

## **Federal Communication 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 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.

FCC Caution: To assure continued compliance, (example - use only shielded interface cables when connecting to computer or peripheral devices) any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This device is intended only for OEM Integrators. The OEM integrator should be aware of the following important issues.

## **Labeling of the End Product**

The end product integrate this module has to be clearly identified on the label that this end product contain an FCC approved RF module. The format of such statement could be " Contains Transmitter with FCC ID: IXMWM-BB-AG-01" or similar.

## **Integration Note**

- a) This module is authorized under limited module approval specified to mobile host equipment. So, the antenna must be installed such that 20cm is maintained between the antenna and users.
- b) The transmitter module may not be co-located with any other transmitter or antenna.

As long as the 2 conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emission, PC peripheral requirements, etc.)

## **IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations, general purpose PCMCIA or similar cards, or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product (including the transmitter) and obtaining a separate FCC authorization.

# 802.11b+Bluetooth COMBO SiP Module WM-BB-AG-01



www.usi.com.tw

Data Sheet Feb. 2004, Rev 2.4

## Introduction

The USI 802.11 Wireless SiP module WM-BB-AG-01 which refers as “COMBO SiP module” is a full small size module that provides full function of 802.11b and Bluetooth class 2 on a 22\*29 mm tiny module via 60 pins board to board connector.

This multi- functionality and board to board physical interface provide system users the maximum flexibility including system feature and system integration.

WM-BB-AG-01 is approved as one of USI embedded Wi-Fi module product lines. There are two product variants of WM-BB-AG-01 by de-populating either 802.11b or Bluetooth to be a single module which provided better cost-feature on system with single design-in effort.

The small size design (**22\*29\*3.5 mm**), low power consumption (**Tx 330 mA**) and excellent radio performance make it the best solution which is suitable for OEM customers who require embedded 802.11b Wi-Fi plus Bluetooth features, such as, wireless PDA, barcode scanner, mini-printer, VoIP phone etc.

For the hardware features, Agere 802.11 chipset solution is adopted for 802.11b, and CSR BlueCore 02-ROM for Bluetooth. Two antenna connectors provide antenna connectivity for each function.

In additional to the classic radio design, physical signaling between Bluetooth and 802.11b functional block provides the best performance when Bluetooth and 802.11b function at the same time.

For the software and driver development, USI provides extensive technical document and reference software code for system integration. Hardware evaluation kit and development utility will be released base on listed OS and processors to OEM customers under agreement for development.



## Features

- Small size suitable for low volume system integration.
- Low power consumption, extend battery life.
- 2.412 – 2.484 GHz frequency band.
- Support hardware signaling
- Easy for integration into mobile and handheld device with flexible system configuration and antenna design.

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## 802.11 b + Bluetooth COMBO SiP Module v 2.4

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### OEM Deliverables

- WM-BB-AG-01 with packing
- Test Platform includes application (PDA ), software utilities which support customers for integration, performance tests, and homologation.

### Temperature and Humidity .

<b>Operating Temperature</b>	0° to 60° Celsius
<b>Non Operating Temperature</b>	-10° to 70° Celsius
<b>Humidity Range</b>	20% to 90% ( Non-condensing, relative)

### Voltage and Current

Power supply for the WM-BB-AG-01 will be provided by the host via the board to board connector.

<b>Voltage</b>	
<b>Operating Voltage</b>	3.3 Volt (Typ.), Max 3.6V, Min 3.15V
<b>Voltage Ripple</b>	+/- 2%(Max value not exceeding operating voltage)
<b>Current (Typical)</b>	
<b>Continuous Transmit</b>	340 mA (Both 802.11 and BT in transmit mode)
<b>Continuous Receive</b>	230 mA (Both 802.11 and BT in receive mode)
<b>Sleep Mode</b>	16 mA (Both 802.11 and BT in sleep mode)

### Wireless Specification

The WM-BB-AG-01 complies with the following features and standards;

Features	Description
<b>WLAN Standards</b>	IEEE 802 Part 11b (802.11b)
<b>Bluetooth</b>	Bluetooth™ 1.1
<b>Antenna Connector</b>	Two antenna connectors support 802.11b and BT one for each.
<b>Coexistence</b>	Hardware signaling
<b>Frequency Band</b>	2.402– 2.484 GHz

### LED Specification

The WM-BB-AG-01 have 2 LED' s (output) via 60 pins connector for feedback to the user on the current WLAN and Bluetooth activity state with individual LED. The signaling will reflect status / activity as described in the table below. The signal is provided via the board to board connector with the following pin assignment.

