



## **BL-M5621DS2A**

**IEEE 802.11b/g/n/ac 866Mbps  
2T2R SDIO WiFi+BT5.1 Module  
Specification**



Top view

|                                                                      |       |
|----------------------------------------------------------------------|-------|
| Module Name: BL-M5621DS2A                                            |       |
| Module Type: IEEE 802.11b/g/n/ac 866Mbps 2T2R SDIO WiFi+BT5.1 Module |       |
| Revision: V1.0                                                       |       |
| Customer Approval:                                                   |       |
| Company:                                                             |       |
| Title:                                                               |       |
| Signature:                                                           | Date: |
| BL-link Approval:                                                    |       |
| Title:                                                               |       |
| Signature:                                                           | Date: |

## Revision History

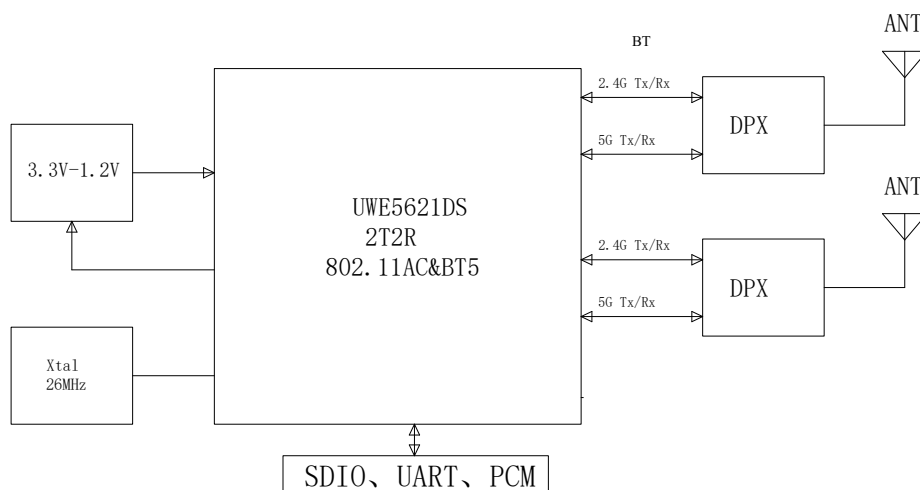
| Revision | Summary          | Release Date |
|----------|------------------|--------------|
| 1.0      | Official release | 2020-12-11   |
|          |                  |              |
|          |                  |              |
|          |                  |              |

## 1. Introduction

BL-M5621DS2A module design is based on UWE5621DS solution, The UWE5621DS is a highly integrated 2-in-1 connectivity single chip which has built in a 2x2 dual-band wireless LAN radio and Bluetooth radio. It includes 2.4 GHz and 5 GHz WLAN IEEE 802.11 a/b/g/n/ac 2x2 MU-MIMO 20/40/80 MHz VHT R2 MAC/PHY/Radio, Bluetooth 5 with supporting high power mode, Mesh, Direction Finding and Long Range. Additionally, this radio-on-a-chip integrates power amplifiers, receive low noise amplifiers and RF TR switch. It supports SDIO 3.0 and PCIe Gen 2 compliant slave interfaces for Wi-Fi, high-speed 4-wire UART for Bluetooth.

### 1.1 RF module Overview

The general HW architecture for the module is shown in Figure 1.



## 1.2 Specification reference

This specification is based on additional references listed below.

- \_ IEEE Std. 802.11a
- \_ IEEE Std. 802.11b
- \_ IEEE Std. 802.11g
- \_ IEEE Std. 802.11n
- \_ IEEE Std. 802.11ac
- \_ Bluetooth 2.1+EDR/4.2/5.0

## 1.3 System Functions

Table1: General Specification as below:

