



WLAN Module

Preliminary Product Datasheet

CAS-PDT-DOC Revision 1.3

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Revision History:

Revision	Revision Date	Originator	Changes
1.0	06/28/2010	WJL/EK	Initial Release
1.1	08/24/2010	WJL/EK	Updated Package information
1.20	10/23/2010	WJL/SK	Updated Pin Descriptions & Packaging information
1.21	12/15/2010	WJL	Added Test Data
1.3	1/7/11	WJL/EK	Added missing images

1 General Description

This specification provides general information regarding performance and integration of W2SW0011U, a complete wireless subsystem featuring 802.11 b/g/n 2.4Ghz WLAN capabilities in a small form factor module. The W2SW0011U device is designed to simplify the process of adding wireless capability without lengthy design cycles or complex RF design. It is completely tested for functionality and performance along with coexistence with other wireless standards. A full menu of certifications will also be provided, simplifying the certification process for your end product while further reducing valuable time-to-market. Based on world-class silicon from Marvell, the W2SW0011U has been fully optimized for throughput and receive sensitivity using careful design practices. Software development resources are available to create drivers for unique processors and operating systems if needed, and to optimize the wireless subsystem for your application.

The specification maximum and minimum limits presented herein are those guaranteed when the unit is integrated into the Wi2Wi's W2SW0011U-DEV Development System. These limits are to serve as representative performance characteristics of the W2SW0011U when properly designed into a customer's product. Wi2Wi makes no warranty, implied or otherwise specified, with respect to design and performance characteristics presented in this specification when used in customer designs.

The latest revision of this document supersedes all previous versions of this document. Wi2Wi reserves the right to change this specification without notice.

2 Features

- Compact design for easy integration: 15mm x 15mm
- LGA with 60 pins
- WLAN technology based on Marvell's 88W8786
- Certified radio
- Optimized RF and electrical design for better performance in co-existence with other wireless standards
- Operates in 2.4GHz ISM band
- ROHS Compliant
- Single supply of 3.3V
- Integrated coexistence support for Bluetooth
- USB 2.0 HS (480Mbps)
- 50-Ohm antenna launch
- Support for various 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)
- 50 Mbps, 72Mbps for 802.11n, planned support for 150 Mbps in a later revision

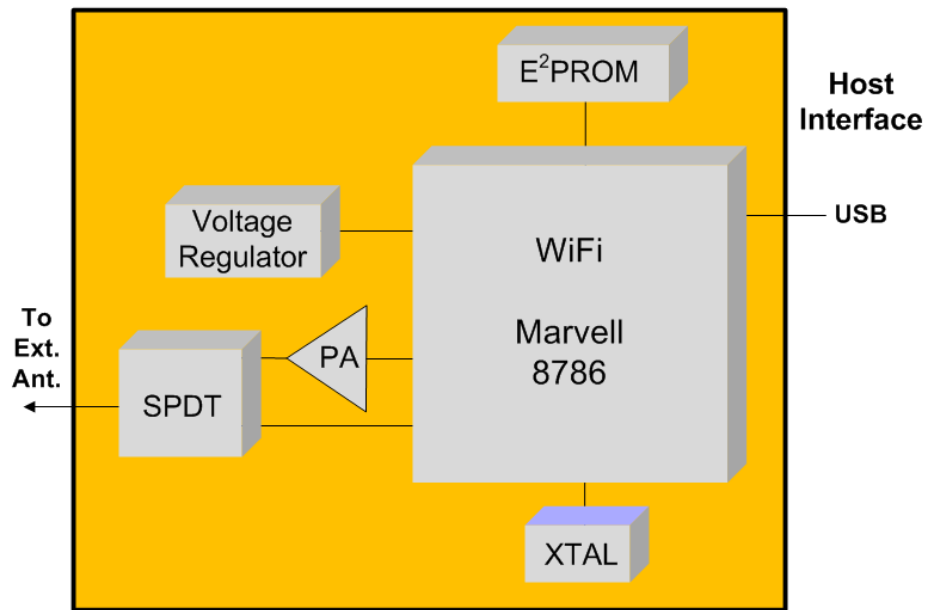
3 System Description

W2SW0011u is a complete module, combination of 88W8786u 802.11b/g/n 1 x 1 SISO device and all the components needed to operate the radio. It preserves characteristics from the Marvell chipset while providing optimized system level functionality and performance.

