Data Sheet

Of

WM-N-BM-01 WLAN Module

Introduction

The 802.11b/g/n Wireless SiP module WM-N-BM-01 which refers as “SiP module” is a small size module that provides full function of 802.11b/g/n (draft n), module via 66 pins LGA Foot Print.

This multi- functionality and board to board physical interface provides SDIO 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 4319 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

Change Sheet

Rev.	Date	Description of change			Approval & Date
		Page	Par	Change(s)	
1.0	11/23/09	All	All	Draft version for Review	Jason Tsai
2.0	01/21/10	10	5.4	Change Tolerance of TX power	Jason Tsai
2.1	01/28/10	9,10	5.2.2, 5.4	Update 11n TX power, sensitivity max. value, add EVM, current consumption	Jason Tsai
2.2	02/02/10	9	5.2	Add USB version operating temperature	Jason Tsai
2.3	03/04/10	6,25	2, 10.3	Modify block diagram, change life cycle to 2 years.	Jason Tsai
2.4	04/06/10	16	5.6	Update Module actual dimension	Scarrie
3.1	06/22/10	11	5.4	Add the operating temperature -30° to 80° of SDIO specification .	Scarrie
3.2	01/10/11	10	8 5.4	Modify Laser Mark Add the 11g all of data rate	Jason Scarrie

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

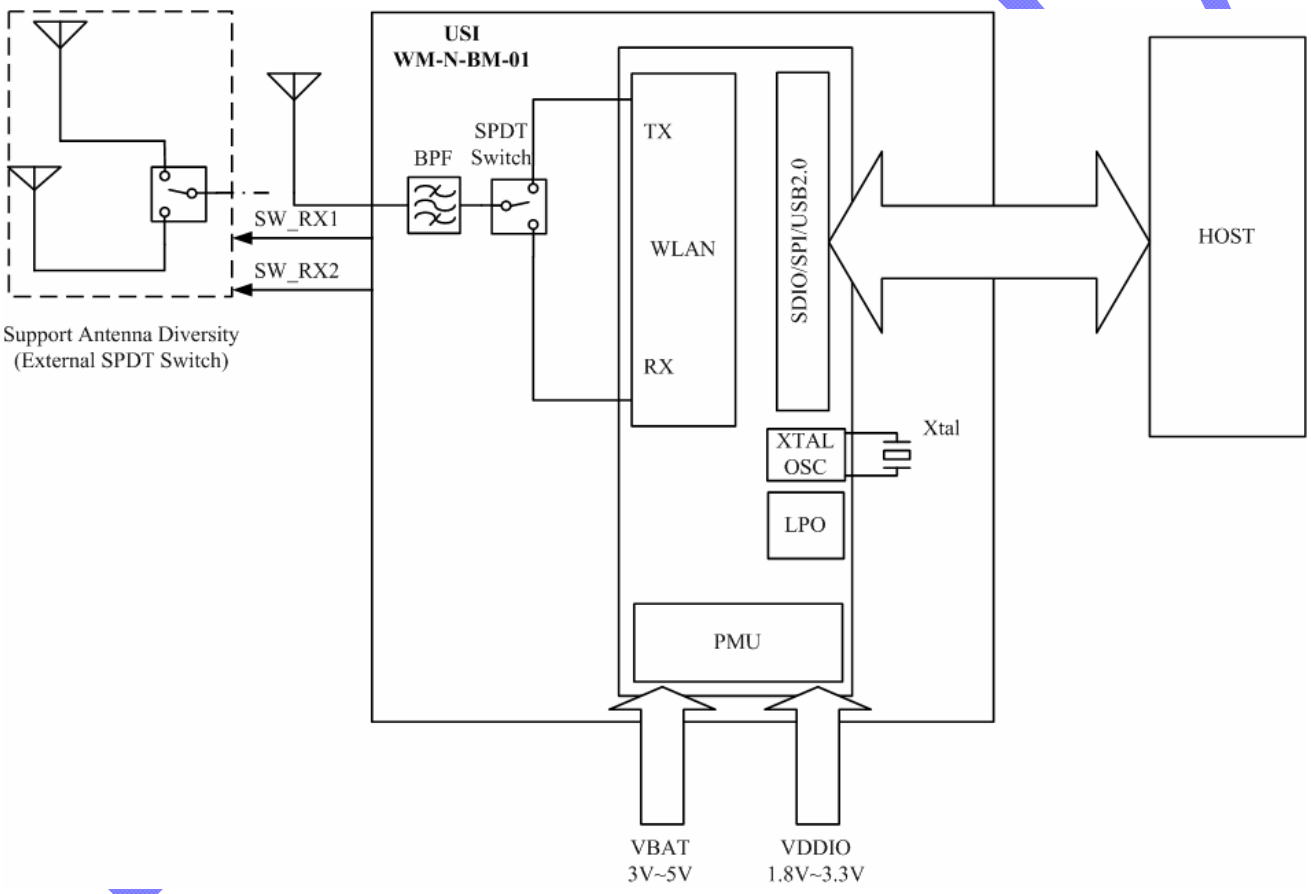
The WM-N-BM-01 module - is one of the product families in USI's product offering, targeting for system integration requiring a smaller form factor. It also provides the standard migration to high data rate to USI's current SIP customers.

The purpose of this document is to define the product specification for 802.11b/g/n (draft n) WiFi module WM-N-BM-01. **All the data in this document is based on Broadcom 4319 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-01.

2. BLOCK DIAGRAM

The WM-N-BM-01 module is designed based on Broadcom 4319 chipset solution.
It supports SDIO interface to connect the WLAN to the host processor. A Bluetooth co-existence interface is supported for external, co-located Bluetooth devices. Antenna diversity should add one SPDT switch outside module and control by module.
A simplified block diagram of the WM-N-BM-01 module is depicted in the Fig. below.



3. DELIVERABLES

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

- WM-N-BM-01 Module with packaging
- Evaluation kits (with SDIO 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-01 module.
- Unit Test / Qualification report
- Product Specifications.
- Agency certification pre-test report base on adapter boards

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-N-BM-01 module has to withstand the operational requirements as listed in the table below.