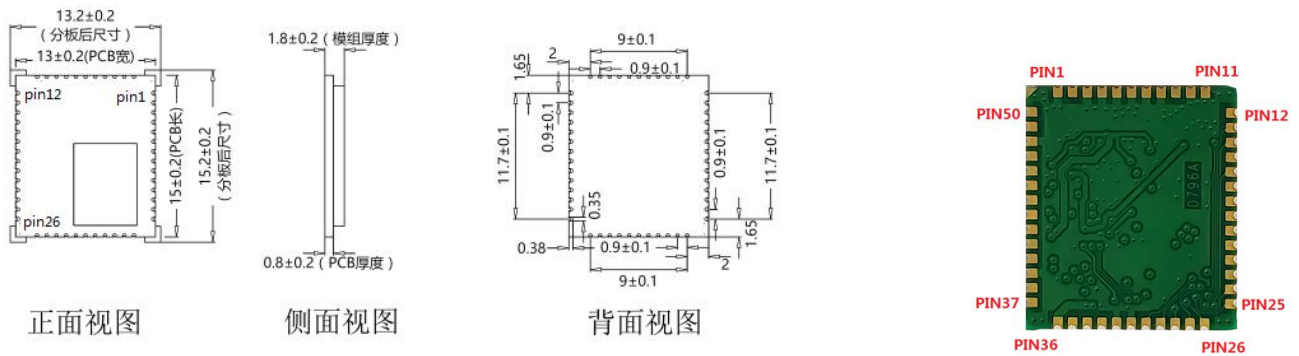
|                       |                                                                                                                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Main Chipset          | Uwe5621DS                                                                                                                                                                                                        |
| Operating Frequency   | 2.4G/5G                                                                                                                                                                                                          |
| WiFi Standard         | 802.11a/b/g/n/ac (2x2)                                                                                                                                                                                           |
| Bluetooth             | 2.1+EDR/4.2/5.0                                                                                                                                                                                                  |
| Modulation            | WIFI: 11b: DBPSK, DQPSK and CCK and DSSS<br>11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM<br>11n: BPSK, QPSK, 16QAM, 64QAM and OFDM<br>11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM<br>BT: FHSS, GFSK, DPSK, DQPSK |
| Data rates            | 11b: 1, 2, 5.5 and 11Mbps<br>11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps<br>11n: MCS0~15, up to 300Mbps<br>11ac: MCS0~9, Nss=2, up to 866.7Mbps                                                                  |
| Form factor           | 50pins                                                                                                                                                                                                           |
| Host Interface        | SDIO/UART/PCM                                                                                                                                                                                                    |
| PCB Stack             | 4-layers design                                                                                                                                                                                                  |
| Dimension             | Typical, 13.0mmx 15.0mm x 1.80mm                                                                                                                                                                                 |
| Antenna               | External Antennas Design                                                                                                                                                                                         |
| Operation Temperature | -10°C to +70°C                                                                                                                                                                                                   |
| Storage Temperature   | -40°C to +125°C                                                                                                                                                                                                  |
| Operation Voltage     | 3.3V +/-10%                                                                                                                                                                                                      |

## 2.0 Mechanical Specification

### 2.1 Mechanical Outline Drawing

Typical Dimension (W x L ): 13.0mmx 15.0mm x 1.80mm

General tolerance:  $\pm 0.20\text{mm}$



| Pin | Define     | Description        | Pin | Define  | Description          |
|-----|------------|--------------------|-----|---------|----------------------|
| 1   | GND        | GND                | 26  | ESMD1   | ESMD1                |
| 2   | ANT0       | ANT 0+BT           | 27  | IISLRCK | IISLRCK              |
| 3   | GND        | GND                | 28  | IISDI   | IISDI                |
| 4   | GND        | GND                | 29  | IISDO   | IISDO                |
| 5   | GND        | GND                | 30  | IISCLK  | IISCLK               |
| 6   | GND        | GND                | 31  | GND     | GND                  |
| 7   | GND        | GND                | 32  | GND     | GND                  |
| 8   | GND        | GND                | 33  | ESMD2   | ESMD2                |
| 9   | ANT1       | ANT 1              | 34  | VDD1V8  | 1.8V Supply for GPIO |
| 10  | GND        | GND                | 35  | RFCTL4  | RFCTL4               |
| 11  | GND        | GND                | 36  | VDD33   | VDD INPUT (3.3V)     |
| 12  | RF_BT (NC) | BT ANT (NC)        | 37  | RFCTL5  | RFCTL5               |
| 13  | ESMCLK     | ESMCLK             | 38  | RST_N   | RST_N                |
| 14  | ESMCSN     | ESMCSN             | 39  | GND     | GND                  |
| 15  | CHIP_EN    | PMU-Enable         | 40  | U0TXD   | U0TXD                |
| 16  | ESMD3      | ESMD3              | 41  | UORXD   | UORXD                |
| 17  | SD_CMD     | SDIO Command Input | 42  | UORTS   | UORTS                |
| 18  | SD_CLK     | SDIO Clock Input   | 43  | UOCTS   | UOCTS                |
| 19  | SD_D3      | SDIO Data Line 3   | 44  | U2TXD   | U2TXD                |
| 20  | SD_D2      | SDIO Data Line 2   | 45  | GPIO2   | GPIO2                |
| 21  | SD_D0      | SDIO Data Line 0   | 46  | U1TXD   | U1TXD                |
| 22  | SD_D1      | SDIO Data Line 1   | 47  | U1RXD   | U1RXD                |
| 23  | GND        | GND                | 48  | GND     | GND                  |

|    |       |       |    |       |       |
|----|-------|-------|----|-------|-------|
| 24 | GPI01 | GPI01 | 49 | U2RXD | U2RXD |
| 25 | ESMD0 | ESMD0 | 50 | INT   | INT   |

