Preliminary Data Sheet
of
WM-BG-BM-02 WLAN +BT+FM 3 in One Module

Introduction

The 802.11b/g + BT + FM receiver Wireless SiP module WM-BG-BM-02 which refers as “SiP 3 in One module” is a small size module that provides full function of 802.11g/b, Bluetooth class 2 and FM receiver in a tiny module via 68 pins LGA Foot Print.

This multi- functionality and board to board physical interface provides SDIO/SPI interface for WiFi, UART for Bluetooth and PCM for FM receiver.

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 Broadcom 4325 chipset which is a WiFi+BT+FM Receiver SOC. The Radio architecture & high integration MAC/BB chip provide excellent sensitivity with rich system performance. 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, CCX 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 Broadcom 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
- 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.

Change Sheet					
Rev.	Date	Description of change			Approval & Date
		Page	Par	Change(s)	
1.0	12/10/07	All	All	Draft version for Review	
1.1	04/30/08	5, 11,12		1. Block Diagram 2. Module Size and pin definition	
1.2	08/11/08	9, 10		Radio Specification	
1.4	10/14/08	16~ 21	9, 10	Add Reflow Profile Add Package Informaiton	
1.5	10/23/08	11, 12, 14,15	5, 7, 10	Add package and Bottom view Modify Pin description of Pin(1, 38,39,62)	

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1. EXECUTIVE SUMMARY

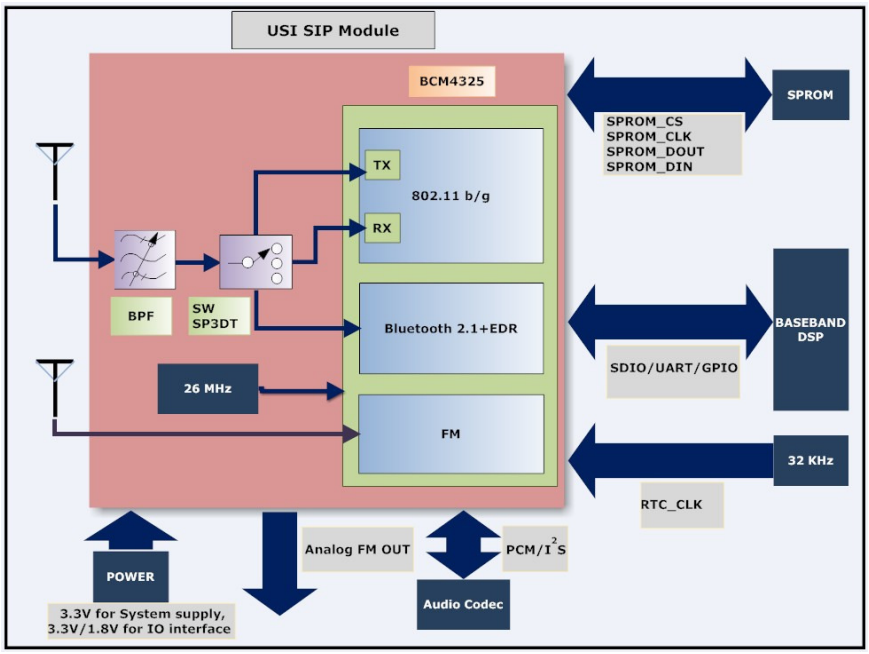
The WM-BG-BM-02 module - is one of the product families in USI's product offering, targeting for system integration requiring a smaller form factor. It also provides the standard migration to high data rate to USI's current SIP customers.

The purpose of this document is to define the product specification for 802.11b/g WiFi + BT 2.1 +FM module WM-BG-BM-02. **All the data in this document is based on Broadcom 4325 data sheet and other documents provided from Broadcom. 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-BM-02.

2. BLOCK DIAGRAM

The WM-BG-BM-02 module is designed based on Broadcom 4325 chipset solution.
It supports generic SPI (G-SPI), SDIO interface to connect the WLAN to the host processor. High speed UART is 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-BM-02 module is depicted in the Fig. below.



3. DELIVERABLES

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

- WM-BG-BM-02 Module with packaging
- Evaluation kits (with SDIO / SPI 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-BM-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.

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-BM-02 module has to withstand the operational requirements as listed in the table below.

