WLAN-Bluetooth SiP W2CBW003
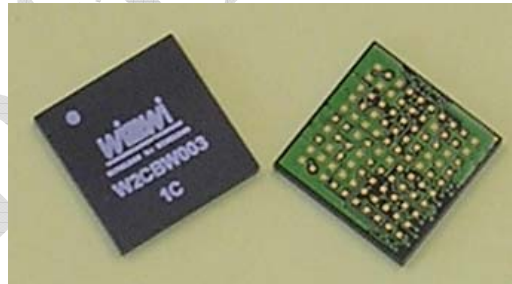
AST-PDT-DOC Revision 1.1
October 20, 2006

Table of Contents

1   Revision History

Document Type:	**Product Specification**
Document Control Number	**AST-PDT-DOC**
Revision	**1.1**
Date	**October 20, 2006**
Initiator	**Kathleen Ciampossin**

Change History

Revision	Revision Date	Originator	Changes
1.0	9/29/2006	Kathleen Ciampossin	First release
1.1	10/20/2006	Dhiraj Sogani	First official release; Added the missing content and changed formatting.

2 Scope

This specification provides a general guideline on the performance and the integration of Wi2Wi's 802.11b/g + Bluetooth System in Package (SiP) Solution. The SiP, P/N W2CBW003, is targeted to assist companies to easily integrate both WLAN and Bluetooth functionally into their products. This is accomplished by reducing their development times and cost by using a complete, small form factor, low power, ready to integrate Radio System Solution.

The specification maximum and minimum limits presented herein are those guaranteed when the unit is integrated into the Wi2Wi's W2CBW003-DEV Development System. These limits are to serve as the representative performance characteristics of the W2CBW003 when properly designed into a customer's product. Wi2Wi makes no warranty, implied or otherwise specified, with respect to a customers design and the performance characteristics presented in this specification.

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

3 General Features

- Compact design for easy integration: 12mm x 12mm x 1.4mm
- System-in-Package LGA with 100 pins
- WLAN technology based on Marvell's 88W8686
- Bluetooth technology based on CSR BC04-ROM
- Certified dual mode radio
- Optimized RF and electrical design for better performance in co-existence with other wireless standards
- Dual-antenna design with separate antennae for Bluetooth and WLAN
- Operates in 2.4GHz ISM band
- ROHS Compliant
- Single supply of 3.3V
- Fully integrated coexistence solution
- WLAN Specific Features
    - o SDIO 1.1 and G-SPI interfaces
    - o Programmable GPIOs for applications
    - o 50-Ohm antenna launch
    - o Support for WinCE and Linux (can be ported to other operating systems)
    - o 1, 2, 5.5 and 11 Mbps data rates for 802.11b (DSSS/CCK modulation)
    - o 6, 9, 12, 18, 24, 36, 48 and 54 Mpbs data rates for 802.11g (OFDM modulation)
- Bluetooth Specific Features
    - o UART, USB, PCM audio interfaces
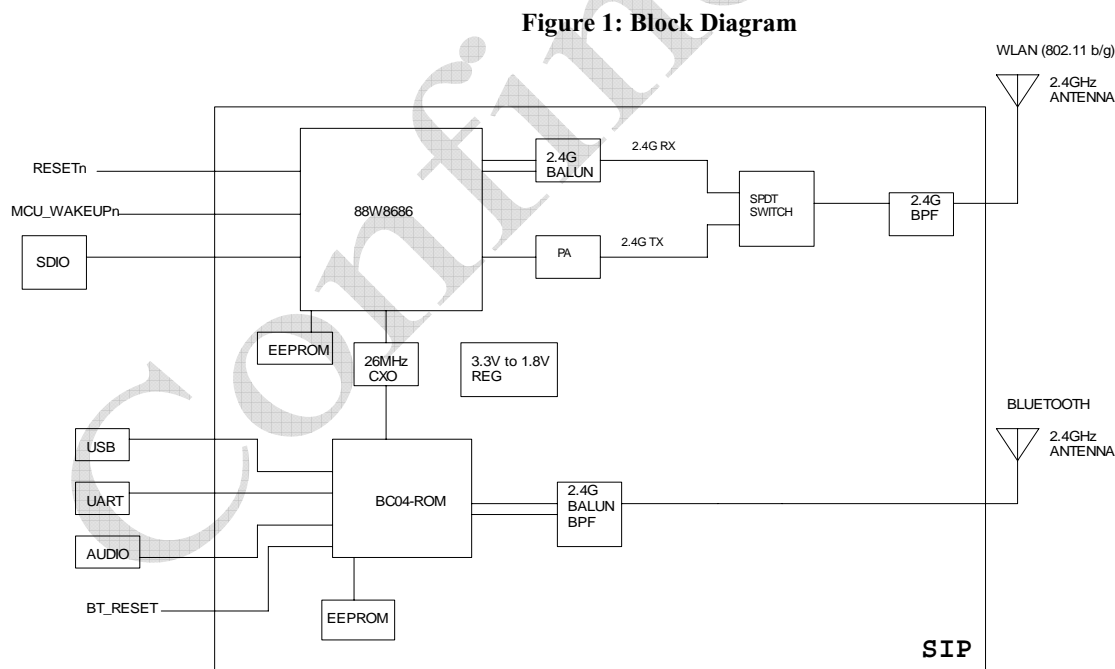   - o SPI interface for integration, test and diagnostics

o Programmable GPIOs for applications
o 50-Ohm antenna launch
o Support for WinCE and Linux (can be ported to other operating systems)
o GFSK modulation for Bluetooth version 2.0
o π/4 DQPSK, 8DPSK modulation for Bluetooth EDR
o Data rate upto 1Mbps for Bluetooth version 2.0
o Data rate upto 3 Mbps for Bluetooth EDR

4 System Description

W2CBW003 is a complete system-in-package combination of 88W8686 802.11b/g and CSR Bluetooth BC04 ROM. It includes all the components to operate both the radio. It preserves the characteristics from individual Marvell and CSR chipsets while providing the optimized the system level functionality and performance.

