

# **AW-CU488**

## **IEEE 802.11 a/b/g/n 1T1R WLAN and Bluetooth Low Energy Microcontroller Module**

### **Datasheet**

**Rev. E**

**DF**

**(For Standard)  
(Halogen Free)**

## Features

### WiFi

802.11 a/b/g/n/ 1x1, 2.4GHz & 5GHz

Support 20MHz/ up to MCS7

Low power architecture

Support low power TX/RX for short range application

Low power beacon listen mode

Low power Rx mode

Very low power suspends mode (DLPS)

### Bluetooth

Support BLE

Support both central and peripheral modes

High power mode (10dbm, share the PA and WIFI) (optional)

Internal co-existence mechanism between and WIFI and BT to share the same antenna

Support BLE5.0

### Peripheral Interface

USB host controller with HS/FS/LS capability

SDIO device with highest SDR25 supported

HS\_UART/LP\_UART supported

Standard and fast mode I2C supported

I2S with 8/12/16/24/32/48/.../176.4 KHz sampling rate

Maximum 2 SPI supported. One supports baud rate up to 50MHz; the other one supports baud rate up to 25MHz



AzureWave Technologies, Inc.

## Revision History

Document NO: RW-2488-DST-01

[illegible]

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## 1. Introduction

### 1.1 Product Overview

AzureWave presents AW-CU448 802.11a/b/g/n 1T1R WLAN and Bluetooth low energy (5.0) Microcontroller Solution provides a highly cost-effective, flexible and easy to-use hardware/software platform to build a new generation of connected, smart devices. These smart-connected devices enable device to deliver a broad-range of services to consumers including energy-management, demand-response, home automation and remote access. This allows a user to manage comfort and convenience, also run diagnostics and receive alerts and notifications, in addition to managing and controlling the device. Developers can leverage the rich connectivity features of these new smart devices to create a new generation of innovative new applications and services

The architecture features the Realtek RTL8721DM integrated single-chip low power dual band (2.4GHz and 5GHz) wireless LAN and Bluetooth Low Energy (V5.0) communication controller. It consists of high-performance MCU (latest architecture v8m, Cortex-M4F instruction compatible) named KM4, a low power MCU (v8m, Cortex-M0 instruction compatible) named KM0, WLAN (802.11a/b/g/n) MAC, a 1T1R capable WLAN baseband, RF, Bluetooth and peripherals.

The AW-CU448 is powered by production quality, field-tested Realtek Easy Connect software that includes a rich set of software components that work together to support the development of Smart Energy devices, and enable these devices to connect to mobile clients such as smart-phones, Internet-based Cloud and Smart-Grid services. The feature-rich software stack enables OEMs to focus on application-specific software functionality, thus enabling rapid development and reduced software development costs and risks.

## 1.3 Specifications Table

### 1.3.1 General

| Features            | Description                                                                   |
|---------------------|-------------------------------------------------------------------------------|
| Product Description | 802.11a/b/g/n 1T1R WLAN and Bluetooth low energy (5.0) Microcontroller Module |
| Major Chipset       | RTL8721DM(with pSRAM 4MB)                                                     |
| Flash               | Built-in SPI 32M-bit Serial Flash                                             |
| Host Interface      | UART                                                                          |
| Dimension           | 36 mm x 18 mm x 3.15 mm                                                       |
| Package             | 150-pin LGA                                                                   |
| Antenna             | Internal Shielding Antenna for WLAN/BT                                        |
| Weight              | TBD                                                                           |

### 1.3.2 WLAN

| Features                 | Description                                                                                                                                                                                                                                                                                                 |     |     |     |      |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| WLAN Standard            | IEEE 802.11a/b/g/n, Wi-Fi compliant                                                                                                                                                                                                                                                                         |     |     |     |      |
| Frequency Rage           | 2.4 GHz : 2.412 ~ 2.484 GHz, ISM radio band<br>5 GHz : 4.915 ~5.925GHz                                                                                                                                                                                                                                      |     |     |     |      |
| Modulation               | DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM for WLAN                                                                                                                                                                                                                                                      |     |     |     |      |
| Number of Channels       | <b>2.4GHz</b><br>USA, North America, Canada and Taiwan – 1 ~ 11<br>China, Australia, Most European Countries – 1 ~ 13<br>Japan, 1 ~ 14(CH14 only for 802.11b)<br><b>5GHz</b><br>USA, EUROPE – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140,149, 153, 157, 161, 165 |     |     |     |      |
| Calibration Output Power | <b>2.4G</b>                                                                                                                                                                                                                                                                                                 |     |     |     |      |
|                          |                                                                                                                                                                                                                                                                                                             | Min | Typ | Max | Unit |
|                          | 11b (11Mbps)<br>@EVM<35%                                                                                                                                                                                                                                                                                    | 15  | 18  | 20  | dBm  |
|                          | 11g (54Mbps)<br>@EVM≤-27 dB                                                                                                                                                                                                                                                                                 | 14  | 17  | 19  | dBm  |
|                          | 11n (HT20 MCS7)                                                                                                                                                                                                                                                                                             | 13  | 16  | 18  | dBm  |

