Wireless 2 Wireless

WLAN-Bluetooth SiP (System in Package) W2CBW0016

Preliminary Product Datasheet

Revision 1.21
May 17, 2013

Table of Contents

List of Figures:

List of Tables:

Revision History:

Revision	Revision Date	Originator	Changes
0.1	05/01/2012	DDS	First production data-sheet version
0.2	06/05/2012	DDS	Updated part ordering information, shield dimensions and shield landing pattern
0.3	06/06/2012	DDS	Added Tray and Tape & Reel Orientation figures
1.0	06/13/2012	DDS	Updated block diagram and corrected text
1.1	02/19/2013	DDS	Updated certifications: RoHS, GREEN, REACH
1.2	04/09/2013	DDS	Added ref. design for eval-board and dev-kit images
1.21	05/17/2013	DDS	Removed SDIO SPI references

1 General Description

This specification provides a general guideline on the performance and integration of W2CBW0016, a complete wireless subsystem featuring full 802.11 b/g/n WLAN as well as Class 1.0/2.0/3.0 Bluetooth capabilities in a small form factor SiP solution. The W2CBW0016 device was designed to simplify the process of adding wireless access to systems without lengthy design cycles or complex RF design. Both radios are fully tested for coexistence, internally and with other external radio technologies. 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 W2CBW0016 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 W2CBW0016-Dev(1/2) Development System. These limits are to serve as representative performance characteristics of the W2CBW0016 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

- Industrial Temperature Operation: -40°C to +85°C
- Compact design for easy integration: 12mm x 12mm x 1.4mm
- 100 Pad LGA surface mount package
- WLAN technology based on Marvell's 88W8787
- Bluetooth technology based on Marvell's 88W8787
- Single antenna design for WLAN and Bluetooth
- 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)
- Bluetooth Specific Features
    - HCI Layer Support
    - GFSK modulation for Bluetooth version 2.1

- Data rate up to 1 Mbps for Bluetooth version 2.1
- Data rate up to 3 Mbps for Bluetooth EDR
- Data rate up to 24 Mbps for Bluetooth AMP
- Support for Class 1.5 Bluetooth (i.e., Class 1 up to 10dBm)

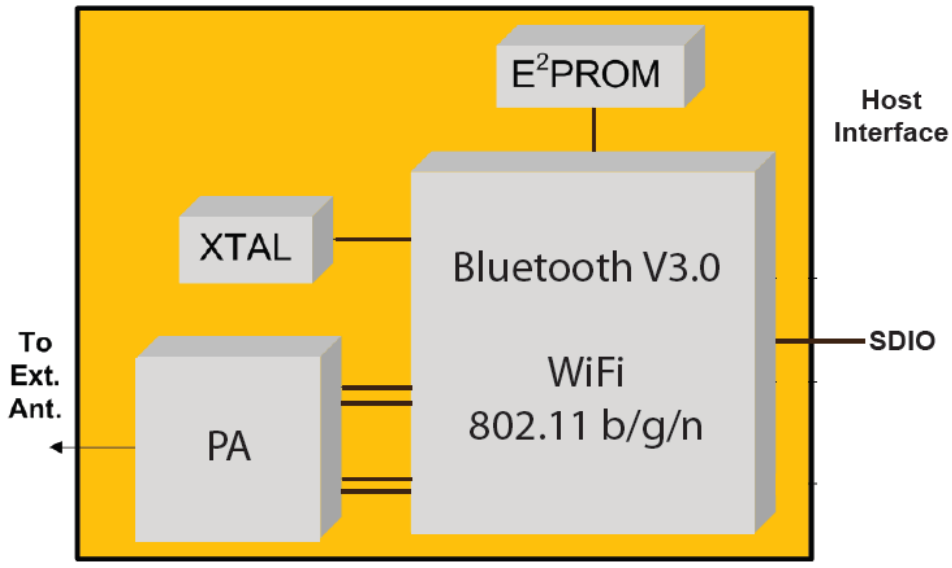
3 System Description

W2CBW0016 is a complete SiP solution that uses Marvell 88W8787 to implement 802.11 b/g/n and Bluetooth functions. It includes all the components needed to operate both radios. 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 W2CBW0016.

Figure 1: Block Diagram



3.2 Pad Description

Table 1: Pad Description

Pin	Pin Name	Type	Supply	Description
A1	GND_A1	Ground		Ground
A2	RES_A2	NC	NC	Reserved Pin, No Connection Recommended
A3	GND_A3	Ground		Ground
A4	PCM_DIN	I/O	VIO	PCM Data Input Signal
A5	GND_A5	Ground		Ground
A6	J1_NC_A6	NC	NC	Reserved Pin, No Connection Recommended
A7	GND_A7	Ground		Ground

A8	J1_NC_A8	NC	NC	Reserved Pin, No Connection Recommended
A9	HOST_PWR_A9	Power	HOST_PWR	Host Power (3.3V)
A10	HOST_PWR_A10	Power	HOST_PWR	Host Power (3.3V)
B1	HOST_PWR_B1	Power	HOST_PWR	Host Power (3.3V)
B2	CLK_REQ	I/O	VIO	Oscillator Mode (active low, output) 0: disable external oscillator 1: enable external oscillator (Default)
B3	I2S_MCLK	I/O	VIO	I2S Master Clock (output)
B4	W1_CNTL	O	VIO	Power management device programming interface control
B5	J1_NC_B5	NC	NC	Reserved Pin, No Connection Recommended
B6	J1_NC_B6	NC	NC	Reserved Pin, No Connection Recommended
B7	J1_NC_B7	NC	NC	Reserved Pin, No Connection Recommended
B8	GND_B8	Ground		Ground
B9	PWDET_2G	I	VIO	2.4 GHz PA Power Detection Signal (analog input)
B10	HOST_PWR_B10	Power	HOST_PWR	Host Power (3.3V)
C1	RES_C1	NC	NC	Reserved Pin, No Connection Recommended
C2	PCM_SYNC	I/O	VIO	PCM Sync Pulse Signal Output if PCM master, Input if PCM slave
C3	PCM_DOUT	I/O	VIO	PCM Data Output Signal
C4	WF_LED	O	VIO	LED Indicator for Wi-Fi
C5	RES_C5	NC	NC	Reserved Pin, No Connection Recommended
C6	RES_C6	NC	NC	Reserved Pin, No Connection Recommended
C7	RES_C7	NC	NC	Reserved Pin, No Connection Recommended
C8	GND_C8	Ground		Ground
C9	GND_C9	Ground		Ground
C10	HOST_PWR_C10	Power	HOST_PWR	Host Power (3.3V)
D1	RES_D1	NC	NC	Reserved Pin, No Connection Recommended
D2	RES_D2	NC	NC	Reserved Pin, No Connection Recommended
D3	PCM_CLK	I/O	VIO	PCM Clock Signal Output if PCM master, Input if PCM slave
D4	BT_LED	O	VIO	LED Indicator for Bluetooth
D5	GND_D5	Ground		Ground
D6	RES_D6	NC	NC	Reserved Pin, No Connection Recommended
D7	RES_D7	NC	NC	Reserved Pin, No Connection Recommended
D8	J1_NC_D8	NC	NC	Reserved Pin, No Connection Recommended
D9	GND_D9	Ground		Ground
D10	HOST_PWR_D10	Power	HOST_PWR	Host Power (3.3V)
E1	SD_D3	I/O	VIO	SDIO 4-bit mode: Data line bit [3] SDIO 1-bit mode: Not used
E2	SD_CLK	I/O	VIO	SDIO 4-bit mode: Clock input SDIO 1-bit mode: Clock input
E3	GND_E3	Ground		Ground
E4	GND_E4	Ground		Ground

