

Data Sheet
Of
WM-N-BM -02_D WLAN

Preliminary

802.11b/g/n Wireless LAN Daughter board V1.0

Introduction

This daughter card featured with full function of 802.11b/g/n (draft n) including both H380A and L330W.

This multi- functionality via 21 pins FPC to connect and 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 card 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 card 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	09/07/12	All	All	Draft version for Review	

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1. EXECUTIVE SUMMARY

The WM-N-BM -02_D 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.

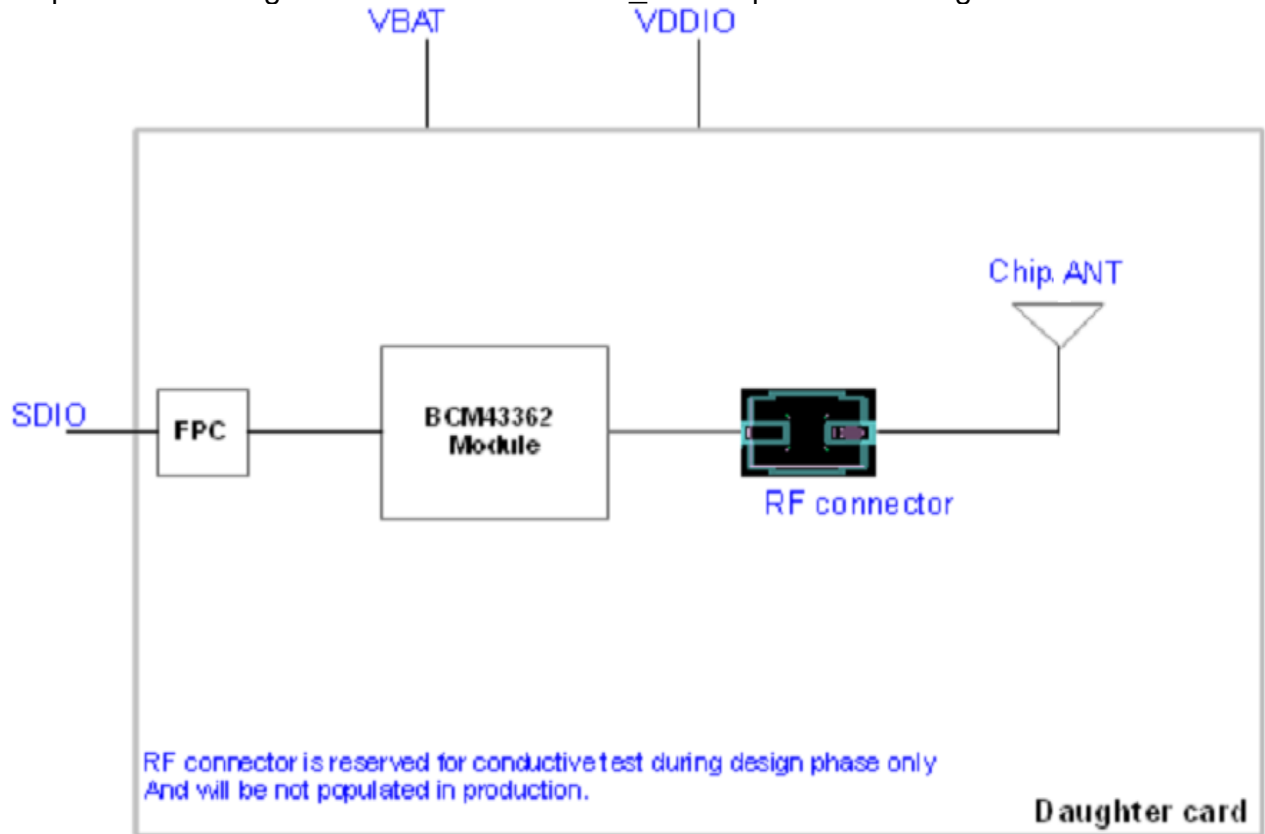
The purpose of this document is to define the product specification for 802.11b/g/n (draft n) WiFi WM-N-BM -02_D. **All the data in this document is based on Broadcom 43362 data sheet and other documents provided from Broadcom. The data will be updated after implementing the measurement of the .**

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_D.

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2. BLOCK DIAGRAM

The WM-N-BM -02_D 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_D is depicted in the Fig. below.