3.1 Block Diagram

Figure 1 shows a block diagram of W2SW0011U along with the interfaces.

Figure 1: Block Diagram



3.2 Pin Description

Table 1: Pin Description

Pin	Pin Name	Type	Supply	Description
1	GND1	Ground	GND	Ground
2	TR_P	O	3.3V	Transmit Switch Control Positive Output
3	GND3	Ground		Ground
4	3.3V	Power	3.3V	3.3V Power Rail
5	NC	NC	NC	NC
6	NC	NC	NC	NC
7	TR3_N	O	3.3V	Transmit Switch 3 Negative Output
8	3.3V	Power	3.3V	3.3V Power Rail

9	WL_ACTIVE	O	V18D	WLAN is Transmitting or Receiving Packets
10	GND10	Ground		Ground
11	NC	NC	NC	NC
12	GND12	Ground		Ground
13	NC	NC	NC	NC
14	NC	NC	NC	NC
15	TR_N	O	3.3V	Transmit Switch Control Negative Output
16	3.3V	Power	3.3V	3.3V Power Rail
17	3.3V	Power	3.3V	3.3V Power Rail
18	NC	NC	NC	NC
19	NC	NC	NC	NC
20	GND20	Ground		Ground
21	NC	NC	NC	NC
22	NC	NC	NC	NC
23	NC	NC	NC	NC
24	NC	NC	NC	NC
25	RESETn	I	3.3V	Reset (active low)
26	NC	NC	NC	NC
27	NC	NC	NC	NC
28	GND28	Ground		Ground
29	GND29	Ground		Ground
30	NC	NC	NC	NC
31	NC	NC	NC	NC
32	NC	NC	NC	NC
33	NC	NC	NC	NC
34	NC	NC	NC	NC
35	NC	NC	NC	NC
36	NC	NC	NC	NC
37	GND37	Ground		Ground
38	NC	NC	NC	NC
39	NC	NC	NC	NC
40	NC	NC	NC	NC
41	NC	NC	NC	NC
42	USB_VA33	Power		3.3V USB 2.0 Power Supply
43	NC	NC	NC	NC
44	USB_DP	I/O	USB_VA33	USB Serial differential Data Positive
45	USB_DM	I/O	USB_VA33	USB Serial differential Data Negative
46	NC	NC	NC	NC
47	NC	NC	NC	NC
48	3.3V	Power	3.3V	3.3V Power Rail
49	GPIO1	I/O	VIO_X1	General Purpose Input/Output 1
50	NC	NC	NC	NC
51	NC	NC	NC	NC
52	3.3V	Power	3.3V	3.3V Power Rail

53	NC	NC	NC	NC
54	GND54	Ground		Ground
55	3.3V	Power	3.3V	3.3V Power Rail
56	3.3V	Power	3.3V	3.3V Power Rail
57	NC	NC	NC	NC
58	GND58	Ground	GND	Ground
59	WLAN_RF1	RF		Wi-Fi RF
60	GND60	Ground	GND	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 +3V_IO		2.7	3.3	4.2	V
Recommended Operating Conditions					
Operating Temperature		0		70	°C
Supply Voltage +3V_IO		3.0	3.3	3.6	V
802.11b Current Consumption					
Initialization Current			170		mA
Continuous Transmit Mode	@11Mbps		270 – 300		mA
Continuous Receive Mode	@11Mbps		185 – 195		mA
IEEE 802.11 Power Save Mode			8		mA
802.11b RF System Specifications					
Transmit Power Output			15		dBm
Receive Sensitivity	1 Mbps, 8% PER		-87		dBm
	2 Mbps, 8% PER		-87		dBm
	5.5 Mbps, 8% PER		-87		dBm
	11 Mbps, 8% PER		-85		dBm
Maximum Receive Level	PER<8%		IEEE Compliant		dBm
Transmit Frequency Offset	Low, Middle, High Channels		±10		PPM
Spectral Mask	Max. TX Power		-40@fc±11MHz		dBc
			-60@fc±22MHz		
Error Vector Magnitude	Max. TX Power @ 11Mbps		-36		dB
Carrier Suppression	Max. TX Power		-25		dBc
Adjacent Channel Rejection	Desired channel is 3dB above sensitivity, 11Mbps, PER<8%		48		dBc
802.11g Current Consumption					
Initialization Current			170		mA
Continuous Transmit Mode	@54Mbps		270 – 300		mA
Continuous Receive Mode	@54Mbps		195 – 205		mA
IEEE 802.11 Power Save Mode			8		mA