E5	I2S_DOUT	I/O	VIO	I2S Data Output Signal
E6	I2S_DIN	I/O	VIO	I2S Data Input Signal
E7	I2S_LRCLK	I/O	VIO	I2S Audio left/right clock Master mode: output Slave mode: input
E8	GND_E8	Ground		Ground
E9	GND_E9	Ground		Ground
E10	HOST_PWR_E10	Power	HOST_PWR	Host Power (3.3V)
F1	SD_D2	I/O	VIO	SDIO 4-bit mode: Data line bit [2] or Read Wait (optional) SDIO 1-bit mode: Not used
F2	SD_D1	I/O	VIO	SDIO 4-bit mode: Data line bit [1] SDIO 1-bit mode: Interrupt
F3	RES_F3	NC	NC	Reserved Pin, No Connection Recommended
F4	RES_F4	NC	NC	Reserved Pin, No Connection Recommended
F5	I2S_BCLK	I/O	VIO	I2S Audio bit clock Master mode: output Slave mode: input
F6	RESETn	I	VIO	Reset (active low); Minimum pulse width of 100ns needed to reset the device
F7	SW_RX2	O	VDD30	Receive switch control, connected to Tx/Rx/BT switch on board (if used)
F8	GND_F8	Ground		Ground
F9	HOST_PWR_F9	Power	HOST_PWR	Host Power (3.3V)
F10	HOST_PWR_F10	Power	HOST_PWR	Host Power (3.3V)
G1	SD_D0	I/O	VIO	SDIO 4-bit mode: Data line bit [0] SDIO 1-bit mode: Data line
G2	SD_CMD	I/O	VIO	SDIO 4-bit mode: Command/response(input/output) SDIO 1-bit mode: Command line (input/output)
G3	I2C_DAT	I/O	VIO	I2C Slave-compatible interface data signal
G4	BT_STATE	I	VIO	BT_STATE (input) No Connect
G5	PDn	I	VIO	Full power down (active low) 0 for full power down 1 for normal mode
G6	LNA_EN_2	O	VDD30	RF Control 6: Power Down Output Low
G7	SW_BT	O	VDD30	Bluetooth (BT) switch control, connected to Tx/Rx/BT switch on board (if used)
G8	HOST_PWR_G8	Power	HOST_PWR	Host Power (3.3V)
G9	HOST_PWR_G9	Power	HOST_PWR	Host Power (3.3V)
G10	HOST_PWR_G10	Power	HOST_PWR	Host Power (3.3V)
H1	SLEEP_CLK	I	VIO	Sleep clock; Supply 32.768 kHz clock to this pin to avoid hang-up
H2	I2C_CLK	I/O	VIO	I2C Slave-compatible interface clock signal
H3	BT_FREQ	I	VIO	BT_FREQ (input) No Connect
H4	SCLK	I/O	VIO	Serial interface clock output for EEPROM
H5	SDA	I/O	VIO	Serial interface data output for EEPROM

H6	GND_H6	Ground		Ground
H7	GND_H7	Ground		Ground
H8	SW_TX2	O	VDD30	Transmit switch control, connected to Tx/Rx/BT switch on board (if used)
H9	GND_H9	Ground		Ground
H10	GND_H10	Ground		Ground
J1	GND_J1	Ground		Ground
J2	BT_GRANTn	O	VIO	BT_GRANTn (output) No Connect
J3	+VIO_J3	Power	VIO	3.3V or 1.8V Power Supply
J4	+VIO_J4	Power	VIO	3.3V or 1.8V Power Supply
J5	BT_REQ	I	VIO	BT_REQ (input) No Connect
J6	ECSn	O	VDD30	EEPROM chip select output, active low for SPI EEPROM, active high for Micro wire EEPROM
J7	HOST_PWR_J7	Power	HOST_PWR	Host Power (3.3V)
J8	HOST_PWR_J8	Power	HOST_PWR	Host Power (3.3V)
J9	GND_J9	Ground		Ground
J10	2.4G_ANT	RF	VIO	2.4 GHz WLAN/BT Antenna
K1	HOST_PWR_K1	Power	HOST_PWR	Host Power (3.3V)
K2	HOST_PWR_K2	Power	HOST_PWR	Host Power (3.3V)
K3	+VIO_K3	Power	VIO	3.3V or 1.8V Power Supply
K4	+VIO_K4	Power	VIO	3.3V or 1.8V Power Supply
K5	GND_K5	Ground		Ground
K6	+VIO_K6	Power	VIO	3.3V or 1.8V Power Supply
K7	+VIO_K7	Power	VIO	3.3V or 1.8V Power Supply
K8	+VIO_K8	Power	VIO	3.3V or 1.8V Power Supply
K9	GND_K9	Ground		Ground
K10	GND_K10	Ground		Ground

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		-40		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
Bluetooth Current Consumption (SDIO BUS)					
Initialization Current		125	138	150	mA
Continuous Transmit Mode		130	135	140	mA
Continuous Receive Mode					mA
Deep Sleep					mA
Bluetooth RF System Specifications					
Transmit Power Output		9	9.4	10	dBm
Receive Sensitivity	BDR, 1 Mbps, 0.1% BER	-	-85	-70	dBm
	EDR, 2 Mbps, 0.1% BER	-	-92	-70	dBm
	EDR, 3 Mbps, 0.1% BER	-	-91	-70	dBm

** 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, W2CBW0016 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

W2CBW0016 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.

W2CBW0016 acts as a device on the SDIO bus. The SDIO device interface main features include:

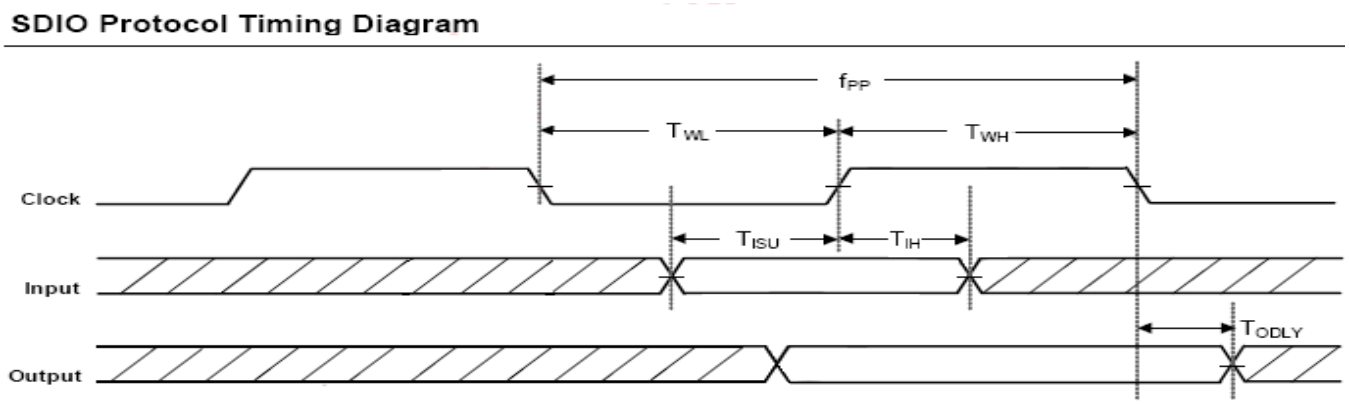
- Support for 1-bit SDIO, and 4-bit SDIO transfer modes at the full clock range of 0 to 50 MHz
- Special interrupt register for information exchange
- Allows card to interrupt host