Operating Temperature	-20° to 70° Celsius	
Humidity range	Max 95%	Non condensing, relative humidity

5.2.1. VOLTAGE

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

Symbol	Parameter	Min	Typ	Max	Unit
VDD_3.3	3.3V Power Supply	3.1	3.3	3.5	V
VIO_HOST_IO	Host Interface Power Supply	1.62	1.8	1.98	V
		2.97	3.3	3.63	V

5.2.2. Power consumption

	Power consumption	Typical	Max
WiFi	Tx @ 15dBm output power @ 25C (11b), 3.3V	660mW	680mW
	Tx @ 15dBm output power @ 25C (11g), 3.3V	792mW	810mW
	Rx @25C, 3.3V	297mW	310mW
BT	Tx @ 4dBm output power @ 25C , 3.3V	198mW	210mW
	Rx @25C, 3.3V	198mW	210mW

■ Include EVB power consumption

5.3. WIRELESS SPECIFICATIONS

The WM-BG-BM-02 module comply 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 GHz – 2.484 GHz

5.4. RADIO SPECIFICATIONS 802.11G

Features	Description
Frequency Band	2.4000 GHz – 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	15 dBm +2.0/-1.5 dBm for 1, 2, 5.5, 11Mbps 15 dBm +2.0/-1.5 dBm for 6, 9Mbps 15 dBm +2.0/-1.5 dBm for > 12Mbps

Receiver Characteristics (3.3V, 25 degree C)	Typical	Max.	Unit
PER <8%, Rx Sensitivity @ 11 Mbps	**-88**	**-85**	**dBm**
PER <8%, Rx Sensitivity @ 6 Mbps	**-89**	**-86**	**dBm**
PER <8%, Rx Sensitivity @ 1 Mbps	**-94**	**-91**	**dBm**
PER <10%, Rx Sensitivity @ 54 Mbps	**-74**	**-71**	**dBm**

5.5. RADIO SPECIFICATIONS 802.15 BLUETOOTH

The Radio specification is compliant with the Bluetooth™ 2.0 + EDR specification

Features	Description
Frequency Band	2400 MHz ~ 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	0 dBm (Max)
Output Power	4dBm (Typical)
Sensitivity	-87 dBm @ 0.1% BER @ 25 ° Celsius (Typical)

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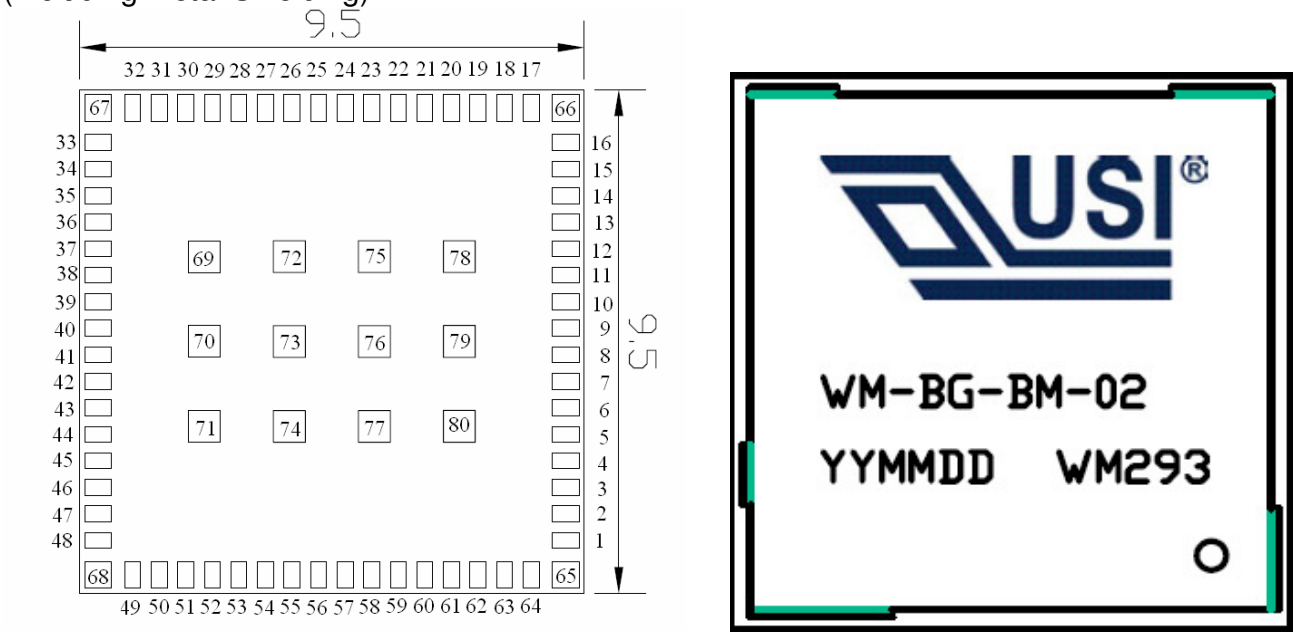
5.7. DIMENSIONS, WEIGHT AND MOUNTING

