User Manual

WIRELESS LAN + BLUETOOTH MODULE
MODEL DWM-W314K

The purpose of this manual is to explain correct way how to integrate module DWM-W314K to the end product. It includes procedures that shall assist you to avoid unforeseen problems.

This manual presents information that shows how module and OEM product, where module integrated,complies with regulations in certain regions. Any modifications, not expressly approved by the manufacturer could void the authority to operate in these regions.

The wireless LAN + Bluetooth module, model DWM-W314K has to be installed and used in accordance with the technical description/installation instructions provided by the manufacturer. For detail information concerning type approval of this module (e.g. where this module is already pre-approved) please contact the authorized local distributor or the manufacturer.

The system may only be implemented in the configuration that was authorized.

Note that any changes or modifications to this equipment not expressly approved by the manufacturer could void the user's authority to operate this equipment.

Regulatory Information

Operational Information

Wireless Interoperability

The end product integrating this module is designed to be interoperable with any wireless LAN and Bluetooth product that is based on direct sequence spread spectrum (DSSS) ,orthogonal frequency division multiplexing (OFDM) ,Frequency Hopping Spread Spectrum (FHSS) and radio technology and to comply with the following standards.

· IEEE Std 802.11b Standard on 2.4GHz Wireless LAN

· IEEE Std 802.11g Standard on 2.4GHz Wireless LAN

· IEEE Std 802.11n Standard on 2.4GHz Wireless LAN

· Bluetooth V4.0 Standard

Federal Communications Commission (FCC) Statement

15.105(b) 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 or more 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.

15.21: You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

FCC RF Radiation Exposure Statement:

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

2.This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

FCC RF Exposure requirements:

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

15.19

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 of the device.

Labeling:

Wireless LAN + Bluetooth module DWM-W314K labeled as below.

FCC ID: EW4DWMW314K

The proposed with FCC ID label format is to be placed on the module. If FCC ID is not visible when the module is installed into the system, "Contains FCC ID:

EW4DWMW314K" shall be placed on the outside of final host system

Instructions to OEM Integrators

A User manual provided to the end user must indicate the operating requirements and conditions that must be observed to ensure compliance with the above-mentioned FCC RF Exposure guideline.

If this module is intended for use in a portable device, integrators are responsible for separate evaluation and/or approval to satisfy FCC RF Exposure requirements.

The antenna used this module is as follows;

Antenna Type: PCB printed antenna

Antenna Gain: -4.7dBi

If an antenna with higher gain or new antenna type is used with this module, integrators must contact to manufacture for additional testing and submission to the FCC.

If other radio devices are to be integrated with this module, an additional evaluation and FCC submission may be required. Integrators are responsible for such additional evaluation and FCC submission.

Notice.

Since this module is not sold to general end users directly, there is no user manual of module.

For the details about this module, please refer to the specification sheet of module.(Next Page)

This module should be installed in the host device according to the interface specification (installation procedure).

This module built-in use in equipment.

If you do not include the module to the equipment,only be operated by "TX continue" and "RX continue" stand alone mode separated.

MODULE   SPECIFICATION

Contents.

1.Product Summary

1-1.Scope

IEEE802.11.b/g/n 2.4 GHz WLAN and Bluetooth 4.0 + LE module with integrated antenna

1-2.General explanation

- ・Weight 0.5g typ
- ・Chipset Marvell.88W8777(WLCSP Package)
- ・Host Interfase SDIO ver2.0

1-2-1.WLAN

- ・Standard IEEE802.11b/g/n
- ・Frequency 2.4-2.4835GHz
- ・Frequency Bandwidth 20MHz
- ・Modulation Types DBPSK, DQPSK and CCK with 802.11b mode
  OFDM(BPSK, QPSK, 16-QAM and 64-QAM) with 802.11g/n mode
- ・Data rate 1,2,5.5Mbps and 11Mbps with 802.11b mode
  6,9,12,18,24,36,48Mbps and 54Mbps with 802.11g mode
  MCS0-7 with 802.11n mode

1-2-2.Bluetooth

- ・Standard Bluetoorh V4.0
- ・Frequency 2.4-2.4835GHz
- ・Host Interfase SDIO ver2.0
- ・Frequency Bandwidth 1MHz(BDR/EDR),2MHz(LE)
- ・Modulation Types GFSK,PI/4-DQPSK,8DPSK
- ・Data rate 1,2,3Mbps

2.Hardware Specification

2-1. Block diagram

PCB Printed Antenna

+1.249V

WLAN TX/RX

Bluetooth TX/RX

LPF

SPDT
RF Switch

LPF1
DEA102700LT-6307A2

U1
NJG1801K75

Operation Frequency:
WLAN:2.412GHz to 2.462GHz
Bluetooth:2.402GHz to 2.480GHz
Operation Voltage DC 3.3V

使用周波数帯:
無線LAN:2.412GHz to 2.462GHz
Bluetooth:2.402GHz to 2.480GHz
定格電圧 DC 3.3V

LDO

U2
88W8777

OTP
Memory

I/F

SDIO I/F

Pdn

HostWakeup

VDD33(3.3V)

VIO

J2
14FZA-SM1-GAN-TB

Y2
NX2012SA

32.768kHz
FCXO

26MHz
XTAL

VIO

Regulator

+1.8V

Y1
NX2016SA

U3
MM3411A18RRE

2-2.Environmental condition

1) Operating environment

Operating temperature range	-20 ~ 70 ℃	※Temperature on the bottom of the module
Operating humidity range	20%～80%	(None dew)

2) Storage environment

Storage temperature range	-30 ~ 85 ℃	
Storage humidity range	20%～85%	(None dew)

2-3.Power supply

Item	Min.[V]	TYP .	Max.[V]
VDD33	2.97	3.30V	3.63

3.Electrical Characteristics

3-1.Channel Plan

IEEE802.11b/g/n

CH ID	Freq.[MHz]	CH ID	Freq.[MHz]	CH ID	Freq.[MHz]
1	2412	6	2437	11	2462
2	2417	7	2442		
3	2422	8	2447		
4	2427	9	2452		
5	2432	10	2457		

IEEE802.15(Bluetooth BDR/EDR)

CH ID	Freq.	CH ID	Freq.	CH ID	Freq.	CH ID	Freq.
0	2402MHz	21	2423MHz	42	2444MHz	63	2465MHz
1	2403MHz	22	2424MHz	43	2445MHz	64	2466MHz
2	2404MHz	23	2425MHz	44	2446MHz	65	2467MHz
3	2405MHz	24	2426MHz	45	2447MHz	66	2468MHz
4	2406MHz	25	2427MHz	46	2448MHz	67	2469MHz
5	2407MHz	26	2428MHz	47	2449MHz	68	2470MHz
6	2408MHz	27	2429MHz	48	2450MHz	69	2471MHz
7	2409MHz	28	2430MHz	49	2451MHz	70	2472MHz
8	2410MHz	29	2431MHz	50	2452MHz	71	2473MHz
9	2411MHz	30	2432MHz	51	2453MHz	72	2474MHz
10	2412MHz	31	2433MHz	52	2454MHz	73	2475MHz
11	2413MHz	32	2434MHz	53	2455MHz	74	2476MHz
12	2414MHz	33	2435MHz	54	2456MHz	75	2477MHz
13	2415MHz	34	2436MHz	55	2457MHz	76	2478MHz
14	2416MHz	35	2437MHz	56	2458MHz	77	2479MHz
15	2417MHz	36	2438MHz	57	2459MHz	78	2480MHz
16	2418MHz	37	2439MHz	58	2460MHz		
17	2419MHz	38	2440MHz	59	2461MHz		
18	2420MHz	39	2441MHz	60	2462MHz		
19	2421MHz	40	2442MHz	61	2463MHz		
20	2422MHz	41	2443MHz	62	2464MHz		

IEEE802.15(Bluetooth LE)

CH ID	Freq.	CH ID	Freq.
0	2402MHz	21	2444MHz
1	2404MHz	22	2446MHz
2	2406MHz	23	2448MHz
3	2408MHz	24	2450MHz
4	2410MHz	25	2452MHz
5	2412MHz	26	2454MHz
6	2414MHz	27	2456MHz
7	2416MHz	28	2458MHz
8	2418MHz	29	2460MHz
9	2420MHz	30	2462MHz
10	2422MHz	31	2464MHz
11	2424MHz	32	2466MHz
12	2426MHz	33	2468MHz
13	2428MHz	34	2470MHz
14	2430MHz	35	2472MHz
15	2432MHz	36	2474MHz
16	2434MHz	37	2476MHz
17	2436MHz	38	2478MHz
18	2438MHz	39	2480MHz
19	2440MHz		
20	2442MHz		

3-2.Power Sequence

Recommended power on timing

T0≧ 750ms., T1≧ 4ms., T2 ≧ 0ms., T3 ≧ 250ms
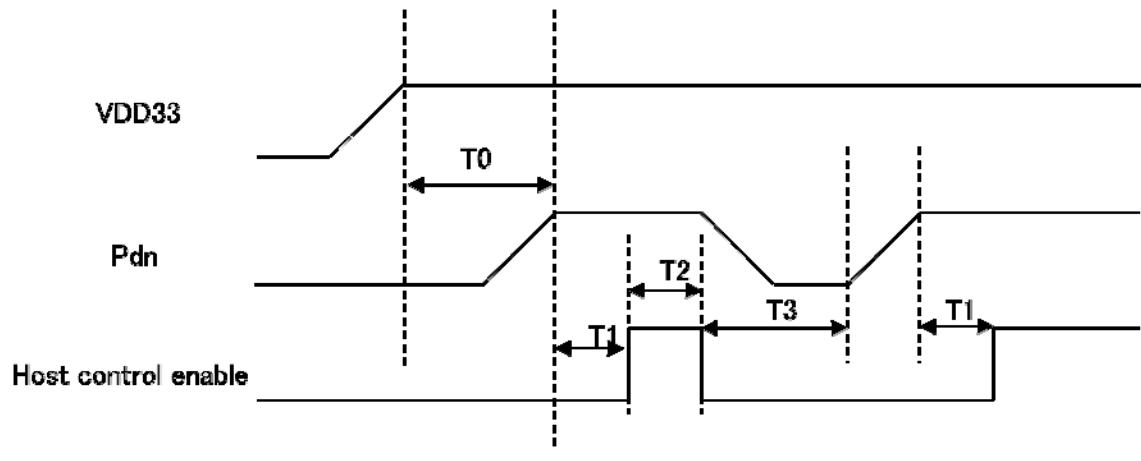
Recommended power off timing

T4≧ 0ms
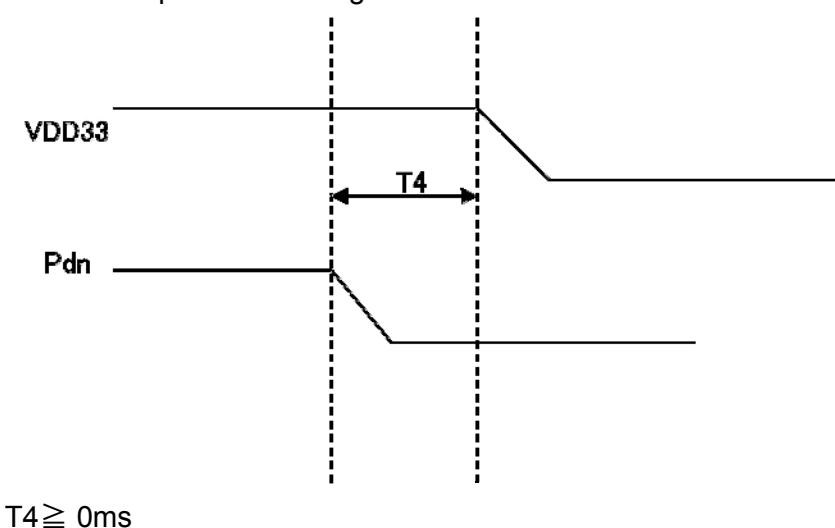
3-3. Interface specification (SDIO)

3-3-1.Internal VIO Output Voltage

Item	Min.[V]	TYP.[V]	Max.[V]
VIO	1.78	1.80	1.82

3-3-2. I/O Ratings

	Min.[V]	Typ.[V]	Max.[V]
Input high voltage	0.8*VIO	-	VIO+0.3
Input low voltage	-0.3	-	0.3*VIO
Input hysteresis	0.15	-	-
Output high voltage	VIO-0.4	-	-
Output low voltage	-	-	0.4

3-3-3.SDIO Protpcol Timing Diagram - Normal Mode
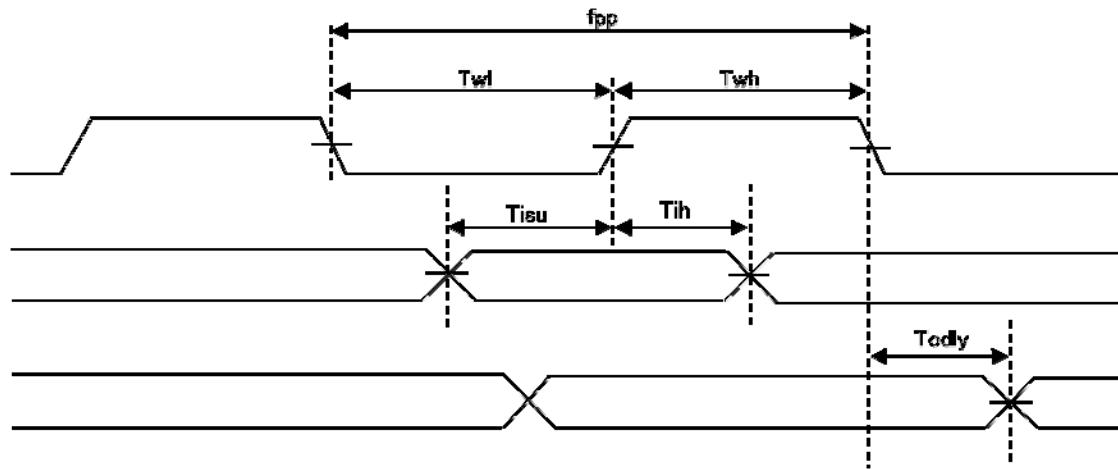
3-3-4.SDIO Protpcol Timing Diagram - High Speed Mode
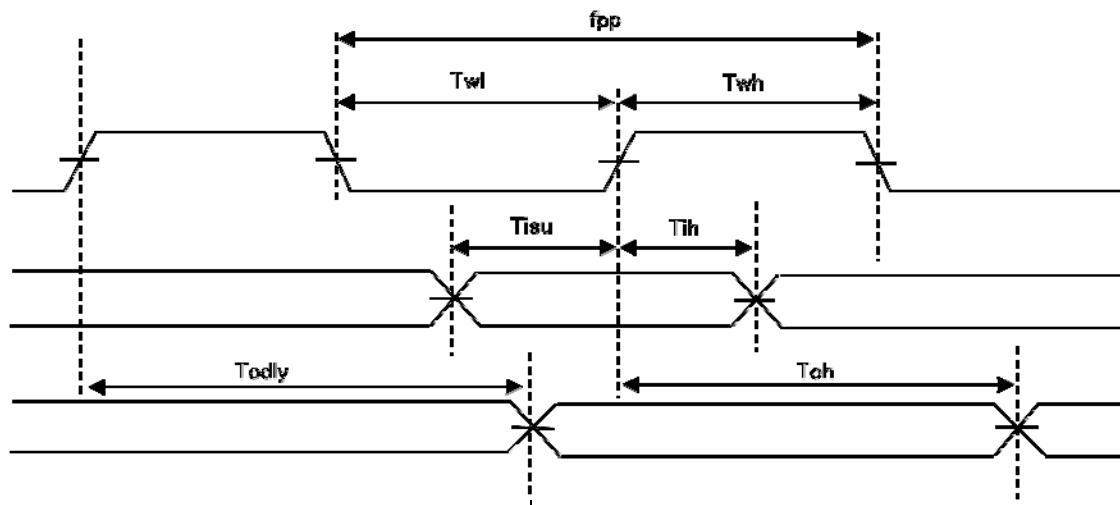
3-3-5. SDIO Timing Data

Symbol	Parameter	Mode	Min	Typ.	Max
fpp	Clock Frequency	Normal	0	-	25 [MHz]
		High Speed	0	-	50 [MHz]
Twl	Clock Low Time	Normal	10 [ns]	-	
		High Speed	7 [ns]	-	
Twh	Clock High Time	Normal	10 [ns]	-	
		High Speed	7 [ns]	-	
Tisu	Input Setup Time	Normal	5 [ns]	-	
		High Speed	6 [ns]	-	
Tih	Input Hold Time	Normal	5 [ns]	-	
		High Speed	2 [ns]	-	
Todly	Output Delay Time			-	14 [ns]
Toh	Output Hold Time	High Speed	2.5 [ns]	-	

3-4. Current consumption

3-4-1.WLAN Upload @ STA Mode

Condition	Data rate	Typ.[mA]	Max[mA]
11b 12dBm	11Mbps	310	380
11g 12dBm	54Mbps	260	330
11n 2dBm	HT20 MCS7	270	340

Disabled Bluetooth

3-4-2.WLAN Download @ STA Mode

Condition	Data rate	Typ.[mA]	Max[mA]
11b 12dBm	11Mbps	170	210
11g 12dBm	54Mbps	170	210
11n 12dBm	HT20 MCS7	190	230

Disabled Bluetooth

@STA Mode

Upload

AP → DUT
← Download

Measure Point
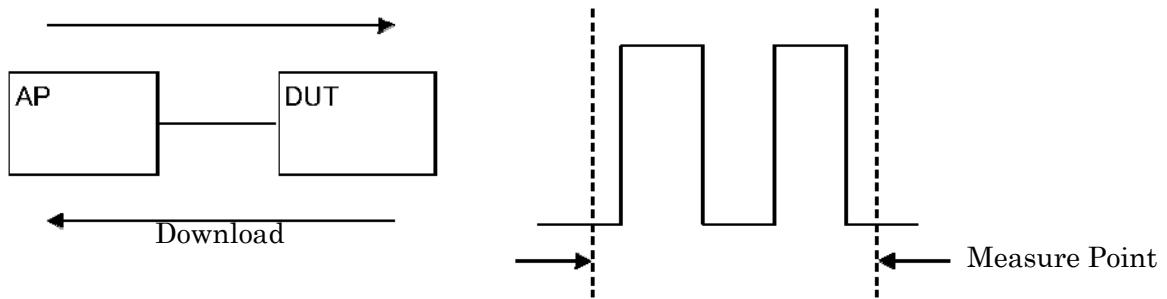
3-4-3.Bluetooth Tx Mode

Condition	Typ.[mA]	Max[mA]
BDR/EDR	41	45
LE	31	35

Disabled WLAN

3-4-4.Bluetooth Rx Mode

Condition	Typ.[mA]	Max[mA]
BDR/EDR	33	36
LE	28	31

Disabled WLAN

@Connection Event

GU@Slave → DUT@Master

Tx Measure Point   Rx Measure Point
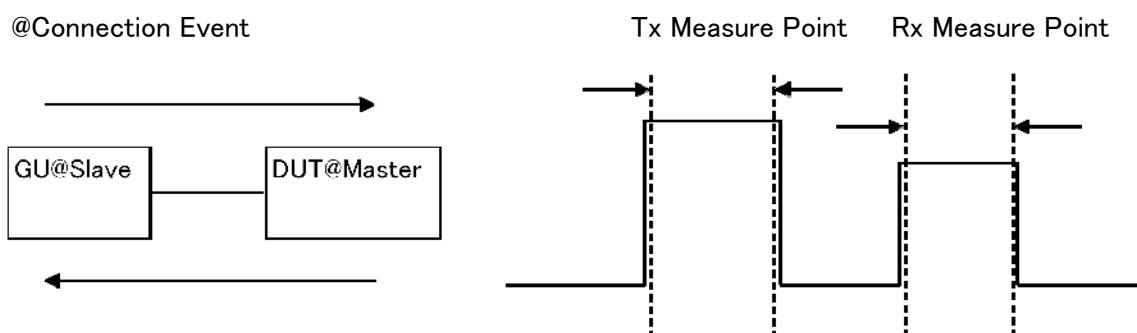
3-4-5. Power Save Mode

		Typ.[mA]	Max[mA]	Remarks
WLAN	DTIM=1	6.0	9.0	Disabled Bluetooth
	DTIM=3	2.0	4.0	
	Deep Sleep	0.5	0.8	
	Pdn	0.1	0.2	
Bluetooth	Deep Sleep	0.8	1.2	Disabled WLAN

3-5. WLAN Receiver characteristics

3-5-1.Minimum Receiver Sensitivity

Standard	Data rate	Min.[dBm]	Typ.[dBm]	Max.[dBm]	PER[%]
802.11b	1 Mbps	-	-93	-80	8
	2 Mbps	-	-90	-80	8
	5.5 bps	-	-88	-76	8
	11 Mbps	-	-86	-76	8
802.11b	6 Mbps	-	-86	-82	10
	9 Mbps	-	-85	-81	10
	12 Mbps	-	-84	-79	10
	18 Mbps	-	-82	-77	10
	24 Mbps	-	-79	-74	10
	36 Mbps	-	-76	-70	10
	48 Mbps	-	-71	-66	10
	54 Mbps	-	-70	-65	10
802.11n	MCS0	-	-86	-82	10
	MCS1	-	-83	-79	10
	MCS2	-	-81	-77	10
	MCS3	-	-78	-74	10
	MCS4	-	-74	-70	10
	MCS5	-	-70	-66	10
	MCS6	-	-68	-65	10
	MCS7	-	-67	-64	10

3-5-2.Maximum Receiver Sensitivity

Standard	Data rate	Min.[dBm]	Typ.[dBm]	Max.[dBm]	PER[%]
802.11b	1,2Mbps	-4	-	-	8
	5.5,11Mbps	-10	-	-	10
802.11g	6 to 54Mbps	-20	-	-	10
802.11n	MCS0 to 7	-20	-	-	10

3-6. WLAN Transmitter Characteristics

3-6-1. Output Power

Item	2412MHz	2442MHz	2462MHz
11b	12.0 dBm	12.0 dBm	12.0 dBm
11g	12.0 dBm	12.0 dBm	12.0 dBm
11n	12.0 dBm	12.0 dBm	12.0 dBm

3-6-2.Output Power Torelance

Item	Min.	Typ.	Max.
Torelance	-2.5dB		2.5dB

3-6-3.EVM

ITEM	rate	EVM [%]
11b	1 Mbps	35
11b	2 Mbps	35
11b	5.5 Mbps	35
11b	11 Mbps	35
11b	6 Mbps	56.2
11g	9 Mbps	39.8
11g	12 Mbps	31.6
11g	18 Mbps	22.4
11g	24 Mbps	15.8
11g	36 Mbps	11.2
11g	48 Mbps	7.9
11g	54 mBps	5.6
11n	MCS0	56.2
11n	MCS1	31.6
11n	MCS2	22.4
11n	MCS3	15.8
11n	MCS4	11.2
11n	MCS5	7.9
11n	MCS6	5.6
11n	MCS7	4.0

3-6-4.Frequency Accuracy

Item	Min.[ppm]	Typ.	Max.[ppm]
Ta = 25 deg.	-10	-	+10
Ta = 0 to 70 deg.	-20	-	+20

3-6-5.Spectrum Mask

		Mask [dBr]
DS	0MHz to +/-11MHz	0
DS	f+/-11MHz to 22MHz	-28
DS	f+/-22MHz	-50
OFDM	0MHz to +/-9MHz	0
OFDM	f+/-11MHz	-20
OFDM	f+/-20MHz	-28
OFDM	f+/-30MHz	-40
HT20	0MHz to +/-9MHz	0
HT20	f+/-11MHz	-20
HT20	f+/-20MHz	-28
HT20	f+/-30MHz	-45

3-7.Bluetooth Reciever Characteristics

3-7-1. Basic Data Rate (BDR)

Item		MIN.	TYP.	MAX.
Frequency		2402MHz		2480MHz
Sensitivity	BER=0.1%		-90dBm	-70dBm
Maximum Input level		-20dBm	-	-

3-7-2. Enhanced Data Rate (EDR)

Item			MIN.	TYP.	MAX.
EDR Sensitivity	BER=0.1%	PI/4DQPSK		-90dBm	-70dBm
		8DPSK		-90dBm	-70dBm
EDR BER Floor Sensitivity					-60dBm
EDR Maximum Input level	BER=0.1%		-20dBm	-	-

3-7-3. Low Energy (LE)

Item		MIN.	TYP.	MAX.
Sensitivity	PER=30.8%		-87dBm	-70dBm
Maximum Input level	PER=30.8%	-10dBm	-	-

3-8.Bluetooth Transmitter Characteristics

3-8.1.Basic Data Rate(BDR)

	MIN	TYP	MAX
Transmit Frequency	2402MHz		2480MHz
Output Power	-	-6	-
Initial Carrier Frequency Tolerance	-75KHz		75KHz
Carrier Frequency Drift			
1: DH1 packet	-25KHz		25KHz
2: DH3 packet	-40KHz		40KHz
3: DH5 packet	-40KHz		40KHz
4: Maximum Drift Rate	-		400Hz/uS
Modulation Characteristics			
1: ⊿f1 AVG	140KHz		175KHz
2: ⊿f2 MAX	115KHz		
3: f2 AVG/f1 AVG	0.8		

3-8.2.Enhanced Data Rate(EDE)

	MIN	TYP	MAX
EDR Relative Transmit Power	-4dB		1dB
EDR Modulation Accuracy			
1: RMS DEVM π/4DQPSK:			20%
2: RMS DEVM 8DPSK			13%
3: 99% DEVM π/4DQPSK			30%
4: 99% DEVM 8DPSK			20%
5: PEAK DEVM π/4DQPSK			35%
6: PEAK DEVM 8DQPSK			25%
7: Differential Phase Encoding			1%
EDR Carrier Frequency Stability			
1: wi(GFSK part)	-75KHz		75KHz
2: wo(PSK part)	-10KHz		10KHz
3: wi+wo(PSK part)	-75KHz		75KHz

3-8.3. Low Energy (LE)

	MIN	TYP	MAX
LE Transmit Power	-	-6dBm	-
LE Modulation Characteristics			
1: ⊿f1 AVG	225KHz		275KHz
2: ⊿f2 MAX	185KHz		-
3: f2 AVG/f1 AVG	0.8		-

3-8.4. Tolerance of Transmit Power (BDR/LE)

|	MIN	TYP	MAX
Torelance	-4.0dB		4.0dB

4.Mechanical Specifications

4-1. Dimension : 9.0mm×19.5mm,   t= 1.6mm MAX

4-2. Weight : Typical   0.5g

4-3. Terminal number and name

No.	Name	Type	Function
1	Pdn	IN	Power on reset
2	VIO	POWER	I/F power supply
3	SD_CMD	IO	SDIO command
4	SD_D0	IO	SDIO data 0
5	SD_D1	IO	SDIO data 1
6	GND	GND	GND
7	SD_CLK	IO	SDIO clock
8	GND	GND	GND
9	SD_D3	IO	SDIO data 3
10	SD_D2	IO	SDIO data 2
11	GND	GND	GND
12	VDD33	POWER	Main power supply 3.3V
13	VDD33	POWER	Main power supply 3.3V
14	HostWakeup	OUT	Host Wake up

4-4. Module Overall Appearance

1.6MAX

0.34 ±0.05
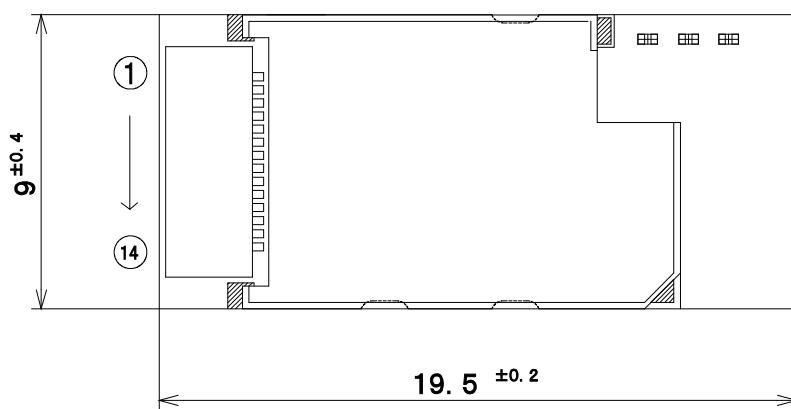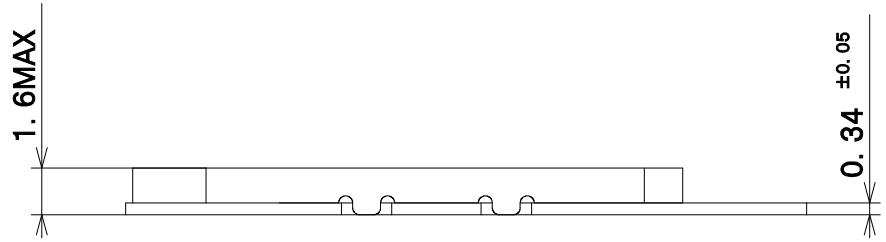
5.Revision

REV	Contents	Date	Name