Operating Temperature	-20° to 70° Celsius for SDIO/gSPI version -15° to 70° Celsius for USB version	
Humidity range	Max 95%	Non condensing, relative humidity

5.2.1. VOLTAGE

Power supply for the WM-N-BM-01 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	315mA	340mA[a]
	Tx @ 15dBm output power @ 25C (11g), 3.3V	220mA	310mA[b]
	Tx @ 15dBm output power @ 25C (11n, HT20), 3.3V	220mA	310mA[b]
	Tx @ 15dBm output power @ 25C (11n, HT40), 3.3V	220mA	290mA[c]
	Rx @25C, 3.3V	77mA	130mA[d]

a. For 1Mbps Max. current
b. For 6Mbps and 11n HT20 MCS0 Max. current
c. For 11n HT40 MCS0 Max. current
d. Include USB mode and SDIO mode max .current range
■ Include EVB power consumption

5.3. WIRELESS SPECIFICATIONS

The WM-N-BM-01 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	2.400 GHz – 2.484 GHz

5.4. RADIO SPECIFICATIONS 802.11B/G/N

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	17 dBm +2/-2 dBm for 1, 2, 5.5, 11Mbps 15 dBm +2/-2 dBm for 6, 9, 12, 18, 24, 36, 48, 54 Mbps 14 dBm +2/-2 dBm for 11n (HT20) 14 dBm +2/-2 dBm for 11n (HT40)		
Wide-Band Noise	-160 dBm/Hz (max.)@869 MHz~960 MHz -160 dBm/Hz (max.)@1800 MHz~1990 MHz -155 dBm/Hz (max.)@2110 MHz~ 2170MHz		
EVM	Typical	Maximum	Unit
@11 Mbps	-13	-11	dB
@1 Mbps	-13	-11	dB
@54 Mbps	-30	-25	dB
@6 Mbps	-30	-25	dB
@ MCS7	-30	-28	dB
@ MCS0	-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 @ 65 Mbps	**-72**	**-68**	**dBm**
PER <10%, Rx Sensitivity @ 135 Mbps	**-68**	**-64**	**dBm**

When the WM-N-BM-01 module has to withstand the operating temperature -30° to 80° Celsius for SDIO version, the specification are list in the table below.

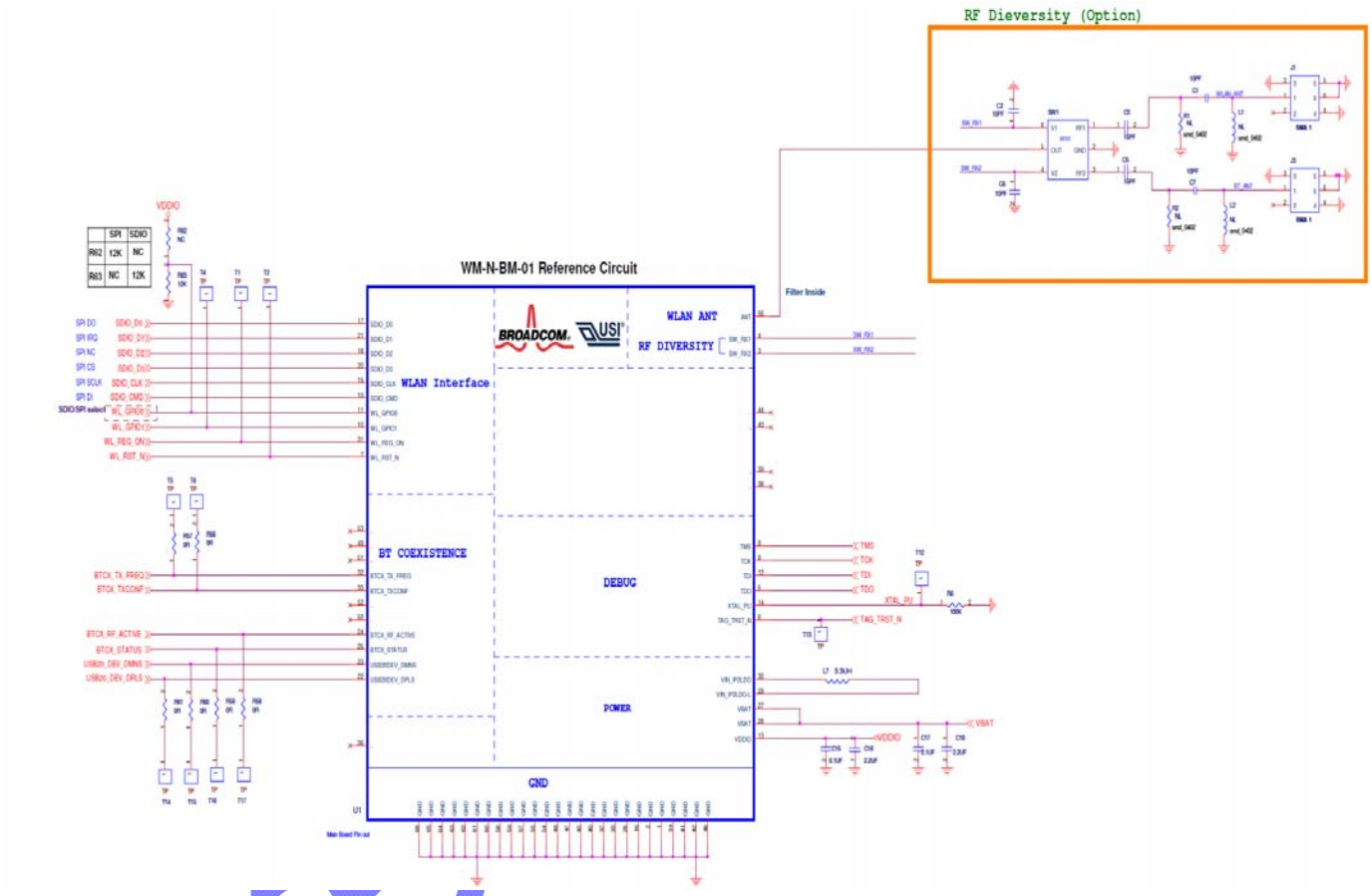
a. RX specification:

Receiver Characteristics (3.3V, 25 degree C)	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	-69	dBm
PER <10%, Rx Sensitivity @ 65 Mbps	-72	-67	dBm
PER <10%, Rx Sensitivity @ 135 Mbps	-68	-64	dBm

b:TX EVM specification:

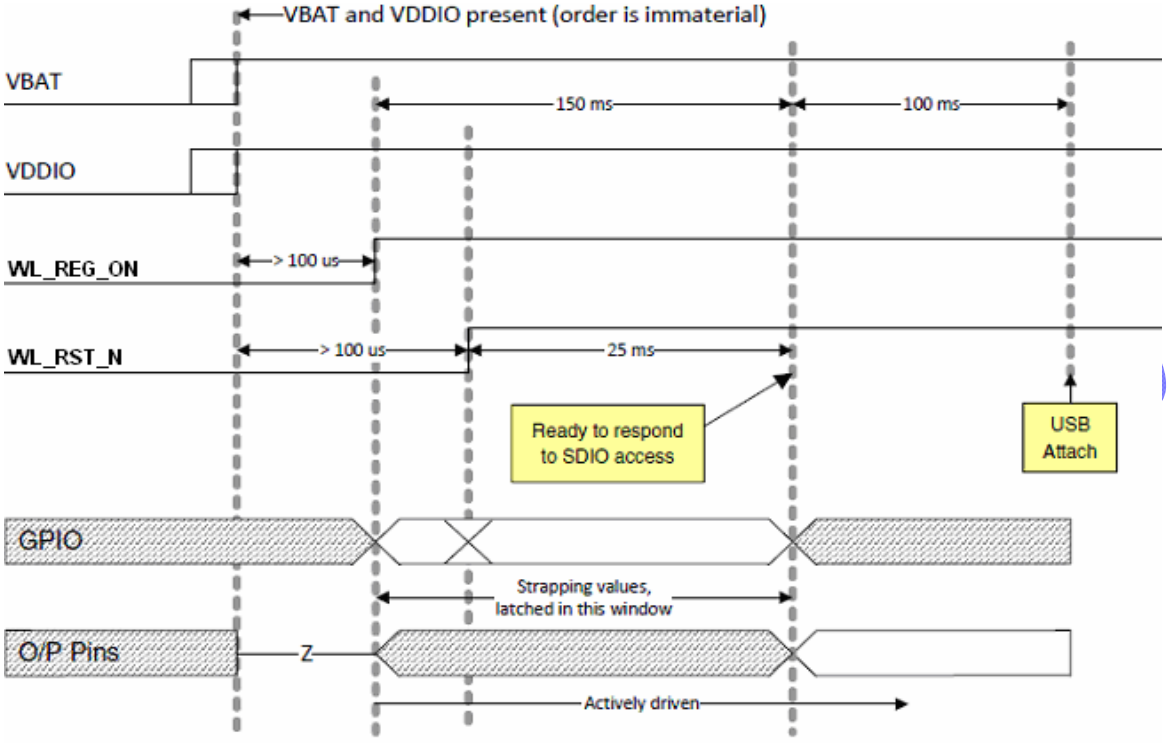
EVM	Typical	Maximum	Unit
@11 Mbps	-13	-11	dB
@1 Mbps	-13	-11	dB
@54 Mbps	-30	-25	dB
@6 Mbps	-30	-25	dB
HT20M@ MCS7	-30	-28	dB
HT20M@ MCS0	-30	-28	dB
HT40M@ MCS7	-30	-25	dB
HT40M@ MCS0	-30	-25	dB