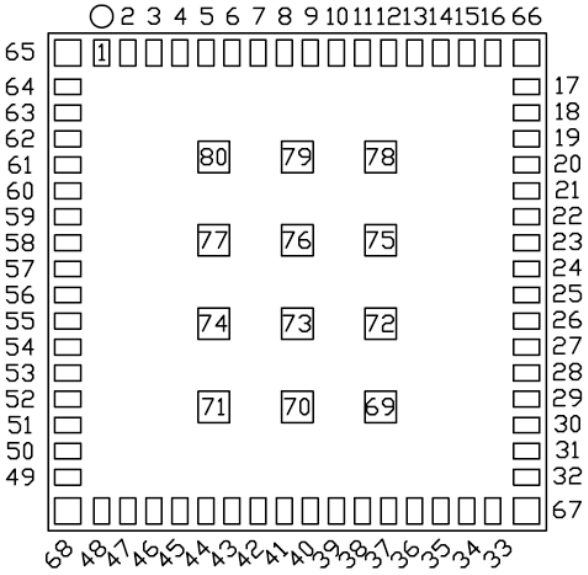
The following paragraphs provide the requirements for the size, weight and mounting of the WM-BG-BM-02 module.

5.7.1. DIMENSIONS

The size and thickness of the WM-BG-BM-02 module is 9.5mm(W) x 9.5mm(L) x 1.3mm(H) (Including Metal Shielding)



TOP View



Bottom View

6. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

The WM-BG-BM-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-BM-02 module. No module level certification on WM-BG-BM-02 module.

7. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

The pin definition is defined as below

Pin- out Definition							
1	WL_WAKE_B	20	BT_UART_RTS	39	BT_GPIO1	58	VBAT
2	SPROM_CS	21	BT_PCM_CLK	40	GND	59	SR_VFB1
3	SPROM_CLK	22	BT_GPIO5	41	S_CLK_IN	60	BT_REG_ON
4	SPROM_DOUT	23	BT_GPIO6	42	GND	61	WL_REG_ON
5	SPROM_DIN	24	GND	43	TDO	62	WL_HOST_WAKE_B
6	XTAL_PU	25	GND	44	TDI	63	WL_UART_TX_0
7	SDIO_D3	26	FM_AUDIO_OUT1	45	TMS	64	WL_UART_RX_0
8	SDIO_D2	27	FM_AUDIO_OUT2	46	TCK	65~80	GND
9	GND	28	GND	47	JTAG_TRST_N		
10	SDIO_CLK	29	FM_RXP	48	SR_VXL1		
11	GND	30	FM_RXN	49	GND		
12	SDIO_D1	31	GND	50	VIN_3P3		
13	SDIO_D0	32	ANT	51	VDDIO		
14	SDIO_CMD	33	GNT	52	TAP_SEL		
15	BT_UART_TXD	34	BT_PCM_IN	53	WL_RST_N		
16	BT_UART_RXD	35	BT_PCM_OUT	54	SR_VOUTBB		
17	VIN_1P2LDO	36	BT_RST_N	55	SR_VLX2BB		
18	BT_PCM_SYNC	37	BT_GPIO2	56	SR_VLX1BB		
19	BT_UART_CTS	38	BT_GPIO0	57	VBAT		