|                      |                                       |     |     |     |      |
|----------------------|---------------------------------------|-----|-----|-----|------|
|                      | @EVM $\leq$ -28 dB                    |     |     |     |      |
|                      |                                       |     |     |     |      |
|                      | <b>5G</b>                             |     |     |     |      |
|                      |                                       | Min | Typ | Max | Unit |
|                      | 11a (54Mbps)<br>@EVM $\leq$ -27 dB    | 12  | 14  | 16  | dBm  |
| Limit Output Power   | 11n (HT20 MCS7)<br>@EVM $\leq$ -28 dB | 11  | 13  | 15  | dBm  |
|                      |                                       |     |     |     |      |
|                      | <b>2.4G</b>                           |     |     |     |      |
|                      |                                       | Min | Typ | Max | Unit |
|                      | 11b (11Mbps)<br>@EVM < 35%            | TBD | TBD | TBD | dBm  |
|                      | 11g (54Mbps)<br>@EVM $\leq$ -27 dB    | TBD | TBD | TBD | dBm  |
|                      | 11n (HT20 MCS7)<br>@EVM $\leq$ -28 dB | TBD | TBD | TBD | dBm  |
|                      |                                       |     |     |     |      |
|                      | <b>5G</b>                             |     |     |     |      |
|                      |                                       | Min | Typ | Max | Unit |
| Receiver Sensitivity | 11a (54Mbps)<br>@EVM $\leq$ -27 dB    | TBD | TBD | TBD | dBm  |
|                      | 11n (HT20 MCS7)<br>@EVM $\leq$ -28 dB | TBD | TBD | TBD | dBm  |
|                      |                                       |     |     |     |      |
|                      | <b>2.4G</b>                           |     |     |     |      |
|                      |                                       | Min | Typ | Max | Unit |
|                      | 11b (11Mbps)                          |     | TBD | -82 | dBm  |
|                      | 11g (54Mbps)                          |     | TBD | -71 | dBm  |
|                      | 11n (HT20 MCS7)                       |     | TBD | -67 | dBm  |
|                      |                                       |     |     |     |      |
|                      | <b>5G</b>                             |     |     |     |      |
| Data Rate            |                                       | Min | Typ | Max | Unit |
|                      | 11a (54Mbps)                          |     | TBD | -71 | dBm  |
|                      | 11n (HT20 MCS7)                       |     | TBD | -67 | dBm  |
|                      |                                       |     |     |     |      |
|                      |                                       |     |     |     |      |
| Security             | TBD                                   |     |     |     |      |

\* HT40 is not yet supported in normal mode

\* If you have any certification questions about output power please contact FAE directly.

### 1.3.3 Bluetooth

| Features             | Description              |     |     |     |      |
|----------------------|--------------------------|-----|-----|-----|------|
| Bluetooth Standard   | Bluetooth V5.0 complaint |     |     |     |      |
| Frequency Range      | 2402~2480MHz             |     |     |     |      |
| Modulation           | GFSK                     |     |     |     |      |
| Output Power         |                          | Min | Typ | Max | Unit |
|                      | LE 1M                    | 2   | 4   | 6   | dBm  |
|                      | LE 2M                    | TBD | TBD | TBD | dBm  |
| Receiver Sensitivity |                          | Min | Typ | Max | Unit |
|                      | LE 1M                    |     | TBD | -70 | dBm  |
|                      | LE 2M                    |     | TBD | -70 | dBm  |