Reference Circuit



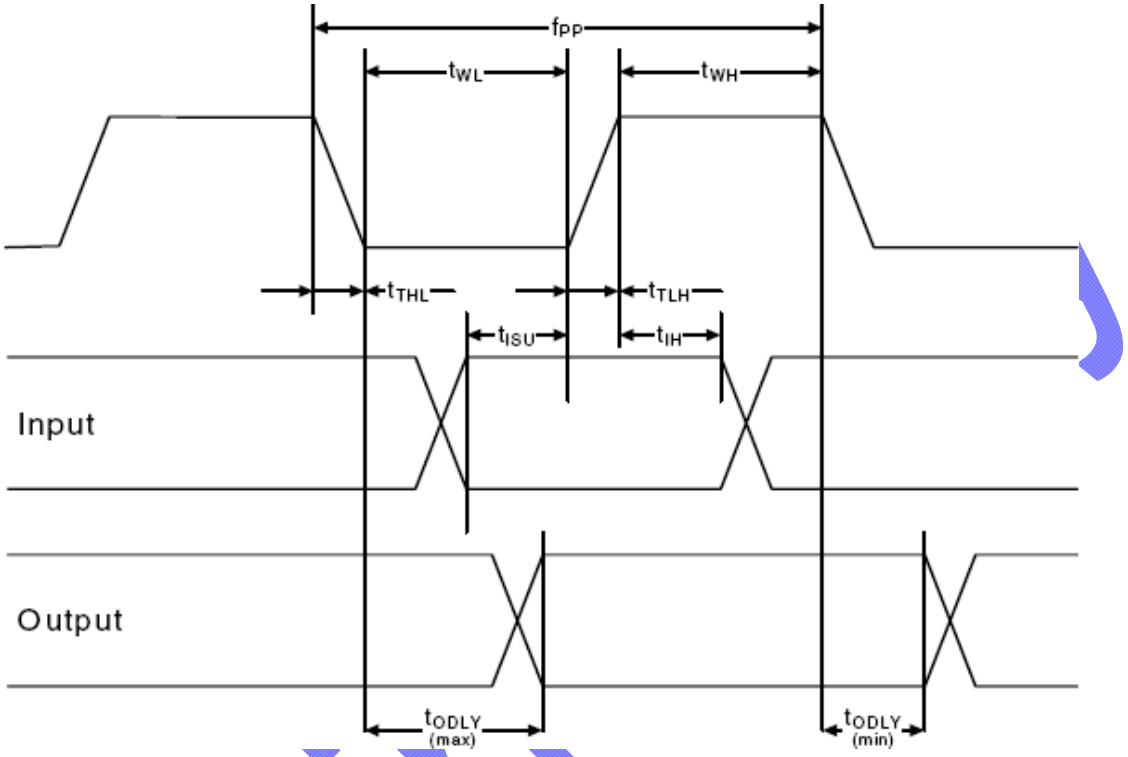
5.5. TIMING DIAGRAM OF INTEFACE

Power UP TIMING DIAGRAMS



SDIO TIMING

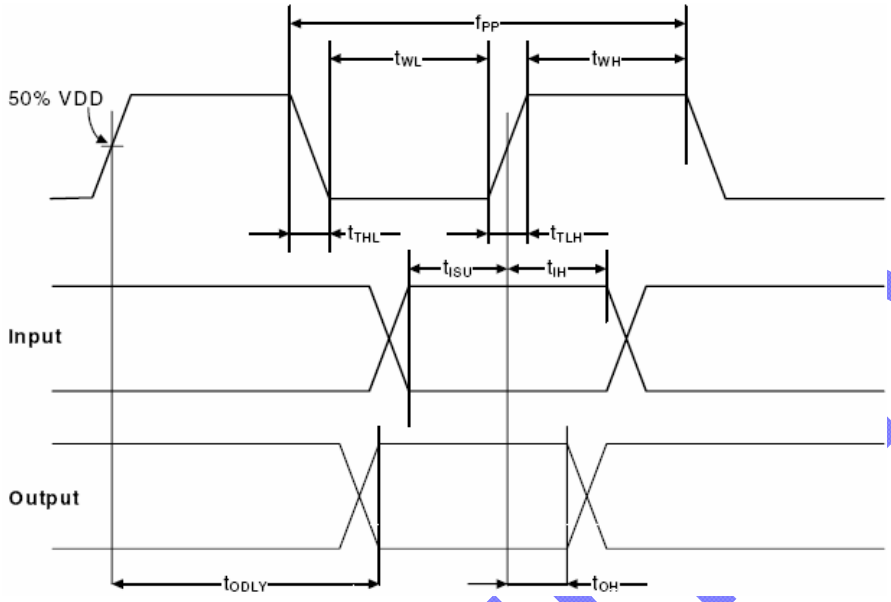
SDIO timing in default mode



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	fPP	0	-	25	MHz
Frequency--Identification Mode	fOD	0	-	400	kHz
Clock Low Time	tWL	10	-	-	ns
Clock High Time	tWH	10	-	-	ns
Clock Rise time	tTLH	-	-	10	ns
Clock Low Time	tTHL	-	-	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input Setup Time	tISU	5	-	-	ns
Input Hold Time	tIH	5	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
Output Delay time--Data Transfer Mode	tODLY	0	-	14	ns
Output Delay time--Identification Mode	tODLY	0	-	50	ns

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	fPP	0	-	50	MHz
Frequency--Identification Mode	fOD	0	-	400	kHz
Clock Low Time	tWL	7	-	-	ns
Clock High Time	tWH	7	-	-	ns
Clock Rise time	tTLH	-	-	3	ns
Clock Low Time	tTHL	-	-	3	ns
Inputs: CMD, DAT (referenced to CLK)					
Input Setup Time	tISU	6	-	-	ns
Input Hold Time	tIH	2	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
Output Delay time--Data Transfer Mode	tODLY	-	-	14	ns
Output Hold time	tOH	2.5	-	-	ns
Total System Capacitance (each line)	CL	-	-	40	pF

Reference	Description	Min	Typ	Max	Unit
1	PCM bit clock frequency	128	–	2048	kHz
2	PCM bit clock high time	209	–	–	ns
3	PCM bit clock low time	209	–	–	ns
4	Setup time for BT_PCM_SYNC before falling edge of BT_PCM_CLK during first bit	50	–	–	ns
5	Hold time for BT_PCM_SYNC after falling edge of BT_PCM_CLK during second bit period. (BT_PCM_SYNC may go low any time from second bit period to last bit period)	10	–	–	ns
6	Delay from rising edge of BT_PCM_CLK or BT_PCM_SYNC (whichever is later) to data valid for first bit on BT_PCM_OUT	–	–	50	ns
7	Hold time of BT_PCM_OUT after BT_PCM_CLK falling edge	–	–	175	ns
8	Setup time for BT_PCM_IN before BT_PCM_CLK falling edge	50	–	–	ns
9	Hold time for BT_PCM_IN after BT_PCM_CLK falling edge	10	–	–	ns
10	Delay from falling edge of BT_PCM_CLK or BT_PCM_SYNC (whichever is later) during last bit in slot to BT_PCM_OUT becoming high impedance	–	–	100	ns