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Pin No	Pin description	Function description
42	WLAN_LED	Link Activity of Wireless LAN
55	BT_LED	Link Activity of Bluetooth

The LED code and related status of the wireless module are listed below:

	WLAN_LED	BT_LED	Cycle Time
<b>Radio on and no activity (when device is in scan mode)</b>	Blinking	Blinking	LED on time: 200ms LED off time: 2000ms
<b>Radio on and activity in each radio</b>	Blinking	Blinking	LED on time: 100ms LED off time: 400ms
<b>Radio off</b>	Off	Off	

### 802.11b Radio Specification

The radio specification is compliant with the SPEC of 802.11b.

Features	Description
<b>Frequency Band</b>	2.412 – 2.484 GHz (2.4 GHz ISM Band)
<b>Number of Selectable Channels</b>	14 channels
<b>Modulation</b>	DSSS (Direct Sequence Spread Spectrum), DBPSK, DQPSK, CCK
<b>Supported Rates</b>	1,2, 5.5 and 11 Mbps
<b>Maximum Receive Level</b>	- 10 dBm (with PER < 8%)
<b>Output Power</b>	13.5 dBm +-1.0 dB
<b>Antenna Connector</b>	One Hirose W.FL –R –SMT(10) RF connector

### 802.11b Radio Characteristics

Receive Sensitivity	Data Rates
- 82 dBm	11 Mbps
- 85 dBm	5.5 Mbps
- 88 dBm	2.0 Mbps
- 91 dBm	1.0 Mbps

\* Under normal operation at room temperature.

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### Bluetooth Radio Specification

The Radio specification is compliant with the Bluetooth v1.1 class 2 specification

Features	Description
Frequency Band	2.402 – 2.484 GHz
Number of Channels	79 channels
Modulation	FHSS (Frequency Hopping Spread Spectrum)
Antenna Connector	One Hirose W.FL –R –SMT(10) RF connector

### Bluetooth Radio Characteristics

Features	Description
Maximum Receive Level	0 dBm(Min) , 3dBm (typical)
Output Power	3 dBm (typical) , 6 dbm (Max)
Sensitivity	-81 dbm @ 0.1% BER @ 25 ° Celsius ( Typical )

### Compatibility and Interoperability

#### Wi-Fi Logo

Wi-Fi certification is limited and dependent on the capability and application of the host system.

