dev-2



12 Certifications

W2CBW0015W will conform to the following standards when integrated into the W2CBW0015-Dev development system.

EMC/Immunity

- TBD

Product Safety

- TBD

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 radiates radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications.

a) This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled RF environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This device and its antenna(s) must not be co-located or operated in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.
b) Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Integrator Guidance:

- Only the antenna(s) described in the filings under this FCC ID or equivalent antenna(s) with equal or lesser gain may be used with this transmitter. Any new antenna type, or higher gain antenna would require a Class II permissive change.
- If the operation of the equipment is for portable (within 20cm of user) use or where co-location configuration use is required, the end product, including the transmitter will require re-evaluation in accordance to the FCC rules.
- Labeling: The final end product must be labeled in a visible area with the following: "Contains FCC ID: XXXXXXXX", where XXXXXXXX is the approved FCC ID for the device being installed. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

13 References

13.1 Specifications

- IEEE 802.11 b/g/n Wireless LAN specification
- SDIO full-speed card specification

13.2 Trademarks, Patents and Licenses

- Trademarks: Wi-Fi
- Licenses: 88W8787 Software from Marvell

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