Pin Description

Pin-Nmnber	Pin-Define	Type	Description
1	WL_WAKE_B	I	WLAN device wake-up: Signal from the host to the WM-BG-BM-02 indicating that the host requires attention. • Asserted: WLAN device must wake-up or remain awake. • Deasserted: WLAN device may sleep when

			sleep criteria are met. The polarity of this signal is software configurable and can be asserted high or low.
2	SPROM_CS	I/O	SPROM Chip Select. Must be connected to the chip select input of the SPROM. This pin has internal pull-down
3	SPROM_CLK	I/O	SPROM Data Clock. Must be connected to the serial clock input of the SPROM
4	SPROM_DOUT	I/O	SPROM Data Out. Must be connected to DIN signal of the SPROM
5	SPROM_DIN	I/O	SPROM Data In. Must be connected to DOUT signal of the SPROM
6	XTAL_PU	O	
7	SDIO_D3	I/O	SDIO data 3
8	SDIO_D2	I/O	SDIO data 2
9	GND	I	Ground
10	SDIO_CLK	I	SDIO clock
11	GND	I	Ground
12	SDIO_D1	I/O	SDIO data 1
13	SDIO_D0	I/O	SDIO data 0
14	SDIO_CMD	I/O	SDIO command
15	BT_UART_TXD	O	Bluetooth UART Serial Output. Serial data output for the HCI UART Interface
16	BT_UART_RXD	I	Bluetooth UART Series Input. Serial data input for the HCI UART Interface
17	VIN_1P2_LDO	I	1.4V input for internal LDOs
18	BT_PCM_SYNC	I/O	PCM sync signal, can be master (output) or slave (input)
19	BT_UART_CTS_N	I	Bluetooth UART Clear to Send. Active-low clear to send signal for the HCI UART interface.
20	BT_UART_RTS_N	O	Bluetooth UART Request to Send. Active-low request to send signal for the HCI UART interface
21	BT_PCM_CLK	I/O	PCM clock, can be master (output) or slave (input)
22	BT_GPIO5	I/O	I2C Data
23	BT_GPIO6	I/O	I2C clock
24	GND	I	Ground
25	GND	I	Ground

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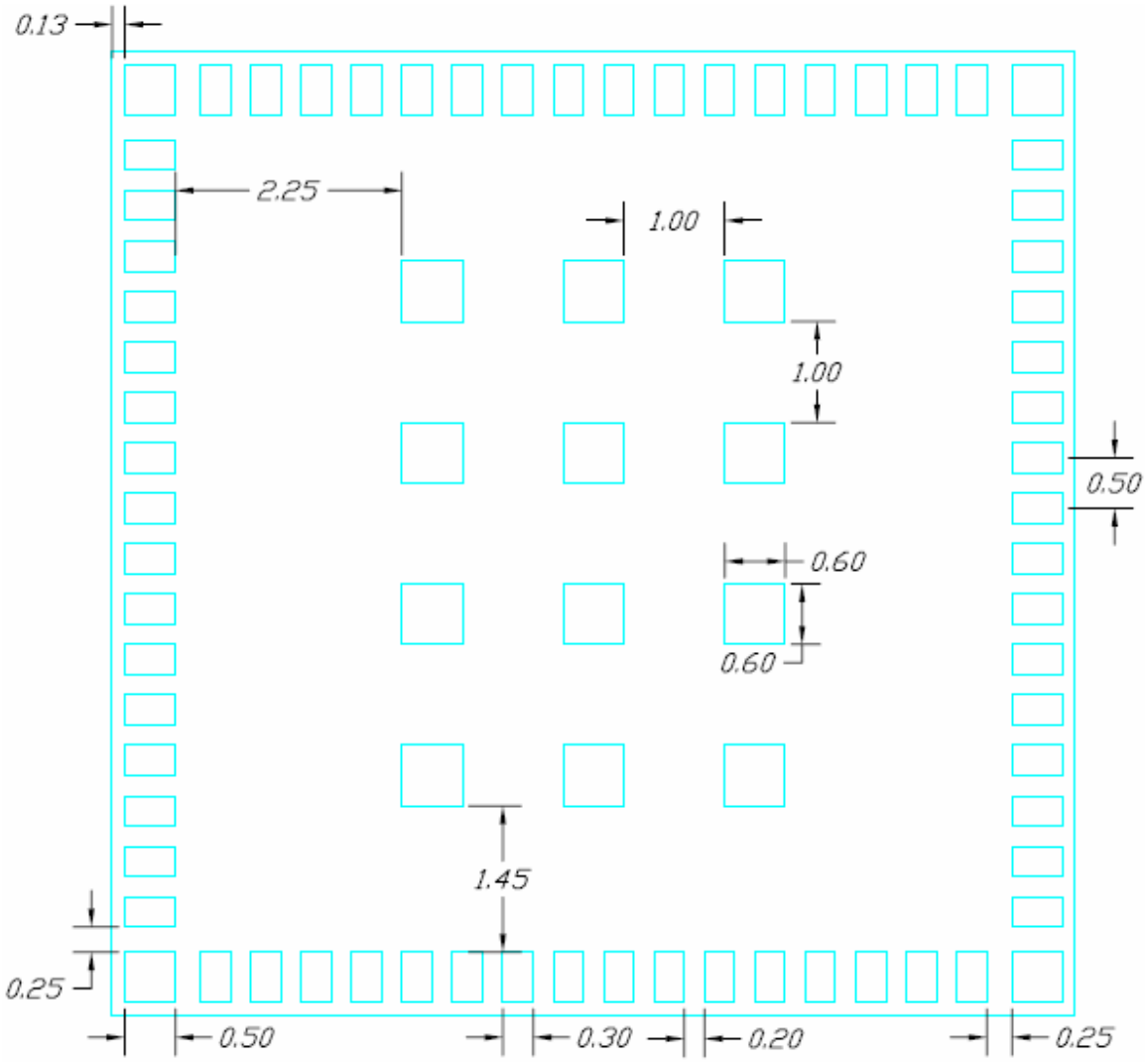
26	FM_AUDIO_OUT1	O	FM analog output channel 1
27	FM_AUDIO_OUT2	O	FM analog output channel 2
28	GND	I	Ground
29	FM_RXP	I	FM radio RF antenna port
30	FM_RXN	I	FM radio RF antenna port
31	GND	I	Ground
32	ANT	I/O	Antenna port for WLAN and Bluetooth
33	GND	I	Ground
34	BT_PCM_IN	I/O	PCM data input
35	BT_PCM_OUT	I/O	PCM data output
36	BT_RST_N	I	WLAN reset input
37	BT_GPIO2	I/O	Bluetooth general purpose interface pin
38	BT_GPIO0	I/O	Bluetooth general purpose interface pin, general assign to be BT_WAKE BT_WAKE: BT device wake-up: Signal from the host to the WM-BG-BM-02 indicating that the host requires attention. • Asserted: BT device must wake-up or remain awake. • Deasserted: BT device may sleep when sleep criteria are met. The polarity of this signal is software configurable and can be asserted high or low.
39	BT_GPIO1	I/O	Bluetooth general purpose interface pin, general assign to be BT_HOST_WAKE BT_HOST_WAKE: Host wake up. Signal from the WM-BG-BM-02 to the host indicating that the BT device requires attention. • Asserted: Host device must wake-up or remain awake. • Deasserted: Host device may sleep when sleep criteria are met. The polarity of this signal is software configurable and can be asserted high or low.

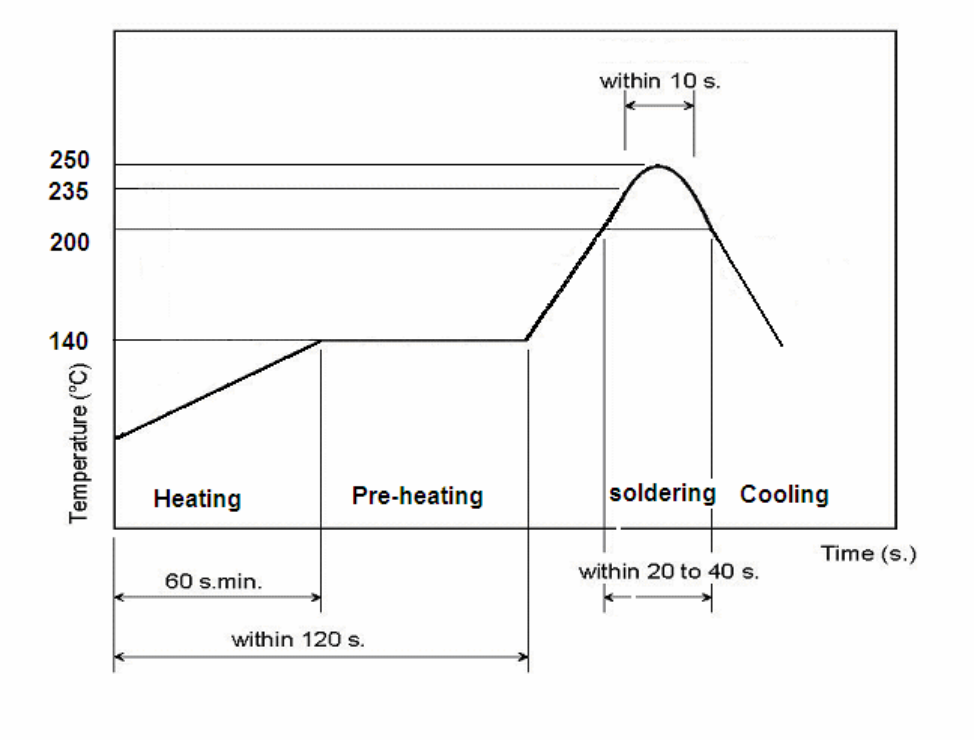
40	GND	I	Ground
41	S_CLK_IN	I	32.768kHz external reference clock input
42	GND	I	Ground
43	TDO	O	JTAG data out
44	TDI	I	JTAG data in
45	TMS	I	JTAG test mode
46	TCK	I	JTAG clock
47	JTAG_TRST_N	I	JTAG reset
48	SR_VLX1	O	Buck Regulator: Output to inductor
49	GND	I	Ground
50	VIN_3P3	I	3.3V input for RFIO, PA power, and internal LDO
51	VDDIO	I	Digital I/O supply
52	TAP_SEL	I	JTAG tap select
53	WL_RST_N	I	WLAN reset input
54	SR_VOUTBB	O	Buck Boost regulator output: 3.3V
55	SR_VLX2BB	O	Buck Boost Regulator: Inductor -ve terminal
56	SR_VLX1BB	O	Buck Boost Regulator: Inductor +ve terminal
57	VBAT	I	Battery supply input (2.8V~5V)
58	VBAT	I	Battery supply input (2.8V~5V)
59	SR_VFB1	I	Buck Regulator: Output voltage feedback
60	BT_REG_ON	I	Bluetooth regulator enable
61	WL_REG_ON	I	WLAN regulator enable
62	WL_HOST_WAKE_B	O	WLAN device wake-up: Signal from the host to the WM-BG-BM-02 indicating that the host requires attention. • Asserted: WLAN device must wake-up or remain awake. • Deasserted: WLAN device may sleep when sleep criteria are met. The polarity of this signal is software configurable and can be asserted high or low.
63	WL_UART_TXD	I/O	Serial Input for WLAN UART
64	WL_UART_RXD	I	Serial Output for WLAN UART
65~80	GND		Ground

8. RECOMMEND FOOTPRINT



Unit: mm

9. RECOMMANDED REFLOW PROFILE



10. PACKAGE AND STORAGE CONDITION

10.1 Package Dimension

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10.2 ESD Level

Note:

1. Surface Resistivity:
   Interior:10^{9}~$10^{11}\Omega$/SQUARE
   EXTERIOR:10^{8}~$10^{12}\Omega$/SQUARE
2. Dimension:475*420mm
3. Tolerance:+5,0mm
4. Color:
   Background : Gray
   Text : Red

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10.3 Tap/Reel Dimension

Embossed carrier tape	Top cover tape	Each Item Size						
W±0.15m/m	W±0.15m/m	A	B±0.5	D±1.0	C±0.2	N±1.0	T±0.1	G±2.0
8	5.3/5.5	330	2.2	20.2	13	100	8.5	13.1
12	9.3	330	2.2	20.2	13	100	12.5	17.1
16	13.3	330	2.2	20.2	13	100	16.5	21.1
24	21.3	330	2.2	20.2	13	100	24.5	29.1
32	25.5	330	2.2	20.2	13	100	32.5	37.1
44	37.5	330	2.2	20.2	13	100	44.5	49.1
56	49.5	330	2.2	20.2	13	100	56.5	61.1

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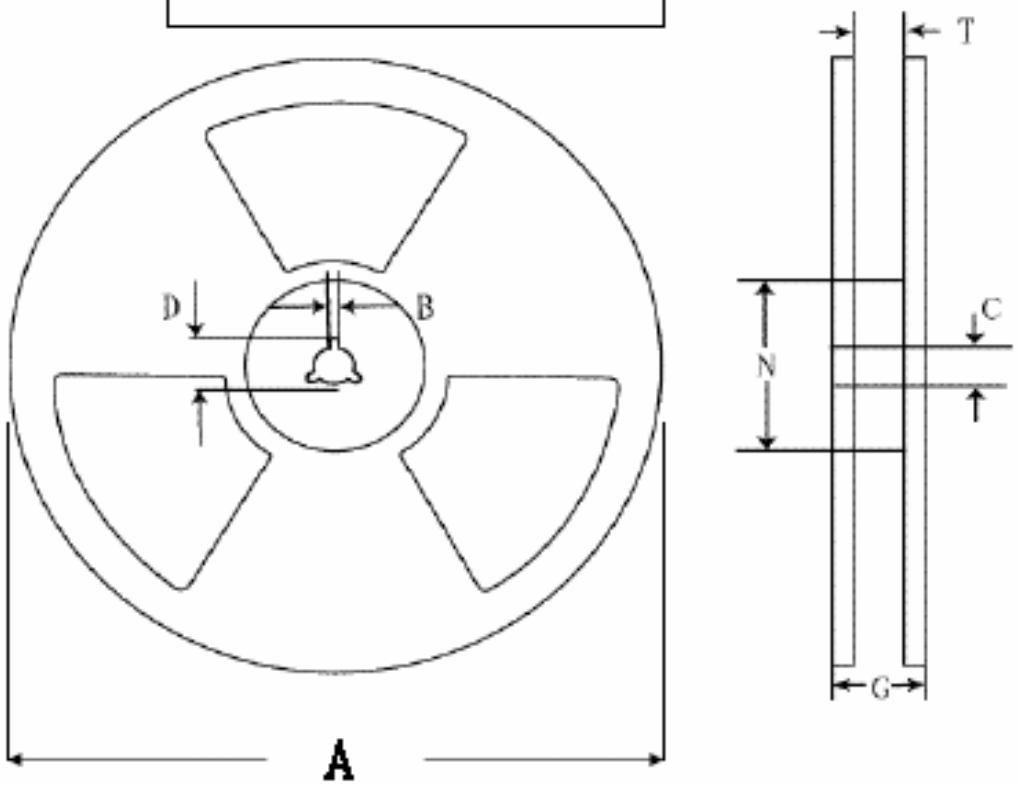

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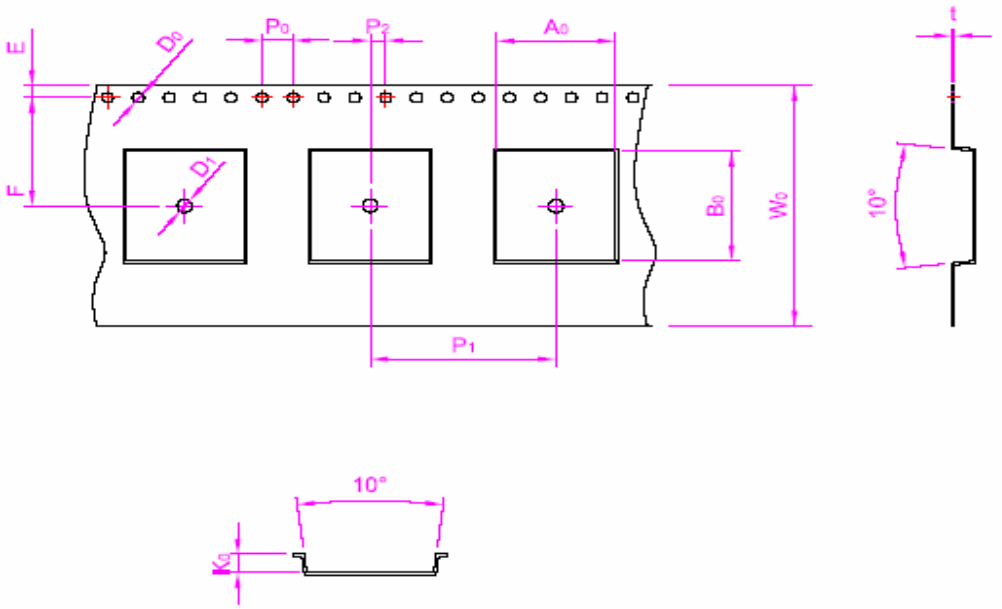
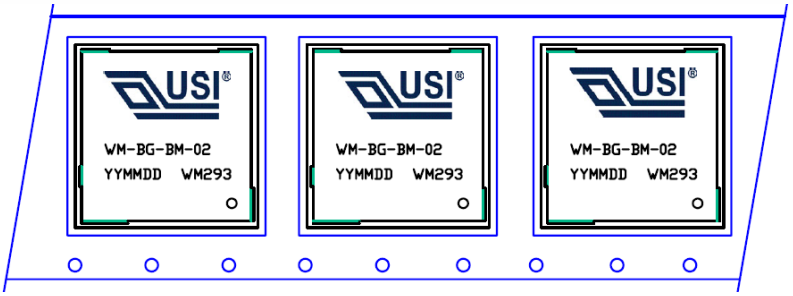


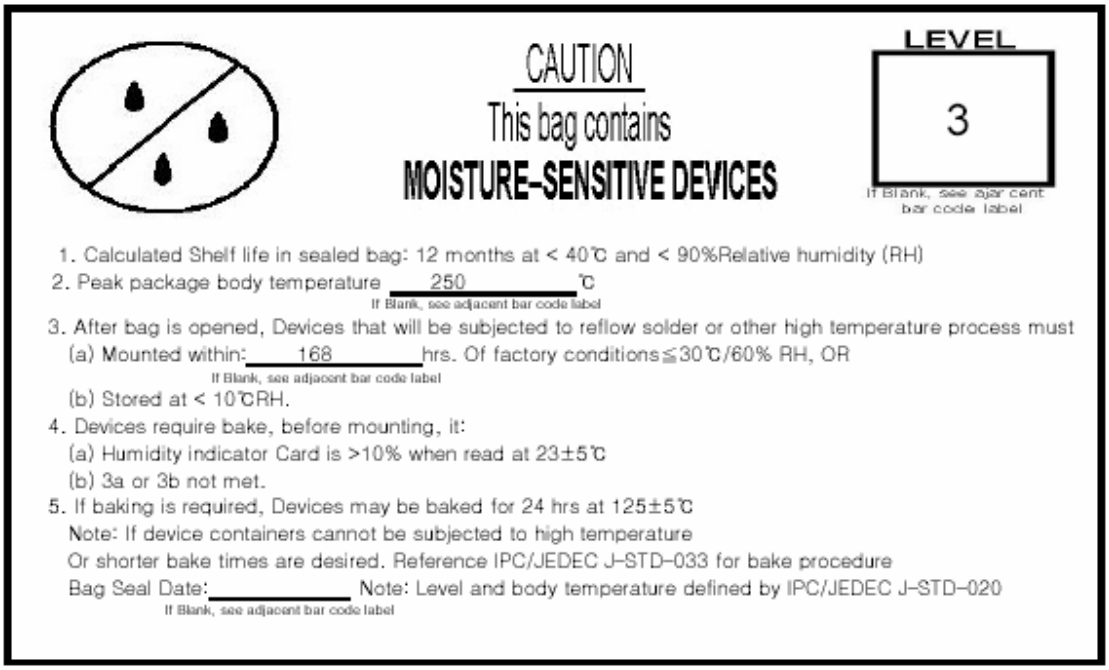
ITEM	A_0	B_0	D_0	D_1	E	F	K_0
SPEC	9.9±0.1	9.9±0.1	1.50+0.1/-0	1.5+0.1/-0	1.75±0.1	11.5±0.1	1.95±0.1
ITEM	K_1	P_0	P_1	P_2	P_0 X10	t	W_0
SPEC		4.00±0.1	12.0±0.1	2.00±0.1	Cumulative Tolerance ±0.2	0.40±0.05	24±0.3



Length leader / trailer tape:
Leader tape: ≥550mm which includes ≥100mm of carrier tape with empty compartments and covered with tape; remaining part might be of cover tape only.
Trailer tape: ≥160mm with empty compartments and covered with tape.

NOTES:
1.Material: Conductive Polystyrene (Recycle)
2.Color: Black
3.Surface resistance: 10^6 Ohms/square 以下
3.Cumulative tolerance per 10 pitches(P_0) is ±0.2mm.
4.Carrier camber shall be not more than 1mm per 100mm,noncumulative over 250mm
5.A_0 & B_0 are measured on the plane by 0.3 mm above the bottom of the pocket.
6.K_0 is measured from the inside bottom of the pocket to the top surface of the carrier.
7.Pocket position relative to sprocket hold is measured as true position of pocket, not sprocket hold.

10.4 MSL Level / Storage Condition



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