#### WHQL Compliance

N/A

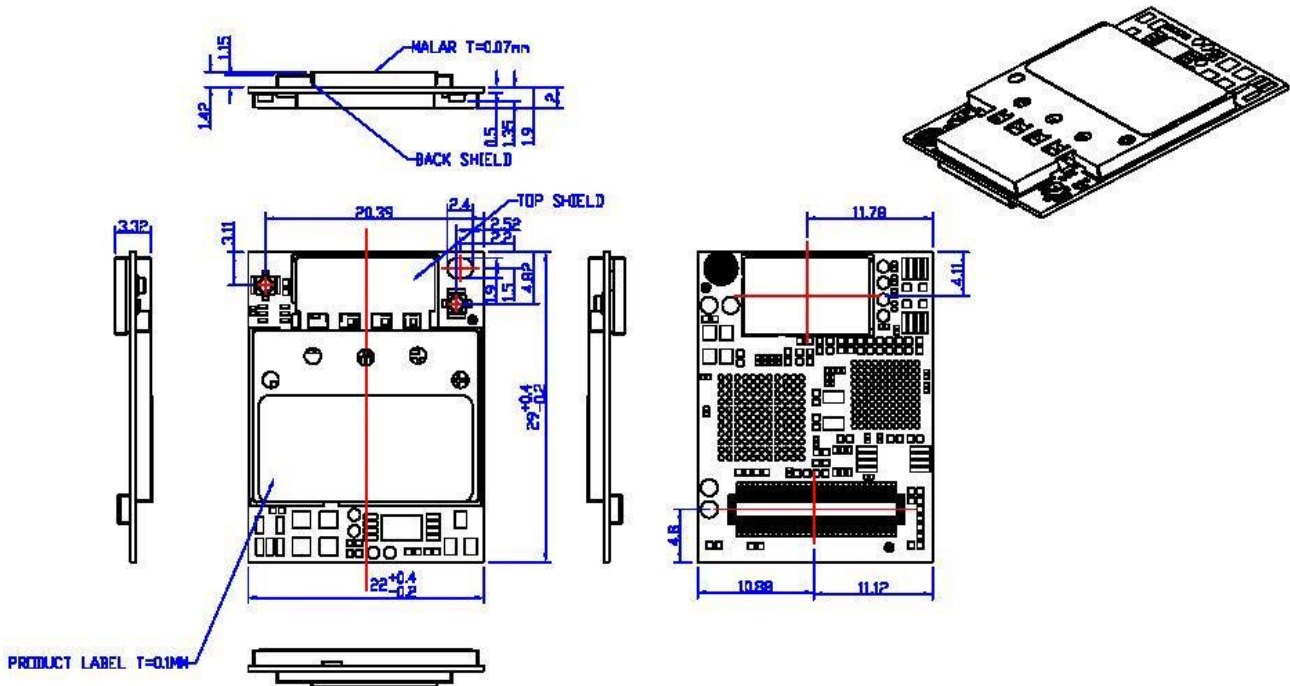
#### BQB Compliance

WM-BB-AG-01 is verified and proved BQB certificated.

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### Mechanical Dimensions

Dimensions: 22 mm x 29 mm x 3.5 mm (excluding RF cable assembly)



### Shock and Vibration

The WM-BB-AG-01 has been developed for incorporated into other devices. No shock and vibration tests for this module has been performed.

### Configuration

Users don't need to configure it. The CIS and MAC Address and Bluetooth ID address will be loaded during production of the WM-BB-AG-01 (RTS).