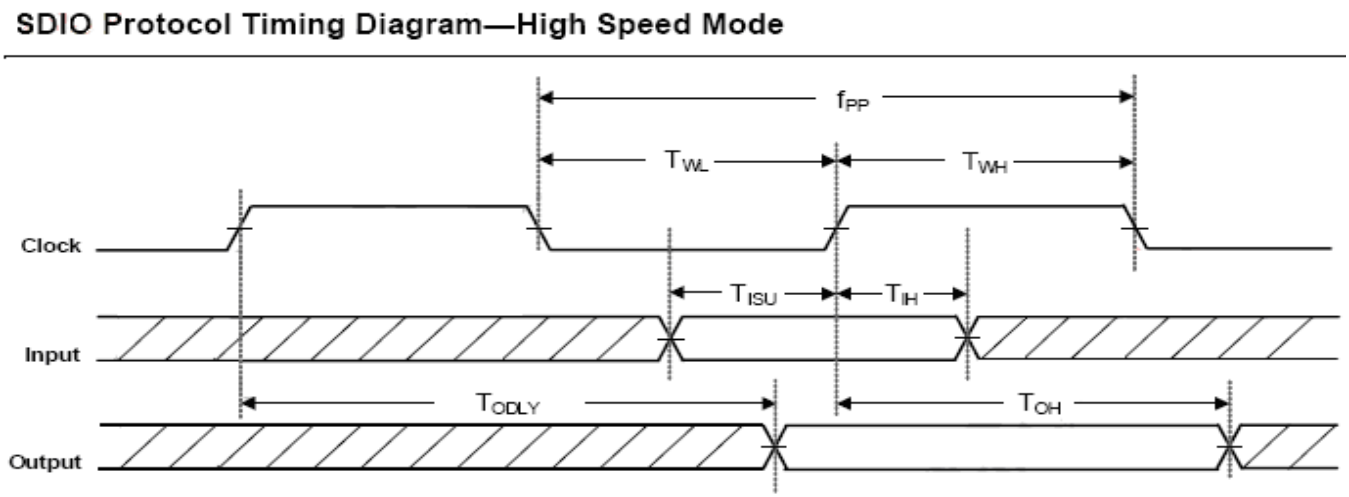
Table 3: SDIO Pin Map

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 Bluetooth Interfaces

For control and connection of the Bluetooth function to a host processor, the W2CBW0016 supports the SDIO. There is also a PCM interface for connection to audio PCM devices such as analog to digital and digital to analog converters.

6.1 SDIO Interface

Bluetooth is supported over the SDIO interface itself. For further details regarding the SDIO interface, please refer Section 5.1.

6.2 PCM Interface

Pulse Code Modulation (PCM) is a standard method used to digitize audio (particularly voice) patterns for transmission over digital communication channels. Through its PCM interface, W2CBW0016 has hardware support for continual transmission and reception of PCM data, thus reducing processor overhead for wireless headset applications. W2CBW0016 offers a bi-directional digital audio interface that route directly into the baseband layer of the on-chip firmware. It does not pass through the HCI protocol layer. Hardware on W2CBW0016 allows the data to be sent to and received from a SCO connection.

W2CBW0016 can operate as the PCM interface Master generating an output clock of 2048 kHz. When configured as PCM interface slave it can operate with an input clock up to 2048 kHz. W2CBW0016 is compatible with Long Frame Sync and Short Frame Sync clock formats. It supports 16-bit linear, 8-bit μ-law or A-law compounded formats at 8k samples/s.

W2CBW0016 has been tested with a Wolfson WM8978 CODEC, but its standard PCM/I2S interface is compatible with various industry standard CODECs from Motorola, OKI, Qualcomm, etc.

7 Antenna and Clock

W2CBW0016 has a single antenna interface, for WLAN and Bluetooth. This interface is 50 Ohm impedance. W2CBW0016 has an internal crystal oscillator with 38.4 MHz frequency and requires an external sleep clock; this is used in low power modes. This oscillator provides clock for both WLAN and Bluetooth.

7.1 Wireless LAN

Wi2Wi provides the end user driver needed for operating WLAN part of W2CBW0016. 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
  - WEP encryption (64 bit/128 bit)
  - IEEE power save mode
  - Deep sleep mode
  - Infrastructure and ad-hoc mode
  - Rate adaptation
  - 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.

7.2 Bluetooth

Bluetooth portion of W2CBW0016 needs a host software stack and profiles for operation. It uses a standard HCI interface – any commercial stack or profile supporting the standard interface will work with W2CBW0016.

Advanced profiles for these operating systems can be procured from commercial vendors like IVT. Wi2Wi does not provide a Bluetooth software stack.

The following are the key features of a typical HCI stack:

- Bluetooth v2.1 + EDR mandatory functionality:
  - EDR, 3 Mbps payload data rate
  - Support 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3 and 3-DH5 packet types
  - Support 2-EV3, 2-EV5, 3-EV3 and 3-EV5 packet types

- Bluetooth v2.1 mandatory functionality:
  - Adaptive Frequency Hopping (AFH), including classifier
  - Faster connection enhanced inquiry scan (immediate FHS response)
  - LMP improvements
  - Parameter ranges
  - Support of AUX1 packet type

- Optional v2.1 + EDR functionality supported:
  - AFH as Master and automatic channel classification
  - Fast connect interlaced inquiry and page scan plus RSSI during inquiry
  - Extended SCO (escort), eV3 + CRC, eV4, eV5
  - SCO handle
  - Synchronization