802.11g RF System Specifications					
Transmit Power Output			15		dBm
Receive Sensitivity	6 Mbps, 10% PER		-86		dBm
	9 Mbps, 10% PER		-85		dBm
	12 Mbps, 10% PER		-85		dBm
	18 Mbps, 10% PER		-84		dBm
	24 Mbps, 10% PER		-80		dBm
	36 Mbps, 10% PER		-77		dBm
	48 Mbps, 10% PER		-73		dBm
	54 Mbps, 10% PER		-72		dBm
Maximum Receive Level	PER<10%		IEEE Compliant		dBm
Transmit Frequency Offset	Low, Middle, High Channels		±10		PPM
Spectral Mask	Max. TX Power		30@fc±11MHz		
			40@fc±20MHz		
			50@fc±30MHz		
Error Vector Magnitude	Max. TX Power @ 54Mbps		-29		dB
Carrier Suppression	Max. TX Power		-25		dBc
Adjacent Channel Rejection	Desired channel is 3dB above sensitivity, 54Mbps, PER<10%		15		dBc
802.11n Current Consumption					
Initialization Current			170		mA
Continuous Transmit Mode	@50Mbps		TBD		mA
Continuous Receive Mode	@50Mbps		TBD		mA
IEEE 802.11 Power Save Mode			TBD		mA
802.11n RF System Specifications					
Transmit Power Output			15		dBm
Receive Sensitivity	50 Mbps		TBD		dBm
	100 Mbps		TBD		dBm
	150 Mbps		TBD		dBm
Maximum Receive Level	PER<10%		IEEE Compliant		dBm
Transmit Frequency Offset	Low, Middle, High Channels		±10		PPM
Spectral Mask	Max. TX Power		30@fc±11MHz		dBc
Error Vector Magnitude	Max. TX Power @ 150Mbps		TBD		dB
Carrier Suppression	Max. TX Power		TBD		dBc
Adjacent Channel Rejection	Desired channel is 3dB above sensitivity, 54Mbps, PER<10%		TBD		dBc

5 Voltage Domains

Voltage domains and limits of all the signal pins are listed in **Error! Reference source not found.**Table 3 and 4.

Table 3: 3.3V Voltage Domain Signal Limits

	Min	Typ	Max	Units
Vih	2	-	3.6	V
Vil	-0.3	-	1	V
Vihys	300	-	-	mV
Voh	2.3	-	-	V
Vol	-	-	0.4	V

Table 4: 1.8V Voltage Domain Signal Limits

	Min	Typ	Max	Units
Vih	1.2	-	2.1	V
Vil	-0.3	-	0.6	V
Vihys	250	-	-	mV
Voh	1.22	-	-	V
Vol	-	-	0.4	V

6 WLAN External Host Interface

For connection to a host processor, W2SW0011U supports the HS USB 2.0 (480 Mbps)

7 WLAN Power-Save Modes

Three types of power save modes can be used by the Wi-Fi section of the W2SW0011U. They are, Full Power Down and IEEE Power Save. The key difference between the two modes is the current consumption, and the time it takes to transition from the power save mode to normal Wi-Fi operation.

7.1 Full Power-Down Mode

This mode completely switches off power to the W2SW0011U. Once in this mode, no power is supplied to the Wi-Fi.

This mode is implemented using an active element such as a FET to control power to the W2SW0011U.

To exit this mode, the FET is switched to supply power. Once power is applied, the host processor downloads firmware to the W2SW0011U. Once firmware has been downloaded, Wi-Fi is considered to have exited this mode.

7.2 IEEE Power Save

This mode puts sections of the Wi-Fi into “sleep with periodic wake” mode. This mode is entered when the appropriate command is sent by the host processor to the Wi-Fi.

The device automatically wakes up to receive beacons periodically, and if there is no traffic indicated for the device, it will go back to sleep. Power consumption is dependent on the DTIM value of the AP it is connected to.

When DTIM=1, the device wakes up every 100ms to receive and acknowledge the beacon from AP to maintain association.