### 1.3.4 Operating Conditions

| Features              | Description           |
|-----------------------|-----------------------|
| Operating Conditions  |                       |
| Voltage               | 3.3V +/- 9%           |
| Operating Temperature | Operating: -20 ~ 85°C |
| Operating Humidity    | less than 85% R.H.    |
| Storage Temperature   | -40 ~ 85°C            |
| Storage Humidity      | less than 60% R.H.    |
| ESD Protection        |                       |
| Human Body Model      | +/- 3.5KV             |
| Changed Device Model  | +/- 500V              |

## 2. Pin Definition

### 2.1 Pin Map

**AW-CU488 Top View Pin Map**

|  | 15  | 14  | 13   | 12   | 11         | 10   | 9    | 8    | 7    | 6    | 5    | 4   | 3   | 2           | 1    |   |
|--|-----|-----|------|------|------------|------|------|------|------|------|------|-----|-----|-------------|------|---|
|  | GND | GND | PA8  | PA7  | CHIP<br>EN | PA2  | PA4  | PA0  | PB31 | PB29 | PB26 | GND | GND | PB23        | PB22 | K |
|  | GND | GND | NC   | NC   | NC         | NC   | NC   | NC   | NC   | NC   | NC   | NC  | NC  | NC          | NC   | J |
|  | GND | GND | GND  | GND  | GND        | GND  | GND  | GND  | GND  | GND  | GND  | GND | GND | NC          | NC   | H |
|  | GND | GND | GND  | GND  | GND        | GND  | GND  | GND  | GND  | GND  | GND  | GND | GND | GND         | GND  | G |
|  | GND | GND | GND  | GND  | GND        | GND  | GND  | GND  | GND  | GND  | GND  | GND | GND | GND         | 3V3  | F |
|  | GND | GND | GND  | GND  | GND        | GND  | GND  | GND  | GND  | GND  | GND  | GND | GND | GND         | GND  | E |
|  | GND | GND | GND  | GND  | GND        | GND  | GND  | GND  | GND  | GND  | GND  | GND | GND | VBAT<br>MEA | PB7  | D |
|  | GND | GND | GND  | GND  | GND        | GND  | GND  | GND  | GND  | GND  | GND  | GND | GND | PB6         | PB5  | C |
|  | GND | GND | PA13 | PA15 | PA17       | PA19 | NC   | NC   | NC   | NC   | NC   | NC  | NC  | PB4         | PB3  | B |
|  | GND | GND | PA12 | PA14 | PA16       | PA18 | PA27 | PA30 | NC   | PA26 | PA25 | PB2 | PB1 | GND         | GND  | A |
|  |     |     |      |      |            |      |      |      |      |      |      |     |     |             |      |   |

## 2.2 Pin Table

| Pin No | Definition | Basic Description                                                         | Voltage | Type     |
|--------|------------|---------------------------------------------------------------------------|---------|----------|
| A1     | GND        | Ground.                                                                   |         | GND      |
| A2     | GND        | Ground.                                                                   |         | GND      |
| A3     | PB1        | The MUX function GPIO pin.                                                |         | I/O      |
| A4     | PB2        | The MUX function GPIO pin.                                                |         | I/O      |
| A5     | PA25       | The MUX function GPIO pin.                                                |         | I/O      |
| A6     | PA26       | The MUX function GPIO pin.                                                |         | I/O      |
| A7     | NC         | Floating Pin.<br>(RREF Port, internal 12kΩ pulled down for USB interface) |         | I/O      |
| A8     | PA30       | The MUX function GPIO pin.                                                |         | I/O      |
| A9     | PA27       | The MUX function GPIO pin.                                                |         | I/O      |
| A10    | PA18       | The MUX function GPIO pin.                                                |         | I/O      |
| A11    | PA16       | The MUX function GPIO pin.                                                |         | I/O      |
| A12    | PA14       | The MUX function GPIO pin.                                                |         | I/O      |
| A13    | PA12       | The MUX function GPIO pin.                                                |         | I/O      |
| A14    | GND        | Ground.                                                                   |         | GND      |
| A15    | GND        | Ground.                                                                   |         | GND      |
| B1     | PB3        | The MUX function GPIO pin.                                                |         | I/O      |
| B2     | PB4        | The MUX function GPIO pin.                                                |         | I/O      |
| B3     | NC         | Floating Pin                                                              |         | Floating |
| B4     | NC         | Floating Pin                                                              |         | Floating |
| B5     | NC         | Floating Pin                                                              |         | Floating |
| B6     | NC         | Floating Pin                                                              |         | Floating |
| B7     | NC         | Floating Pin                                                              |         | Floating |
| B8     | NC         | Floating Pin                                                              |         | Floating |
| B9     | NC         | Floating Pin                                                              |         | Floating |
| B10    | PA19       | The MUX function GPIO pin.                                                |         | I/O      |