Module Interface during Sleep mode

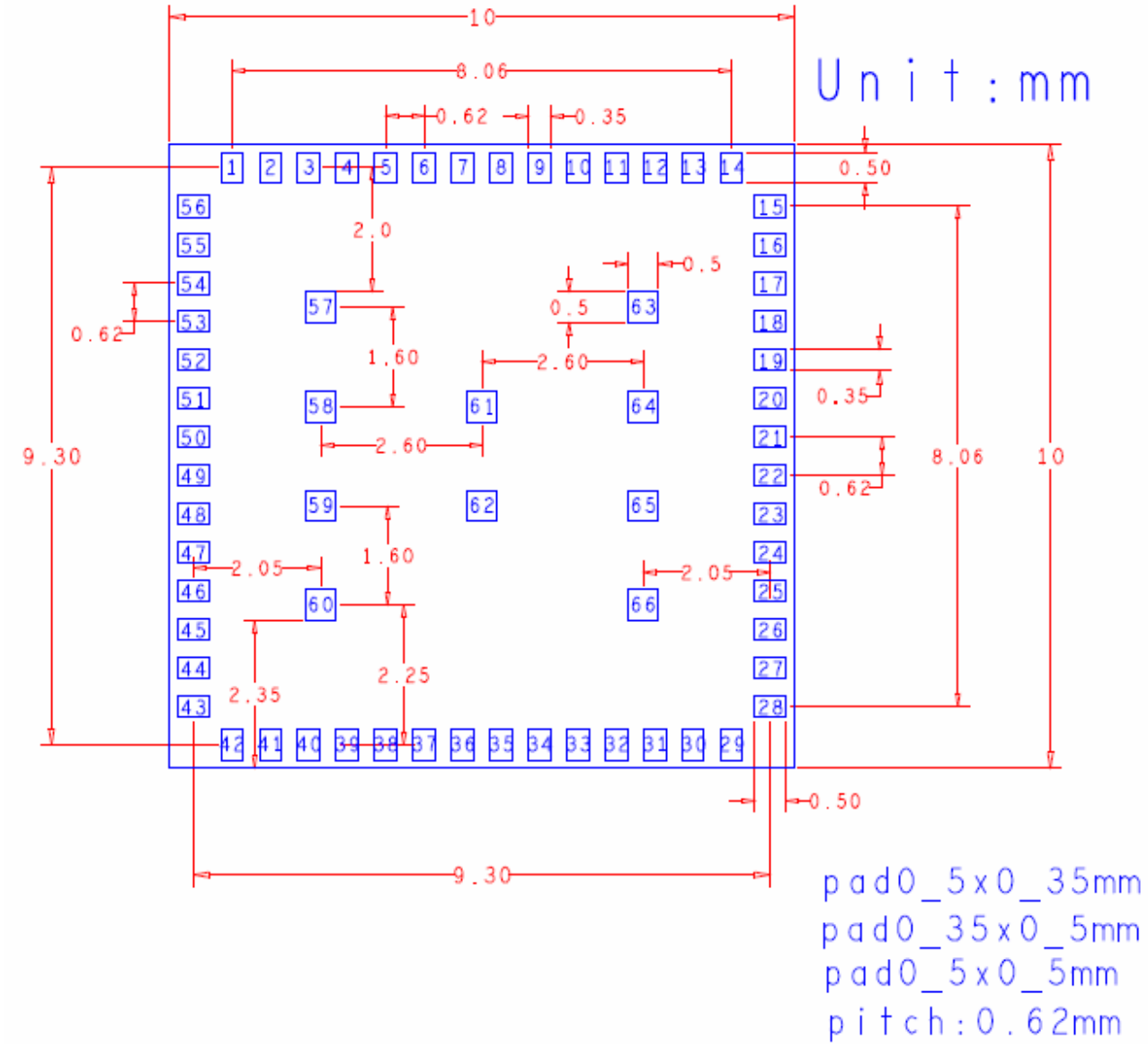
PD: Pull Down, PU: Pull UP

5.6. DIMENSIONS, WEIGHT AND MOUNTING

The following paragraphs provide the requirements for the size, weight and mounting of the WM-N-BM-01 module.

5.6.1. DIMENSIONS

The size and thickness of the WM-N-BM-01 module is "10 mm (W) x 10 mm (L) x 1.3 mm (H) +0.05/-0.13 mm "(Including Metal Shielding)

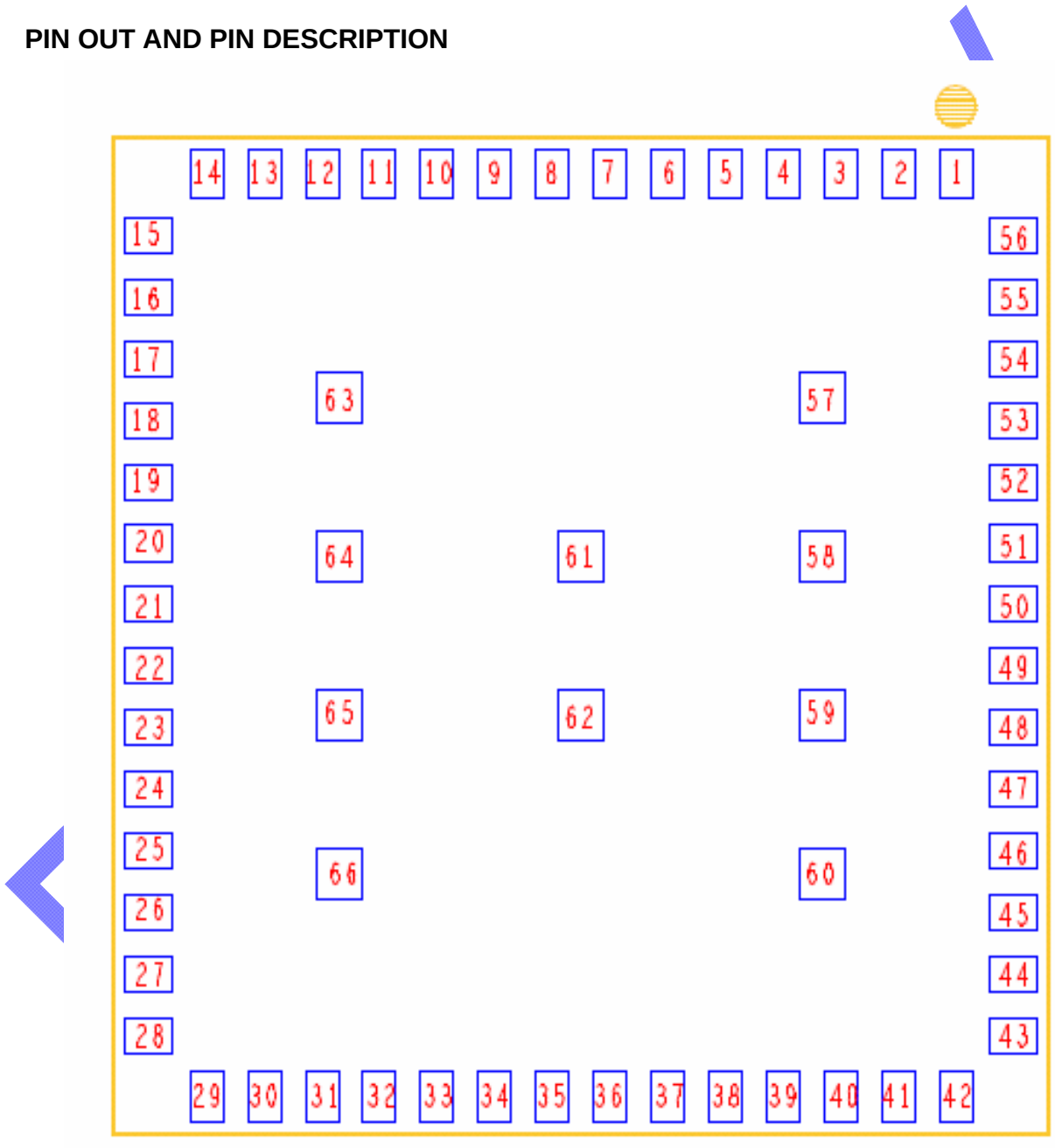


(Bottom View)

6. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

The WM-N-BM-01 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-01 module. No module level certification on WM-N-BM-01 module.

7. PIN OUT AND PIN DESCRIPTION



Top View

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Pin Description

Pin-Nmnber	Pin-Define	Type	Description
1	GND	I	Ground
2	GND	I	Ground
3	SW_RX2	O	Control signal for Antenna Diversity RF2
4	SW_RX1	O	Control signal for Antenna Diversity RF1
5	TDO	I	For debug only
6	TAG_TRST_N	I	For debug only
7	WL_RST_N	I	Low asserting reset for WLAN core
8	TCK	I	For debug only
9	TMS	I	For debug only
10	WL_GPIO_1	O	HOST_WAKE Host wake up: Signal from the module to the host indicating that the module 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.
11	WL_GPIO_0	I	SDIO mode: Low, gSPI mode:High
12	TDI	I	For debug only
13	VDDIO	I	Digital I/O supply (1.8V or 3.3V)
14	XTAL_PU	O	Crystal circuit/reference clock enable (programmable polarity, default is active high)
15	SDIO_CLK	I/O	SDIO clock. This pin has an internal weak pull-up resistor.
16[A]	GND	I	Ground
17	SDIO_D0	I/O	SDIO data 0. This pin has an internal weak pull-up resistor.
18	SDIO_D2	I/O	SDIO data 2. This pin has an internal weak pull-up resistor.
19	SDIO_CMD	I/O	SDIO command. This pin has an internal weak pull-up resistor.
20	SDIO_D3	I/O	SDIO data 3. This pin has an internal weak pull-up resistor.
21	SDIO_D1	I/O	SDIO data 1. This pin has an internal weak pull-up resistor.
22	-	-	-
23	-	-	-