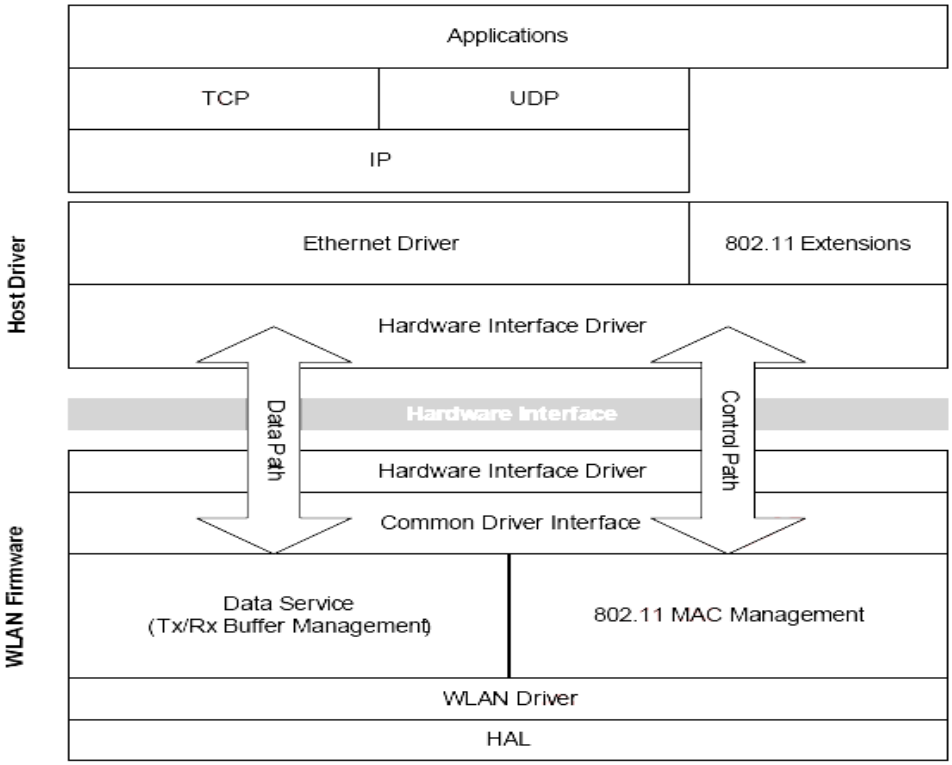
- Bluetooth Core Specification v2.1 + EDR supported features:
  - Bluetooth components: Baseband (including LC), LM and HCI
  - UART HCI transport layer
  - All standard radio packet types
  - Full Bluetooth data rate, up to 723.2Kbits/s asymmetric
  - Operation with up to seven active slaves
  - Maximum number of simultaneous active ACL connections: 7
  - Maximum number of simultaneous active SCO connections: 3
  - Operation with up to three SCO links, routed to one or more slaves
  - All standard SCO voice coding, plus transparent SCO
  - Standard operating modes: page, inquiry, page-scan and inquiry-scan
  - All standard pairing, authentication, link key and encryption operations
  - Standard Bluetooth power-saving mechanisms:
    Hold, Sniff and Park modes, including Forced Hold
  - Dynamic control of peers. Transmit power via LMP
  - Master/slave switch
  - Broadcast
  - Channel quality driven data rate
  - All standard Bluetooth Test Modes

- Bluetooth Core Specifications v3.0 supported

8 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



8.1 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.