|     |           |                             |  |     |
|-----|-----------|-----------------------------|--|-----|
| B11 | PA17      | The MUX function GPIO pin.  |  | I/O |
| B12 | PA15      | The MUX function GPIO pin.  |  | I/O |
| B13 | PA13      | The MUX function GPIO pin.  |  | I/O |
| B14 | GND       | Ground.                     |  | GND |
| B15 | GND       | Ground.                     |  | GND |
| C1  | PB5       | The MUX function GPIO pin.  |  | I/O |
| C2  | PB6       | The MUX function GPIO pin.  |  | I/O |
| C3  | GND       | Ground.                     |  | GND |
| C4  | GND       | Ground.                     |  | GND |
| C5  | GND       | Ground.                     |  | GND |
| C6  | GND       | Ground.                     |  | GND |
| C7  | GND       | Ground.                     |  | GND |
| C8  | GND       | Ground.                     |  | GND |
| C9  | GND       | Ground.                     |  | GND |
| C10 | GND       | Ground.                     |  | GND |
| C11 | GND       | Ground.                     |  | GND |
| C12 | GND       | Ground.                     |  | GND |
| C13 | GND       | Ground.                     |  | GND |
| C14 | GND       | Ground.                     |  | GND |
| C15 | GND       | Ground.                     |  | GND |
| D1  | PB7       | The MUX function GPIO pin.  |  | I/O |
| D2  | VBAT_MEAS | ADC input pin, 5V tolerance |  | I   |
| D3  | GND       | Ground.                     |  | GND |
| D4  | GND       | Ground.                     |  | GND |
| D5  | GND       | Ground.                     |  | GND |
| D6  | GND       | Ground.                     |  | GND |
| D7  | GND       | Ground.                     |  | GND |
| D8  | GND       | Ground.                     |  | GND |

|     |     |                   |  |     |
|-----|-----|-------------------|--|-----|
| D9  | GND | Ground.           |  | GND |
| D10 | GND | Ground.           |  | GND |
| D11 | GND | Ground.           |  | GND |
| D12 | GND | Ground.           |  | GND |
| D13 | GND | Ground.           |  | GND |
| D14 | GND | Ground.           |  | GND |
| D15 | GND | Ground.           |  | GND |
| E1  | GND | Ground.           |  | GND |
| E2  | GND | Ground.           |  | GND |
| E3  | GND | Ground.           |  | GND |
| E4  | GND | Ground.           |  | GND |
| E5  | GND | Ground.           |  | GND |
| E6  | GND | Ground.           |  | GND |
| E7  | GND | Ground.           |  | GND |
| E8  | GND | Ground.           |  | GND |
| E9  | GND | Ground.           |  | GND |
| E10 | GND | Ground.           |  | GND |
| E11 | GND | Ground.           |  | GND |
| E12 | GND | Ground.           |  | GND |
| E13 | GND | Ground.           |  | GND |
| E14 | GND | Ground.           |  | GND |
| E15 | GND | Ground.           |  | GND |
| F1  | 3V3 | 3.3V power supply |  | VCC |
| F2  | GND | Ground.           |  | GND |
| F3  | GND | Ground.           |  | GND |
| F4  | GND | Ground.           |  | GND |
| F5  | GND | Ground.           |  | GND |
| F6  | GND | Ground.           |  | GND |

|     |     |              |  |          |
|-----|-----|--------------|--|----------|
| F7  | GND | Ground.      |  | GND      |
| F8  | GND | Ground.      |  | GND      |
| F9  | GND | Ground.      |  | GND      |
| F10 | GND | Ground.      |  | GND      |
| F11 | GND | Ground.      |  | GND      |
| F12 | GND | Ground.      |  | GND      |
| F13 | GND | Ground.      |  | GND      |
| F14 | GND | Ground.      |  | GND      |
| F15 | GND | Ground.      |  | GND      |
| G1  | GND | Ground.      |  | GND      |
| G2  | GND | Ground.      |  | GND      |
| G3  | GND | Ground.      |  | GND      |
| G4  | GND | Ground.      |  | GND      |
| G5  | GND | Ground.      |  | GND      |
| G6  | GND | Ground.      |  | GND      |
| G7  | GND | Ground.      |  | GND      |
| G8  | GND | Ground.      |  | GND      |
| G9  | GND | Ground.      |  | GND      |
| G10 | GND | Ground.      |  | GND      |
| G11 | GND | Ground.      |  | GND      |
| G12 | GND | Ground.      |  | GND      |
| G13 | GND | Ground.      |  | GND      |
| G14 | GND | Ground.      |  | GND      |
| G15 | GND | Ground.      |  | GND      |
| H1  | NC  | Floating Pin |  | Floating |
| H2  | NC  | Floating Pin |  | Floating |
| H3  | GND | Ground.      |  | GND      |
| H4  | GND | Ground.      |  | GND      |