8 Antenna and Clock

W2SW0011u's antenna launch has 50 Ohm impedance.

W2SW0011u has an internal crystal oscillator and requires no external clock source.

9 Software Specifications

Wi2Wi can provide the end user driver needed for operating WLAN part of W2SW0011U for a fee. 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 available off the shelf. Please contact your sales representative for cost and availability. Wi2Wi also provides custom driver development services based on customers' requirements.

Following is a brief description of the driver features along with the processors, operating systems and host buses. Please contact your sales representative for an up-to-date list of supported OS's and platforms.

- Key Features
 - WEP encryption (64 bit/128 bit)
 - IEEE power save mode
 - Infrastructure and ad-hoc mode
 - Rate adaptation
 - WPA TKIP security
 - WPA2
- Operating System Support
 - Linux: Slackware 9.1, Fedora Core 1.0; Kernel: 2.4.22 & above
- Platform Support
 - Intel x86, Atom D2
 - Marvell PXA270, PXA300, PXA310, PXA320
- Host Interface
 - USB 2.0 HS (480 Mbps)

In addition to the end user driver, Wi2Wi also provides, for a fee, engineering tools needed for production testing and certification.

9.1 Host Processor

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

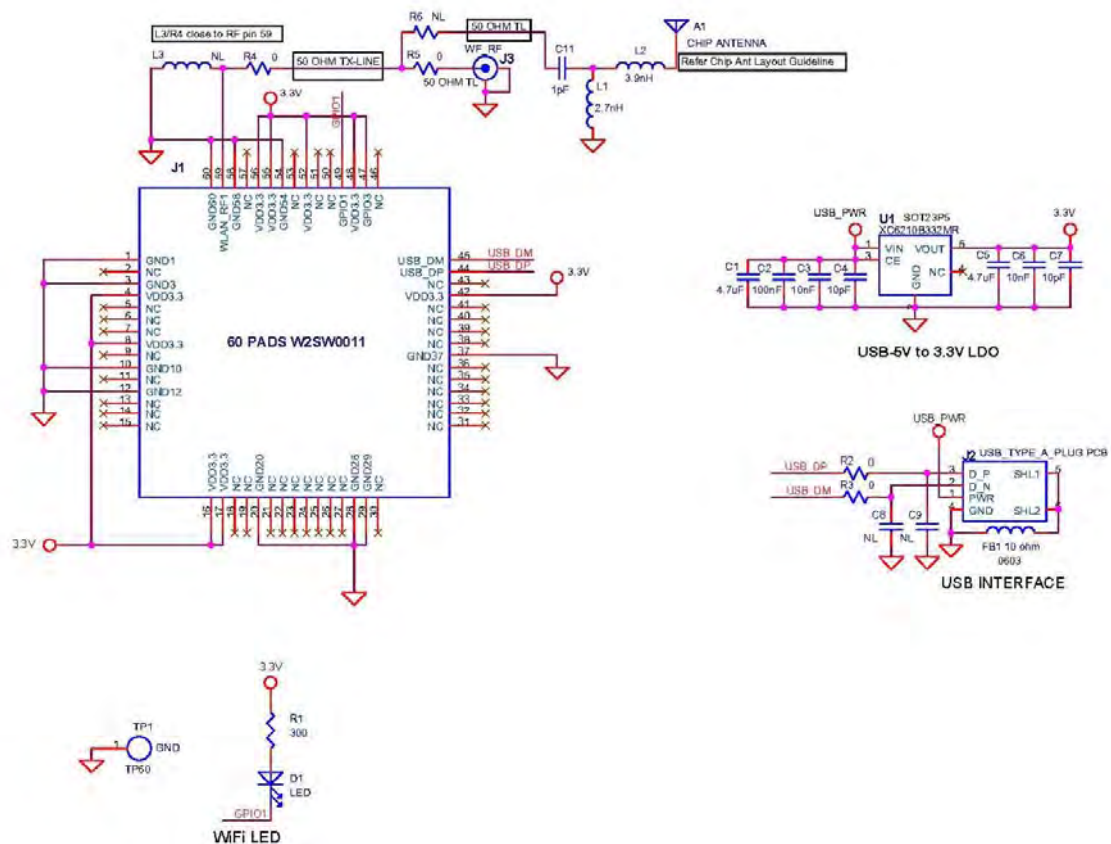
WLAN firmware for Wi-Fi is downloaded through the host interface by the Hardware Interface Driver at power up.

