

# **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.

Except the following combination DWM-W314K and K1506M.

2. The available scientific evidence does not show that any health problems are associated with using low power wireless devices. There is no proof, however, that these low power wireless devices are absolutely safe. Low power Wireless devices emit low levels of radio frequency energy (RF) in the microwave range while being used. Whereas high levels of RF can produce health effects (by heating tissue), exposure of low-level RF that does not produce heating effects causes no known adverse health effects. Many studies of low-level RF exposures have not found any biological effects. Some studies have suggested that some biological effects might occur, but such findings have not been confirmed by additional research. DWM-W314K has been tested and found to comply with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines.

**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.

Except the following combination DWM-W314K and K1506M.

**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

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## 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)

#### 1-2-1.WLAN

|                     |                 |
|---------------------|-----------------|
| Standard            | IEEE802.11b/g/n |
| Frequency           | 2.4-2.4835GHz   |
| Host Interface      | SDIO ver2.0     |
| Frequency Bandwidth | 20MHz           |

- Chipset:Marvell.88W8777(WLCSP Package)
- 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: 1,2,5.5M and 11M with 802.11b mode  
6,9,12,18,24,36,48M and 54M with 802.11g mode  
MCS0-7 with 802.11n mode

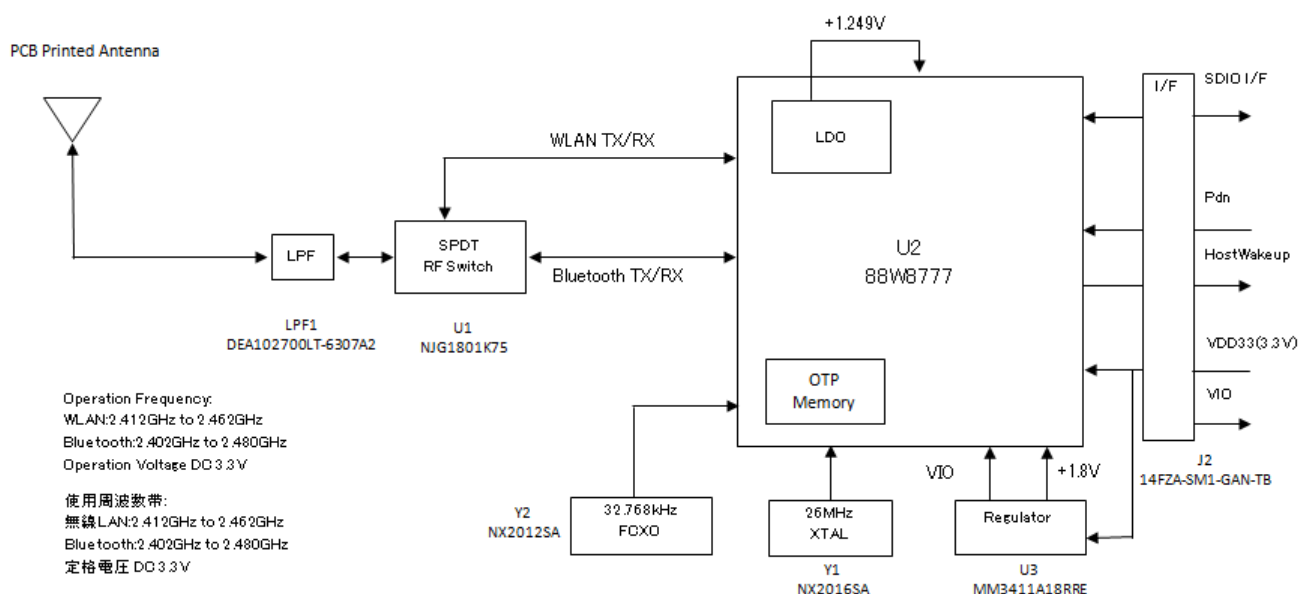
#### 1-2-2.Bluetooth

|                     |                        |
|---------------------|------------------------|
| Standard            | Bluetooth V4.0         |
| Frequency           | 2.4-2.4835GHz          |
| Host Interface      | SDIO ver2.0            |
| Frequency Bandwidth | 1MHz(BDR/EDR),2MHz(LE) |

- Modulation Types: GFSK,PI/4-DQPSK,8DPSK
- Data rate: 1,2,3M

## 2.Hardware Specification

### 2-1. Block diagram



### 2-2.Environmental condition

#### 1) Operating environment

Operating temperature range : -20 ~ 70 °C ※Temperature on the bottom of the module

Operating humidity range: 20% ~ 80% (None dew)

#### 2) Storage environment

Storage temperature range: -30 ~ 85 °C

Storage humidity range 20% ~ 85% (None dew)

### 2-3.Power supply

| Item  | Min.[V] | TYP . | Max.[V] |
|-------|---------|-------|---------|
| VDD33 | 2.97    | -     | 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       | 12    | 2467       |
| 3     | 2422       | 8     | 2447       | 13    | 2472       |
| 4     | 2427       | 9     | 2452       |       |            |
| 5     | 2432       | 10    | 2457       |       |            |

IEEE802.15(Bluetooth BDR/EDR)

| CH ID | Freq.   |
|-------|---------|
| 0     | 2402MHz |
| 1     | 2403MHz |
| 2     | 2404MHz |
| 3     | 2405MHz |
| 4     | 2406MHz |
| 5     | 2407MHz |
| 6     | 2408MHz |
| 7     | 2409MHz |
| 8     | 2410MHz |
| 9     | 2411MHz |
| 10    | 2412MHz |
| 11    | 2413MHz |
| 12    | 2414MHz |
| 13    | 2415MHz |
| 14    | 2416MHz |
| 15    | 2417MHz |
| 16    | 2418MHz |
| 17    | 2419MHz |
| 18    | 2420MHz |

|    |         |
|----|---------|
| 19 | 2421MHz |
| 20 | 2422MHz |

| CH ID | Freq.   |
|-------|---------|
| 21    | 2423MHz |
| 22    | 2424MHz |
| 23    | 2425MHz |
| 24    | 2426MHz |
| 25    | 2427MHz |
| 26    | 2428MHz |
| 27    | 2429MHz |
| 28    | 2430MHz |
| 29    | 2431MHz |
| 30    | 2432MHz |
| 31    | 2433MHz |
| 32    | 2434MHz |
| 33    | 2435MHz |
| 34    | 2436MHz |
| 35    | 2437MHz |
| 36    | 2438MHz |
| 37    | 2439MHz |
| 38    | 2440MHz |
| 39    | 2441MHz |
| 40    | 2442MHz |
| 41    | 2443MHz |

| CH ID | Freq.   |
|-------|---------|
| 42    | 2444MHz |
| 43    | 2445MHz |
| 44    | 2446MHz |
| 45    | 2447MHz |
| 46    | 2448MHz |
| 47    | 2449MHz |
| 48    | 2450MHz |
| 49    | 2451MHz |
| 50    | 2452MHz |
| 51    | 2453MHz |
| 52    | 2454MHz |
| 53    | 2455MHz |
| 54    | 2456MHz |
| 55    | 2457MHz |
| 56    | 2458MHz |
| 57    | 2459MHz |
| 58    | 2460MHz |
| 59    | 2461MHz |
| 60    | 2462MHz |
| 61    | 2463MHz |
| 62    | 2464MHz |

| CH ID | Freq.   |
|-------|---------|
| 63    | 2465MHz |
| 64    | 2466MHz |
| 65    | 2467MHz |
| 66    | 2468MHz |
| 67    | 2469MHz |
| 68    | 2470MHz |
| 69    | 2471MHz |
| 70    | 2472MHz |
| 71    | 2473MHz |
| 72    | 2474MHz |
| 73    | 2475MHz |
| 74    | 2476MHz |
| 75    | 2477MHz |
| 76    | 2478MHz |
| 77    | 2479MHz |
| 78    | 2480MHz |
|       |         |
|       |         |
|       |         |
|       |         |

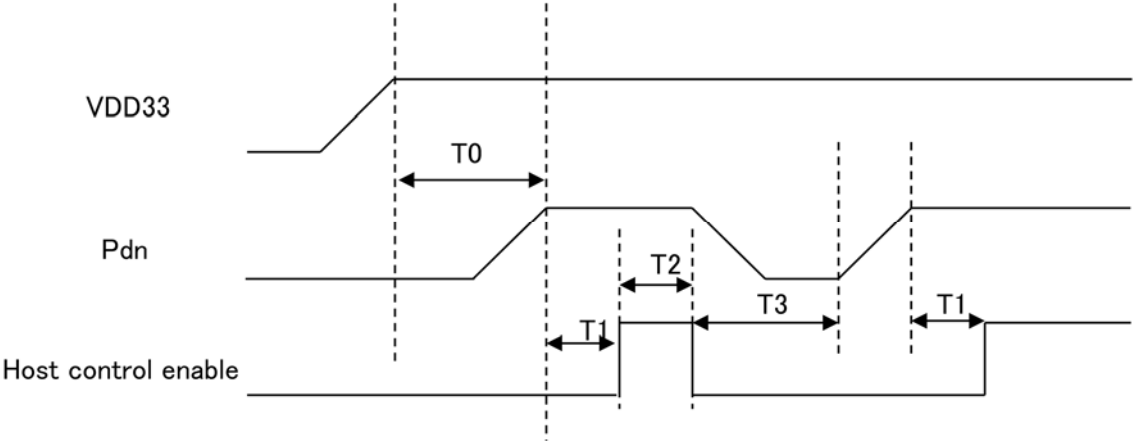
IEEE802.15(Bluetooth LE)

| CH ID | Freq.   |
|-------|---------|
| 21    | 2444MHz |
| 22    | 2446MHz |
| 23    | 2448MHz |
| 24    | 2450MHz |
| 25    | 2452MHz |
| 26    | 2454MHz |
| 27    | 2456MHz |
| 28    | 2458MHz |

| CH ID | Freq.   |
|-------|---------|
| 0     | 2402MHz |
| 1     | 2404MHz |
| 2     | 2406MHz |
| 3     | 2408MHz |
| 4     | 2410MHz |
| 5     | 2412MHz |
| 6     | 2414MHz |
| 7     | 2416MHz |
| 8     | 2418MHz |
| 9     | 2420MHz |
| 10    | 2422MHz |
| 11    | 2424MHz |
| 12    | 2426MHz |
| 13    | 2428MHz |
| 14    | 2430MHz |
| 15    | 2432MHz |
| 16    | 2434MHz |
| 17    | 2436MHz |
| 18    | 2438MHz |
| 19    | 2440MHz |
| 20    | 2442MHz |

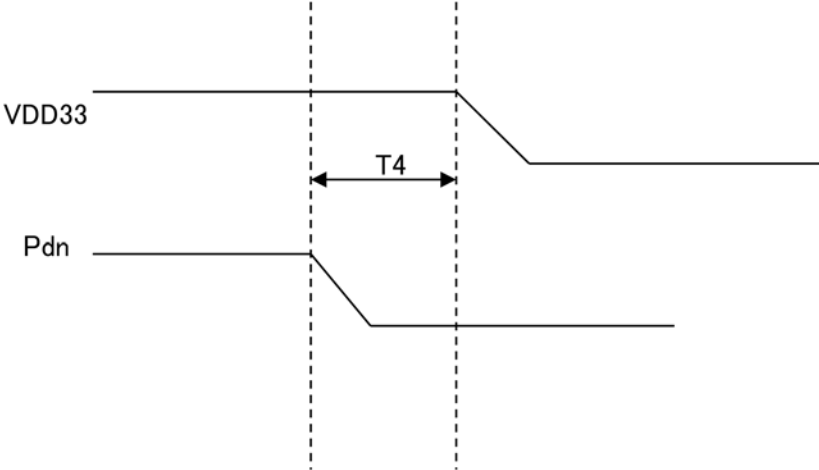
|    |         |
|----|---------|
| 29 | 2460MHz |
| 30 | 2462MHz |
| 31 | 2464MHz |
| 32 | 2466MHz |
| 33 | 2468MHz |
| 34 | 2470MHz |
| 35 | 2472MHz |
| 36 | 2474MHz |
| 37 | 2476MHz |
| 38 | 2478MHz |
| 39 | 2480MHz |
|    |         |
|    |         |

Recommended power on timing



$T0 \geq 750\text{ms.}, T1 \geq 4\text{ms.}, T2 \geq 0\text{ms.}, T3 \geq 250\text{ms}$

Recommended power off timing



$T4 \geq 0\text{ms}$

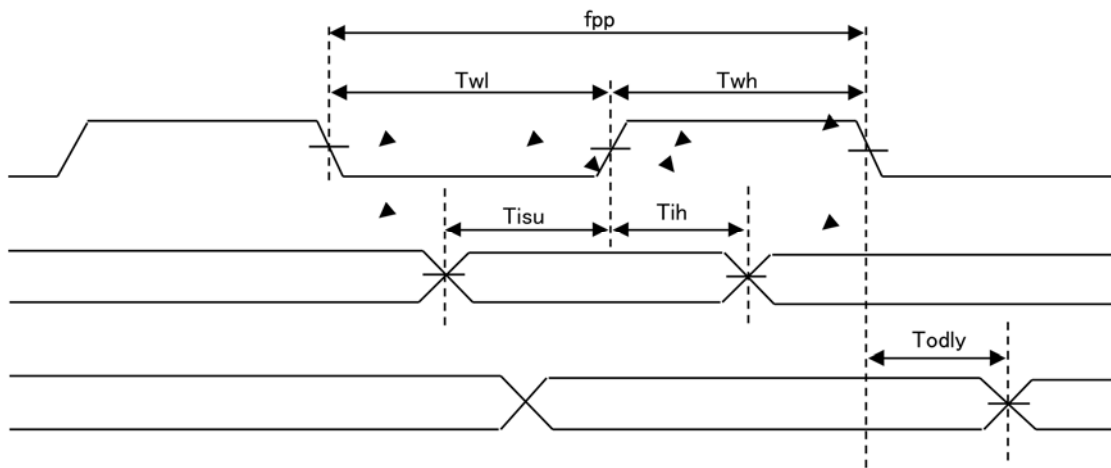
### 3-3-1. Internal VIO Output Voltage

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

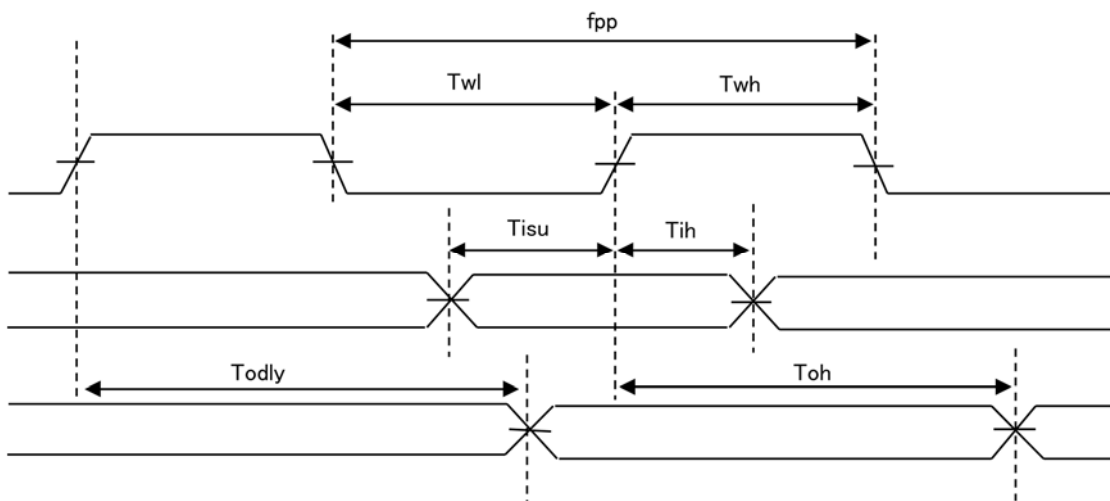
### 3-3-2. I/O Ratings

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

### 3-3-3. SDIO Protocol Timing Diagram - Normal Mode



### 3-3-4. SDIO Protocol Timing Diagram - High Speed Mode



### 3-3-5. SDIO Timing Data

| Symbol | Parameter         | Mode       | Min      | Typ. | Max      |
|--------|-------------------|------------|----------|------|----------|
| fpp    | Clock Frequency   | Normal     | 0 [MHz]  | -    | 25 [MHz] |
|        |                   | High Speed | 0 [MHz]  | -    | 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]   | -    |          |
| Today  | Output Delay Time |            | 0 [ns]   | -    | 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 11Mbps 12dBm | 11Mbps    | 310      | 380     |
| 11g 54Mbps 12dBm | 54Mbps    | 260      | 330     |
| 11n MCS7 12dBm   | HT20 MCS7 | 270      | 340     |

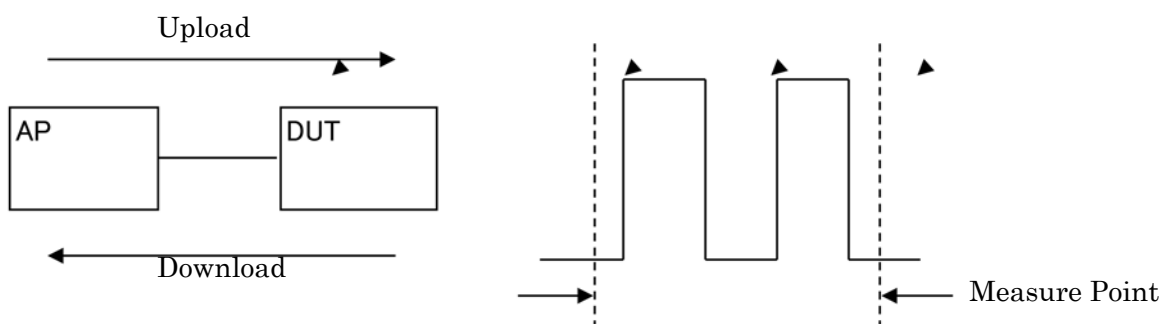
Disabled Bluetooth

#### 3-4-2.WLAN Download @ STA Mode

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

Disabled Bluetooth

#### @STA Mode



### 3-4-3. Bluetooth Tx Mode

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

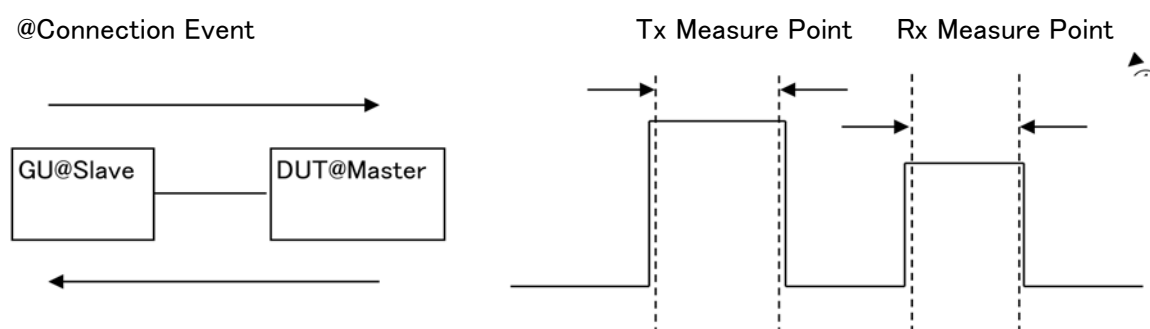
Disabled WLAN

### 3-4-4. Bluetooth Rx Mode

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

Disabled WLAN

@Connection Event



### 3-4-5. Power Save Mode

|           |            | Typ.[mA] | Max[mA] |
|-----------|------------|----------|---------|
| WLAN      | DTM=1      | 6.0      | 9.0     |
|           | DTM=3      | 2.0      | 4.0     |
|           | Deep Sleep | 0.5      | 0.8     |
|           | Pdn        | 0.1      | 0.2     |
| Bluetooth | Deep Sleep | 0.8      | 1.2     |

## 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  | 1M,2M     | -4        | -         | -         | 8      |
|          | 5.5M,11M  | -10       | -         | -         | 10     |
| 802.11g  | 6M to 54M | -20       | -         | -         | 10     |
| 802.11n  | MCS0 to 7 | -20       | -         | -         | 10     |

### 3-6. WLAN Transmitter Characteristics

### 3-6-1. Output Power

| Item | 2412MHz  | 2442MHz  | 2472MHz  |
|------|----------|----------|----------|
| 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 Tolerance

| Item      | Min.   | Typ. | Max.  |
|-----------|--------|------|-------|
| Tolerance | -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 Receiver 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: $\Delta f_1$ AVG                 | 140KHz  |     | 175KHz   |
| 2: $\Delta f_2$ MAX                 | 115KHz  |     |          |
| 3: $f_2$ AVG/ $f_1$ 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 $\pi/4$ DQPSK:      |        |     | 20%   |
| 2: RMS DEVM 8DPSK               |        |     | 13%   |
| 3: 99% DEVM $\pi/4$ DQPSK       |        |     | 30%   |
| 4: 99% DEVM 8DPSK               |        |     | 20%   |
| 5: PEAK DEVM $\pi/4$ DQPSK      |        |     | 35%   |
| 6: PEAK DEVM 8DQPSK             |        |     | 25%   |
| 7: Differential Phase Encoding  |        |     | 1%    |
| EDR Carrier Frequency Stability |        |     |       |
| 1: $w_i$ (GFSK part)            | -75KHz |     | 75KHz |
| 2: $w_o$ (PSK part)             | -10KHz |     | 10KHz |
| 3: $w_i+w_o$ (PSK part)         | -75KHz |     | 75KHz |

### 3-8.3. Low Energy (LE)

|                               | MIN    | TYP   | MAX    |
|-------------------------------|--------|-------|--------|
| LE Transmit Power             | -      | -6dBm | -      |
| LE Modulation Characteristics |        |       |        |
| 1: $\Delta f_1$ AVG           | 225KHz |       | 275KHz |
| 2: $\Delta f_2$ MAX           | 185KHz |       | -      |
| 3: $f_2$ AVG/ $f_1$ AVG       | 0.8    |       | -      |

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

|           | MIN    | TYP | MAX   |
|-----------|--------|-----|-------|
| Tolerance | -4.0dB |     | 4.0dB |

## 4. Mechanical Specifications

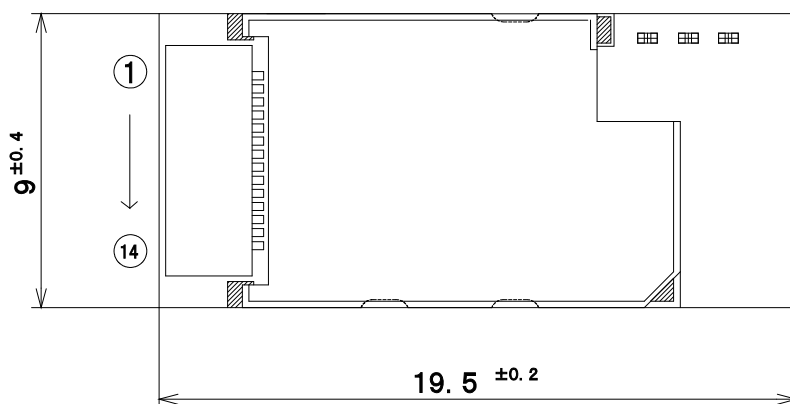
4-1. Dimension : 9.0mm×19.5mm, t= 1.6mm MAX

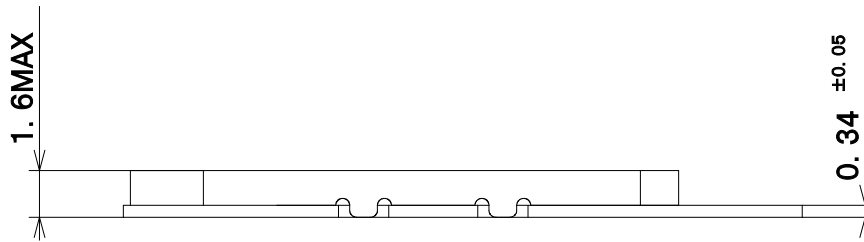
4-2. Weight : Typical 0.5g

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           |

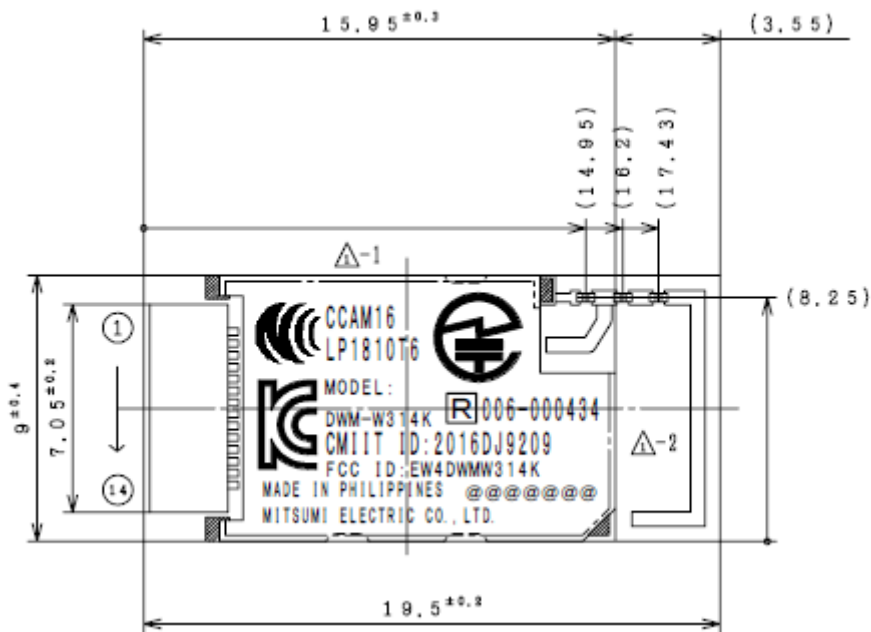
4-4. Module Overall Appearance





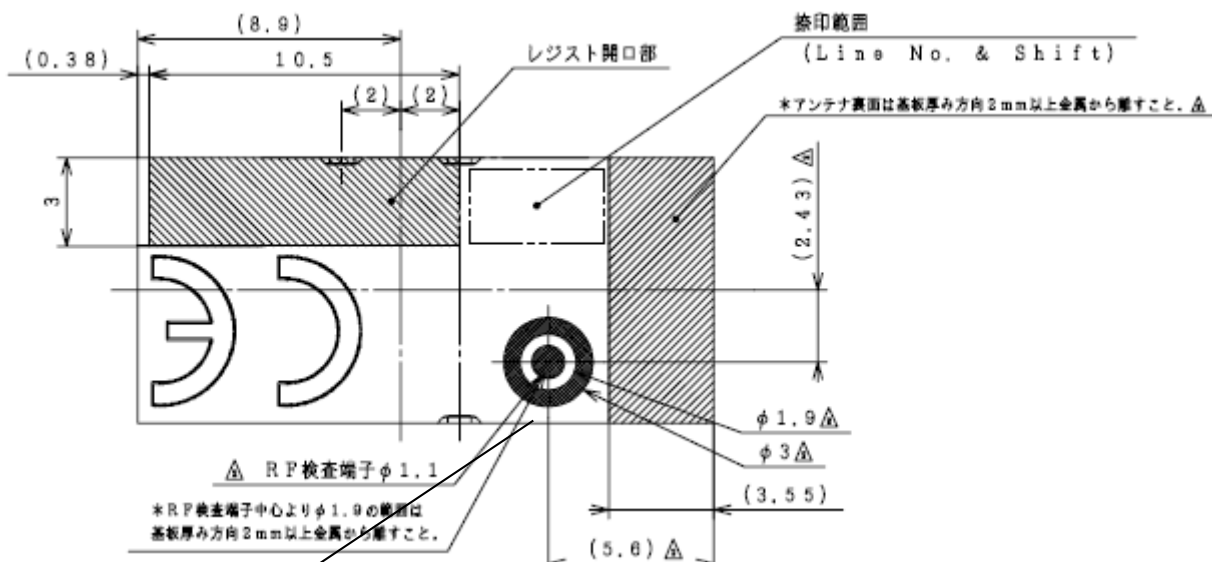
#### 4-5. Module installation procedure

##### 4-5-1 Antenna Area Clearance



It is recommendation to install for final products, around the antenna area, should make clearance 30mm × 30mm or more.

##### 4-5-2 Clearance of bottom side



It should be made clearance  $\phi 1.9\text{mm}$  at center of the test point and distance 2mm or more, and also, avoid the metal from Antenna Area.(Distance 2mm or more)

#### 4-5-3 FPC/FFC cable direction

About direction of the insertion of the FPC/FFC cable, refer to Tabel 4-3 Terminal Pin assign information, should be careful design of the cable and connection.

#### 5.Revision

| REV | Contents | Date | Name |
|-----|----------|------|------|
|     |          |      |      |
|     |          |      |      |
|     |          |      |      |
|     |          |      |      |