9 Reference Schematics

Figure 4: Box Diagram

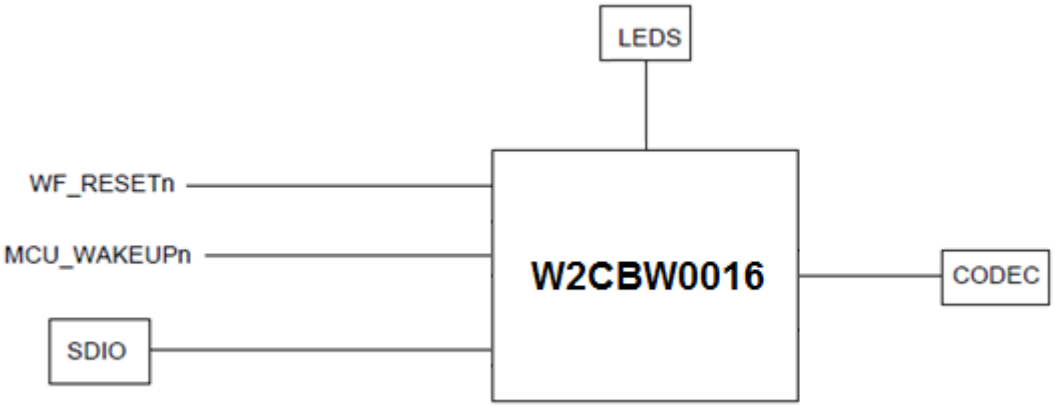


Figure 5: Top View of Pads

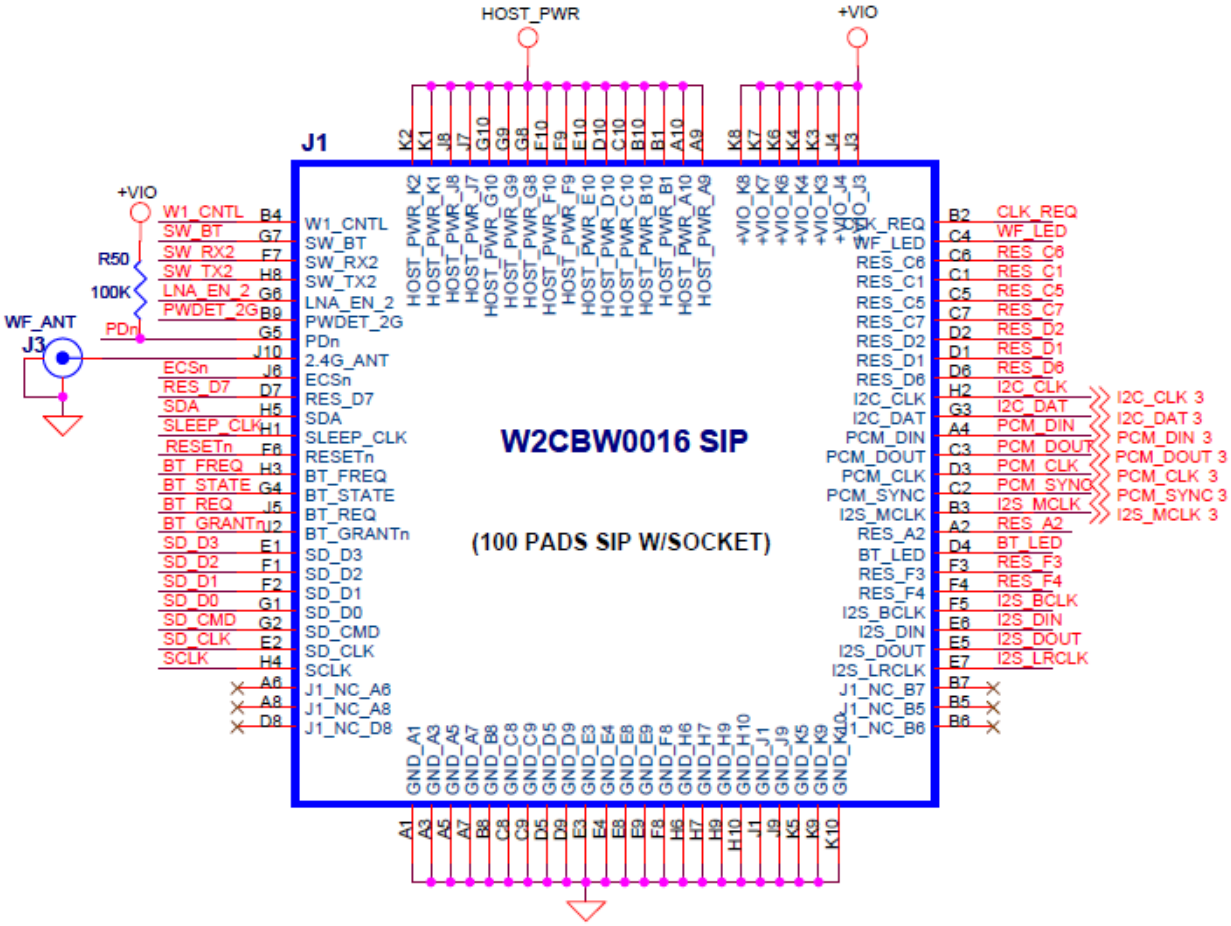


Figure 6: Initialization Configuration

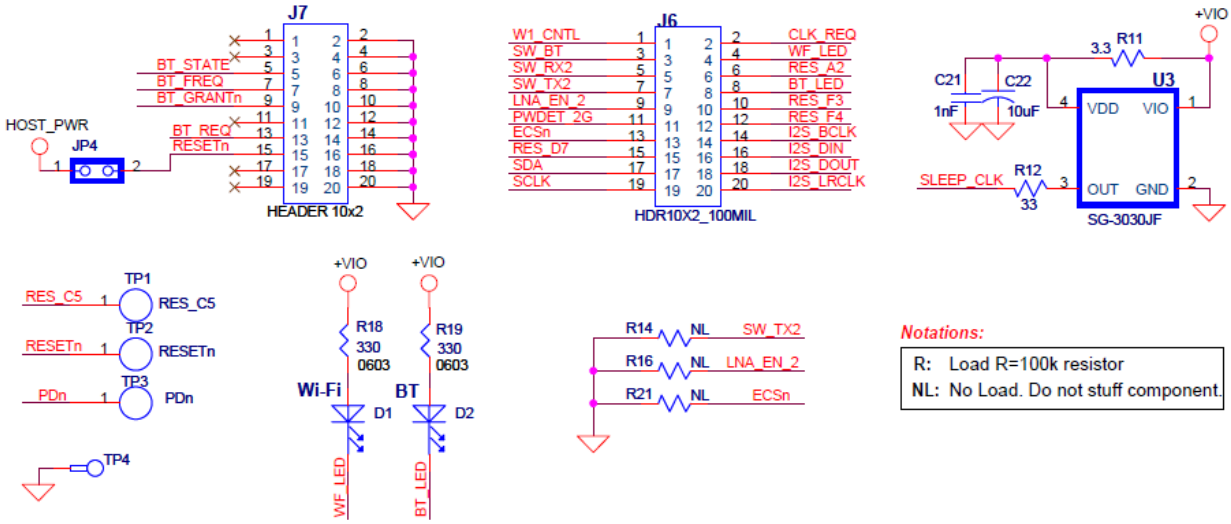
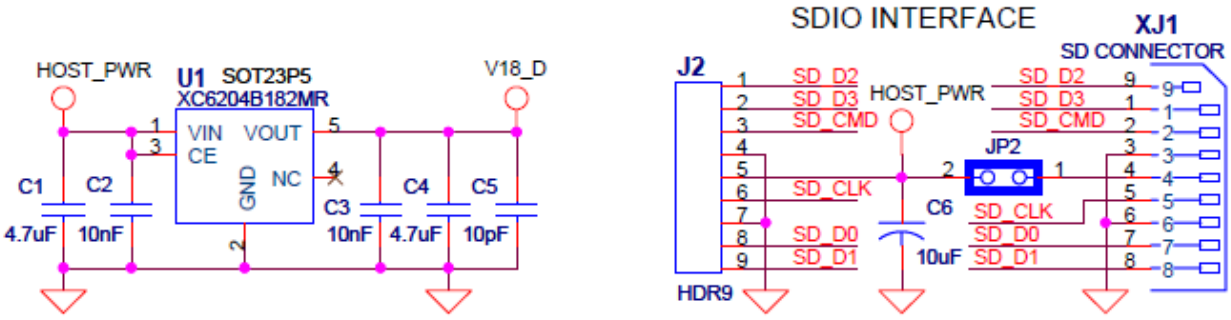


Figure 7: SDIO Interface



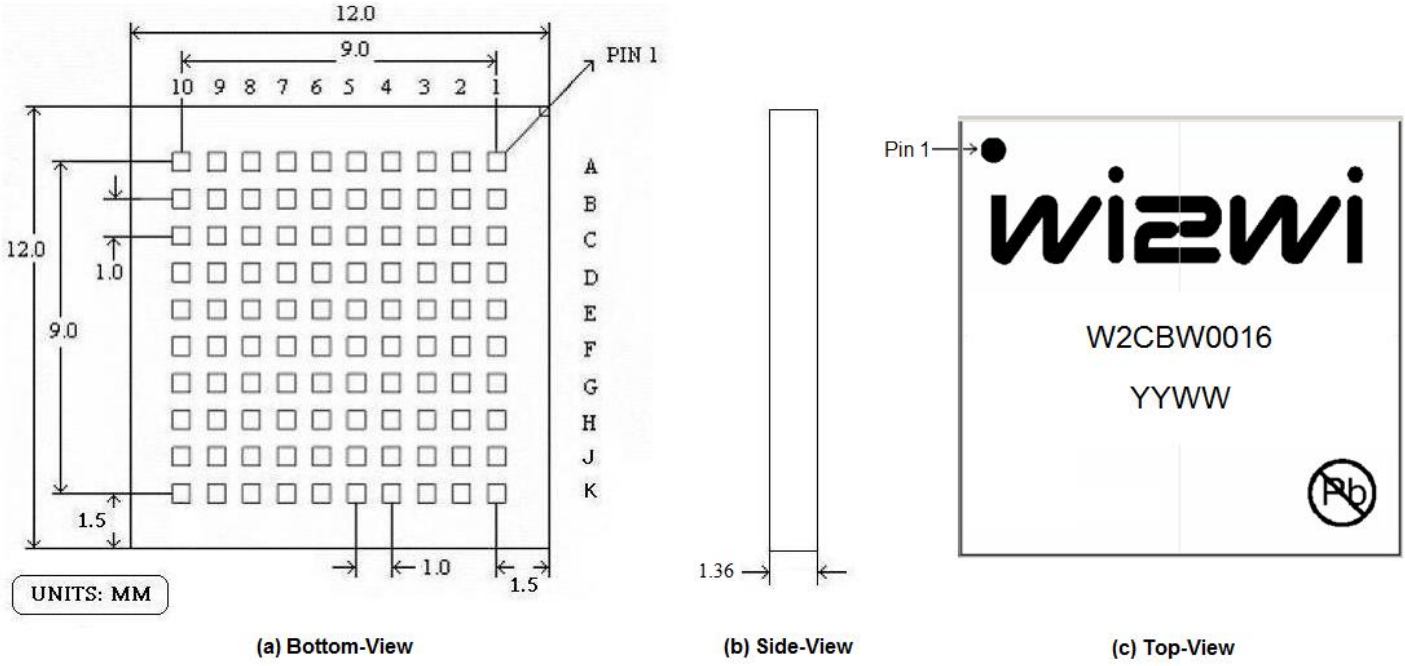
10 Manufacturing Notes

10.1 Physical SiP Dimensions and Pad Locations

- Physical Size: 12 mm x 12 mm x 1.4 mm LGA
- Solder Mask Opening Around Pads: 0.48 mm x 0.48 mm
- Recommended Landing Pattern of Pads: 0.4 mm x 0.4 mm
- Pad Size: 0.38 mm x 0.38 mm
- Pad Pitch: 1.0 mm
- Pad Grid Array: 10 x 10