### 3. Electrical Specification

This Specification is based-on conductive DVT testing result. The extreme condition include overall temperature (0°C,+25°C,+40°C) and overall voltage (3.0V,3.3V,3.6V).

#### 3. 1 IEEE 802.11g /a Section:

| Items                                                   | Contents                                 |      |      |      |        |
|---------------------------------------------------------|------------------------------------------|------|------|------|--------|
| Specification                                           | IEEE802.11g&IEEE802.11a                  |      |      |      |        |
| Mode                                                    | BPSK, QPSK, 16QAM, 64QAM and OFDM        |      |      |      |        |
| Channel                                                 | CH1 to CH13 @ 11g<br>CH36 to CH165 @ 11a |      |      |      |        |
| Data rate                                               | 6, 9, 12, 18, 24, 36, 48, 54Mbps         |      |      |      |        |
| TX Characteristics                                      | Min.                                     | Typ. | Max. | Unit | Remark |
| 1. Power Levels                                         |                                          |      |      |      |        |
| 1) 15dBm Target (For Each antenna port)<br>@ 11g 54Mbps | 13±2                                     | 15±2 | 18±2 | dBm  |        |
| 2) 15dBm Target (For Each antenna port)<br>@ 11a 54Mbps | 11±2                                     | 13±2 | 15±2 | dBm  |        |
| 2. Spectrum Mask @ Target Power                         |                                          |      |      |      |        |
| 1) at fc +/-11MHz                                       | -                                        | -    | -20  | dBr  |        |
| 2) at fc +/-20MHz                                       | -                                        | -    | -28  | dBr  |        |
| 3) at fc > +/-30MHz                                     | -                                        | -    | -40  | dBr  |        |
| 3. Constellation Error(EVM) @ Target Power              |                                          |      |      |      |        |
| 1) 6Mbps                                                | -                                        |      | -5   | dB   |        |
| 2) 9Mbps                                                | -                                        | -    | -8   | dB   |        |
| 3) 12Mbps                                               | -                                        | -    | -10  | dB   |        |
| 4) 18Mbps                                               | -                                        | -    | -13  | dB   |        |
| 5) 24Mbps                                               | -                                        |      | -16  | dB   |        |
| 6) 36Mbps                                               | -                                        | -    | -19  | dB   |        |
| 7) 48Mbps                                               | -                                        | -    | -22  | dB   |        |
| 8) 54Mbps                                               | -                                        | -27  | -25  | dB   |        |
| 4. Frequency Error                                      |                                          |      |      |      |        |
| 1) IEEE802.11g/a                                        | -10                                      |      | 10   | ppm  |        |
| RX Characteristics                                      | Min.                                     | Typ. | Max. | Unit |        |
| 5. Minimum Input Level Sensitivity(each chain)          |                                          |      |      |      |        |
| 1) 6Mbps (PER ≤ 10%)                                    | -                                        |      | -82  | dBm  |        |
| 2) 9Mbps (PER ≤ 10%)                                    | -                                        |      | -81  | dBm  |        |

|                                           |     |    |     |     |  |
|-------------------------------------------|-----|----|-----|-----|--|
| 3) 12Mbps (PER $\leq 10\%$ )              | -   |    | -79 | dBm |  |
| 4) 18Mbps (PER $\leq 10\%$ )              | -   |    | -77 | dBm |  |
| 5) 24Mbps (PER $\leq 10\%$ )              | -   |    | -74 | dBm |  |
| 6) 36Mbps (PER $\leq 10\%$ )              | -   |    | -70 | dBm |  |
| 7) 48Mbps (PER $\leq 10\%$ )              | -   |    | -66 | dBm |  |
| 8) 54Mbps (PER $\leq 10\%$ )              | -   |    | -65 | dBm |  |
| 6. Maximum Input Level (PER $\leq 10\%$ ) |     |    |     |     |  |
| 1) IEEE802.11g/a                          | -20 | -5 | -   | dBm |  |

### 3.2 IEEE 802.11b Section:

| Items                                                    | Contents                      |            |            |      |        |
|----------------------------------------------------------|-------------------------------|------------|------------|------|--------|
| Specification                                            | IEEE802.11b                   |            |            |      |        |
| Mode                                                     | DBPSK, DQPSK and CCK and DSSS |            |            |      |        |
| Channel                                                  | CH1 to CH13                   |            |            |      |        |
| Data rate                                                | 1, 2, 5.5, 11Mbps             |            |            |      |        |
| TX Characteristics                                       | Min.                          | Typ.       | Max.       | Unit | Remark |
| 1. Power Levels(Calibrated)                              |                               |            |            |      |        |
| 1) 17dBm Target (For Each antenna port)<br>@1Mbps~11Mbps | 14 $\pm$ 2                    | 16 $\pm$ 2 | 18 $\pm$ 2 | dBm  |        |
| 2. Spectrum Mask @ Target Power                          |                               |            |            |      |        |
| 1) fc +/-11MHz to +/-22MHz                               | -                             | -          | -30        | dBr  |        |
| 2) fc > +/-22MHz                                         | -                             | -          | -50        | dBr  |        |
| 3. Constellation Error(EVM) @ Target Power               |                               |            |            |      |        |
| 1) 1Mbps                                                 | -                             |            | -10        | dB   |        |
| 2) 2Mbps                                                 | -                             |            | -10        | dB   |        |
| 3) 5.5Mbps                                               | -                             |            | -10        | dB   |        |
| 4) 11Mbps                                                | -                             | -20        | -10        | dB   |        |
| 4. Frequency Error                                       | -10                           | -          | 10         | ppm  |        |
| RX Characteristics                                       | Min.                          | Typ.       | Max.       | Unit |        |
| 5. Minimum Input Level Sensitivity(each chain)           |                               |            |            |      |        |
| 1) 1Mbps (FER $\leq 8\%$ )                               | -                             |            | -76        | dBm  |        |
| 2) 2Mbps (FER $\leq 8\%$ )                               | -                             |            | -76        | dBm  |        |
| 3) 5.5Mbps (FER $\leq 8\%$ )                             | -                             |            | -76        | dBm  |        |
| 4) 11Mbps (FER $\leq 8\%$ )                              | -                             |            | -76        | dBm  |        |
| 6. Maximum Input Level (FER $\leq 8\%$ )                 | -10                           | -5         | -          | dBm  |        |

### 3.3 IEEE 802.11n HT20 Section:

| Items                                                  | Contents                                 |      |      |      |        |
|--------------------------------------------------------|------------------------------------------|------|------|------|--------|
| Specification                                          | IEEE802.11n HT20 @ 2.4G/5G               |      |      |      |        |
| Mode                                                   | BPSK, QPSK, 16QAM, 64QAM and OFDM        |      |      |      |        |
| Channel                                                | CH1 to CH13 @ 2.4G<br>CH36 to CH165 @ 5G |      |      |      |        |
| Data rate (MCS index)                                  | MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15 |      |      |      |        |
| TX Characteristics                                     | Min.                                     | Typ. | Max. | Unit | Remark |
| 1. Power Levels                                        |                                          |      |      |      |        |
| 1) 14dBm Target (For Each antenna port)<br>@ 2.4G MCS7 | 12±2                                     | 14±2 | 18±2 | dBm  |        |
| 2) 14dBm Target (For Each antenna port)<br>@ 5G MCS7   | 12±2                                     | 14±2 | 16±2 | dBm  |        |
| 2. Spectrum Mask @ Target Power                        |                                          |      |      |      |        |
| 1) at fc +/-11MHz                                      | -                                        | -    | -20  | dBr  |        |
| 2) at fc +/-20MHz                                      | -                                        | -    | -28  | dBr  |        |
| 3) at fc > +/-30MHz                                    | -                                        | -    | -45  | dBr  |        |
| 3. Constellation Error(EVM) @ Target Power             |                                          |      |      |      |        |
| 1) MCS0                                                | -                                        |      | -5   | dB   |        |
| 2) MCS1                                                | -                                        | -    | -10  | dB   |        |
| 3) MCS2                                                | -                                        | -    | -13  | dB   |        |
| 4) MCS3                                                | -                                        | -    | -16  | dB   |        |
| 5) MCS4                                                | -                                        |      | -19  | dB   |        |
| 6) MCS5                                                | -                                        | -    | -22  | dB   |        |
| 7) MCS6                                                | -                                        | -    | -25  | dB   |        |
| 8) MCS7                                                | -                                        | -28  | -27  | dB   |        |
| 4. Frequency Error                                     |                                          |      |      |      |        |
| 1) IEEE802.11n HT20 @ 2.4G/5G                          | -10                                      | -    | 10   | ppm  |        |
| RX Characteristics                                     | Min.                                     | Typ. | Max. | Unit |        |
| 5. Minimum Input Level Sensitivity(each chain)         |                                          |      |      |      |        |
| 1) MCS0 (PER ≤ 10%)                                    | -                                        |      | -82  | dBm  |        |
| 2) MCS1 (PER ≤ 10%)                                    | -                                        |      | -79  | dBm  |        |
| 3) MCS2 (PER ≤ 10%)                                    | -                                        |      | -77  | dBm  |        |
| 4) MCS3 (PER ≤ 10%)                                    | -                                        |      | -74  | dBm  |        |
| 5) MCS4 (PER ≤ 10%)                                    | -                                        |      | -70  | dBm  |        |
| 6) MCS5 (PER ≤ 10%)                                    | -                                        |      | -66  | dBm  |        |
| 7) MCS6 (PER ≤ 10%)                                    | -                                        |      | -65  | dBm  |        |
| 8) MCS7 (PER ≤ 10%)                                    | -                                        |      | -64  | dBm  |        |
| 6. Maximum Input Level (PER ≤ 10%)                     |                                          |      |      |      |        |
| 1) IEEE802.11n HT20 @ 2.4G/5G                          | -20                                      | -6   | -    | dBm  |        |

### 3.4 IEEE 802.11n HT40 Section:

| Items                                                  | Contents                                 |      |      |      |        |
|--------------------------------------------------------|------------------------------------------|------|------|------|--------|
| Specification                                          | IEEE802.11n HT40 @ 2.4G/5G               |      |      |      |        |
| Mode                                                   | BPSK, QPSK, 16QAM, 64QAM and OFDM        |      |      |      |        |
| Channel                                                | CH3 to CH11 @ 2.4G<br>CH38 to CH163 @ 5G |      |      |      |        |
| Data rate (MCS index)                                  | MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15 |      |      |      |        |
| TX Characteristics                                     | Min.                                     | Typ. | Max. | Unit | Remark |
| 1. Power Levels                                        |                                          |      |      |      |        |
| 1) 14dBm Target (For Each antenna port)<br>@ 2.4G MCS7 | 12±2                                     | 14±2 | 18±2 | dBm  |        |
| 2) 14dBm Target (For Each antenna port)<br>@ 5G MCS7   | 12±2                                     | 14±2 | 16±2 | dBm  |        |
| 2. Spectrum Mask @ Target Power                        |                                          |      |      |      |        |
| 1) at fc +/-11MHz                                      | -                                        | -    | -20  | dBr  |        |
| 2) at fc +/-20MHz                                      | -                                        | -    | -28  | dBr  |        |
| 3) at fc > +/-30MHz                                    | -                                        | -    | -45  | dBr  |        |
| 3. Constellation Error(EVM) @ Target Power             |                                          |      |      |      |        |
| 1) MCS0                                                | -                                        |      | -5   | dB   |        |
| 2) MCS1                                                | -                                        |      | -10  | dB   |        |
| 3) MCS2                                                | -                                        |      | -13  | dB   |        |
| 4) MCS3                                                | -                                        |      | -16  | dB   |        |
| 5) MCS4                                                | -                                        |      | -19  | dB   |        |
| 6) MCS5                                                | -                                        | -    | -22  | dB   |        |
| 7) MCS6                                                | -                                        | -    | -25  | dB   |        |
| 8) MCS7                                                | -                                        | -30  | -28  | dB   |        |
| 4. Frequency Error                                     |                                          |      |      |      |        |
| 1) IEEE802.11n HT40 @ 2.4G                             | -10                                      | -    | 10   | ppm  |        |
| RX Characteristics                                     | Min.                                     | Typ. | Max. | Unit |        |
| 5. Minimum Input Level Sensitivity(each chain)         |                                          |      |      |      |        |
| 1) MCS0 (PER ≤ 10%)                                    | -                                        |      | -79  | dBm  |        |
| 2) MCS1 (PER ≤ 10%)                                    | -                                        |      | -76  | dBm  |        |
| 3) MCS2 (PER ≤ 10%)                                    | -                                        |      | -74  | dBm  |        |
| 4) MCS3 (PER ≤ 10%)                                    | -                                        |      | -71  | dBm  |        |
| 5) MCS4 (PER ≤ 10%)                                    | -                                        |      | -67  | dBm  |        |
| 6) MCS5 (PER ≤ 10%)                                    | -                                        |      | -63  | dBm  |        |
| 7) MCS6 (PER ≤ 10%)                                    | -                                        |      | -62  | dBm  |        |
| 8) MCS7 (PER ≤ 10%)                                    | -                                        |      | -61  | dBm  |        |
| 6. Maximum Input Level (PER ≤ 10%)                     |                                          |      |      |      |        |
| 1) IEEE802.11n HT40 @ 2.4G/5G                          | -20                                      | -6   | -    | dBm  |        |

### 3.5 IEEE 802.11 ac Section:

| Items                                             | Contents                                                                   |       |       |      |        |
|---------------------------------------------------|----------------------------------------------------------------------------|-------|-------|------|--------|
| Specification                                     | IEEE802.11ac @ 5G                                                          |       |       |      |        |
| Mode                                              | BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM                                  |       |       |      |        |
| Channel                                           | CH36 to CH165 @ VHT-20<br>CH38 to CH163 @ VHT-40<br>CH42 to CH157 @ VHT-80 |       |       |      |        |
| Data rate (MCS index)                             | MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15                                   |       |       |      |        |
| TX Characteristics                                | Min.                                                                       | Typ.  | Max.  | Unit | Remark |
| 1. Power Levels                                   |                                                                            |       |       |      |        |
| 1) 13dBm Target (For Each antenna port)<br>@ MCS9 | 10±2                                                                       | 12±2  | 15±2  | dBm  |        |
| 2. Spectrum Mask @ Target Power                   |                                                                            |       |       |      |        |
| 1) at fc +/-11MHz                                 |                                                                            |       | -20   | dBr  |        |
| 2) at fc +/-20MHz                                 |                                                                            |       | -28   | dBr  |        |
| 3) at fc > +/-30MHz                               |                                                                            |       | -45   | dBr  |        |
| 3. Constellation Error(EVM) @ Target Power        |                                                                            |       |       |      |        |
| 1) MCS0                                           |                                                                            |       | -5    | dB   |        |
| 2) MCS1                                           |                                                                            |       | -10   | dB   |        |
| 3) MCS2                                           |                                                                            |       | -13   | dB   |        |
| 4) MCS3                                           |                                                                            |       | -16   | dB   |        |
| 5) MCS4                                           |                                                                            |       | -19   | dB   |        |
| 6) MCS5                                           |                                                                            |       | -22   | dB   |        |
| 7) MCS6                                           |                                                                            |       | -25   | dB   |        |
| 8) MCS7                                           |                                                                            |       | -27   | dB   |        |
| 9) MCS8                                           |                                                                            |       | -30   |      |        |
| 10) MCS9                                          |                                                                            | -32   | -32   |      |        |
| 4. Frequency Error                                |                                                                            |       |       |      |        |
| 1) IEEE802.11ac                                   | -10                                                                        |       | 10    | ppm  |        |
| RX Characteristics                                | Max.                                                                       |       |       | Unit |        |
| 5. Minimum Input Level Sensitivity(each chain)    | VHT20                                                                      | VHT40 | VHT80 |      |        |
| 1) MCS0 (PER ≤ 10%)                               | -82                                                                        | -79   | -76   | dBm  |        |
| 2) MCS1 (PER ≤ 10%)                               | -79                                                                        | -76   | -73   | dBm  |        |
| 3) MCS2 (PER ≤ 10%)                               | -77                                                                        | -74   | -71   | dBm  |        |
| 4) MCS3 (PER ≤ 10%)                               | -74                                                                        | -71   | -68   | dBm  |        |
| 5) MCS4 (PER ≤ 10%)                               | -70                                                                        | -67   | -64   | dBm  |        |
| 6) MCS5 (PER ≤ 10%)                               | -66                                                                        | -63   | -60   | dBm  |        |
| 7) MCS6 (PER ≤ 10%)                               | -65                                                                        | -62   | -59   | dBm  |        |
| 8) MCS7 (PER ≤ 10%)                               | -64                                                                        | -61   | -58   | dBm  |        |
| 9) MCS8 (PER ≤ 10%)                               | -59                                                                        | -56   | -53   |      |        |

|                                           |     |     |     |     |  |
|-------------------------------------------|-----|-----|-----|-----|--|
| 10) MCS9 (PER $\leq 10\%$ )               |     | -54 | -51 |     |  |
| 6. Maximum Input Level (PER $\leq 10\%$ ) |     |     |     |     |  |
| 1) IEEE802.11ac                           | -30 |     | -   | dBm |  |

### 3.6 Bluetooth Section:

#### 3.6.1 BR Specification

| Items                                                | Contents                              |           |            |          |  |
|------------------------------------------------------|---------------------------------------|-----------|------------|----------|--|
| Host Interface                                       | UART                                  |           |            |          |  |
| Antenna Reference                                    | Small antennas with 0~2 dBi peak gain |           |            |          |  |
| Channel                                              | CH0 to CH78                           |           |            |          |  |
| Modulation                                           | GFSK                                  |           |            |          |  |
|                                                      | Min.                                  | Typ.      | Max.       | Unit     |  |
| TX Characteristics                                   |                                       |           |            |          |  |
| 1.Output Average Power                               | -6 $\pm$ 2                            | 5 $\pm$ 2 | 10 $\pm$ 2 | dBm      |  |
| 2.Modulation Characteristics                         |                                       |           |            |          |  |
| 1)Delta f1(Avg)                                      |                                       | 157       |            | kHz      |  |
| 2)Delta f2max(For at least 99.9% of all Delta f2max) |                                       | 121       |            | kHz      |  |
| 3)Delta f2/ Delta f1                                 |                                       | 0.85      |            | kHz      |  |
| 3.Initial Carrier Frequency Tolerance                |                                       | +/-20     | -          | kHz      |  |
| 4. Carrier Frequency Drift                           |                                       |           |            |          |  |
| 1) One Slot packet drift (DH1)                       |                                       | +/-15     |            | kHz      |  |
| 2) Three Slot packet drift (DH3)                     |                                       | +/-15     |            | kHz      |  |
| 3) Five Slot packet drift (DH5)                      |                                       | +/-15     |            | kHz      |  |
| 4) Max Drift Rate                                    |                                       | +/-15     |            | kHz/50us |  |
| RX Characteristics                                   |                                       |           |            |          |  |
| 1. Receiver Sensitivity (BER<0.1%)                   |                                       | -91       |            | dBm      |  |
| 2. Maximum usable signal (BER<0.1%)                  |                                       | -5        |            | dBm      |  |

### 3.6.2 EDR Specification

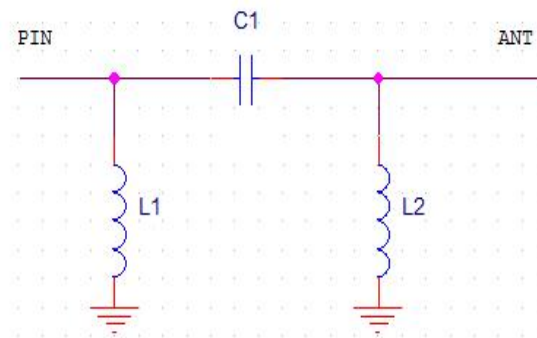
| Items                               | Contents                              |       |      |      |  |
|-------------------------------------|---------------------------------------|-------|------|------|--|
| Host Interface                      | UART                                  |       |      |      |  |
| Antenna Reference                   | Small antennas with 0~2 dBi peak gain |       |      |      |  |
| Channel                             | CH0 to CH78                           |       |      |      |  |
| Modulation                          | $\pi/4$ -DQPSK 、 8PSK                 |       |      |      |  |
|                                     | Min.                                  | Typ.  | Max. | Unit |  |
| TX Characteristics                  |                                       |       |      |      |  |
| 1.Relative Transmit Power           |                                       |       |      |      |  |
| 1) $\pi/4$ -DQPSK                   |                                       | -1.5  |      | dBm  |  |
| 2) 8PSK                             |                                       | -1.5  |      | dBm  |  |
| 2. Frequency Stability              |                                       |       |      |      |  |
| 1) Omega-i                          |                                       | +/-4  |      | kHz  |  |
| 2) Omega-0                          |                                       | +/-4  | -    | kHz  |  |
| 3) Omega-0 + Omega-i                |                                       | +/-4  |      |      |  |
| 3. Modulation Accuracy              |                                       |       |      |      |  |
| 1) RMS DEVM                         |                                       |       |      |      |  |
| $\pi/4$ -DQPSK                      |                                       | +/-9  |      | %    |  |
| 8PSK                                |                                       | +/-9  |      | %    |  |
| 2) Peak DEVM                        |                                       |       |      |      |  |
| $\pi/4$ -DQPSK                      |                                       | +/-28 |      | %    |  |
| 8PSK                                |                                       | +/-21 |      | %    |  |
| 3) 99% DEVM                         |                                       |       |      |      |  |
| $\pi/4$ -DQPSK                      |                                       | +/-15 |      | %    |  |
| 8PSK                                |                                       | +/-12 |      | %    |  |
| RX Characteristics                  |                                       |       |      |      |  |
| 1. Receiver Sensitivity (BER<0.01%) |                                       |       |      |      |  |
| 1) $\pi/4$ -DQPSK                   |                                       | -91   |      | dBm  |  |
| 2) 8PSK                             |                                       | -85   |      | dBm  |  |
| 2. Maximum usable signal (BER<0.1%) |                                       |       |      |      |  |
| 1) $\pi/4$ -DQPSK                   |                                       | -5    |      | dBm  |  |
| 2) 8PSK                             |                                       | -5    |      | dBm  |  |

### 3.6.3 LE Specification

| Items                                                | Contents                              |      |      |       |  |
|------------------------------------------------------|---------------------------------------|------|------|-------|--|
| Host Interface                                       | UART                                  |      |      |       |  |
| Antenna Reference                                    | Small antennas with 0~2 dBi peak gain |      |      |       |  |
| Channel                                              | CH0 to CH39                           |      |      |       |  |
|                                                      | Min.                                  | Typ. | Max. | Unit  |  |
| TX Characteristics                                   |                                       |      |      |       |  |
| 1. Output power at NOC                               |                                       | 0±2  |      | dBm   |  |
| 2. Modulation Characteristics                        |                                       |      |      |       |  |
| 1)Delta f1(Avg)                                      | 225                                   |      | 275  | kHz   |  |
| 2)Delta f2max(For at least 99.9% of all Delta f2max) | 185                                   |      |      | kHz   |  |
| 3)Delta f2/ Delta f1                                 | 0.8                                   | 0.94 |      | Hz/Hz |  |
| 3. Carrier frequency offset and drift                |                                       |      |      |       |  |
| 1) Frequency Offset                                  | -150                                  |      | 150  | kHz   |  |
| 2) Frequency Drift                                   | -50                                   |      | 50   | kHz   |  |
| 3) Max Drift Rate                                    | -20                                   |      | 20   | Hz/us |  |
| 4.In-band Spurious Emissions                         |                                       |      |      |       |  |
| 1)/+/-2M offset                                      |                                       |      | 20   | dBm   |  |
| 2)/>+/-3MHz offset                                   |                                       |      | 30   | dBm   |  |
| RX Characteristics                                   |                                       |      |      |       |  |
| 1. Receiver Sensitivity (BER<30.8%)                  |                                       | -91  |      | dBm   |  |
| 2. Maximum usable signal (BER<30.8%)                 |                                       | -5   |      | dBm   |  |

#### 1. Antenna matching

The BT RF , ANT0 and ANT1 Pin connect to antenna, please refer to design demand



**FCC 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.

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

NOTE: 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 important announcement

Important Note:

**Radiation Exposure Statement**

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

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

Country Code selection feature to be disabled for products marketed to the US/Canada.

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

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing 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 cannot 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 cannot 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: **2AL6KBL-M5621DS2A** "

**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.

## Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

### 2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

### 2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

### 2.4 Limited module procedures

This module is Limited single modular without shielding, host manufacturer have to consult with module manufacturer for the module limiting conditions when integrate the module in the host. module manufacturer should reviews detailed test data or host designs prior to giving the host manufacturer approval.

### 2.5 Trace antenna designs

Not applicable

### 2.6 RF exposure considerations

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

### 2.7 Antennas

This radio transmitter **2AL6KBL-M5621DS2A** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

| Model              | Type                | Connector | Peak gain ( dBi )  |                  |                  |                  |                  |
|--------------------|---------------------|-----------|--------------------|------------------|------------------|------------------|------------------|
|                    |                     |           | 2400-2483.5<br>MHz | 5150-5250<br>MHz | 5250-5350<br>MHz | 5470-5725<br>MHz | 5725-5850<br>MHz |
| 2400-2483.5<br>MHz | External<br>Antenna | /         | 2.0dBi             | /                | /                | /                | /                |
| 5000-6000<br>MHz   | External<br>Antenna | /         | /                  | 2.0dBi           | /                | /                | 2.0dBi           |

### 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AL6KBL-M5621DS2A".

### 2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

### 2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.