24[A]	BTCX_RF_ACTIVE	I	Indicates that the coexistence BT is active.
25[A]	BTCX_STATUS	I	Indicates the coexistence of BT priority status and RX/TX direction.
26	GND	I	Ground
27	VBAT	I	Battery supply input (2.8V~5V)
28	VBAT	I	Battery supply input (2.8V~5V)
29	VIN_IP2LDO-L	O	Connect to Boost L (3.3uH is required)
30	VIN_1P2LDO	I	Connect to Boost L (3.3uH is required)
31	WL_REG_ON	I	Used by PMU (along with WL_REG_ON) to decide whether or not to power down internal BCM4319 regulators.
32[A]	BTCX_FREQ	I	Indicates that the coexistence BT is about to transmit on a restricted channel.
33[A]	BTCX_TXCONF	O	Output permission for the coexistence BT to transmit.
34	GND	I	Ground
35	GND	I	Ground
36	-	-	-
37	GND	I	Ground
38	-	-	-
39	-	-	-
40	GND	I	Ground
41	GND	I	Ground
42	GND	I	Ground
43	-	-	-
44	-	-	-
45	GND	I	Ground
46	GND	I	Ground
47	GND	I	Ground
48	GND	I	Ground
49	-	-	-
50	-	-	-
51	-	-	-
52	-	-	-

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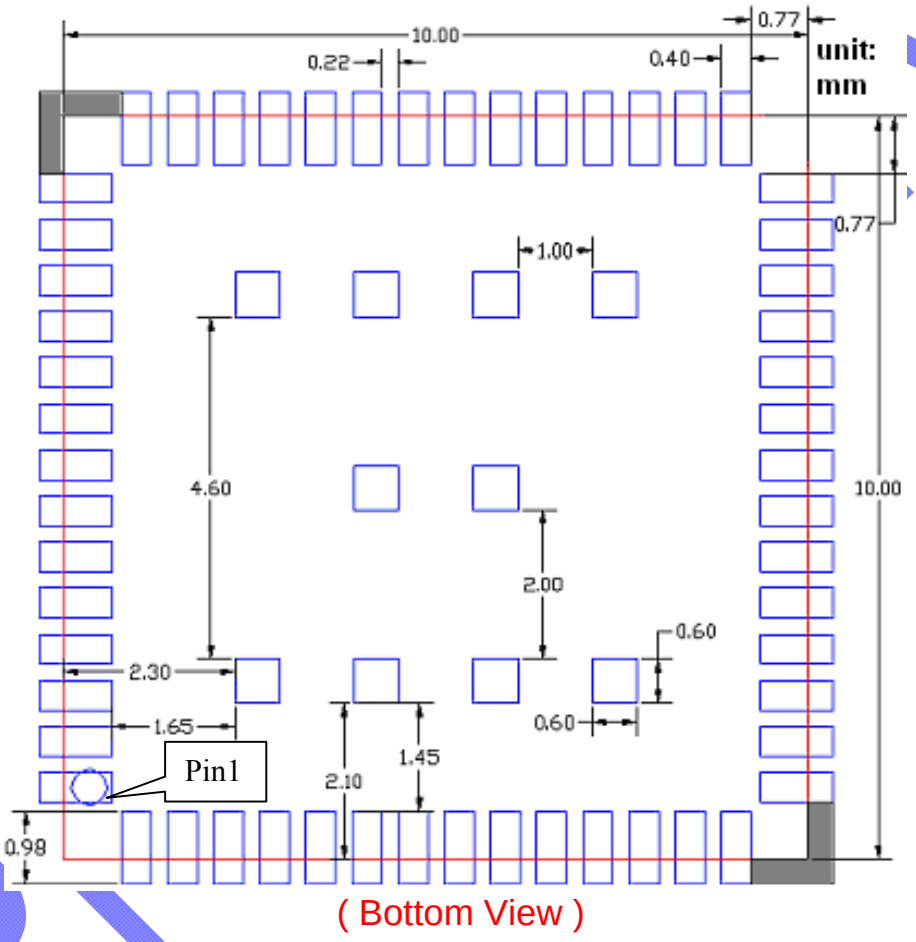
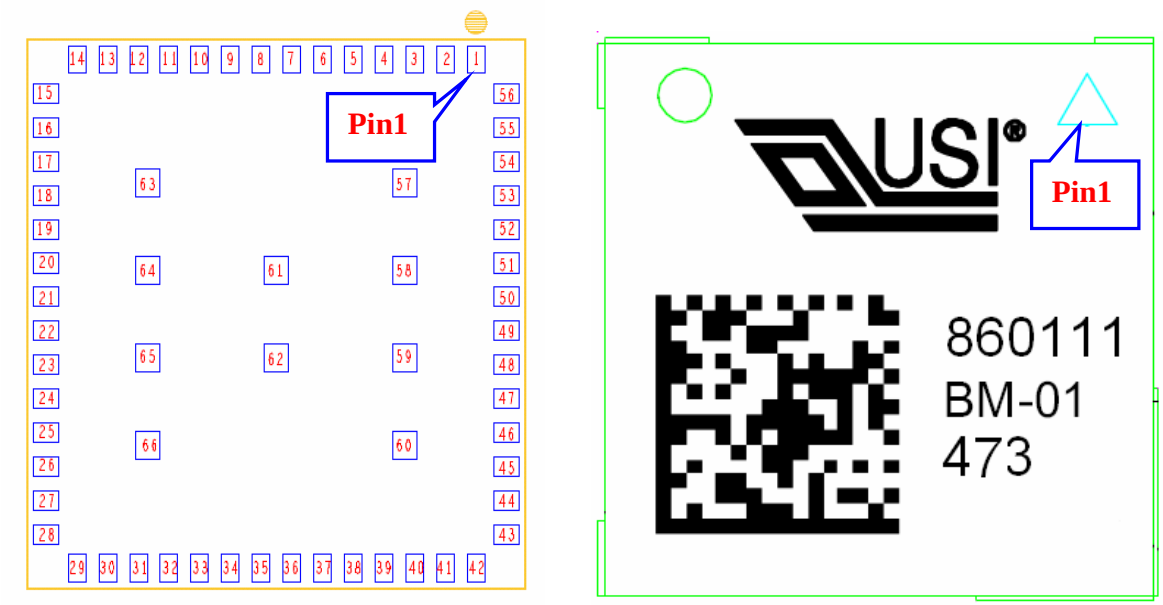
53	-	-	-
54	GND	I	Ground
55	GND	I	Ground
56	ANT	I/O	Antenna port for WLAN and Bluetooth
57~66	GND	I	Ground