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

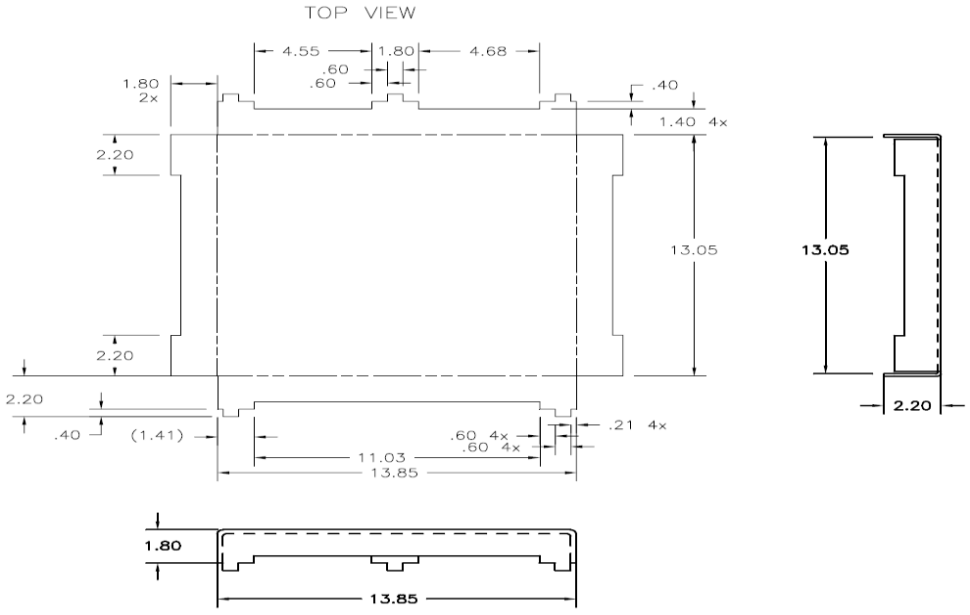
Figure 8: Physical Dimensions and Pad Locations



10.2 Physical Shield Dimensions

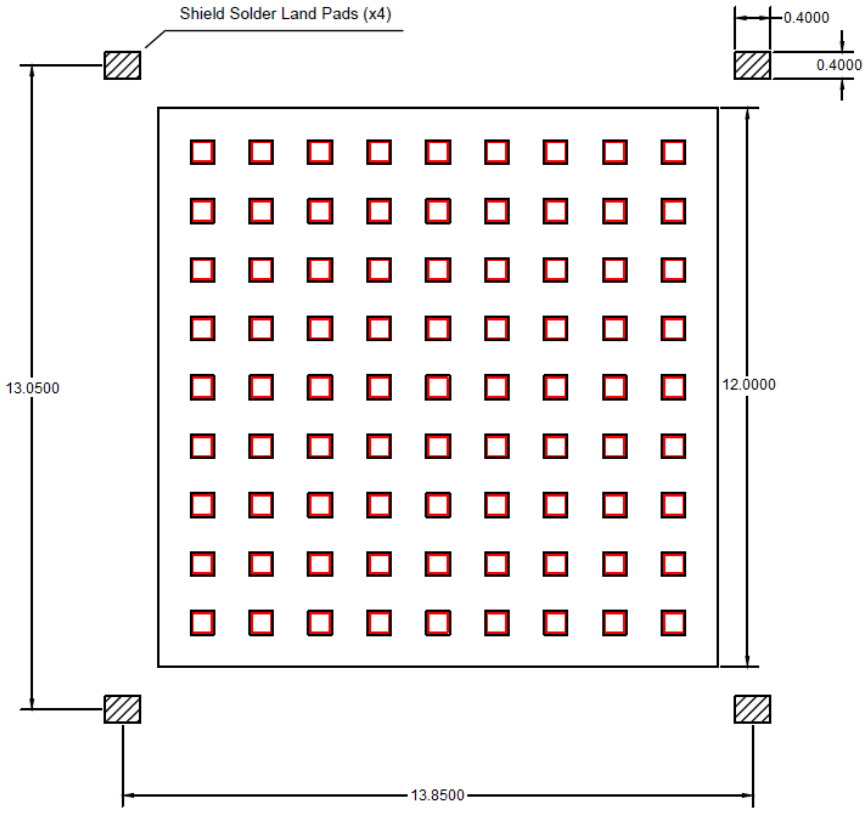
It is recommended that W2CBW0016 be covered with a shield for optimal performance. The recommended dimensions for the shield are shown in Figure 9. (Other shield dimensions can also be used depending on the system requirements). The shields provided by Wi2Wi are RoHS compliant.