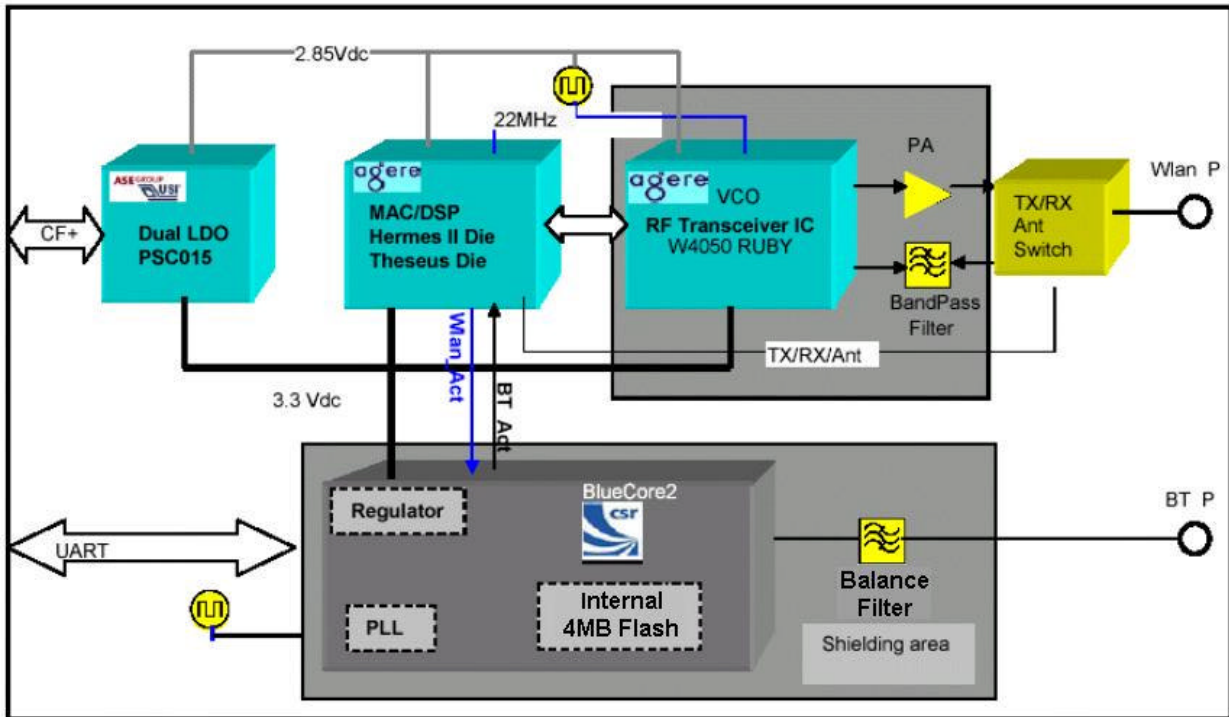
### Security

WEP 64/128 bits.

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### Functional Block Diagram

A simplified block diagram of the WM-BB-AG-01 is depicted in the picture below.



### Host Interface

The host interface will be compatible with CompactFlash (PCMCIA) standard, 16 bit I/O bus. Signals which are not used won't be routed to the physical interface (connector). The host interface of SiP Combo is compliant with UART interface.

For the connector, high reliability connectors will be used.

### On Board connector

Molex SD53794-0608 [Socket, 60 pins, with positioning protection, stack height which is able to support 1.5 mm.



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### Host System:

Molex SD54037-0607 [Header, 60 pins, with positioning protection, stack height 1.5mm]



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## Pin Definition

[...] means optional function of the pin.

**PD**: Signal pull down internally in the chip by 20K ohm register while initialization.

**PU**: Signal pull up internally in the chip by 20K ohm register while initialization.

**WPD**: Signal pull down internally in the chip by 1Mohm register during initialization

**WPU**: Signal pull up internally in the chip by 1Mohm register during initialization

**5VT**: 5 Volt tolerance pin

**xxx\_B**: Signal pins end with \_B are "active Low"

Pin Number	Definition	Draft Description		Type
WM-BB-AG-01	CF+ interface			
1	GND	GND	GND	
2	D03	HD3	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	O, PD, 5VT, 4mA Databus
3	D04	HD4	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	O, PD, 5VT, 4mA Databus
4	D05	HD5	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA Databus
5	D06	HD6	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
6	D07	HD7	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
7	-CE_1	HCE1_B	Card Enable1 is driven by the host system and is used as select strobe in both I/O and memory mode. Enables even numbered address bytes.	Input, PU, 5VT
8	A10	A10	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. The pin is open in B2B module.	N/A
9	-OE	HOE_B	OUTPUT ENABLE is driven by the host during a memory Read Access.	Input, PU, 5VT
10	A09	HA9	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT

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11	A08	HA8	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD,5VT
12	A07	HA7	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD,5VT
13	VCC	VCC_WLAN	Power, 3.3V_WLAN	Input
14	A06	HA6	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
15	A05	HA5	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
16	A04	HA4	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
17	A03	HA3	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II . This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
18	A02	HA2	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
19	A01	HA1	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
20	A00	HA0	ADDRESS BUS lines driven by the host system which enables addressing of 0.5K address range within HERMES II. This address range is mainly used for accessing the CIS in Memory Mode. Signal HA0 is not used in word access mode.	Input, PD, 5VT
21	D00	HD0	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
22	D01	HD1	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
23	D02	HD2	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE	IO, PD, 5VT, 4mA

