

# Datasheet

## Aurawave AW100 Series

Bluetooth™ Auracast™ and LE Audio Module +

Aurawave Audio Framework v1.0 with AT Command Interface

*Version 1.0*

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## Revision History

| Version | Date        | Notes                            | Contributors                      | Approver                    |
|---------|-------------|----------------------------------|-----------------------------------|-----------------------------|
| 0.1     | 7 May 2025  | Initial version.                 |                                   |                             |
| 0.2     | 12 May 2025 | Ezurio branding                  | Dave Drogowski                    |                             |
| 1.0     | 7 Aug 2025  | Prepare for general availability | Garrett LoVerde<br>Dave Drogowski | Josh Toole<br>Jonathan Kaye |

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## 1 Introduction

This document provides a brief product outline of the Aurawave™ AW100 series modules, the Aurawave Audio Framework software, and the functionality they provide when combined.

The document outlines the specific hardware capabilities and interfaces of the Aurawave AW100 series modules including electrical and mechanical specifications. It also provides basic descriptions of the Aurawave Audio Framework's software architecture and operation.

## 2 Terminology

| Term                               | Definition                                                                                                                                             |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auracast™                          | Bluetooth technology for broadcasting audio to many devices simultaneously                                                                             |
| Aurawave AT Command Interface      | A serial command and control interface for the Aurawave Audio Framework for runtime configuration and control of the module and LE Audio functionality |
| Aurawave Audio Framework           | Software framework which includes LE audio related middleware with an AT interface for use on Auraware module(s)                                       |
| Aurawave Module                    | A module in the Aurawave family of LE audio products                                                                                                   |
| BAP (Basic Audio Profile)          | Bluetooth profile for basic audio functionalities, including broadcast audio                                                                           |
| BIS (Broadcast Isochronous Stream) | A connectionless Bluetooth data stream used to transmit audio                                                                                          |
| CAP (Common Audio Profile)         | Bluetooth profile for common audio functionalities                                                                                                     |
| Codec                              | A device or software that encodes and decodes audio signals                                                                                            |
| GPIO                               | General Purpose Input/Output                                                                                                                           |
| I2C                                | Inter-Integrated Circuit                                                                                                                               |
| I2S (Inter-IC Sound)               | A serial bus interface standard for connecting digital audio devices                                                                                   |
| PBP (Public Broadcast Profile)     | Bluetooth profile for public audio broadcasting                                                                                                        |
| QSPI Flash                         | Quad Serial Peripheral Interface Flash memory                                                                                                          |
| SPI                                | Serial Peripheral Interface                                                                                                                            |
| SWD (Serial Wire Debug)            | A debugging interface for ARM processors                                                                                                               |
| TRS (Tip-Ring-Sleeve)              | A type of audio connector, commonly used for 3.5mm jacks                                                                                               |
| UART                               | Universal Asynchronous Receiver-Transmitter                                                                                                            |

## 3 Introduction

The primary function of the **Aurawave AW100 series** modules when combined with the **Aurawave Audio Framework** AT command software is to serve as an **Auracast™** transmitter, enabling the wireless broadcasting of high-quality audio to multiple Bluetooth receivers simultaneously. Auracast™ technology is at the forefront of wireless audio streaming, offering a seamless and reliable user experience in environments such as public venues, conference halls, and personal audio setups.

In addition to its Auracast™ capabilities, the module is engineered to act as a flexible Bluetooth LE Audio device, intended to reduce time and design cost to integrate Bluetooth LE audio functionality into customer end devices. This dual functionality allows the module to be integrated into a wide range of use cases, from consumer electronics to industrial applications, where reliable Bluetooth LE connectivity is essential.

### 3.1 Modes of Operation

#### 3.1.1 Standalone Mode

- Initial configuration using AT commands over USB serial port
- Factory default configuration for easy demonstration purposes
- Board powered via USB-C Connector (5v) using standard power supply
- Broadcast line-level analog audio from any device with a 3.5mm jack
- Broadcast digital audio from any device that supports USB Audio class drivers
- Configure, deploy, and forget!