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.

10 Normal Operation Mode

The schematic in Figure 2 shows the W2SW0011U connections.

Figure 2: Normal Operation Mode

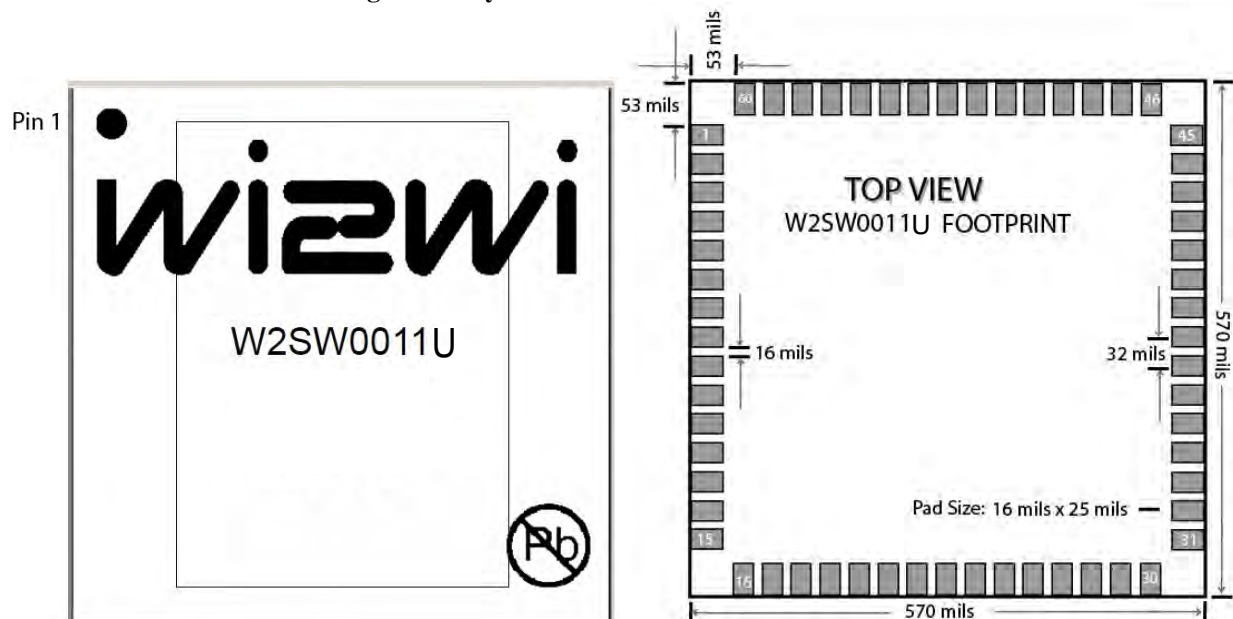


11 Manufacturing Notes

11.1 Physical Dimensions and Pad Locations

- Module Physical Size: 570 x 570 x 100 mils (14.5 x 14.5 x 2.5 mm) (including shield)
- Solder Pad Size: 16 x 25 mils (0.41 x 0.63 mm)
- Pad to pad space: 16 mils (0.41 mm)
- Pad Pitch: 32 mils (0.81 mm)
- Last pad to Module edge: 53 mils (1.35 mm)
- Pad Finish: ENIG (Electroless Nickel Immersion Gold)
- Pads: 60 (4 x 15)

Figure 3: Physical Dimensions and Pad Locations



11.2 Shield Note

The W2SW0011U has an integrated shield; as such a secondary shield is not required.

11.3 Storage and Baking Instructions

W2SW0011U is an MSL3 qualified package. After opening the bag, the parts should be:

- a. Stored as per J-STD-033 standard and
- b. Mounted within 168 hours of factory conditions ($\leq 30^{\circ}\text{C}$, 60% RH)