|     |      |                            |  |          |
|-----|------|----------------------------|--|----------|
| H5  | GND  | Ground.                    |  | GND      |
| H6  | GND  | Ground.                    |  | GND      |
| H7  | GND  | Ground.                    |  | GND      |
| H8  | GND  | Ground.                    |  | GND      |
| H9  | GND  | Ground.                    |  | GND      |
| H10 | GND  | Ground.                    |  | GND      |
| H11 | GND  | Ground.                    |  | GND      |
| H12 | GND  | Ground.                    |  | GND      |
| H13 | GND  | Ground.                    |  | GND      |
| H14 | GND  | Ground.                    |  | GND      |
| H15 | GND  | Ground.                    |  | GND      |
| J1  | NC   | Floating Pin               |  | Floating |
| J2  | NC   | Floating Pin               |  | Floating |
| J3  | NC   | Floating Pin               |  | Floating |
| J4  | NC   | Floating Pin               |  | Floating |
| J5  | NC   | Floating Pin               |  | Floating |
| J6  | NC   | Floating Pin               |  | Floating |
| J7  | NC   | Floating Pin               |  | Floating |
| J8  | NC   | Floating Pin               |  | Floating |
| J9  | NC   | Floating Pin               |  | Floating |
| J10 | NC   | Floating Pin               |  | Floating |
| J11 | NC   | Floating Pin               |  | Floating |
| J12 | NC   | Floating Pin               |  | Floating |
| J13 | NC   | Floating Pin               |  | Floating |
| J14 | GND  | Ground.                    |  | GND      |
| J15 | GND  | Ground.                    |  | GND      |
| K1  | PB22 | The MUX function GPIO pin. |  | I/O      |
| K2  | PB23 | The MUX function GPIO pin. |  | I/O      |

|     |         |                                             |  |     |
|-----|---------|---------------------------------------------|--|-----|
| K3  | GND     | Ground.                                     |  | GND |
| K4  | GND     | Ground.                                     |  | GND |
| K5  | PB26    | The MUX function GPIO pin.                  |  | I/O |
| K6  | PB29    | The MUX function GPIO pin.                  |  | I/O |
| K7  | PB31    | The MUX function GPIO pin.                  |  | I/O |
| K8  | PA0     | The MUX function GPIO pin.                  |  | I/O |
| K9  | PA4     | The MUX function GPIO pin.                  |  | I/O |
| K10 | PA2     | The MUX function GPIO pin.                  |  | I/O |
| K11 | CHIP_EN | Enable Chip:1 Enable Chip, 0 Shut Down Chip |  | I   |
| K12 | PA7     | The MUX function GPIO pin.                  |  | I/O |
| K13 | PA8     | The MUX function GPIO pin.                  |  | I/O |
| K14 | GND     | Ground.                                     |  | GND |
| K15 | GND     | Ground.                                     |  | GND |



### 3. Electrical Characteristics

#### 3.1 Absolute Maximum Ratings

| Symbol | Parameter         | Minimum | Typical | Maximum | Unit |
|--------|-------------------|---------|---------|---------|------|
| 3V3    | 3.3V Power supply | 3.0     | 3.3     | 3.6     | V    |