Figure 9: Physical Shield Dimensions



10.3 Shield Landing Pattern

Figure 10: Shield Landing Pattern



10.4 Tray Orientation

Figure 11: IC Orientation on Tray

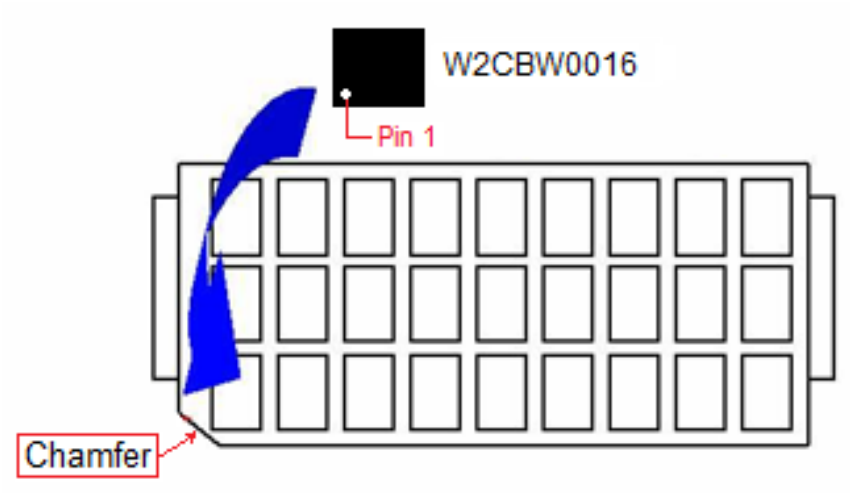
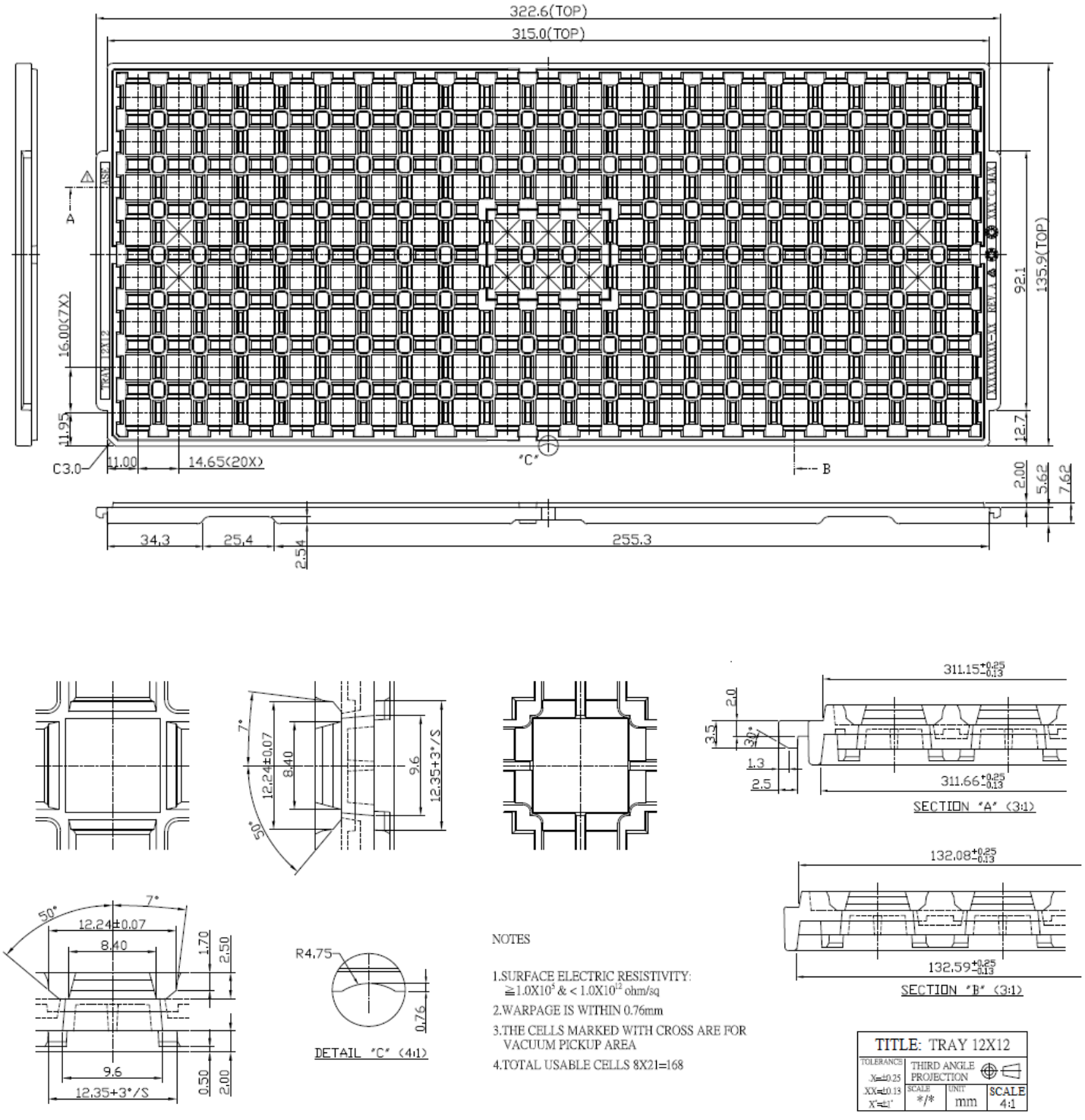


Figure 12: Carrier Tray Package Outline Drawing



10.5 Tape and Reel Orientation

Figure 13: IC Orientation on Tape and Reel

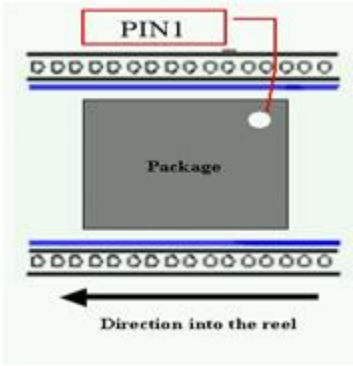


Figure 14: Leader and Trailer

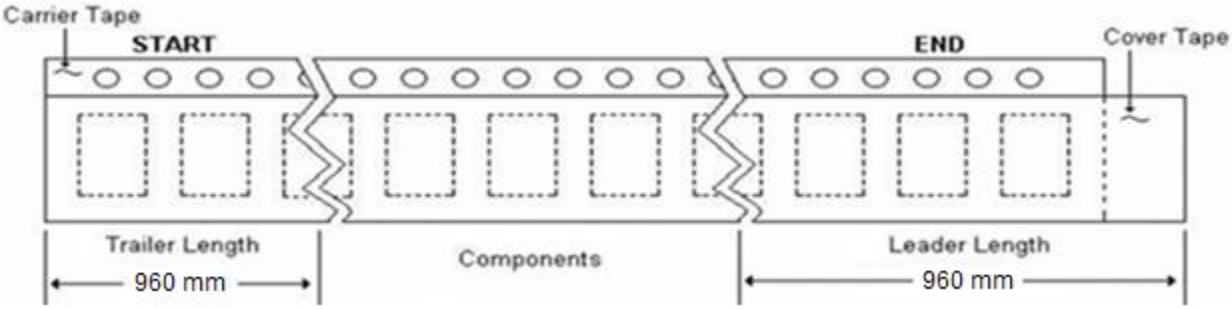
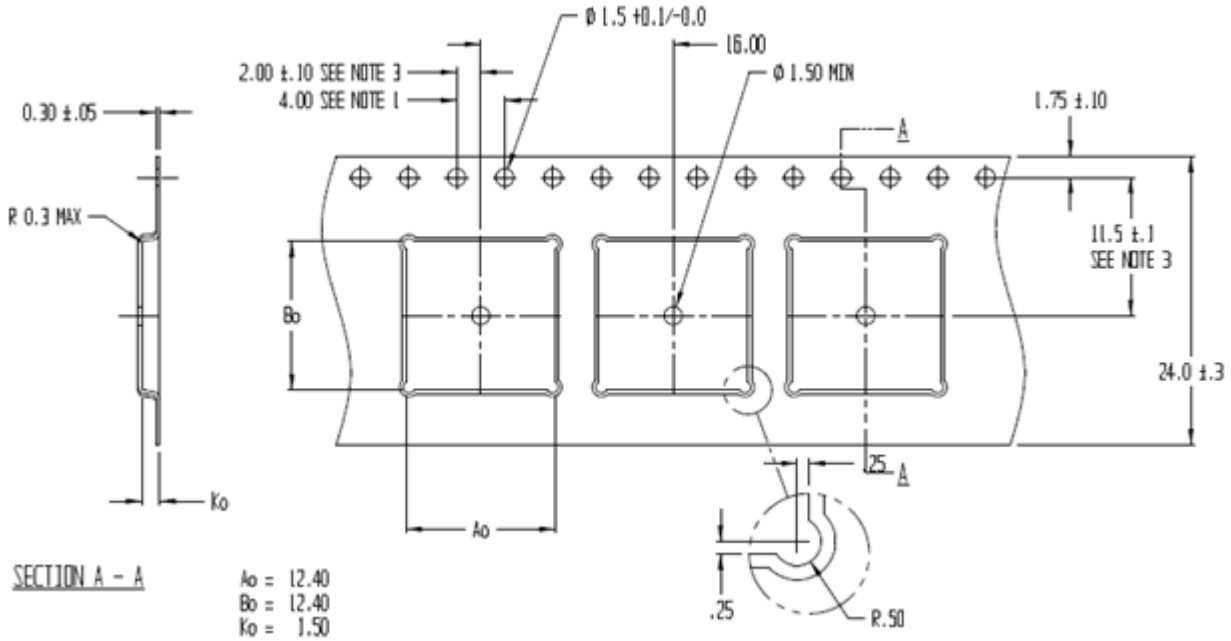