8. RECOMMEND FOOTPRINT



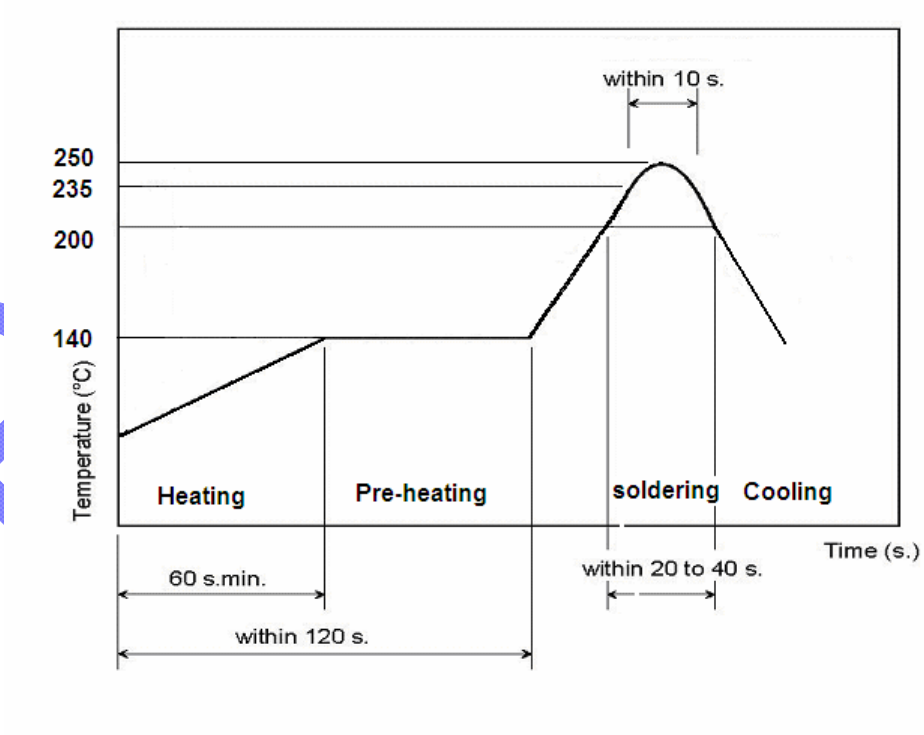
(Bottom View)

Unit: mm



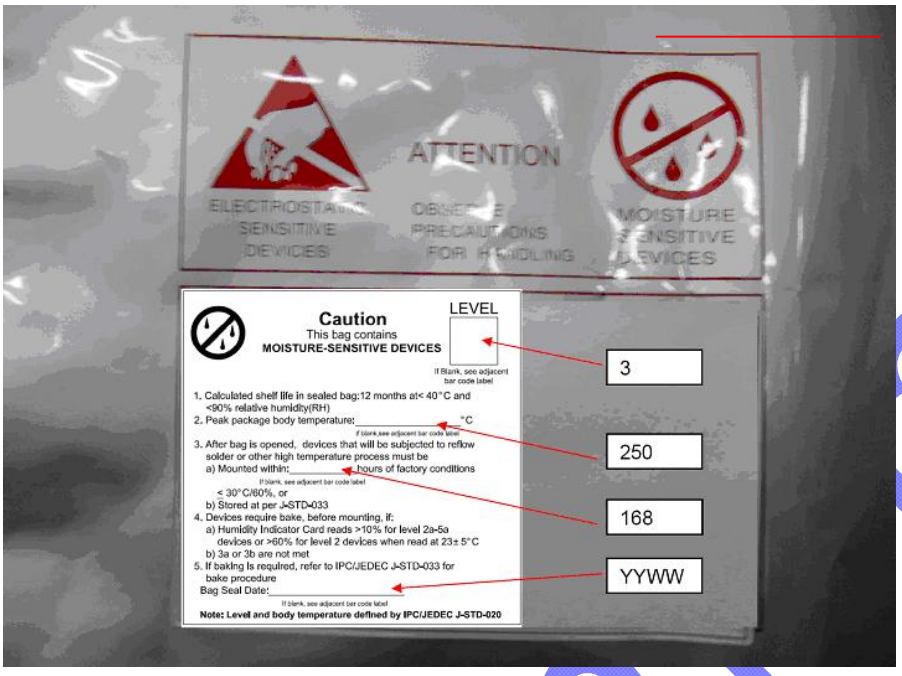
(TOP View)

9. RECOMMANDED REFLOW PROFILE



10. PACKAGE AND STORAGE CONDITION

10.1 Package Dimension



10.2 ESD Level

Note:

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

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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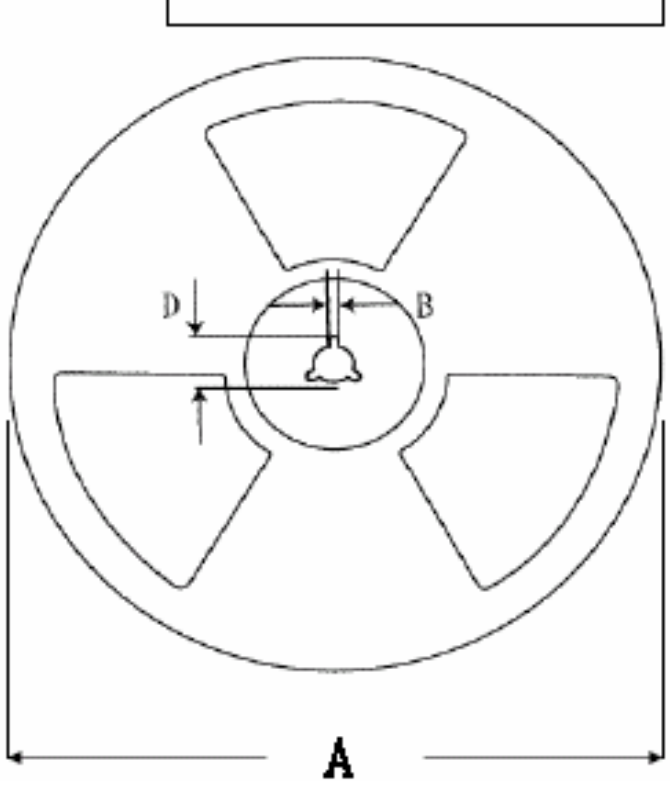

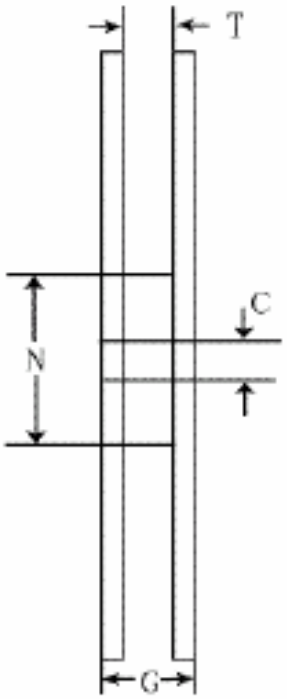

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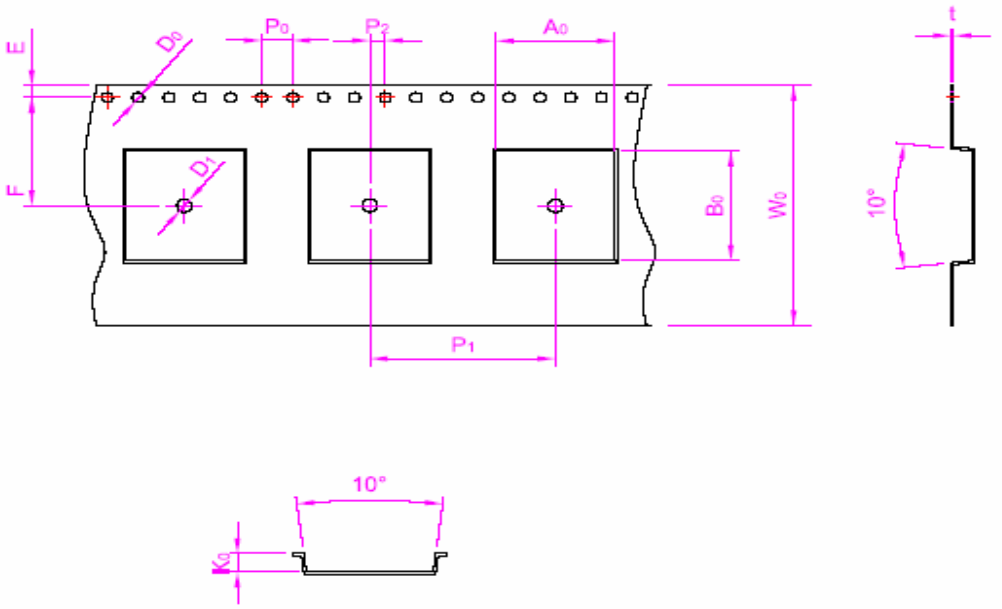
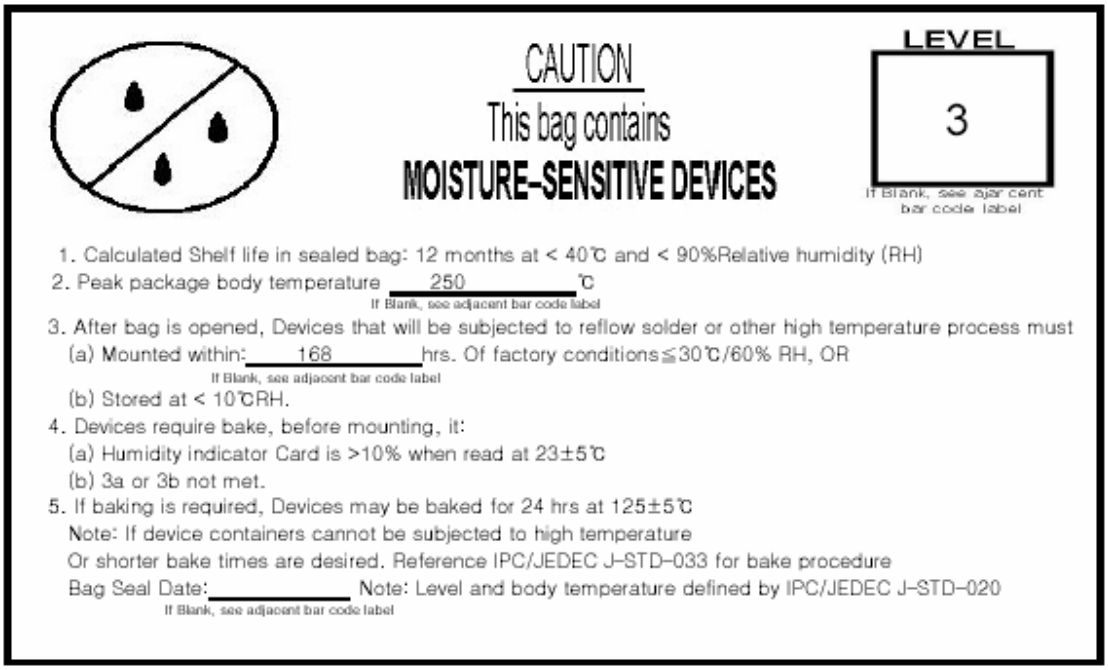


ITEM	A0	B0	D0	D1	E	F	K0
SPEC	9.9±0.1	9.9±0.1	1.50+0.1/-0	1.5+0.1/-0	1.75±0.1	11.5±0.1	1.95±0.1
ITEM	K1	P0	P1	P2	P0 X10	t	W0
SPEC		4.00±0.1	12.0±0.1	2.00±0.1	Cumulative Tolerance ±0.2	0.40±0.05	24±0.3

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



Half-Sine Shock
Sustained for Mechanical Shock under 2000G
Life cycle: 2years

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For Additional information, please contact the following:
Universal Scientific Industrial Co., Ltd.
Headquarters
141, Lane 351, Taiping Road, Sec. 1, Tsao-Tuen, Taiwan,
Http://www.usi.com.tw
Tel: + 886-49-2350876, 2325876
Fax: +886-49-3439561, 2337360,2351093
E-mail:usi@ms.usi.com.tw