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			bus. HD[15:0] are used to access the MODULE MAC Host Interface register	
24	-IOIS16	HIOIS16_B	Control signal to enable engineer testing mode	Out, 6mA,5V T
25	-CD2	CD2	Normal operation, this pin is functionally for card detection.	Out, 6mA, 5VT.
26	N/A	TXD_B	UART CMOS output data line	Output,WPU, 1µA
27	N/A	RTS_B	UART CMOS output signal, request to sent	Output ,WPU, 1µA
28	N/A	N/A	NA	No connection
29	N/A	VCC_WLAN	Power_WLAN	Input
30	GND	GND		
31	GND	GND		
32	D10	HD10	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
33	D09	HD9	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
34	D08	HD8	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
35	-STSCHG	HSTSCHG_B	STATUS CHANGE indication to the host. This signal gets active when one of the bits in the PRR or CSR registers are set	Output, 4mA
36	-SPKR	N/A	N/A	No connection
37	-REG	HREG_B	ATTRIBUTE MEMORY SELECT is driven by the host system and is used to access the Attribute Memory	Input, PU, 5VT
38	-INPACK	HINPACK_B	INPUT ACKNOWLEDGE is driven by HERMES II. Is asserted when the device is selected and the device is responding to an I/O Read command.	Output, 2mA
39	-WAIT	HWAIT_B	HWAIT_B is driven by HERMES II and allows for extending the memory or I/O cycle	Output, 4mA
40	RESET	HRESET	Used to asynchronously reset the complete Module	Input, PU,5VT
41	-VS2	VS2_B	Voltage sense signal	Output , 5VT 4mA
42	N/A	WLAN_LED_B	WLAN LED control signal, driven the LED indicating the link status of WLAN	Output, 4mA
43	N/A	N/A	Reserved pin	No connection
44	IREQ	IREQ_B	INTERRUPT REQUEST to the host. In Memory mode this pin signifies RDY/BSY_ typically used during card initialization immediately after reset or power on. Indicates to the host that the device is not able to transfer data	Output, 4mA
45	-WE	HWE_B	WRITE ENABLE is driven by the host during a memory Write Access	Input, PU,5VT
46	-IOWR	HIOWR_B	I/O Write Strobe is driven by the host and is asserted when the host wants to write to an on-chip	Input, PU,5VT

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			I/O register	
47	-IORD	HIORD_B	I/O Read Strobe is driven by the host and is asserted when the host wants to read from an on-chip I/O register	Input, PU,5VT
48	-VS1	RF control	RF CONTROL is driven by the host system and is used to enable and disable the RF circuit block	Output , 5VT
49	-CE2	HCE2_B	CARD ENABLE2 is driven by the host system and is used as select strobe in both I/O and memory mode. Enables odd numbered address bytes	Input, PU,5VT
50	D15	HD15	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
51	D14	HD14	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
52	D13	HD13	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
53	D12	HD12	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
54	D11	HD11	Data Input/Output line constitute a bi-directional bus. HD[15:0] are used to access the MODULE MAC Host Interface register	IO, PD, 5VT, 4mA
55	N/A	BT_LED_B	BT LED control signal which drive the LED to indicate the activity of Bluetooth	Output 4mA
56	N/A	RXD_B	UART data line CMOS input signal	Input, WPD, 1μA
57	N/A	CTS_B	UART clear to sent COMS input signal	Input, WPD, 1μA
58	N/A	N/A	N/A	N/A
59	VCC	VCC_BT	Power 3.3V_BT	Input
60	GND	GND		

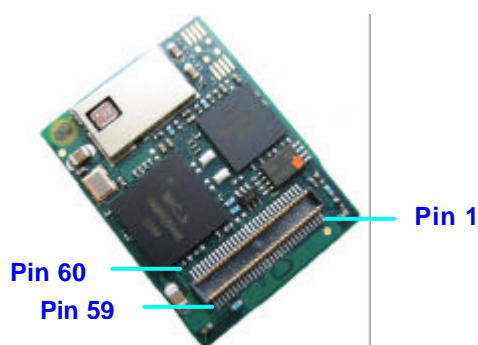


FIG 1: PIN 1 ASSIGNMENT AND INDICATION DRAWING

## 802.11 b + Bluetooth COMBO SiP Module v 2.4

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### Antenna Interface

No antenna diversity supported on the 802.11b , neither BT on this COMBO Wireless  
The output impedance of the cable is 50 Ohms.  
Antenna Connector: *Hirose W.FL-R-SMT (10)*

### Operating System Compatibility

Drivers are supported for the following OS:

- Windows CE 3.0/.NET
- Windows 98SE/2000/XP

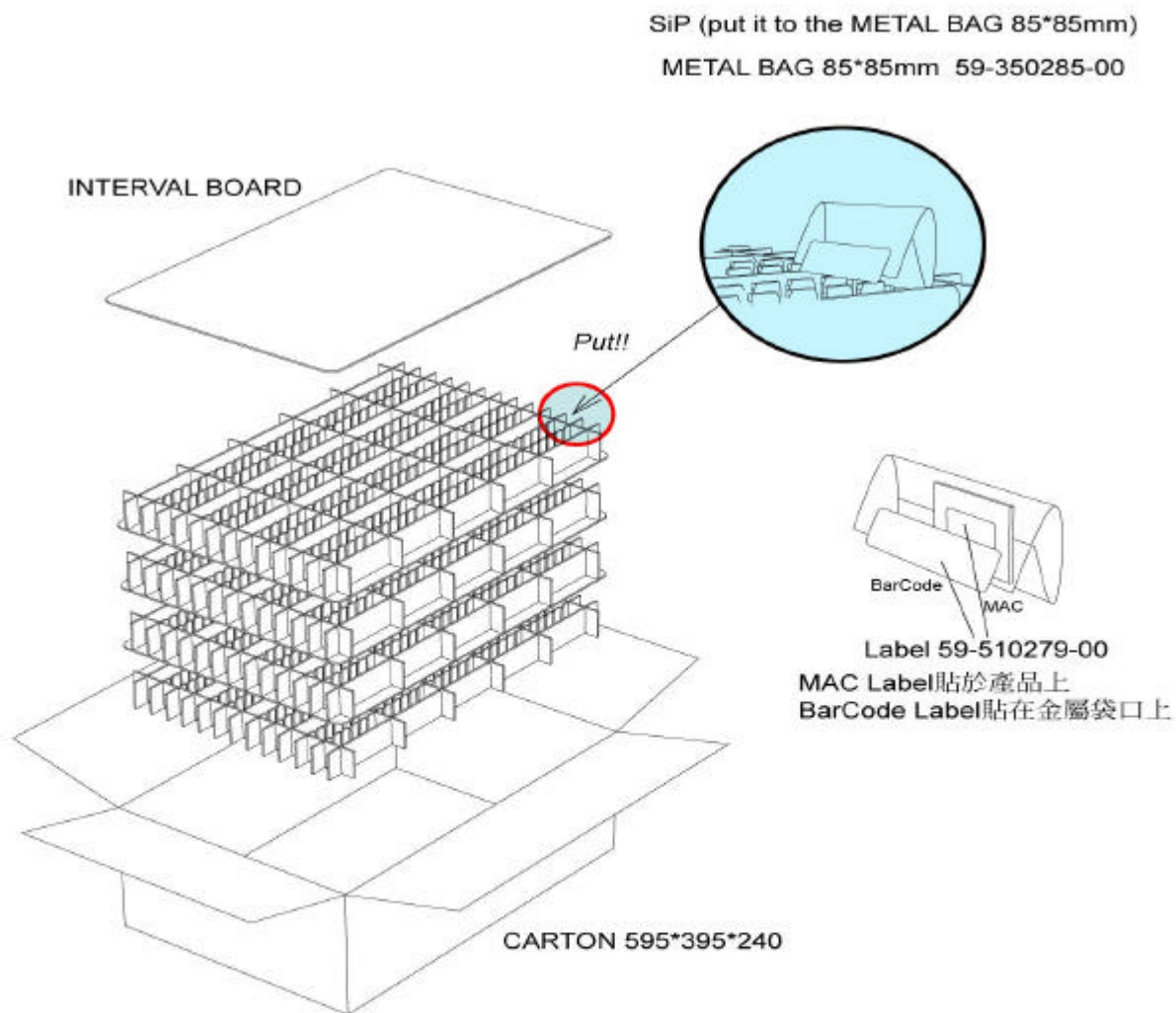
### Reliability

The WM-BB-AG-01 will guarantee a MTBF of 100,000 hours based on an ambient temperature and workload of 2,920 hours. The workload is based on a unit working for 8 hours per day, 365 days per year.

# 802.11 b + Bluetooth COMBO SiP Module v 2.4

## Packaging Design

SiP包裝規範



CARTON 595*395*240	59-000124-00 * 1
INTERVAL BOARD A-FLUTE, 581*381	59-200108-00 * 4
DIVIDED B,D BIG B-FLUTE 581*50	59-200599-00 * 20 (5 / Layer)
DIVIDED B,D SMALL B-FLUTE 381*50	59-200598-00 * 24 (6 / Layer)
SLOTTED DIVIDED B,D B-FLUTE 581*50	59-200600-00 * 32 (8 / Layer)

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