4.1 Block Diagram

Figure #1 shows the detailed block diagram of W2CBW003 along with the interfaces.

Figure 1: Block Diagram

4.2 Pin Description

Table 1: Pin Description

Pin Number	Pin Name	Type	Description
WLAN Pins			
E2	WF_RESETn	I/O	WLAN Reset (active low)
K9	WF_ANT	RF	WLAN RF port to Antenna
H3	WF_SDIO_CMD	I/O	Standard SDIO command line
F1	WF_SDIO_DATA_3	I/O	Standard SDIO data bus
J4	WF_SDIO_CLK	I/O	Standard SDIO clock line
F4	WF_SDIO_DATA_1	I/O	Standard SDIO data bus
K6	WF_SDIO_DATA_2	I/O	Standard SDIO data bus
J5	WF_SDIO_DATA_0	I/O	Standard SDIO data bus
J2	WF_TDO	O	JTAG Test Data Input, external 5GHz LNA output, reset configuration of XOSC
K7	WF_TR_N	O	Transmit Switch Control Negative Output, reset configuration of internal/external 1.2V regulator
K4	WF_ANT_SEL_N	O	Differential antenna select negative output, reset configuration of host interface select
J3	WF_ANT_SEL_P	O	Differential antenna select positive output
K3	WF_PA_PE_G	O	PA Power Enable Control (802.11g mode), reset configuration of host interface select
G2	WF_GPIO0	I/O	External oscillator control/SLEEPn
H2	WF_GPIO1	I/O	Transmit power or receive ready LED
F3	WF_GPIO2	I/O	UART RTS output, reset configuration of JTAG/function mode
G1	WF_GPIO3	I/O	UART DSR input
G4	WF_GPIO4	I/O	WLAN MAC wake-up input/interrupt input
D1	WF_GPIO5	I/O	UART DTR output, reset configuration of XOSC
E1	WF_GPIO6	I/O	UART SOUT output, reset configuration of XOSC
A3	CLK_SOURCE	I	External CLK source if no internal OSC in SIP
F2	WF_SLEEP CLK	I	External Sleep clock source if not use internal sleep clock
G3	WF_PDn	I	Full power down, connect to power down pin of host or 1.8V
Power Pins			
C1, C3, G6, F7, A8, B8, G8, H8, J8, K8, B9, G9, J9, A10, B10, J10, K10	GND	Ground	Ground
A1, B1, C2, D2, D3, E3, F5, J6, G7, H7, J7, F8, H9, G10	3V3_W	Power	3.3V Power supply for WLAN
B4, F6, E7, E8, E9, C10, D10, E10	3V3_B	Power	3.3V Power supply for Bluetooth

Pin Number	Pin Name	Type	Description
Bluetooth Pins			
A9	BT_ANT	RF	Bluetooth RF port for antenna
C5	BT_PCM_CLK	I/O	Synchronous data clock
C4	BT_PCM_IN	I	Synchronous data input
C8	BT_PCM_OUT	O	Synchronous data output
B6	BT_PCM_SYNC	I/O	Synchronous data sync
D8	BT_UART_RX	I	UART data input
E5	BT_UART_TX	O	UART data output
E4	BT_UART_RTS	O	UART data request to send
C7	BT_UART_CTS	I	UART data clear to send
D6	BT_USB_DN	I/O	USB data
D7	BT_USB_DP	I/O	USB data
A2	BT_SPI_CSB	I	Chip select for Serial Peripheral Interface (SPI)
B3	BT_SPI_MOSI	I	SPI data input into BlueCore
D5	BT_SPI_CLK	I	SPI clock
A4	BT_SPI_MISO	O	SPI data output from BlueCore
B2	BT_RESETn	I/O	Bluetooth reset if low > 5ms
B7	BT_GPIO10	I/O	Programmable I/O
Reserved Pins (leave unconnected)			
H4, H6, H5, G5, D4, D9, C6, E6, J1, K2, H1, K1, K5, H10, A7, A6, A5, C9, B5, F9, F10	RESERVED	TEST POINT	For debugging purposes

4.3 Pin Map (Top View)

W2CBW003 10/20/06	1	2	3	4	5	6	7	8	9	10
A	3V3_W	BT_SPI_CSB	CLK_SOURCE	BT_SPI_MISO	NC	NC	NC	GND	BT_ANT	GND
B	3V3_W	BT_RESET	BT_SPI_MOSI	3V3_B	NC	BT_PCM_SYNC	BT_PIO_10	GND	GND	GND
C	GND	3V3_W	GND	BT_PCM_IN	BT_PCM_CLK	NC	BT_UART_CTS	BT_PCM_OUT	NC	3V3_B
D	GPIO5	3V3_W	3V3_W	NC	BT_SPI_CLK	BT_USB_DN	BT_USB_DP	BT_UART_RX	NC	3V3_B
E	GPIO6	RESETN	3V3_W	BT_UART_RTS	BT_UART_TX	NC	3V3_B	3V3_B	3V3_B	3V3_B
F	SD_D3	CLK_OUT	GPIO2	SD_D1	3V3_W	3V3_B	GND	3V3_W	NC	NC
G	GPIO3	GPIO0	PDN	GPIO4	NC	GND	3V3_W	GND	GND	3V3_W
H	NC	GPIO1	SD_CMD	NC	NC	NC	3V3_W	GND	3V3_W	NC
J	NC	TDO	ANT_SEL_P	SD_CLK	SD_D0	3V3_W	3V3_W	GND	GND	GND
K	NC	NC	PA_PE_G	ANT_SEL_N	NC	SD_D2	TR_N	GND	11B/G_ANT	GND

5 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			3.3	4.2	V
Recommended Operating Conditions					
Operating Temperature		-20		75	°C
Supply Voltage +3V_IO		3	3.3	3.6	V
802.11b Current Consumption					
Initialization Current			100		mA
Continuous Transmit Mode	@11Mbps	190	210	230	mA
Continuous Receive Mode	@11Mbps	160	180	190	mA
IEEE 802.11 Power Save Mode			2		mA
802.11b RF System Specifications					
Transmit Power Output			16		dBm
Receive Sensitivity	1 Mbps, 8% PER		-84		dBm
	2 Mbps, 8% PER		-85		dBm
	5.5 Mbps, 8% PER		-85		dBm
	11 Mbps, 8% PER		-82		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		-30		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			100		mA
Continuous Transmit Mode	@54Mbps	220	230	240	mA
Continuous Receive Mode	@54Mbps	200	210	220	mA
IEEE 802.11 Power Save Mode			2		mA
802.11g RF System Specifications					
Transmit Power Output			15		dBm

	6 Mbps, 10% PER		-81		dBm
	9 Mbps, 10% PER		-81		dBm
	12 Mbps, 10% PER		-81		dBm
Receive Sensitivity	18 Mbps, 10% PER		-78		dBm
	24 Mbps, 10% PER		-74		dBm
	36 Mbps, 10% PER		-73		dBm
	48 Mbps, 10% PER		-68		dBm
	54 Mbps, 10% PER		-67		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
			-40@fc±20MHz		
			-50@fc±30MHz		
Error Vector Magnitude	Max. TX Power @ 11Mbps		-30		dB
Carrier Suppression	Max. TX Power		-25		dBc
Adjacent Channel Rejection	Desired channel is 3dB above sensitivity, 11Mbps, PER<8%		15		dBc
Bluetooth Current Consumption					
Initialization Current			20		mA
Continuous Transmit Mode		45	50	59	mA
Continuous Receive Mode		32	36	42	mA
IEEE 802.11 Power Save Mode			4		mA
Bluetooth RF System Specifications					
Transmit Power Output		1.5	3	4	dBm
Receive Sensitivity	1 Mbps, 0.1% BER		-84		dBm
	2 Mbps, 0.1% BER		-87		dBm
	3 Mbps, 0.1% BER		-80		dBm
Initial Carrier Frequency Tolerance			5		kHz
Drift Rate			10		kHz
Drift (single slot packet)			10		kHz
Drift (five slot packet)			13		kHz
Carrier Frequency Drift Rate, DH5			13		kHz
Δf1avg Maximum Modulation			165		kHz
Δf2max Minimum Modulation			168		kHz
Δf2 avg /Δf1 avg			1.02		
20dB Bandwidth			654		kHz

6 Coexistence Test Results

W2CBW003 has an integrated coexistence mechanism. The following is a summary of the test results for six different use cases.

General Test Configuration

- Two antennae 2.6 inches apart (one for WLAN and one for Bluetooth)
- Open environment testing with no shielding
- Windows XP platform
- Toshiba laptop with SDIO slot for WLAN and USB for Bluetooth
- IBM laptop for Access Point
- WLAN transmission throughput measurements with "iperf"
- Bluetooth transmission using Toshiba setup
- Co-existence enabled on Bluetooth and WLAN
- AFH enabled on Bluetooth
- A2DP profile on Bluetooth.
- Skype on PC.

Case 1: Data transfer over WLAN with simultaneous data transfer over Bluetooth

Case specific test configuration: Bluetooth ACL Link

	WLAN Data Throughput	Bluetooth Data Throughput
WLAN Data Transfer Only	~17 Mbps	-
Bluetooth Data Transfer Only	-	1.073 Mbps
Simultaneous Bluetooth and WLAN Data Transfer	~16 Mbps	128 kbps

Case 2: Data transfer over WLAN with simultaneous voice over Bluetooth headset

Case specific test configuration: Bluetooth SCO Link

	WLAN Data Throughput	Bluetooth Audio Quality
WLAN Data Transfer Only	~16 Mbps	-
Bluetooth Voice Only	-	Voice is Clear
WLAN Data Transfer with Voice Over Bluetooth	~10 Mbps	Voice is clear

Case 3: Data over WLAN while using Bluetooth Human Input Device (HID).

Case specific test configuration: Bluetooth ACL Link

	WLAN Data Throughput	Bluetooth Mouse Speed
WLAN Data Transfer Only	~16 Mbps	-
Bluetooth Mouse Only	-	BT mouse moving speed is acceptable
WLAN Data Transfer with Simultaneous Bluetooth Mouse	~14 Mbps	BT mouse moving speed is acceptable

Case 4: Streaming media over WLAN with stereo audio over BT.

Case specific test configuration:
- *Bluetooth ACL link and with A2DP profile*
- *Access point connected to Internet*
- *WLAN client connected to Access Point for streaming media*

Stereo Audio Quality	Very Good
Video Quality	Clear with no breaks in video

Case 5: VoIP call over WLAN with Bluetooth headset.

Case specific test configuration:
- *Bluetooth SCO link*
- *Access Point connected to internet*
- *WLAN client connected to Access Point and using VOIP application (Skype) on PC to make a call*

Voice Quality	Clear

Case 6: VoIP call over WLAN on PC with simultaneous Data transfer over Bluetooth .

Case Specific Test Configuration:
- *Bluetooth ACL link*
- *Access Point connected to internet*

- *WLAN client connected to AP and using VOIP application (Skype) on PC to make a call*

VoIP Voice Quality	Clear
BT transfer data (bit rate)	780 Kbps

7 WLAN External Interfaces

W2CBW003 supports SDIO and G-SPI interfaces for WLAN.

7.1 SDIO Interface

W2CBW003 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.

W2CBW003 acts as a device on the SDIO bus. The host unit can access registers of the SDIO interface directly and can access shared memory in the device through the use of BARs and a DMA engine.

The SDIO device interface main features include:
- On-chip memory used for CIS
- Supports SPI, 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

W2CBW003 Pin Name	SDIO Specification Pin Name	Type	Description
WF_SDIO_DATA_3	DAT3	I/O	Data Line Bit 3
WF_SDIO_DATA_2	DAT2	I/O	Data Line Bit 2
WF_SDIO_DATA_1	DAT1	I/O	Data Line Bit 1
WF_SDIO_DATA_0	DAT0	I/O	Data Line Bit 0
WF_SDIO_CLK	CLK	I/O	Clock
WF_SDIO_CMD	CMD	I/O	Command/Response

7.2 G-SPI Interface

W2CBW003 supports a generic, half-duplex, DMA-assisted SPI host interface (G-SPI) that allows a host controller using a generic SPI bus protocol to access the WLAN device. The G-SPI interface contains interface circuitry between an external SPI bus and the internal shared bus.

The 88W8686 acts as the device on the SPI bus. The host unit can access the G-SPI registers directly and can access shared memory in the device through the use of BARs and a DMA engine.

The SPI unit supports generic SPI Interface protocols as detailed in the following sections. The design is capable of 50 MHz operation. The interface supports the following functionality:

- SPI unit bus device operation
- SPI unit register read / write
- Interrupt generation to internal CPU
- Interrupt generation to the SPI unit host
- DMA to internal memories
- Wake Interrupt to the Power Management Unit

8   Bluetooth External Interfaces

W2CBW003 supports UART, USB, PCM and SPI interfaces for Bluetooth.

8.1 UART Interface

W2CBW003 UART interface provides a simple mechanism for communicating with other serial devices using the RS232 standard. Four signals are used to implement the UART function:

- BT_UART_TX
- BT_UART_RX
- BT_UART_RTS
- BT_UART_CTS

When W2CBW003 is connected to another digital device, BT_UART_RX and BT_UART_TX transfer data between the two devices. The remaining two signals, BT_UART_CTS and BT_UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators. UART configuration parameters, such as Baud rate and packet format, are set using W2CBW003 PS keys.

To communicate with the UART at its maximum data rate using a standard PC, an accelerated serial port adapter card is required for the PC. An external RS232 transceiver chip is also needed.

Table 4: UART Baud Rates

Parameter		Possible Values
Baud Rate	Minimum	1200 Baud (≤2%Error)
		9600 Baud (≤1%Error)
	Maximum	3MBaud (≤1%Error)
Flow Control		RTS/CTS or None
Parity		None, Odd or Even
Number of Stop Bits		1 or 2
Bits per channel		8

The UART interface is capable of resetting W2CBW003 upon reception of a break signal. A break is identified by a continuous logic low (0V) on the BT_UART_RX.

Figure 2: UART Break Signal
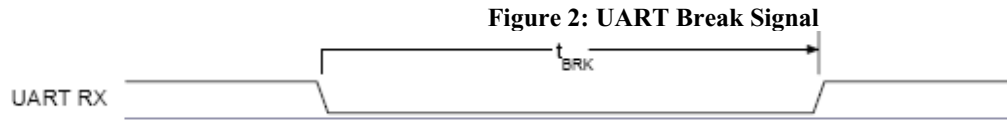
PS Key "PSKEY_UART_BAUD_RATE (0x204)" can be used to set the desired Baud Rate for UART.

8.2 USB Interface

W2CBW003 contains a full speed (12Mbits/s) USB interface that is capable of driving a USB cable directly. No external USB transceiver is required. The device operates as a USB peripheral, responding to requests from a master host controller such as a PC. Both the OHCI and UHCI standards are supported. The set of USB endpoints implemented can behave as specified in the USB section of the Bluetooth Specification v2.0 + EDR or alternatively can appear as a set of endpoints appropriate to USB audio devices such as a set of USB speakers.

USB is a master/slave oriented system (in common with other USB peripherals). W2CBW003 only supports USB slave operation.

8.3 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, W2CBW003 has hardware support for continual transmission and reception of PCM data, so reducing processor overhead for wireless headset applications. W2CBW003 offers a bi-directional digital audio interface that routes directly into the baseband layer of the on-chip firmware. It does not pass through the HCI protocol layer.

Hardware on W2CBW003 allows the data to be sent to and received from a SCO connection.

Up to three SCO connections can be supported by the PCM interface at any one time.

W2CBW003 can operate as the PCM interface Master generating an output clock of 128, 256 or 512kHz. When configured as PCM interface slave it can operate with an input clock up to 2048kHz. W2CBW003 is compatible with a variety of clock formats, including Long Frame Sync, Short Frame Sync and GCI timing environments.

It supports 13 or 16-bit linear, 8-bit µ-law or A-law companded sample formats at 8ksamples/s, and can receive and transmit on any selection of three of the first four slots following PCM_SYNC. The PCM configuration options are enabled by setting the PS Key PS KEY_PCM_CONFIG.

W2CBW003 interfaces directly to PCM audio devices including the following:

- Qualcomm MSM 3000 series and MSM 5000 series CDMA baseband devices
- OKI MSM7705 four channel A-law and μ-law CODEC
- Motorola MC145481 8-bit A-law and μ-law CODEC
- Motorola MC145483 13-bit linear CODEC
- STW 5093 and 5094 14-bit linear CODECs
- W2CBW003 is also compatible with the Motorola SSI. interface

8.4 SPI Interface

W2CBW003 uses a 16-bit data and 16-bit address serial peripheral interface. Transactions may occur when the internal processor is running or is stopped. This section describes the considerations required when interfacing to W2CBW003 via the four dedicated serial peripheral interface terminals. Data can be written or read one word at a time or the auto increment feature can be used to access blocks of data.

9 Antenna and Clock

W2CBW003 has two antenna interfaces, one for Bluetooth and one for WLAN. Both of these interfaces have 50 Ohm impedance.

W2CBW003 has an internal crystal oscillator with 26 MHz frequency (frequency stability +/- 20ppm) and requires no external clock source. This crystal provides clock for both WLAN and Bluetooth.

10 Software Specifications

10.1 Wireless LAN

- Key Features
  - WEP encryption (64 bit/128 bit)
  - IEEE power save mode
  - Deep sleep mode
  - Infrastructure and ad-hoc made
  - Rate adaptation
  - WPA TKIP security
  - WPA2
  - Bluetooth coexistence
- Operating System Support
  - WinCE 4.2/5.0, Windows Mobile 2003, Windows Mobile 5.0

- o Linux: Slakeware 9.1, Fedora Core 1.0; Kernel: 2.4.22 & above
- o Other operating systems can be supported by request

10.2 Bluetooth

This section describes the key features of the BlueCore HCI stack.

- Bluetooth v2.0 + EDR mandatory functionality
  - o EDR, 2Mbps payload data rate
  - o EDR, 3Mbps payload data rate
  - o Support 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3 and 3-DH5 packet types
  - o Support 2-EV3, 2-EV5, 3-EV3 and 3-EV5 packet types
- Bluetooth v1.2 mandatory functionality:
  - o Adaptive Frequency Hopping (AFH), including classifier
  - o Faster connection enhanced inquiry scan (immediate FHS response)
  - o LMP improvements
  - o Parameter ranges
  - o Support of AUX1 packet type
- Optional v2.0 + EDR functionality supported:
  - o AFH as Master and automatic channel classification
  - o Fast connect interlaced inquiry and page scan plus RSSI during inquiry
  - o Extended SCO (escort), eV3 + CRC, eV4, eV5
  - o SCO handle
  - o Synchronization
- The firmware has been written against the Bluetooth Core Specification v2.0 + EDR:
  - o Bluetooth components: Baseband (including LC), LM and HCI
  - o Standard USB v2.0 (full speed) and UART HCI transport layers
  - o All standard radio packet types
  - o Full Bluetooth data rate, up to 723.2Kbits/s asymmetric[1]
  - o Operation with up to seven active slaves[1]
  - o Scatternet v2.5 operation
  - o Maximum number of simultaneous active ACL connections: 7[2]
  - o Maximum number of simultaneous active SCO connections: 3[2]
  - o Operation with up to three SCO links, routed to one or more slaves
  - o All standard SCO voice coding, plus .transparent SCO.
  - o Standard operating modes: page, inquiry, page-scan and inquiry-scan
  - o All standard pairing, authentication, link key and encryption operations
  - o Standard Bluetooth power-saving mechanisms: Hold, Sniff and Park modes, including .Forced Hold.
  - o Dynamic control of peers. transmit power via LMP
  - o Master/slave switch
  - o Broadcast
  - o Channel quality driven data rate

- All standard Bluetooth Test Modes
- Operating System Support
  - WinCE
  - Linux
  - Other operating systems can be supported by request

11 Manufacturing Notes

11.1 Physical Dimensions and Pin Locations

- Physical Size: 12mm x 12mm x 1.4mm
- Pad Size: 0.4mm X 0.4mm
- Pad Spacing: 1mm
- Pin Grid Array: 10 x 10

Figure 3: Physical Dimensions and Pin Locations
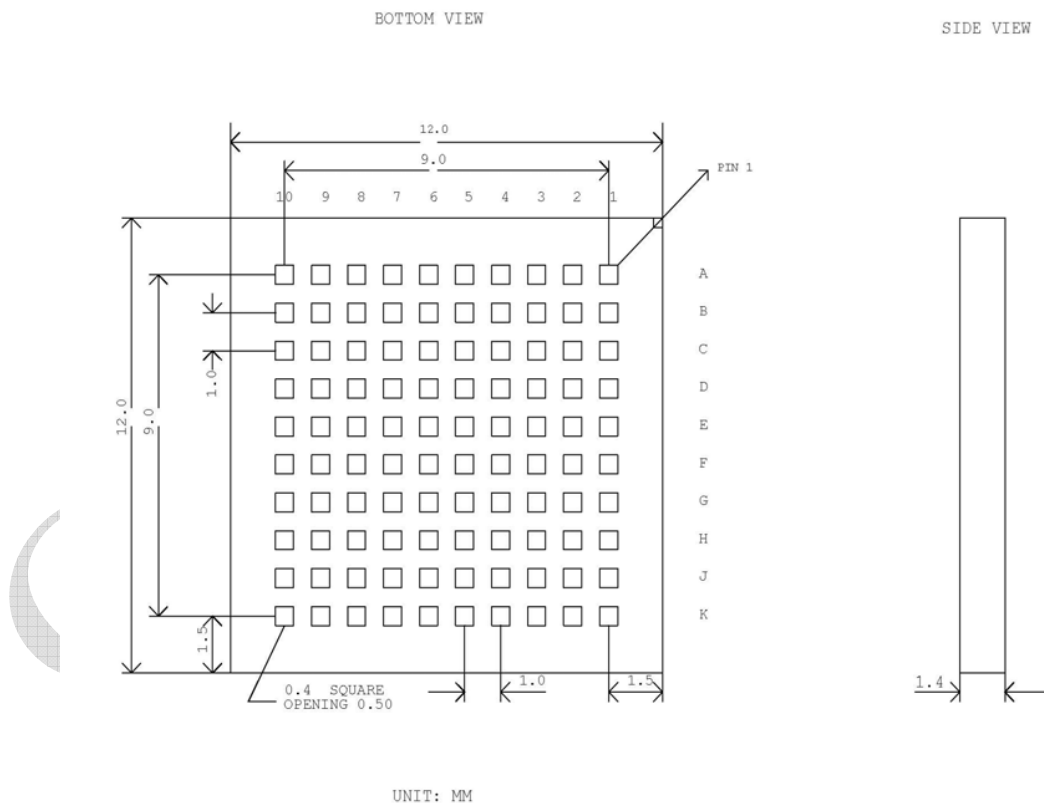
11.2 Recommended Reflow Profile

Figure 4: Recommended Reflow Profile
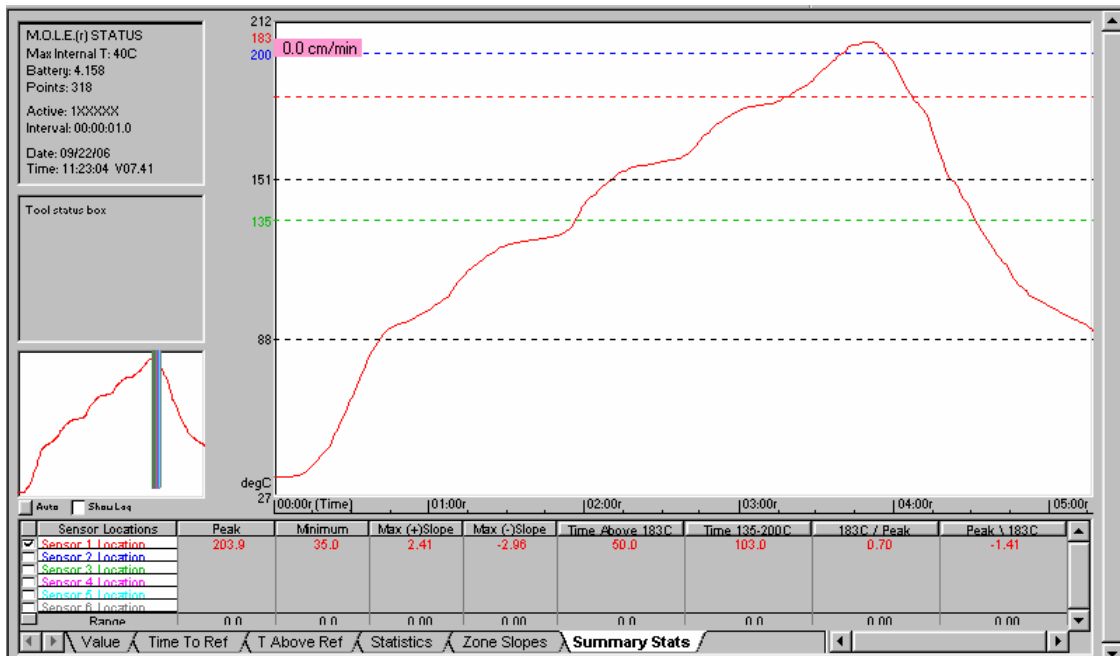
12 Certifications

W2CBW003 shall conform to the following standards when integrated to the W2CBW003-DEV development system.

EMC/Immunity
- United States: FCC Part 15
- Canada: ICES 033
- European Union: EN 55022, IEC 1004/CISPR 22
- Japan: VCCI - V series
- Taiwan: CNS 13438
- People's Republic of China: GB9254
- Korea: MIC

Product Safety
- United States/Canada: UL/CSA 60950, UL 61010, UL 60065, CSA 601,CSA 61010,C22.2 No. 225
- European Union: EN 60950, EN61010, IEC 60065, IEC 60601
- Japan: ARIB STD-T66
- People's Republic of China: CNCA-08C-0312001
- Restriction of Hazardous Substances Directive (RoHS) 2002/95/EC

13 References

13.1 Specifications

- IEEE 802.11 b/g wireless LAN Specification
- Specification of the Bluetooth System, v2.0+EDR, 04 November 2004
- SDIO full-speed card specification
- Universal Serial Bus Specification, v2.0, 27 April 2000

13.2 Trademarks, Patents and Licenses

- Trademarks: Bluetooth, Wi-Fi, EDR
- Licenses: 88W8686 Software from Marvell; BC04-ROM Software from CSR

13.3 Other

- W2CBW003-DEV: Development Kit, WLAN-Bluetooth SiP
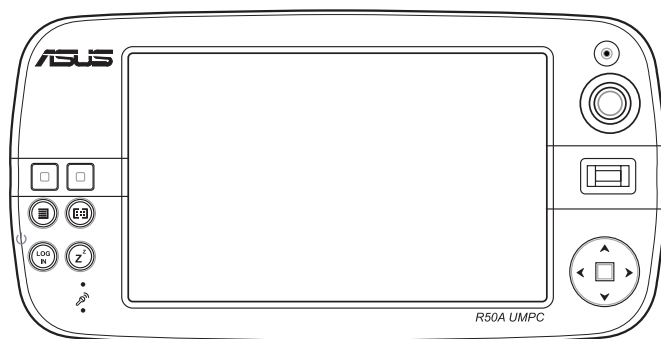
R50A
UltraMobilePC

User Manual

E3850

First Edition
May 2008

Table of Contents

Chapter 3: Connections

Appendices

About this guide

This user guide provides information on the various components of the UltraMobilePC (UMPC) and how to use them.

How this guide is organized

- **Chapter 1: Getting started**

  This chapter describes the features of your UMPC.

- **Chapter 2: Using your UMPC**

  This chapter provides you the steps in using your UMPC.

- **Chapter 3: Connections**

  This chapter provides you with information on the connectivity features of your UMPC.

- **Appendices**

  This chapter provides you with additional information.

Conventions used in this guide

To make sure that you perform certain tasks properly, take note of the following symbols used throughout this manual.

DANGER/WARNING: Information to prevent injury to yourself when trying to complete a task.

CAUTION: Information to prevent damage to the components when trying to complete a task.

IMPORTANT: Instructions that you MUST follow to complete a task.

NOTE: Tips and additional information to help you complete a task.

Safety information

IMPORTANT! Disconnect the AC power and remove the battery pack before cleaning Wipe the UMPC using a clean cellulose sponge or chamois cloth dampened with a solution of nonabrasive detergent and a few drops of warm water and remove any extra moisture with a dry cloth.

DO NOT place on uneven or unstable work surfaces. Seek servicing if the casing has been damaged.

DO NOT place or drop objects on top and do not shove any foreign objects into the UMPC.

DO NOT scratch the display panel. Do not place together with small items that may scratch or enter the UMPC vents.

DO NOT expose to strong magnetic or electrical fields.

DO NOT expose to dirty or dusty environments. **DO NOT** operate during a gas leak.

DO NOT expose to or use near liquids, rain, or moisture. **DO NOT** use the modem during an electrical storm.

DO NOT leave the UMPC on your lap or any part of the body in order to prevent discomfort or injury from heat exposure.

Battery safety warning:
DO NOT throw the battery in fire.
DO NOT short circuit the contacts.
DO NOT disassemble the battery.

SAFE TEMP: This UMPC should only be used in environments with ambient temperatures between 5°C (41°F) and 35°C (95°F)

INPUT RATING: Refer to the rating label on the bottom of the UMPC and ensure that your power adapter complies with the rating.

DO NOT throw the UMPC in municipal waste. Check local regulations for disposal of electronic products.

DO NOT carry or cover a UMPC that is powered ON with any materials that will reduce air circulation such as a carrying bag.

Transportation Precautions

To prepare the UMPC for transport, you should turn it OFF and **disconnect all external peripherals to prevent damage to the connectors**. The hard disk drive's head retracts when the power is turned OFF to prevent scratching of the hard disk surface during transport. Therefore, you should not transport the UMPC while the power is still ON.

Cover Your UMPC

You can purchase an optional carrying case to protect it from dirt, water, shock, and scratches.

CAUTION: The UMPC's surface is easily dulled if not properly cared for. Be careful not to rub or scrape the UMPC surfaces when transporting your UMPC.

Charge Your Batteries

If you intend to use battery power, be sure to fully charge your battery pack and any optional battery packs before going on long trips. Remember that the power adapter charges the battery pack as long as it is plugged into the computer and an AC power source. Be aware that it takes much longer to charge the battery pack when the UMPC is in use.

Airplane Precautions

Contact your airline if you want to use the UMPC on the airplane. Most airlines will have restrictions for using electronic devices. Most airlines will allow electronic use only between and not during takeoffs and landings.

CAUTION: There are three main types of airport security devices: X-ray machines (used on items placed on conveyor belts), magnetic detectors (used on people walking through security checks), and magnetic wands (hand-held devices used on people or individual items). You can send your UMPC and diskettes through airport X-ray machines. However, it is recommended that you do not send your UMPC or diskettes through airport magnetic detectors or expose them to magnetic wands.

R50A specifications

Processor & Cache	Intel Fred (Silverthorne) CPU Z520 1.33GHz, 512L2 cache
Operating System	Microsoft Windows® Vista Ultimate
Main Memory	On board 1GB DDR2-400 (667 down grade) DRAM design
Display	5.6"active matrix TFT, 1024 x 600 pixel
Camera	2.0 megapixel auto-focus camera
Card Slots	1 Micro-SD card slot, push/push type
Hard Disk Drive	SSD HDD 32GB SSD HDD 16GB SSD HDD 8GB
Connectivity	Integrated USB 802.11b/g Bluetooth 2.0+EDR Sierra 3G with Voice solution SIM card connector build in under battery is suggested Support Band 4 or 5 with difference antenna depends on mechanical dimension.
TV	Optional DVB-T mini-Card TV module support dual antenna and mobility to 120kM/hr External Antenna for TV
Battery Pack & Life	Output : 12V/15W DC Input : 100~240V AC, 50/60Hz universal 3/ 2 pin compact power supply system Optional accessory : 12V cable for car charging
Dimensions/Weight	199 x 97 x 28.4 (mm) 520 g (for Primary Battery)
GPS	Built-in GPS One RF connector for external antenna

Package contents

Check your device package for the following items:

Standard Items	
· R50A UMPC	· External ODD Pack*
· AC adapter	· GPS Pack*
· Headset	· External GPS antenna*
· VGA cable	· External TV antenna*
· Mini-USB audio cable	· USB mouse*
· Installation CD	· Bluetooth mouse*
· USB tablet bi-fold keyboard with USB cable	

*Optional

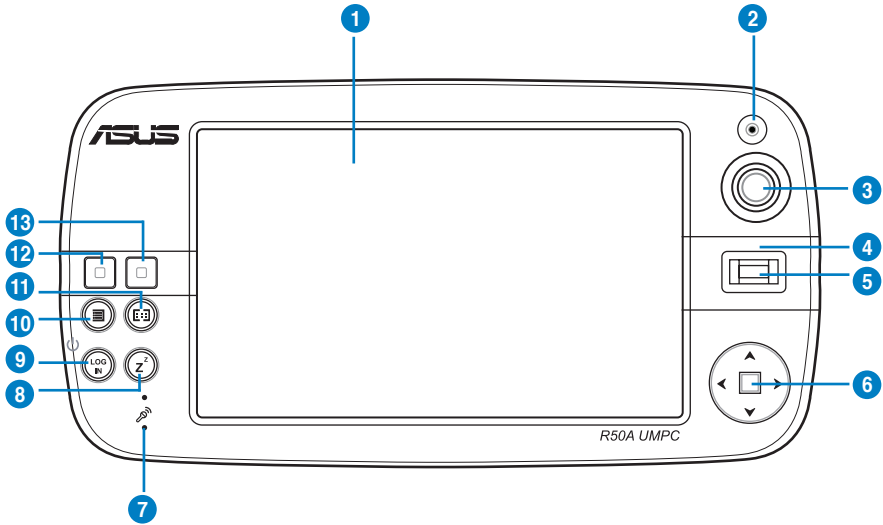**NOTE**: If any of the above items is damaged or missing, contact your retailer.

Chapter 1

Getting started

- **Getting to know your UMPC**
- **Getting your device ready**
- **Starting up**

Getting to know your UMPC

Front features

R50A UMPC

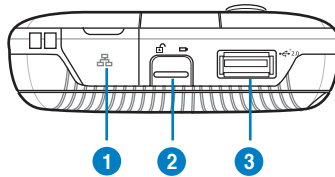| Features	
1	**Display Panel** The 5.6-inch active matrix, 1024 x 600 resolution TFT LCD screen provides you with excellent viewing similar to that of desktop monitors.
2	**Camera** The 2.0 megapixel auto-focus built-in camera allows you to take pictures or video clips. This can also be used for video conferencing and other interactive applications.
3	**Mouse pointer** This a pointing device that mimics the functions of a desktop mouse.
4	**Status indicator** This indicates the status of your battery, drive activity, WLAN, and Bluetooth. Refer to the section *Status indicators* on page 16 for more details.
5	**Fingerprint sensor** The built-in fingerprint sensor allows you to use your fingerprint as your identity key for added security.
6	**Arrow/Enter keys** The arrow keys (left, right, up, down) and the enter key have the same functions as that on the keyboard.

Features	
7	**Microphone (Built-in)** The built-in mono microphone is used for video conferencing, voice narrations, or simple audio recordings.
8	**Sleep/Standby Mode key** Press this key to put your UMPC into Sleep/Standby mode. Slide down the power switch to awaken your UMPC from its Sleep/Standby mode.
9	**LOGIN key** The LOGIN button sends a [Ctrl][Alt][Del] keyboard combination to the operating system to show Windows Security for logging in/off, locking, shutting down, showing task manager, or changing passwords. This special login feature is also known as Secure Attention Sequence (SAS).
10	**UMPC Settings key** This allows you to set the brightness, volume, resolution or power mode of your UMPC.
11	**Windows® Media Center key** This launches the Windows® Media Center which allows you to view and play media files such as video clips, music files, or movies.
12	**Left key** This key mimics the left-click action of a desktop mouse.
13	**Right key** This key mimics the right-click action of a desktop mouse.

Status indicators

Icon	LED Indicator	Status
⏻ **Power**	Blue	The UMPC is turned on.
	Blinking blue	The UMPC is in the Sleep/Standby mode.
	Off	The UMPC is turned off or in Hibernation mode.
▱ **Battery**	Red	The battery is charging.
	Blinking red	The battery capacity is less than 10%.
	Off	The battery is fully-charged.
⬭ **HDD**	Blue	**Drive Activity Indicator** The UMPC is accessing the hard disk drive.
	Blinking blue	The UMPC is shutting down.
((•)) WLAN	On	The built-in wireless LAN (WLAN) is enabled.
❈ Bluetooth	On	The built-in Bluetooth function is activated.

Right features

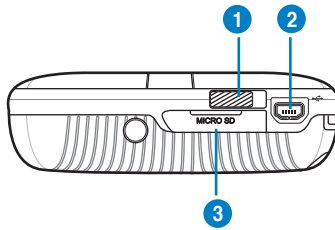| Features	
①	**USB Bluetooth port** This contains the USB Bluetooth port. Insert a USB Bluetooth dongle to activate the UMPC's built-in Bluetooth function.
②	**Battery Lock** Keeps the battery secure. Press up then slide the back cover downward to open the battery.
③	**USB Port (2.0/1.1)** Insert USB2.0 or USB1.1 devices such as keyboards, pointing devices, hard disk drives, printers and scanners into this port.

Left features

Features	
①	**Power switch** Turns on/off the UMPC and puts it on Sleep/Standby or Hibernation mode.
②	**Mini-USB port** Insert an external USB keyboard into this port.
③	**MicroSD slot** Insert a microSD card into this slot.