

**802.11b/g + BT2.1 Combo SiP Module
(WM-BG-AQ-02)**



Data Sheet Feb 3rd. 2009 Rev 1.5

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**Preliminary Product Specification
of
WM-BG-AQ-02 WLAN +BT Combo Module**

Preliminary

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Introduction

The 802.11b/g Wireless SiP module WM-BG-AQ-02 which refers as “SiP-g combo module” is a small size module that provides full function of 802.11g/b and Bluetooth class 1/2 in a tiny module via 56 pins LGA Foot Print.

This multi-functionality and board to board physical interface provides SDIO/GSPI interface for WiFi and UART for Bluetooth.

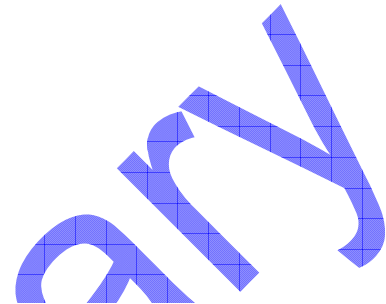
The small size & low profile physical design make it easier for system design to enable high performance wireless connectivity without space constrain. The low power consumption and excellent radio performance make it the best solution for OEM customers who require embedded 802.11g Wi-Fi + Bluetooth features, such as, Wireless PDA, Smart phone, MP3, PMP, slim type Notebook, VoIP phone etc.

The module is based on Atheros AR6002 WiFi and Qualcomm BTS4025 BT chipset. The Radio architecture & high integration MAC/BB chip provide excellent sensitivity. The module is designed as single antenna for WiFi and Bluetooth for the application of small size hand held device.

In addition to WEP 64/128, WPA and TKIP, AES is supported to provide the latest security requirement on your network.

For the software and driver development, USI provides extensive technical document and reference software code for the system integration under the agreement of Atheros International Ltd.

Hardware evaluation kit and development utilities will be released base on listed OS and processors to OEM customers.



Features

- Lead Free design which supporting Green design requirement, RoHS Compliance.
- Support single Antenna for WiFi and Bluetooth
- Excellent Sensitivity.Good Isolation between BT/WiFi and CDMA Small size suitable for low volume system integration.Low power consumption & excellent power management performance extend battery life.
- 2.412-2.484 GHz two SKUs for worldwide market.
- Easy for integration into mobile and handheld device with flexible system configuration and antenna design.



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Change Sheet					
Rev.	Date	Description of change			Approval & Date
		Page	Par	Change(s)	
1.0	11/18/08	All	All	Draft version for Review	
1.1	12/03/08	8,9	5.3	Update Supply Voltage	
1.2	12/17/08	5, 11, 12		Change Module Size and Pin Definition	
1.3	12/22/08	9,10	5	Update Product Spec	
1.4	12/23/08	9,10	5	Update Product Spec	
1.5	02/03/09	5, 8, 10		Change Block Diagram, change WiFi operating temperature -20° to 60°, VBATT 3.0V to 3.6V, and Bluetooth outpower to 8 dBm	

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1. EXECUTIVE SUMMARY

The WM-BG-AQ-02 module is one of the product families in USI's product offering, targeting for system integration requiring a smaller form factor. It also provides the standard migration to high data rate to USI's current SIP customers.

The purpose of this document is to define the product specification for 802.11b/g WiFi module WM-BG-AQ-02. **All the data in this document is based on Atheros AR6002 and Qualcomm 4025 data sheet and other documents provided from Atheros and Qualcomm. The data will be updated after implementing the measurement of the module.**

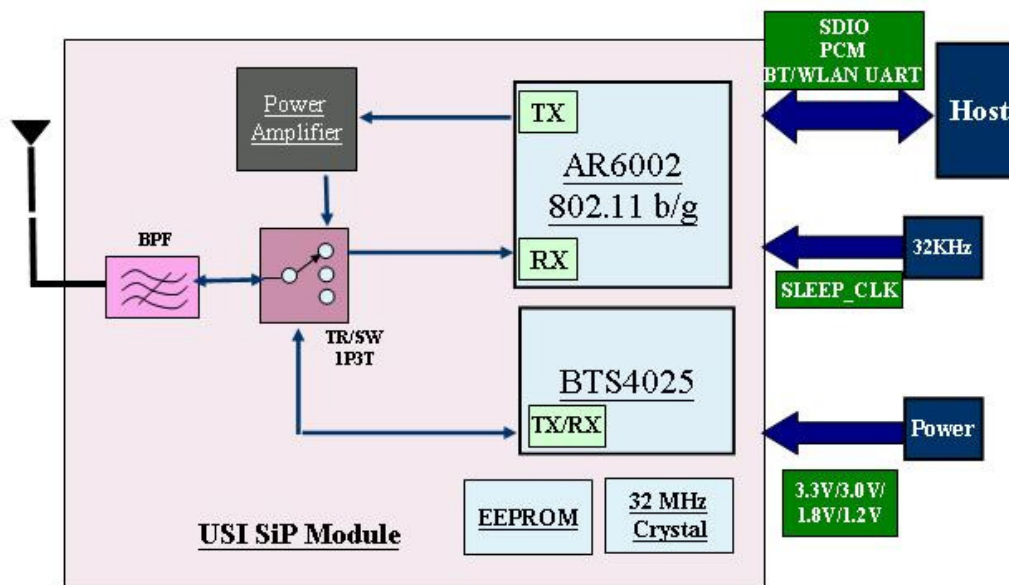
This product is designated for use in embedded applications mainly in the mobile device, which required, small size and high data rate wireless connectivity. The application such as, Wireless PDA, slim type Notebook, Media Adapter, Barcode scanner, mini-Printer, VoIP phone, Data storage device could be the potential application for wireless WM-BG-AQ-02.

2. BLOCK DIAGRAM

The WM-BG-AQ-02 module is designed based on Atheros AR6002 and Qualcomm BTS4025 chipset solution.

It supports generic GSPI, SDIO interface to connect the WLAN to the host processor. High speed UART interfaces are available to connect the Bluetooth2.1 + EDR to the host processor. A Bluetooth co-existence interface is supported for external, co-located Bluetooth devices.

A simplified block diagram of the WM-BG-AQ-02 module is depicted in the Fig. below.



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3. DELIVERABLES

The following products and software will be part of the product.

- ✚ WM-BG-AQ-02 Module with packaging
- ✚ Evaluation kits (with SDIO / GSPI interface)
- ✚ Software utility which supporting customer for integration, performance test, and homologation. Capable of testing, loading (firmware) and configuring (MAC, CIS) for the WM-BG-AQ-02 module.
- ✚ Unit Test / Qualification report
- ✚ Product Specifications.
- ✚ Agency certification pre-test report base on adapter boards

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4. REFERENCE DOCUMENTS

- C.I.S.P.R. Pub. 22 "Limits and methods of measurement of radio interference characteristics of information technology equipment." International Special Committee on Radio Interference (C.I.S.P.R.), Third Edition, 1997.
- CB Bulletin No. 96A "Adherence to IEC Standards: "Requirements for IEC 950, 2nd Edition and Amendments 1 (1991), 2(1993), 3 (1995) and 4(1996). Product Categories: Meas, Med, Off, Tron." IEC System for Conformity Testing to Standards for Safety of Electrical Equipment (IECEE), April 2000.
- CFR 47, Part 15-B "Unintentional Radiators". Title 47 of the Code of Federal Regulations, Part 15, FCC Rules, Radio Frequency Devices, Subpart B.
- CFR 47, Part 15-C "Intentional Radiators". Title 47 of the Code of Federal Regulations, Part 15, FCC Rules, Subpart C. URL: http://www.access.gpo.gov/nara/cfr/waisidx_98/47cfr15_98.html
- CSA C22.2 No. 950-95 "Safety of Information Technology Equipment including Electrical Business Equipment, Third Edition." Canadian Standards Association, 1995, including revised pages through July 1997.
- EN 60 950 "Safety of Information Technology Equipment Including Electrical Business Equipment." European Committee for Electrotechnical Standardization (CENELEC), 1996, (IEC 950, Second Edition, including Amendment 1, 2, 3 and 4).
- IEC 950 "Safety of Information Technology Equipment Including Electrical Business Equipment." European Committee for Electrotechnical Standardization, Intentional Electrotechnical Commission. 1991, Second Edition, including Amendments 1, 2, 3, and 4.
- IEEE 802.11 "Wireless LAN Medium Access Control (MAC) And Physical Layer (PHY) Specifications." Institute of Electrical and Electronics Engineers. 1999.

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5. TECHNICAL SPECIFICATION

5.1. ABSOLUTE MAXIMUM RATING

Supply Power	Max +3.6 Volt	
Non Operating Temperature	- 40° to 85° Celsius	
Voltage ripple	+/- 2%	Max. Values not exceeding Operating voltage

5.2. RECOMMENDABLE OPERATION CONDITION

5.2.1. TEMPERATURE, HUMIDITY

The WM-BG-AQ-02 module has to withstand the operational requirements as listed in the table below.

Operating Temperature	-20° to 60° Celsius	
Humidity range	Max 95%	Non condensing, relative humidity

5.2.1. VOLTAGE

Power supply for the WM-BG-AQ-02 module will be provided by the host via the power pins

Symbol	Parameter	Min	Typ	Max	Unit
VBATT	Battery Voltage	3.0	3.3	3.6	V
DVDD_GPIO_0	GPIO I/O Supply	1.71	1.8	3.46	V
DVDD_SDIO	GPIO I/O Supply	1.71	1.8	3.46	V
DVDD12	Digital 1.2V core supply	1.14	1.2	1.26	V
AVDD12	Analog 1.2V core supply	1.14	1.2	1.26	V
AVDD18	Analog 1.8V I/O supply	1.71	1.8	1.89	V

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DVDD_BT	BT coexistence I/O supply	1.71	1.8	3.46	V
BT_VDD_IO	POWER SUPPLY VOLTAGE, DIGITAL I/OS	1.62	1.8 TO 3.0	3.63	V
BT_VDD_PA	POWER SUPPLY VOLTAGE TO AMPLIFIER	1.7	----	3.0	V
BT_VDD_MSM	POWER SUPPLY VOLTAGE, DIGITAL REGULATORS	1.7	----	3.0	V

5.3. WIRELESS SPECIFICATIONS

The WM-BG-AQ-02 module complies with the following features and standards;

Features	Description
WLAN Standards	IEEE 802 Part 11b/g (802.11b/g)
Bluetooth	Bluetooth™ 2.1 compliance
Antenna Port	Support Single Antenna for WiFi and BT
Frequency Band	2.400 – 2.484 GHz

5.4. RADIO SPECIFICATIONS 802.11G

Features	Description
Frequency Band	2.4000 – 2.497 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
Supported rates	1,2, 5.5,11,6,9,12,24,36,48,54 Mbps
Maximum receive level	- 10dBm (with PER < 8%)
Output Power	16 dBm +2.0/-1.5 dBm for 11b 15 dBm +2.0/-1.5 dBm for 11g

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Receiver Characteristics (3.3V, 25 degree C)	Typical	Max.	Unit
PER <8%, Rx Sensitivity @ 11 Mbps	-86	-84	dBm
PER <8%, Rx Sensitivity @ 6 Mbps	-90	-88	dBm
PER <8%, Rx Sensitivity @ 1 Mbps	-92	-90	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-72	-70	dBm

5.5. RADIO SPECIFICATIONS 802.15 BLUETOOTH

The Radio specification is compliant with the Bluetooth™ 2.1 + EDR specification

Features	Description
Frequency Band	2400 ~ 2483.5 MHz
Number of Channels	79 channels
Modulation	FHSS (Frequency Hopping Spread Spectrum) , GFSK
Antenna Port	Single Antenna for WiFi and BT

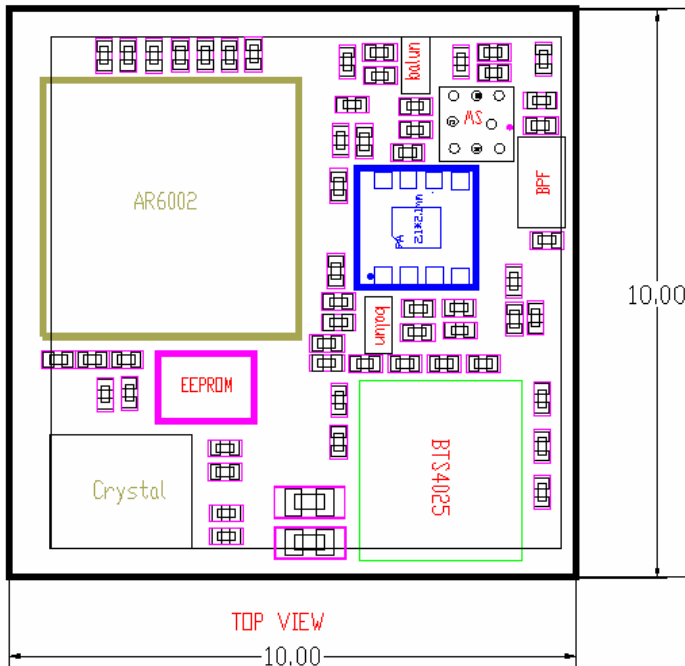
5.6. BLUETOOTH RADIO CHARACTERISTICS

Features	Description
Maximum Receive Level	TBD
Output Power	8 dBm (Typical)
Sensitivity	-84 dBm @ 0.1% BER @ 25 ° Celsius (Typical)

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5.7. DIMENSIONS, WEIGHT AND MOUNTING

The following paragraphs provide the requirements for the size, weight and mounting of the WM-BG-AQ-02 module.



5.7.1. DIMENSIONS

The size and thickness of the WM-BG-AQ-02 module 10mm (W) x 10mm (L) x 1.3mm (H):

6. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

The WM-BG-AQ-02 module is pre-tested to ensure that all requirements met as set forth in the following sections.

Final certification (module certification) requires the antenna of targeted system with a lead-time of 6 weeks. The product deliverable shall be a pre-tested WM-BG-AQ-02 module. No module level certification on WM-BG-AQ-02 module.

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7. PIN DEFINITION

The foot print dimension and pin definition is defined as below

PIN	DESCRIPTION	PIN	DESCRIPTION	PIN	DESCRIPTION
1	XTALI	21	BT_PCM_IN	41	BT_CLK_REQ_OUT
2	XTALO	22	BT_PCM_CLK	42	VBATT
3	BT_CLK_EN	23	BT_PCM_SYNC	43	VBATT
4	TXDO	24	BT_CLK32K_IN	44	DVDD_BT
5	Wow	25	BT_DLDO_C	45	GPIO_4
6	RXDO	26	GND	46	GPIO_5
7	CLK_REQ	27	BT_VDD18	47	DVDD12
8	SYS_RST_L	28	BT_EXT_WAKE	48	DVDD_GPIO_0
9	CHIP_PWD_L	29	BT_ALDO_C	49	AVDD12
10	SDIO_DATA[0]	30	BT_SYSRST	50	AVDD18
11	GND	31	BT_HOST_WAKE	51	DVDD_GPIO_1
12	SDIO_CLK	32	BT_XTAL_P/CLK	52	GND
13	GND	33	BT_UART_CTS	53	GND
14	SDIO_DATA[1]	34	BT_UART_RTS	54	GND
15	SDIO_DATA[2]	35	BT_UART_TXD	55	GND
16	SDIO_CMD	36	BT_UART_RXD	56	GND
17	SDIO_DATA[3]	37	GND		
18	LF_XTALI	38	RF_IN_OUT_1		
19	DVDD_SDIO	39	GND		
20	BT_PCM_OUT	40	BT_VDD_IO		

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8. RECOMMEND FOOTPRINT

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