#### 3.2 Recommended Operating Conditions

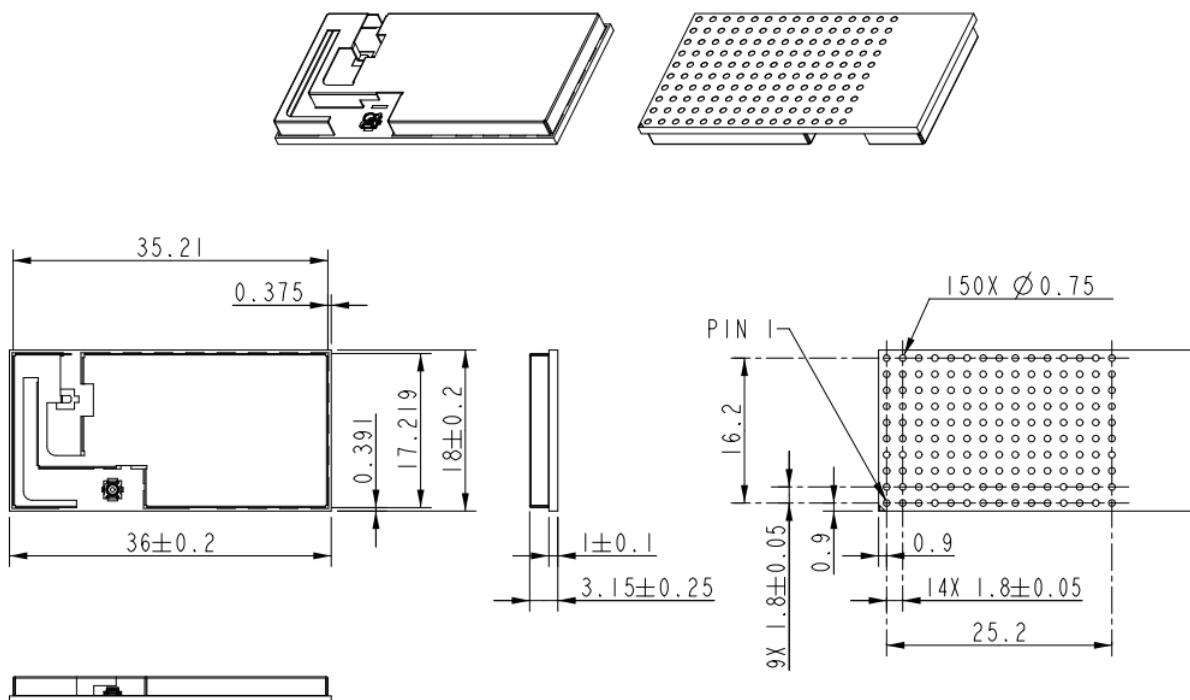
| Symbol | Parameter         | Minimum | Typical | Maximum | Unit |
|--------|-------------------|---------|---------|---------|------|
| 3V3    | 3.3V Power supply | 3.0     | 3.3     | 3.6     | V    |

#### 3.3 Digital IO Pin DC Characteristics

| Symbol          | Parameter           | Minimum | Typical | Maximum | Unit |
|-----------------|---------------------|---------|---------|---------|------|
| V <sub>IH</sub> | Input high voltage  | 2       | --      |         | V    |
| V <sub>IL</sub> | Input low voltage   |         | --      | 0.8     | V    |
| V <sub>OH</sub> | Output high voltage | 2.4     | --      |         | V    |
| V <sub>OL</sub> | Output low voltage  |         | --      | 0.4     | V    |