WM-N-BM -02_D

3. DELIVERABLES

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

- WM-N-BM -02_D 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_D .
- Unit Test / Qualification report
- Product Specifications.
- Agency certification pre-test report base on adapter boards

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4. REFERENCE DOCUMENTS

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

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5. TECHNICAL SPECIFICATION

5.1. ABSOLUTE MAXIMUM RATING

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

5.2. RECOMMENDABLE OPERATION CONDITION

5.2.1. TEMPERATURE, HUMIDITY

The WM-N-BM -02_D has to withstand the operational requirements as listed in the table below.

Operating Temperature	-20° to 65° Celsius for SDIO/gSPI version	
Humidity range	Max 95%	Non condensing, relative humidity

5.2.2. VOLTAGE

Power supply for the WM-N-BM -02_D 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

5.2.3. 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_D 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	-91	-88	dBm
PER <8%, Rx Sensitivity @ 11 Mbps	-87	-83	dBm
PER <10% Rx Sensitivity @ 6 Mbps	-87	-83	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-73	-69	dBm
PER <10%, Rx Sensitivity @ MCS0	-87	-83	dBm
PER <10%, Rx Sensitivity @ MCS7	-70	-66	dBm

Note "All Rx Sensitivity and Tx EVM specifications are reference to BCM43362 module test"

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5.5. ANTENNA SPECIFICATIONS

H380A type:

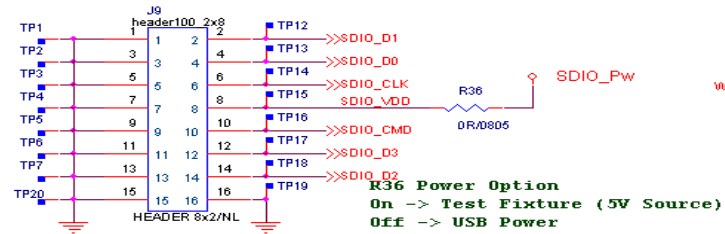
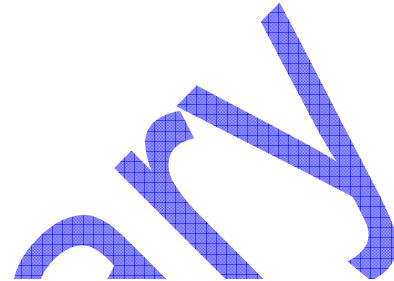
Diversity Antenna (Rx Only)	Band 2400	Units
Normal Impedance	50	Ohms
Operating Frequency	2412-2484	MHz
VSWR	<2:1	-
Radiated Efficiency ¹	30	%
Peak Gain ^{1,2}	TBD	dBi
Directivity ^{1,3}	TBD	dBi
¹ For reference only. Active measurements are the only requirement. ² Peak gain measured with 0dBm reference input. ³ Directivity(dBi) = Peak Gain(dB) – Average Gain(dB) ⁴ Band 850 fully covers CDMA 800 (BC0)		

L330W type:

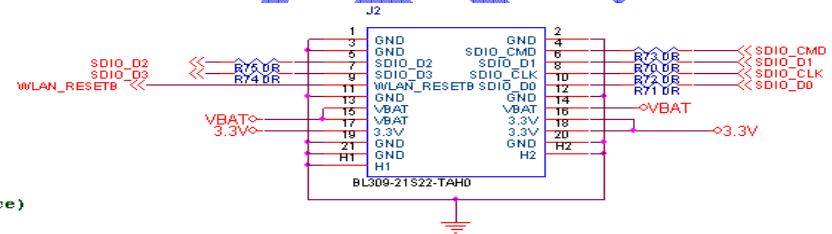
Diversity Antenna (Rx Only)	Band 2400	Units
Normal Impedance	50	Ohms
Operating Frequency	2412-2484	MHz
VSWR	<2:1	-
Radiated Efficiency ¹	40	%
Peak Gain ^{1,2}	TBD	dBi
Directivity ^{1,3}	TBD	dBi
¹ For reference only. Active measurements are the only requirement. ² Peak gain measured with 0dBm reference input. ³ Directivity(dBi) = Peak Gain(dB) – Average Gain(dB) ⁴ Band 850 fully covers CDMA 800 (BC0)		

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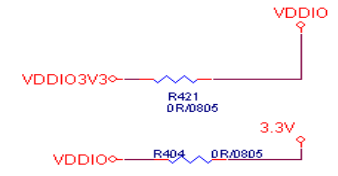
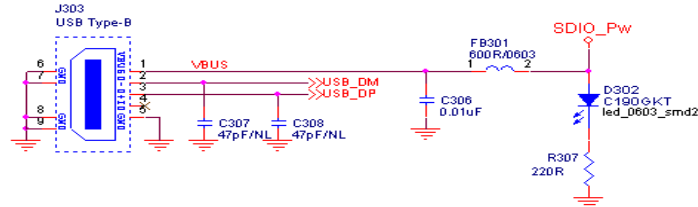
5.6. REFERENCE CIRCUIT



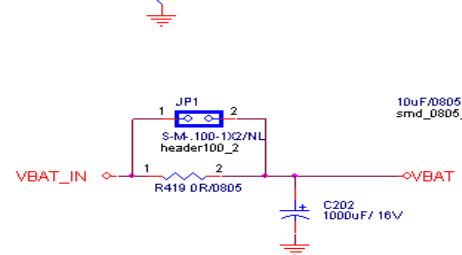
R36 Power Option
On -> Test Fixture (5V Source)
Off -> USB Power



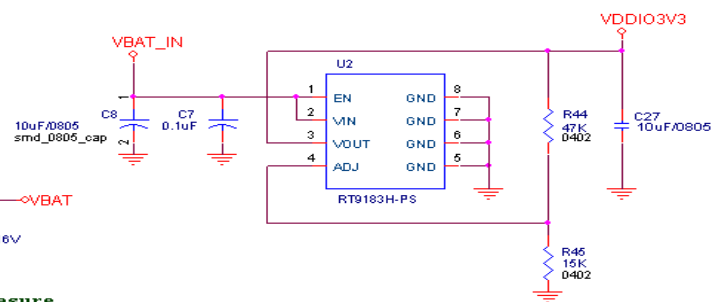
FB301 Power Option
On -> USB Power
Off -> Test Fixture (5V Source)



Ext-Power Option
R418 -> RD use (3.8V Source)
R420 -> Test Fixture (5V to 3.9V Source)



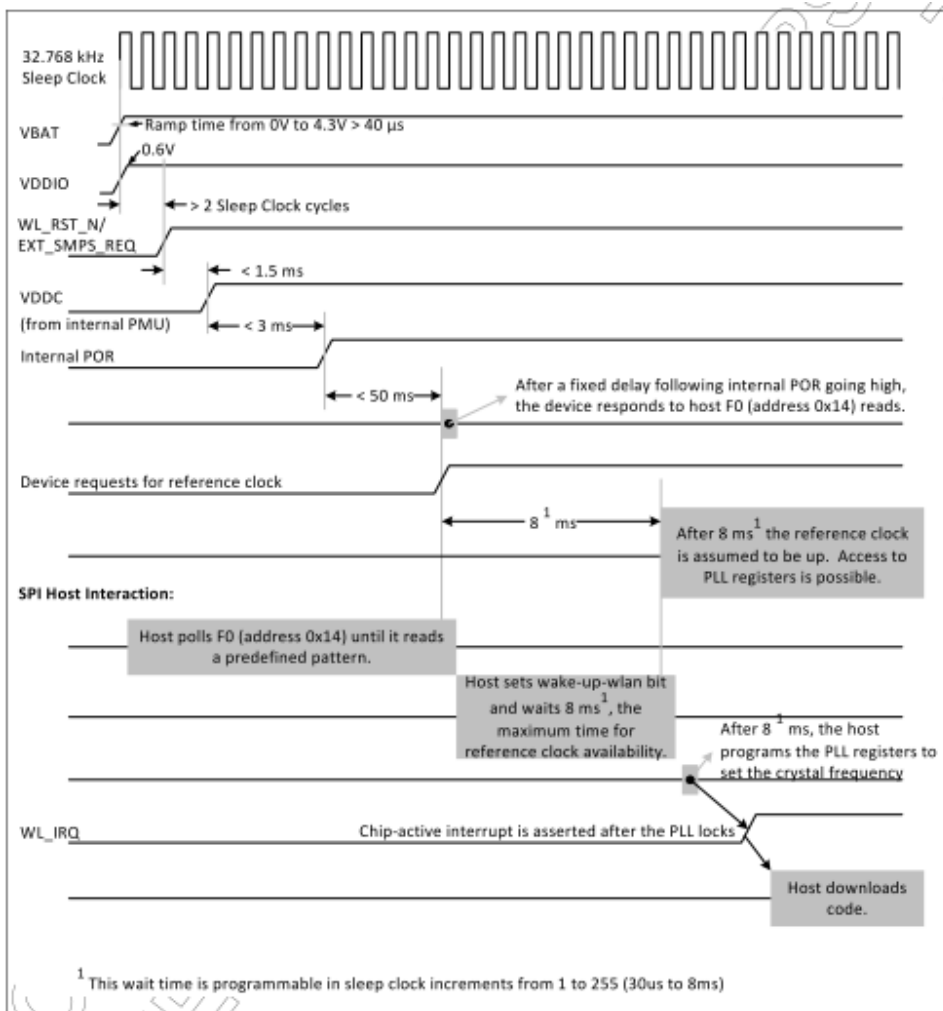
JP401 for Module Current Measure
C202 is Tank Cap.



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5.7. TIMING DIAGRAM OF INTEFACE

WIFI BOOT-UP Sequence

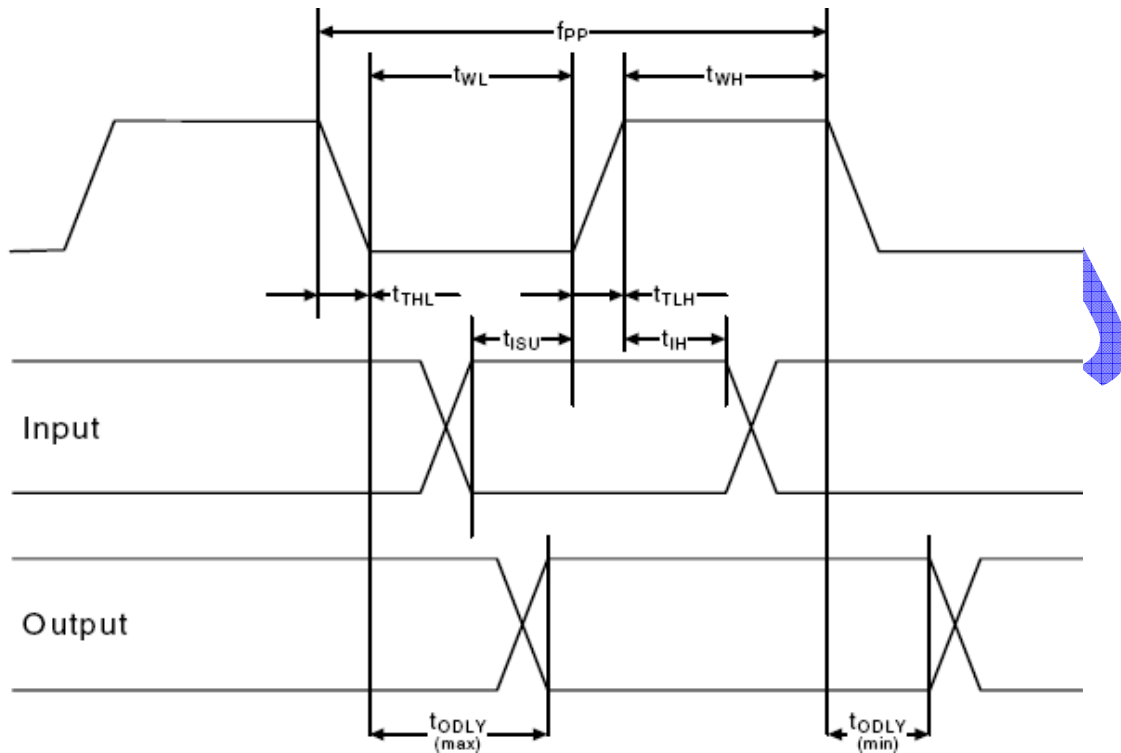


WIFI BOOT-UP Sequence

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SDIO TIMING

SDIO timing in default mode

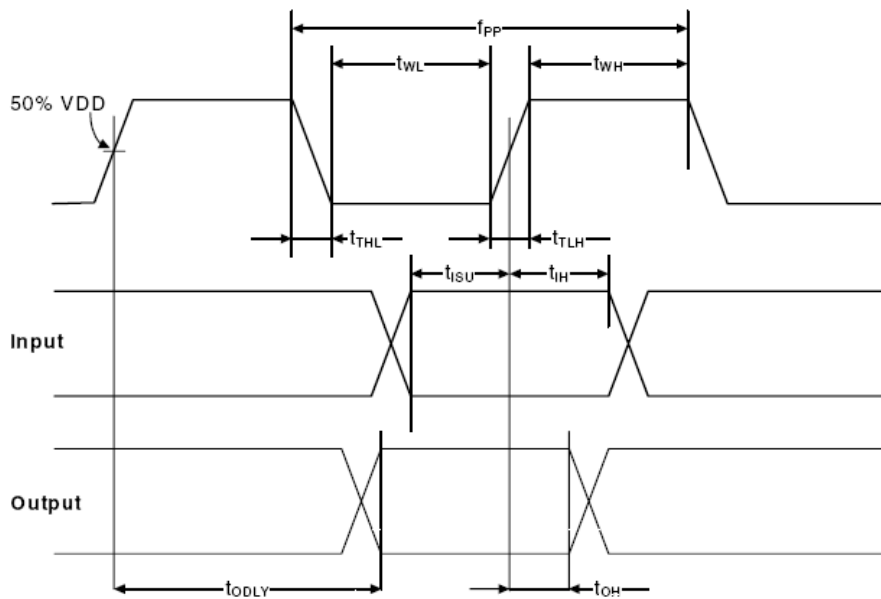


SDIO Bus Timing Parameters (Default Mode)

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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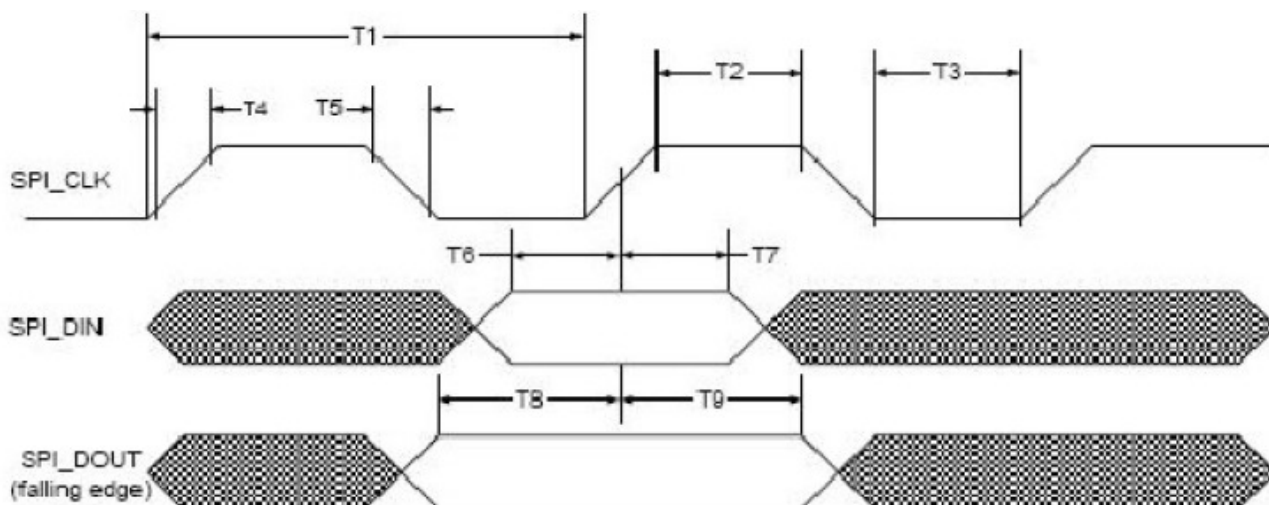
SDIO timing in High-Speed Mode



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	F _{max} = 48 MHz
Clock high/low	T2/T3	(0.45xT1) - T4	(0.55 xT1) - T4	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)

Interface during Sleep mode

PD: Pull Down, PU: Pull UP

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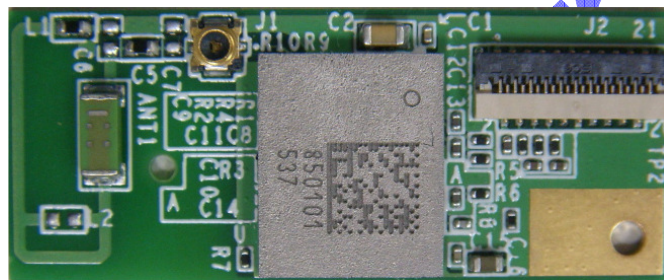
5.8. DIMENSIONS, WEIGHT AND MOUNTING

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

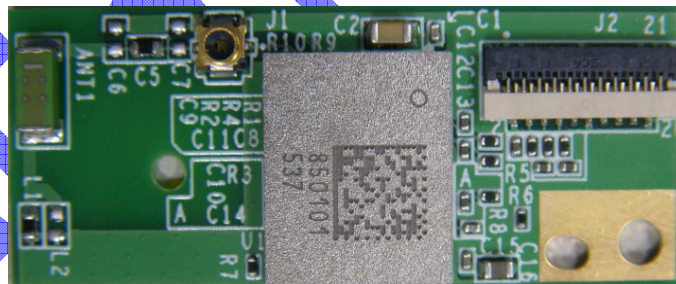
5.8.1. DIMENSIONS

The size and thickness of the WM-N-BM -02_D is "11 mm (W) x 27 mm (L) x 1.8 mm (Max)(H)

H380A



L330W



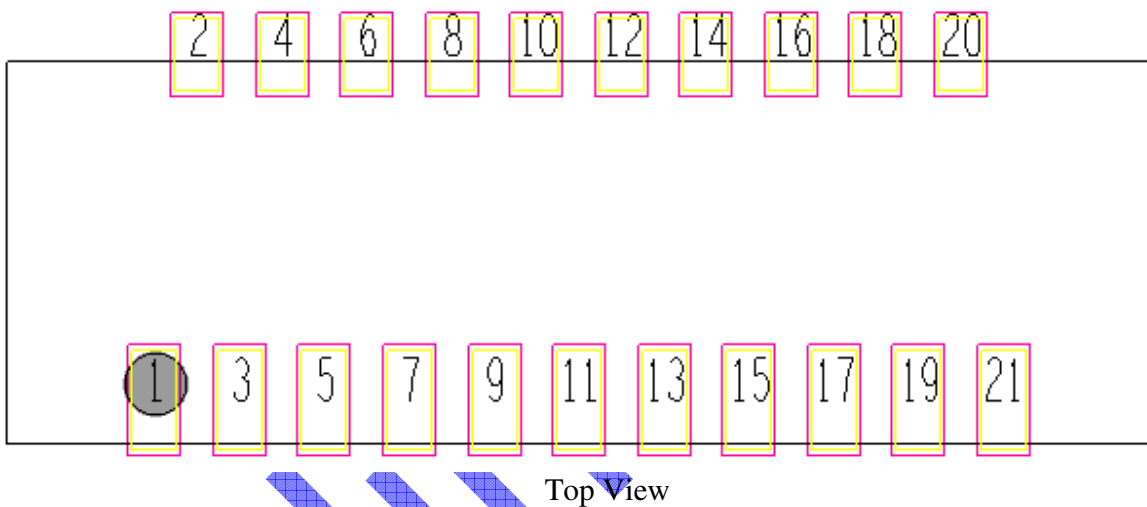
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6. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

The WM-N-BM -02_D is pre-tested to ensure that all requirements met as set forth in the following sections.

Final certification (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_D . No level certification on WM-N-BM -02_D .

7. PIN OUT AND PIN DESCRIPTION



Pin Description

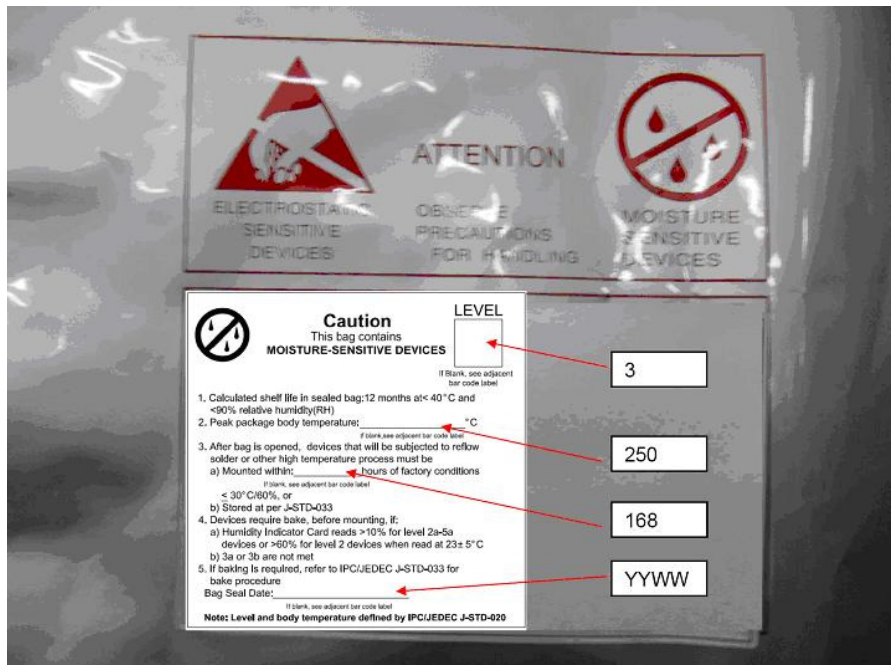
Pin-Nmnumber	Pin-Define	Type	Description
1	GND	I	Ground
2	GND	I	Ground
3	SDIO_CLK	I/O	SDIO clock. This pin has an internal weak pull-up resistor.
4	GND	I	Ground
5	SDIO_DAT0	I/O	SDIO data 0. This pin has an internal weak pull-up resistor.
6	SDIO_CMD	I/O	SDIO command. This pin has an internal weak pull-up resistor.
7	SDIO_DAT3	I/O	SDIO data 3. This pin has an internal weak pull-up resistor.
8	SDIO_DAT2	I/O	SDIO data 2. This pin has an internal weak pull-up resistor.
9	SDIO_DAT1	I/O	SDIO data 1. This pin has an internal weak pull-up resistor.

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10	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
11	GND	I	Ground
12	GND	I	Ground
13	GND	I	Ground
14	VBAT	I	Battery supply input (2.8V~5V)
15	VBAT	I	Battery supply input (2.8V~5V)
16	VBAT	I	Battery supply input (2.8V~5V)
17	3.3V	I	--Digital I/O supply (3.3V)
18	3.3V	I	--Digital I/O supply (3.3V)
19	3.3V	I	--Digital I/O supply (3.3V)
20	GND	I	Ground
21	GND	I	Ground

8. PACKAGE AND STORAGE CONDITION

8.1. PACKAGE DIMENSION



8.2. ESD LEVEL

For Additional information, please contact the following:

Universal Scientific Industrial Co., Ltd.

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Fax: +886-49-3439561, 2337360, 2351093

E-mail: usi@ms.usi.com.tw

Federal Communication Commission Interference Statement

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 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: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This module can be used with **FUJIFILM Digital Camera: FinePix S8200W, FinePix S8250W, FinePix S8300W, FinePix S8350W, FinePix S8400W, FinePix S8450W, FinePix S8500W, FinePix S8550W, FinePix S8230W, FinePix S8330W, FinePix S8430W, FinePix S8530W** or similar platform with similar dimension, antenna location and RF characteristic.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed at same location as tested in the certification filing.
- 2) The transmitter module may not be co-located with any other transmitter or antenna.
- 3) For portable usage condition, this module has been SAR evaluated in **Fuji Film Digital Camera: FinePix S8200W** host with compliance result and can be used with this specific host as described in the certification filing. Other host or platform needs separate approval.

As long as 3 conditions above are met, further transmitter test 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

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations 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. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following: “**Contains FCC ID: W2Z-02100003**”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

IC Regulations:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This module can be used with [FUJIFILM Digital Camera: FinePix S8200W, FinePix S8250W, FinePix S8300W, FinePix S8350W, FinePix S8400W, FinePix S8450W, FinePix S8500W, FinePix S8550W, FinePix S8230W, FinePix S8330W, FinePix S8430W, FinePix S8530W](#) or similar platform with similar dimension, antenna location and RF characteristic.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p) is not more than necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Labeling Requirements for the Host Device (from Section 3.2.1, RSS-Gen, Issue 3, December 2010): The host device shall be properly labeled to identify the module within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words —Contains transmitter module, or the word —Contains, or similar wording expressing the same meaning, as follows: Contains transmitter module [IC: 7736B-02100003](#)

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the

maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.