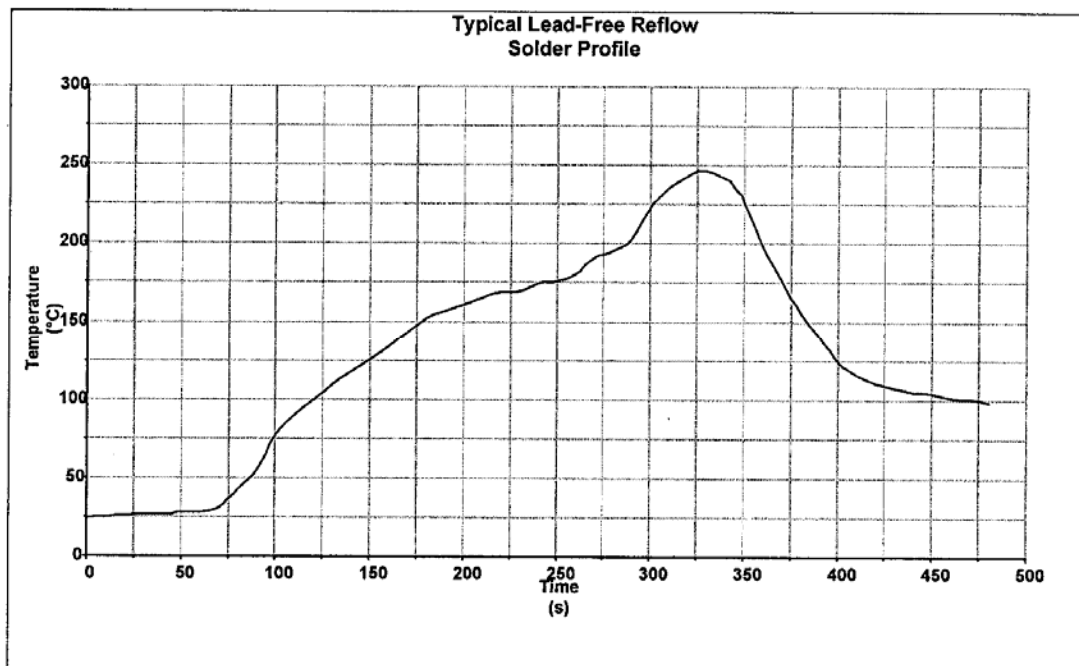
If the parts have been exposed in transit, they need to be baked at 125°C for 16 hours.

11.4 Recommended Reflow Profile

Assembly Guidelines:

1. Follow solder paste manufacturers recommended profile
 - a. All RoHS solder pastes contain the same basic chemistry; however, each manufacturer may have a recommended reflow profile that performs best for their product.
2. The profile illustrated in JESD-020 and below is for reference only.
 - a. **There is no one profile that fits all scenarios.**
3. Profiles must be dialed in to the specific assembly type.
4. ENIG finishes are more susceptible to voids and air entrapment.
 - a. Selecting a RoHS solder paste that is “ENIG” compatible is recommended.
5. Recommended finishes for LGA/BGA inclusive assemblies include HASL, OSP, Tin, & Silver.

Figure 4: 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) = 3°C/sec max.
- Time above liquidus temperature (217°C): 45-90 seconds

12 Disclaimers

Wi2Wi, Inc. PRODUCTS ARE NOT AUTHORISED 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 to change without notice said circuitry and specifications.

12.1 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, firmware 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.

13 Ordering Information

The following part numbering scheme is used for the W2SW0011u

- Part with default firmware settings: W2SW0011U -Y, where “Y” stands for packaging information (explained below)
- Part W2SW0011u

“Y” specifies the packaging information. It can take two values:

- “T” for Tray, and
- “TR” for Tape & Reel.

14 Certifications

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.

W2SW0011U conforms to the following standards when integrated to the W2SW0011U-DEV development system.

FCC
CE

15 References

15.1 Specifications

- IEEE 802.11 b/g/n wireless LAN Specification
- USB 2.0 HS Specification

15.2 Trademarks, Patents and Licenses

- Trademarks: Wi-Fi
- Licenses: 88W8786i Software from Marvell

15.3 Other

- W2SW0011U-DEV: Development Kit

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

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.

CAUTION:

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

Labeling requirements

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.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.

- This device is intended for OEM integrators only.

- Please See the full Grant of Equipment document for other restrictions.

- This device must be operated and used with a locally approved access point.

Information To Be Supplied to the End User by the OEM or Integrator

The following regulatory and safety notices must be published in documentation supplied to the end user of the product or system incorporating an adapter in compliance with local regulations. Host system must be labeled with "Contains FCC ID: U9R -W2SW0011U"