## 4. Mechanical Information

### 4.1 Mechanical Drawing



|   |    |   |    |   |    |   |    |   |    |   |    |   |    |   |    |   |    |   |     |   |     |   |     |   |     |   |     |   |     |
|---|----|---|----|---|----|---|----|---|----|---|----|---|----|---|----|---|----|---|-----|---|-----|---|-----|---|-----|---|-----|---|-----|
| ○ | K1 | ○ | K2 | ○ | K3 | ○ | K4 | ○ | K5 | ○ | K6 | ○ | K7 | ○ | K8 | ○ | K9 | ○ | K10 | ○ | K11 | ○ | K12 | ○ | K13 | ○ | K14 | ○ | K15 |
| ○ | J1 | ○ | J2 | ○ | J3 | ○ | J4 | ○ | J5 | ○ | J6 | ○ | J7 | ○ | J8 | ○ | J9 | ○ | J10 | ○ | J11 | ○ | J12 | ○ | J13 | ○ | J14 | ○ | J15 |
| ○ | H1 | ○ | H2 | ○ | H3 | ○ | H4 | ○ | H5 | ○ | H6 | ○ | H7 | ○ | H8 | ○ | H9 | ○ | H10 | ○ | H11 | ○ | H12 | ○ | H13 | ○ | H14 | ○ | H15 |
| ○ | G1 | ○ | G2 | ○ | G3 | ○ | G4 | ○ | G5 | ○ | G6 | ○ | G7 | ○ | G8 | ○ | G9 | ○ | G10 | ○ | G11 | ○ | G12 | ○ | G13 | ○ | G14 | ○ | G15 |
| ○ | F1 | ○ | F2 | ○ | F3 | ○ | F4 | ○ | F5 | ○ | F6 | ○ | F7 | ○ | F8 | ○ | F9 | ○ | F10 | ○ | F11 | ○ | F12 | ○ | F13 | ○ | F14 | ○ | F15 |
| ○ | E1 | ○ | E2 | ○ | E3 | ○ | E4 | ○ | E5 | ○ | E6 | ○ | E7 | ○ | E8 | ○ | E9 | ○ | E10 | ○ | E11 | ○ | E12 | ○ | E13 | ○ | E14 | ○ | E15 |
| ○ | D1 | ○ | D2 | ○ | D3 | ○ | D4 | ○ | D5 | ○ | D6 | ○ | D7 | ○ | D8 | ○ | D9 | ○ | D10 | ○ | D11 | ○ | D12 | ○ | D13 | ○ | D14 | ○ | D15 |
| ○ | C1 | ○ | C2 | ○ | C3 | ○ | C4 | ○ | C5 | ○ | C6 | ○ | C7 | ○ | C8 | ○ | C9 | ○ | C10 | ○ | C11 | ○ | C12 | ○ | C13 | ○ | C14 | ○ | C15 |
| ○ | B1 | ○ | B2 | ○ | B3 | ○ | B4 | ○ | B5 | ○ | B6 | ○ | B7 | ○ | B8 | ○ | B9 | ○ | B10 | ○ | B11 | ○ | B12 | ○ | B13 | ○ | B14 | ○ | B15 |
| ○ | A1 | ○ | A2 | ○ | A3 | ○ | A4 | ○ | A5 | ○ | A6 | ○ | A7 | ○ | A8 | ○ | A9 | ○ | A10 | ○ | A11 | ○ | A12 | ○ | A13 | ○ | A14 | ○ | A15 |

PIN DEFINED (BOTTOM VIEW)

PIN Defined

## 5. Packaging Information

TBD

**Industry Canada statement:**

This device complies with ISED's licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

**Radiation Exposure Statement:**

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

**Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

**This device is intended only for OEM integrators under the following conditions: (For module device use)**

- 1) The antenna must be installed and operated with greater than 20cm between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as **2** conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

- 1) L'antenne doit être installée et exploitée avec plus de 20 cm entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les **2** conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

**IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

**NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 9569A-424151A".

**Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 9569A-424151A ".

**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.

**Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module. Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

**Caution :**

(i) the device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

(iv) where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain

compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.

**Avertissement:**

Le guide d'utilisation des dispositifs pour réseaux locaux doit inclure des instructions précises sur les restrictions susmentionnées, notamment :

(i) les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;

(iv) lorsqu'il y a lieu, les types d'antennes (s'il y en a plusieurs), les numéros de modèle de l'antenne et les pires angles d'inclinaison nécessaires pour rester conforme à l'exigence de la p.i.r.e. applicable au masque d'élévation, énoncée à la section 6.2.2.3, doivent être clairement indiqués

### **Federal Communication Commission Interference Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

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

This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

### **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 & your body.

**This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01**



guidance, the following conditions must be strictly followed when using this certified module:

**KDB 996369 D03 OEM Manual v01 rule sections:**

**2.2 List of applicable FCC rules**

This module has been tested for compliance to FCC Part 15.247 and 15.407

**2.3 Summarize the specific operational use conditions**

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

**2.4 Limited module procedures**

Not applicable.

**2.5 Trace antenna designs**

Not applicable.

**2.6 RF exposure considerations**

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

**2.7 Antennas**

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

| Brand   | Model         | Antenna Gain(dBi) | Frequency range | Antenna Type | Connector Type |
|---------|---------------|-------------------|-----------------|--------------|----------------|
| LYNwave | ALX20M-222AAC | 3.7               | 2.4~2.5GHz      | PIFA         | NA             |
|         |               | 3.6               | 5.15~5.85GHz    |              |                |

**2.8 Label and compliance information**

The final end product must be labeled in a visible area with the following: "Contains FCC ID: TLZ-CU488". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

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

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

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

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

#### **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.

#### **OEM/Host manufacturer responsibilities**

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment