

Data Sheet

Of

WM-N-BM-02 WLAN Module

802.11b/g/n Wireless LAN SiP Module V2.4

Introduction

The 802.11b/g/n Wireless SiP module WM-N-BM-02 which refers as “SiP module” is a small size module that provides full function of 802.11b/g/n (draft n), module via 54 pins QFN Foot Print.

This multi- functionality and board to board physical interface provides SDIO/SPI/ (option) interface for WiFi.

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 802.11b/g/n Wi-Fi features, such as, Wireless PDA, Smart phone, MP3, PMP, slim type Notebook, VoIP phone etc.

The module is based on Broadcom 43362 chipset which is a WiFi Transceiver 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 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.
- 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.
- Supports per packet Rx Antenna diversity



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Change Sheet					
Rev.	Date	Description of change			Approval & Date
		Page	Par	Change(s)	
1.0	04/12/11	All	All	Draft version for Review	
1.1	06/22/11	6,9,10,11	All	Change Block Diagram Delete TX 11n, HT40 WIFI RX 11n sensitivity	
1.2	08/18/11	19,20	All	Pin Define (Pin 53,54)	
1.3	11/12/21	10	All	Change 11g and 11n output power	
1.4	12/01/09	9,11	All	Change operating high temperature from 80° to 65°	
2.1	13/04/22	21	All	Update reflow profile	
2.2	13/05/23	9	9	Update operating temp to 85 degrees	
2.3	13/08/14	9	9	Update operating temp to -30 degrees	
2.4	14/03/21	All	All	Remove Watermark "Preliminary"	

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1. EXECUTIVE SUMMARY

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

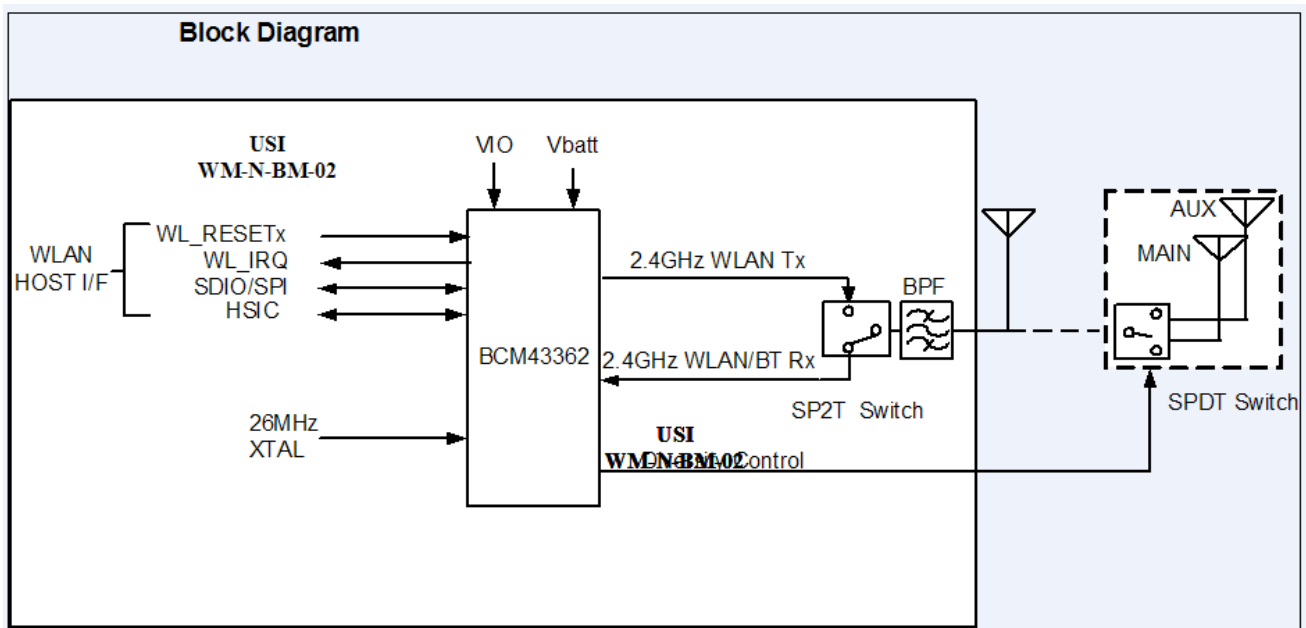
The purpose of this document is to define the product specification for 802.11b/g/n (draft n) WiFi module WM-N-BM-02. **All the data in this document is based on Broadcom 43362 data sheet and other documents provided from Broadcom. The data will be updated after implementing the measurement of the module.**

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-N-BM-02.

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2. BLOCK DIAGRAM

The WM-N-BM-02 module is designed based on Broadcom 43362 chipset solution. It supports generic SPI (G-SPI), SDIO interface to connect the WLAN to the host processor. A simplified block diagram of the WM-N-BM-02 module is depicted in the Fig. below.



WM-N-BM-02 Module

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3. DELIVERABLES

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

- ✚ WM-N-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-N-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, 2 nd 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-N-BM-02 module has to withstand the operational requirements as listed in the table below.

Operating Temperature	-30° to 85° Celsius for SDIO/gSPI version	
Humidity range	Max 95%	Non condensing, relative humidity

5.2.1. VOLTAGE

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

Symbol	Parameter	Min	Typ	Max	Unit
VBAT	3.3V Power Supply	2.8	3.3	5.0	V
VDDIO	Host Interface Power Supply	1.62	1.8	1.98	V
		2.97	3.3	3.63	V

5.2.2. Power consumption (SDIO, gSPI mode)

	Power consumption	Typical	Max
WiFi	Tx @ 17dBm output power @ 25C (11b), 3.3V		350mA
	Tx @ 15dBm output power @ 25C (11g), 3.3V		310mA
	Tx @ 15dBm output power @ 25C (11n, HT20), 3.3V		310mA
	Rx @25C, 3.3V		130mA

- For 1Mbps Max. current
 - For 6Mbps and 11n HT20 MCS0 Max. current
 - Include USB mode and SDIO mode max .current range
- Include EVB power consumption

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5.3. WIRELESS SPECIFICATIONS

The WM-N-BM-02 module complies with the following features and standards;

Features	Description
WLAN Standards	IEEE 802 Part 11b/g/n (802.11b/g/n)
Antenna Port	Support Single Antenna for WiFi
Frequency Band	2.412 GHz – 2.484 GHz

5.4. RADIO SPECIFICATIONS 802.11B/G/N

Features	Description
Frequency Band	2.4000 GHz – 2.484 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	17 dBm +2/-2 dBm for 1, 2, 5.5, 11Mbps 14 dBm +2/-2 dBm for 6, 9, 12, 18, 24, 36, 48, 54 Mbps 12 dBm +2/-2 dBm for 11n (HT20)
EVM	Typical Maximum Unit
@11 Mbps	-13 -11 dB
@1 Mbps	-13 -11 dB
@54 Mbps	-30 -25 dB
@6 Mbps	-30 -22 dB
HT20 @ MCS0	-30 -22 dB
HT20 @ MCS7	-30 -28 dB

Receiver Characteristics (3.3V, 25 degree C)	Typical	Max.	Unit
PER <8%, Rx Sensitivity @ 1 Mbps	-94	-91	dBm
PER <8%, Rx Sensitivity @ 11 Mbps	-87	-83	dBm
PER <10% Rx Sensitivity @ 6 Mbps	-86	-83	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-73	-69	dBm
PER <10%, Rx Sensitivity @ MCS0	-86	-83	dBm
PER <10%, Rx Sensitivity @ MCS7	-70	-66	dBm

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When the WM-N-BM-02 module has to withstand the operating temperature -20° to 65° Celsius for SDIO version, the specification are list in the table below.

a. RX specification:

Receiver Characteristics	Typical	Max.	Unit
PER <8%, Rx Sensitivity @ 1 Mbps	-94	-89	dBm
PER <8%, Rx Sensitivity @ 11 Mbps	-87	-83	dBm
PER <10%, Rx Sensitivity @ 6 Mbps	-86	-81	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-73	-68	dBm
PER <10%, Rx Sensitivity @ MCS0	-86-	-81	dBm
PER <10%, Rx Sensitivity @ MCS7	-70-	-65	dBm

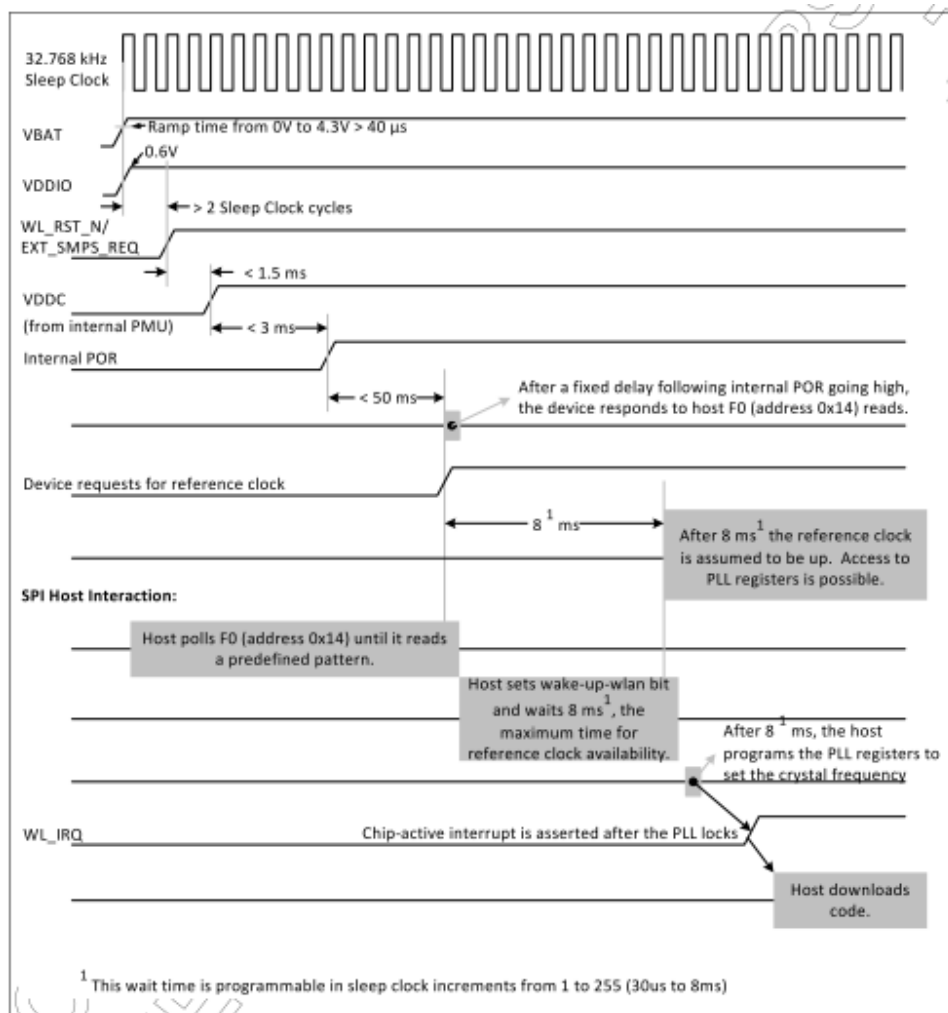
b:TX EVM specification:

EVM	Typical	Maximum	Unit
@11 Mbps	-13	-11	dB
@1 Mbps	-13	-11	dB
@54 Mbps	-30	-25	dB
@6 Mbps	-30	-22	dB
HT20M@ MCS0	-30	-22	dB
HT20M@ MCS7	-30	-28	dB

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5.5. TIMING DIAGRAM OF INTEFACE

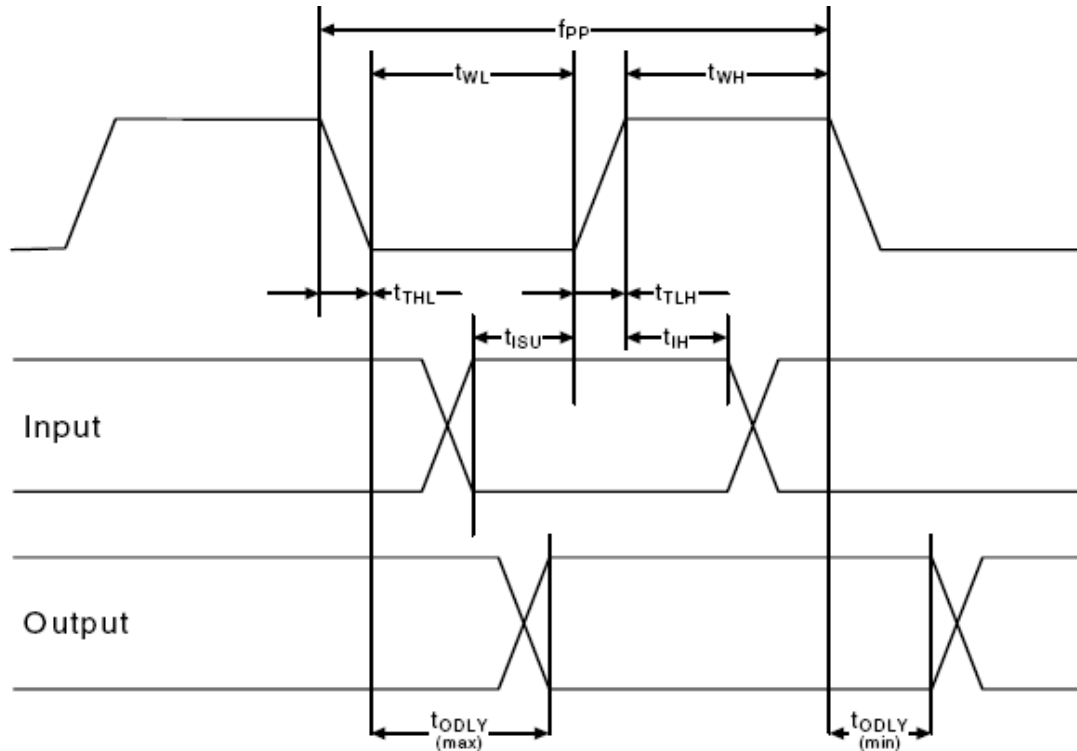
WIFI BOOT-UP Sequence



WIFI BOOT-UP Sequence

SDIO TIMING

SDIO timing in default mode

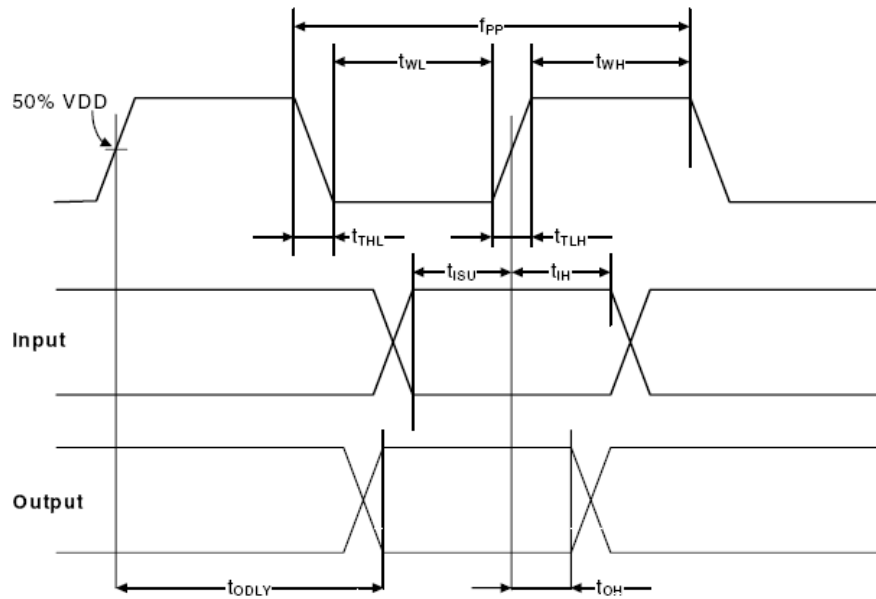


SDIO Bus Timing Parameters (Default Mode)

Parameter	Symbol	Min	Typical	Max	Unit
Clock CLK (All values are referred to min. VIH and max. VIL)					
Frequency--Data Transfer Mode	f_{PP}	0	-	25	MHz
Frequency--Identification Mode	f_{OD}	0	-	400	kHz
Clock Low Time	t_{WL}	10	-	-	ns
Clock High Time	t_{WH}	10	-	-	ns
Clock Rise time	t_{TLH}	-	-	10	ns
Clock Low Time	t_{THL}	-	-	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input Setup Time	t_{ISU}	5	-	-	ns
Input Hold Time	t_{IH}	5	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
Output Delay time--Data Transfer Mode	t_{ODLY}	0	-	14	ns
Output Delay time--Identification Mode	t_{ODLY}	0	-	50	ns

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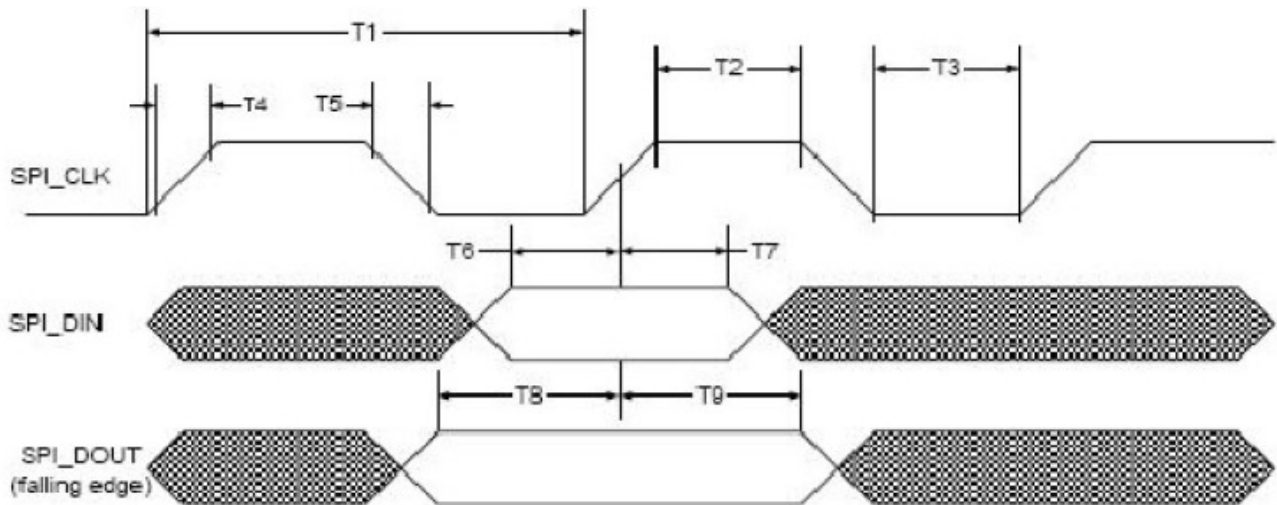
SDIO timing in High-Speed Mode



SDIO Bus Timing Parameters (High-Speed Mode)

Parameter	Symbol	Min	Typical	Max	Unit
Clock CLK (all values are referred to min. VIH and max. VIL)					
Frequency--Data Transfer Mode	f_{PP}	0	-	50	MHz
Frequency--Identification Mode	f_{OD}	0	-	400	kHz
Clock Low Time	t_{WL}	7	-	-	ns
Clock High Time	t_{WH}	7	-	-	ns
Clock Rise time	t_{TLH}	-	-	3	ns
Clock Low Time	t_{THL}	-	-	3	ns
Inputs: CMD, DAT (referenced to CLK)					
Input Setup Time	t_{ISU}	6	-	-	ns
Input Hold Time	t_{IH}	2	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
Output Delay time--Data Transfer Mode	t_{ODLY}	-	-	14	ns
Output Hold time	t_{OH}	2.5	-	-	ns
Total System Capacitance (each line)	CL	-	-	40	pF

GSPI Timing



Parameter	Symbol	Minimum	Maximum	Units	Note
Clock period	T1	20.8	-	ns	Fmax= 48 MHz
Clock high/low	T2/T3	$(0.45 \times T1) - T4$	$(0.55 \times T1) - T4$ ns	ns	-
Clock rise/fall time	T4/T5	-	2.5	ns	-
Input setup time	T6	5	-	ns	Setup time, SIMO valid to SPI_CLK active edge
Input hold time	T7	5	-	ns	Hold time, SPI_CLK active edge to SIMO invalid
Output setup time	T8	5	-	ns	Setup time, SOMI valid before SPI_CLK rising
Output hold time	T9	5	-	ns	Hold time, SPI_CLK active edge to SOMI invalid
CSX to clocka	-	7.86	-	ns	CSX fall to 1st rising edge
Clock to CSXa	-	-	-	ns	Last falling edge to CSX high

a. SPI_CSx remains active for entire duration of SPI read/write/write_read transaction (i.e., overall words for multiple word transaction)

Module Interface during Sleep mode

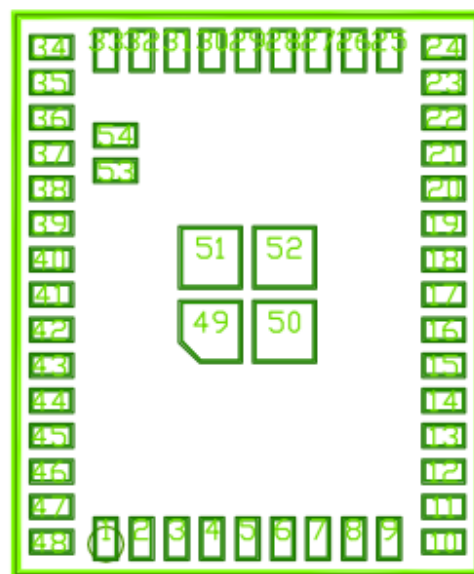
PD: Pull Down, PU: Pull UP

5.6. DIMENSIONS, WEIGHT AND MOUNTING

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

5.6.1. DIMENSIONS

The size and thickness of the WM-N-BM-02 module is “7.2 mm (W) x 8.7 mm (L) x 1.1 mm (H) +0.1/-0.2 mm “(Including conformal shielding)



REF
pad0_3x0_6mm
pad0_9x0_9mm
pad0_9x0_9mm_s
pitch:0.55mm

(TOP View)

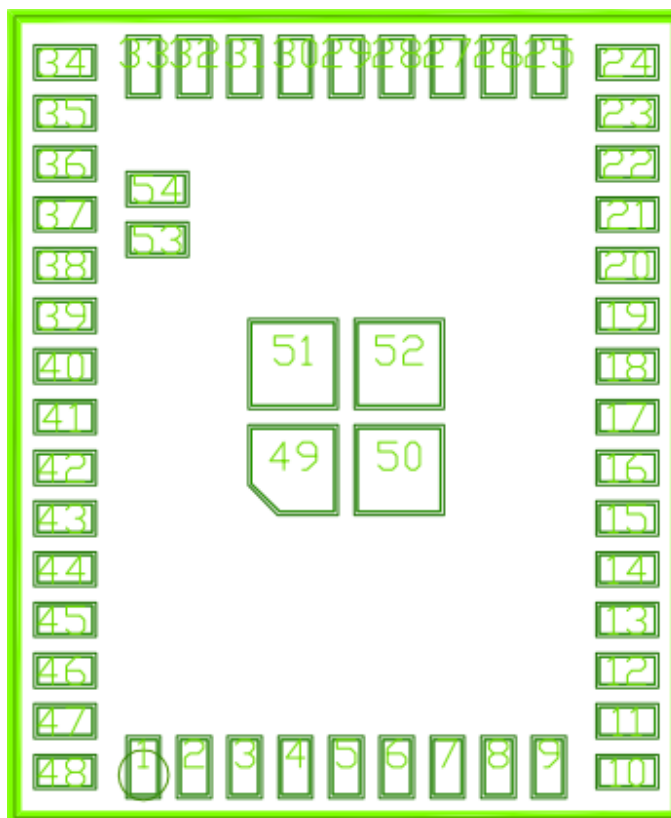
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6. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

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

7. PIN OUT AND PIN DESCRIPTION



Top View

Pin Description

Pin-Nmnber	Pin-Define	Type	Description
1	VBAT	I	Battery supply input (2.8V~5V)
2	VBAT	I	Battery supply input (2.8V~5V)
3	GND	I	Ground
4	NC	--	--
5	GND	I	Ground
6	NC	--	--
7	NC	--	--
8	GND	I	Ground

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9	ANT	I/O	Antenna port for WLAN
10	GND	I	Ground
11	NC	--	--
12	NC	--	--
13	NC	--	--
14	NC	--	--
15	NC	--	--
16	NC	--	--
17	NC	--	--
18	NC	--	--
19	NC	--	--
20	NC	--	--
21	NC	--	--
22	NC	--	--
23	JTAG_TRST	I	For normal operation, connect as described in the JTAG specification . Otherwise, if JTAG is not used, this pin can be left unconnected (NC) as it has an internal weak pull-up resistor.
24	JTAG_TDO	I	For normal operation, connect as described in the JTAG specification . Otherwise, if JTAG is not used, this pin can be left unconnected (NC). This pin is also muxed with UART_TX, which can be enabled by software.
25	WL_SDIO_SPI_SEL	I	This pin is used as a strapping option to select between SDIO mode (pull low)or SPI mode(pull high)
26	JTAG_TDI	I	For normal operation, connect as described in the JTAG specification . Otherwise, if JTAG is not used, this pin can be left unconnected (NC) as it has an internal weak pull-up resistor. This pin is also muxed with UART_RX, which can be enabled by software.
27	JTAG_TCK	I	For normal operation, connect as described in the JTAG specification . Otherwise, if JTAG is not used, this pin can be left unconnected (NC) as it has an internal weak pull-up resistor.
28	JTAG_TMS	I	For normal operation, connect as described in the JTAG specification . Otherwise, if JTAG is not used, this pin can be left unconnected (NC) as it has an internal weak pull-up resistor.
29	WLAN_HOST_WAKE	I/O	General purpose interface pin. This pin is high-

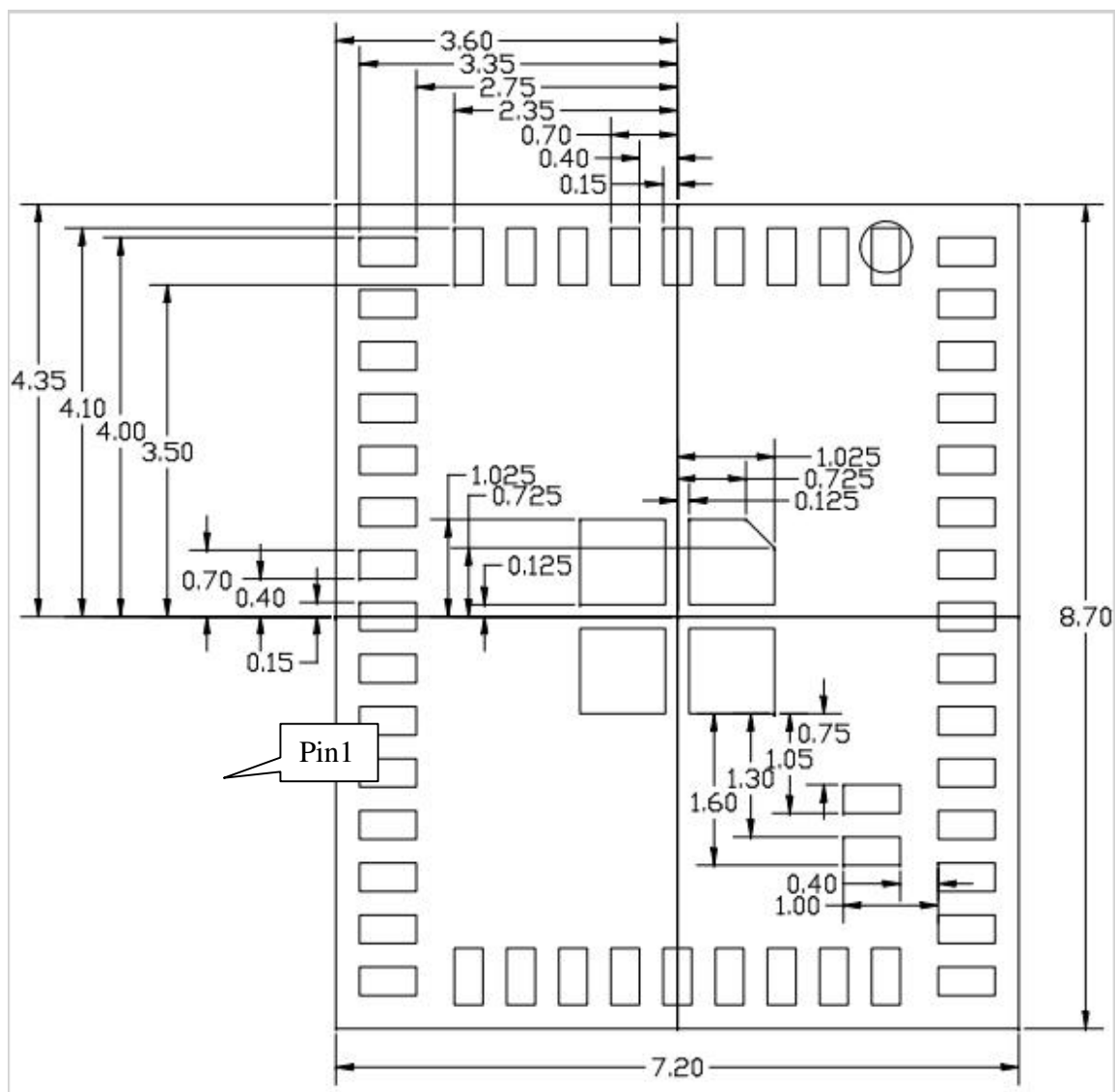
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			impedance on power up and reset. Subsequently, it becomes an input or output through software control. This pin has a programmable weak pull-up/down.
30	NC	--	--
31	WLAN_RESETB	I	Active low WLAN reset signal includes an internal 200K Ω pull-down resistor. Within 1.5ms of WL_RST_N being driven high, the PMU changes this from PD to High-Z, Software can optionally enable the pull-down resistor. VIH=1.08V to 3.6V. VIL<0.4V
32	NC	--	--
33	VDDIO	I	Digital I/O supply (1.8V or 3.3V)
34	NC	--	--
35	NC	--	--
36	GND	I	Ground
37	SLEEP_CLK	I	Input pin for optional high- precision 32.768kHz Clock(Sleep Clock).
38	GND	I	Ground
39	SDIO_DAT0	I/O	SDIO data 0. This pin has an internal weak pull-up resistor.
40	SDIO_CLK	I/O	SDIO clock. This pin has an internal weak pull-up resistor.
41	SDIO_DAT1	I/O	SDIO data 1. This pin has an internal weak pull-up resistor.
42	SDIO_CMD	I/O	SDIO command. This pin has an internal weak pull-up resistor.
43	SDIO_DAT3	I/O	SDIO data 3. This pin has an internal weak pull-up resistor.
44	SDIO_DAT2	I/O	SDIO data 2. This pin has an internal weak pull-up resistor.
45	EXT_SMPS_REQ	I	Internal 200K Ω pull-down resistor included. VIH=1.08V to 3.6V. VIL<0.4V
46	EXT_PWM_REQ	I	Driving this input high forces CBUCK into PWM mode. Internal Internal 200K Ω pull-down resistor included. VIH=1.08V to 3.6V. VIL<0.4V
47	NC	--	--
48	NC	--	--
49	GND	I	Ground
50	GND	I	Ground
51	GND	I	Ground

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52	GND	I	Ground
53	SW_ANT_AUX	O	Antennt Switch control line. Default at this pin is high.
54	SW_ANT_MAIN	O	Antennt Switch control line. Default at this pin is high.

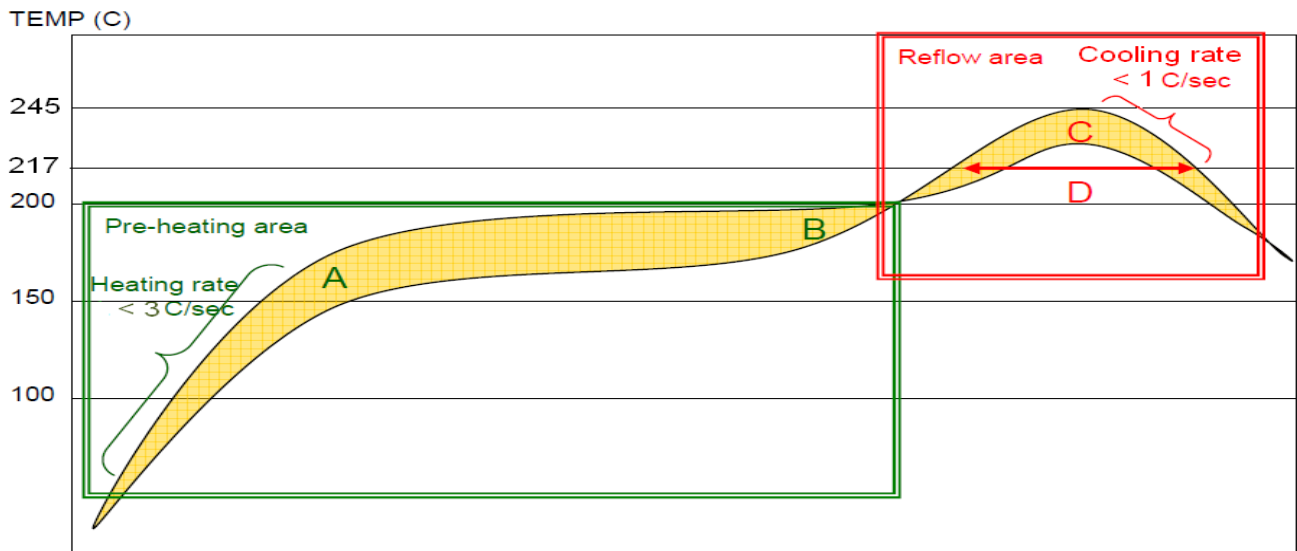
8. RECOMMEND FOOTPRINT



(TOP View)

Unit: mm

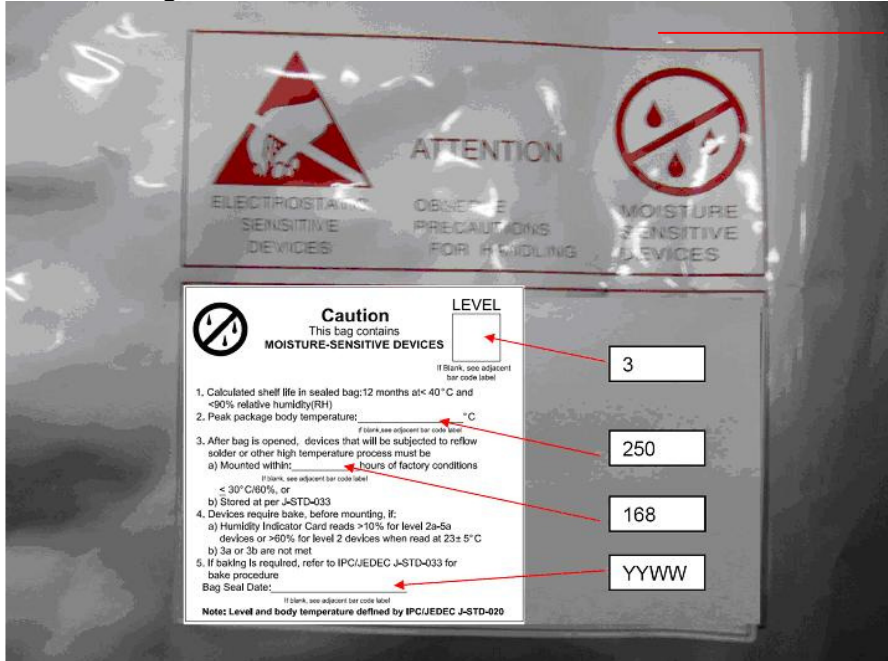
9. RECOMMENDED REFLOW PROFILE



- (1) Solder paste alloy : SAC305 (Sn96.5/Ag3.0/Cu0.5) (Lead Free solder paste.)
 - (2) A-B. Temp.: 150~200°C ; soak time:60~120sec.(Base on Flux type, reference only)
 - (3) C. Peak temp: <245°C
 - (4) D. Time above 217 °C : 40~90sec.(Base on SAC305)
 - (5) Suggestion: Optimal cooling rate is <1°C/sec. from peak to 217 °C .
 - (6) Nine heater zones at least for Reflow equipment.
 - (7) Nitrogen usage is recommended and be controlled the value less than 1500 ppm.
- Note: Need to inspect solder joint by X-ray post reflow.

10. PACKAGE AND STORAGE CONDITION

10.1 Package Dimension



10.2 ESD Level

Note:

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

For Additional information, please contact the following:

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