Figure 15: Carrier Tape Package Outline Drawing



10.6 Storage and Baking Instructions

W2CBW0016 is an MSL4 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

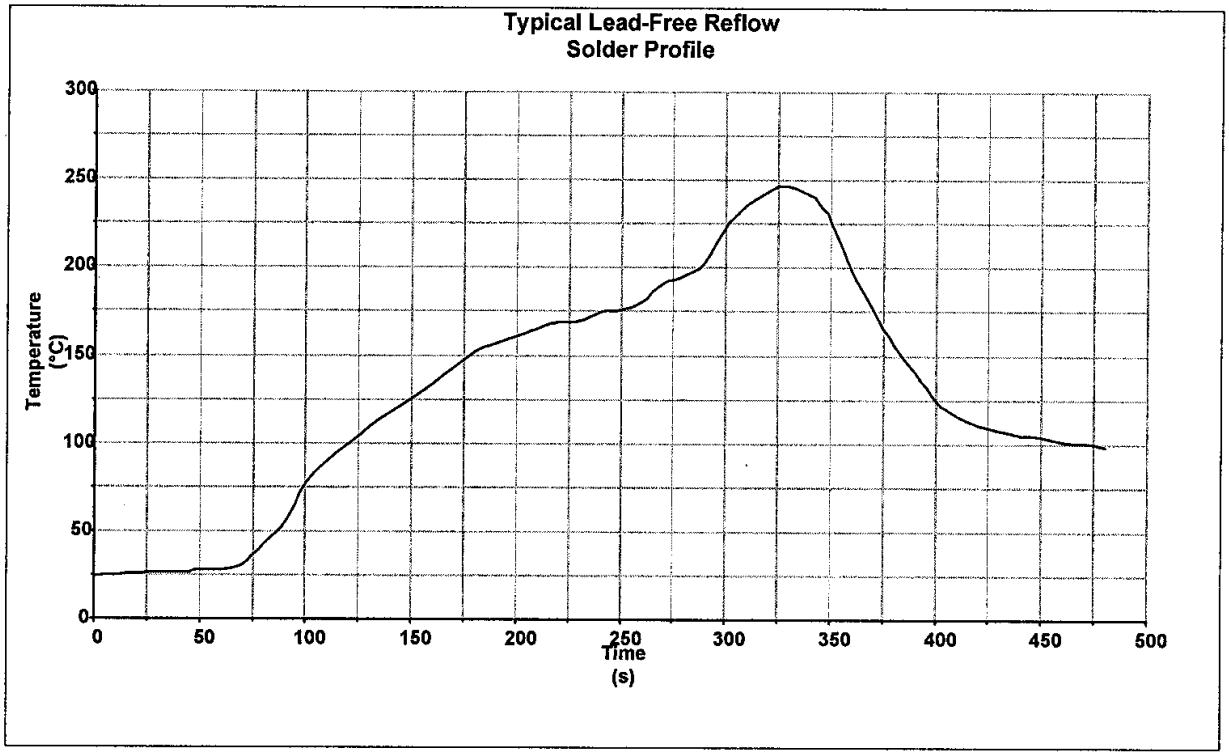
Please follow JEDEC specifications for baking these units on Tape and Reel.

10.7 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 16: 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.

11 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.

11.1 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.

12 Ordering Information

The following part ordering scheme shall be followed for W2CBW0016:

Part Order Number	Description
W2CBW0016-T	Packed and shipped in Trays
W2CBW0016-TR	Packed and shipped on Tape and Reel
W2CBW0016 Dev-1	Development Kit without Beagle Board
W2CBW0016 Dev-2	Development Kit with Beagle Board
W2CBW0016-SHLD	Surface mount shield for W2CBW0016

12.1 Development Kit

- W2CBW0016 Dev-1: W2CBW0016 (802.11 b/g/n + BT) Development Kit

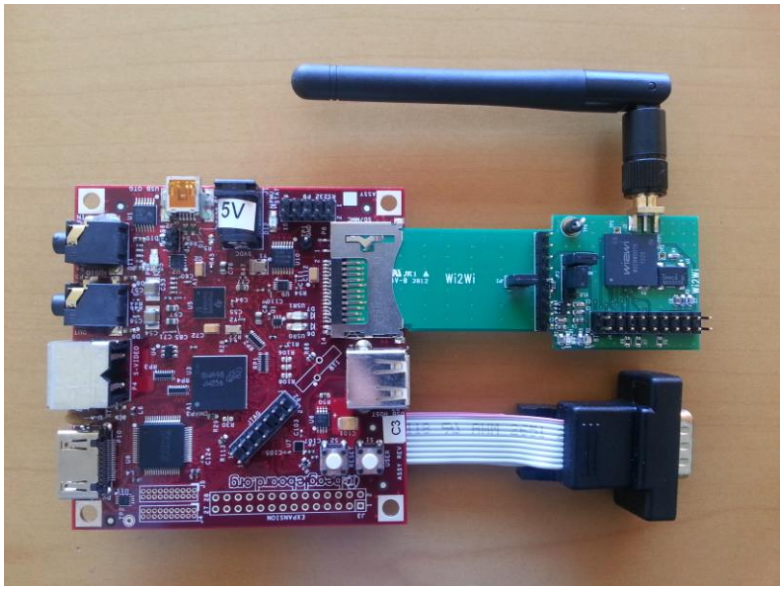
  This Dev-Kit is designed for a quick evaluation with customer's host processor. The host machine must have a SDIO interface. This Dev-Kit also includes a 2.4 GHz RF antenna, Win-7 and Linux drivers, and user-guides for WiFi and BT tests.

Figure 17: W2CBW0016 Dev-1

- W2CBW0016 Dev-2: W2CBW0016 (802.11 b/g/n + BT) Development Kit + 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 18: W2CBW0016 Dev-2



13 Certifications

W2CBW0016 will conform to the following standards when integrated into the W2CBW0016-Dev development system.

EMC/Immunity
- TBD

Product Safety
- TBD

English Version:
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

French Version:
Cet appareil est conforme à Industrie Canada une licence standard RSS exonérés(s). Son fonctionnement est soumis aux deux conditions suivantes: (1) Cet appareil ne doit pas provoquer d'interférences, and (2) Cet appareil doit accepter toute interférence reçue, y compris les interférences pouvant provoquer un fonctionnement indésirable de l'appareil.

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.

14 References

14.1 Specifications

- IEEE 802.11 b/g/n Wireless LAN Specification
- Specification of the Bluetooth System, v2.1+EDR, v3.0
- SDIO full-speed card specification

14.2 Trademarks, Patents and Licenses

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