#### 3.1.2 Host Mode

- Standard 40-Pin header for easy integration
- Powered via I/O pins or USB
- AT control interface via UART/GPIO or USB
- Flexible control of stream meta data and configuration
- Audio over I2S, USB, or line-level analog via 40-Pin header

### 3.2 Key Features (v1.0)

Key features of the AW100 series module with included Aurawave Audio Framework Software v1.0:

- **Easy AT Command Interface:** Ships with firmware that enables straight forward configuration and control of Bluetooth Auracast™ broadcasts via AT commands
- **Auracast™ Source Capability:** Broadcast high-quality audio streams to multiple Bluetooth receivers simultaneously, supporting use cases in public and private environments
- **Bluetooth LE 5.4:** Seamlessly integrate with third-party Bluetooth LE devices, offering flexibility for various applications, including audio, data transfer, sensor connectivity
- **Audio Input & Output:** I2S, USB, and onboard codec to handle analog and digital audio I/O
- **Standalone Operation:** When powered by common power adapters (USB-C), the Bluetooth LE Auracast™ module will operate without the need for other supporting hardware to broadcast analog audio
- **USB-C Interface:** The Aurawave module can be powered and controlled by a USB-C host device using standard AT-Commands over a virtual serial port while also exposing a digital audio interface
- **40 Pin Expansion Header:** Integrate LE audio into your product via the 40-pin header, which exposes power, serial, audio, GPIO and more
- **Compact and Modular Design:** The module is designed for easy integration into existing hardware setups, with a form factor that suits both consumer and industrial applications
- **Customizable Firmware:** The Aurawave AW100 ships with pre-built binaries to support control using AT commands. The module firmware can also be customized to meet specific application needs by Cloud2GND. A standard 10-pin SWD header is available for the user to flash custom binaries using standard Nordic tools

### 3.3 Aurawave Audio Framework Capabilities (v1.0)

- AT Command Interface
  - Configure audio inputs
  - Configure broadcast parameters
  - Selectable audio source per broadcast channel
  - Configuration persistence
  - Factory reset
  - Enter firmware upgrade mode
  - *See [Aurawave AW100 Series AT Command Specification](#) for more information.*
- Audio Source Options
  - 2 Channels of Analog I/O at 48kHz or 16kHz sampling rate
  - 2 Channels of Digital Audio via USB at 48kHz sampling rate
- Auracast™ Transmitter (Public Broadcast Profile)
  - Standard Quality Broadcast (16kHz)
    - Low latency: 16\_2\_1,
    - High reliability: 16\_2\_2
  - High Quality Broadcast (48kHz)
    - Low latency: 48\_2\_1
    - High reliability: 48\_2\_2
  - 1 x Broadcast isochronous group, up to 2 Subgroups<sup>1</sup>
  - Encode up to 2 audio input channels simultaneously
  - 2 x Broadcast Isochronous Streams with one audio channel per BIS
  - Configurable BAP Audio Locations (Mono, Left, Right, Center, etc.)<sup>2</sup>
  - Broadcast Encryption
- Supported Bluetooth LE Features & Roles
  - Public Broadcast Profile (PBP) - Public Broadcast Source
  - Common Audio Profile (CAP) - Initiator
  - Basic Audio Profile (BAP) - Broadcast Source
  - Bluetooth Core 5.4
- Firmware Upgrade
  - Firmware upgrade via provided tools
- Push Button Input
  - Factory Reset - Press and hold
  - Firmware upgrade mode - hold on boot
- Custom Firmware/Feature Development
  - Additional services and custom support available.

### 3.4 Hardware Features (AW100PA-A-INT)

- Ezurio BL5340PA Series Module
  - Nordic nRF5340
  - Nordic nRF21540 Front End Module
  - 128/64 MHz Arm Cortex-M33 application processor with 1 MB Flash & 512 KB RAM
  - 64 MHz Arm Cortex-M33 network processor with 256 KB Flash & 64 KB RAM
  - Internal Antenna
- AKM AK4558 Digital Sigma-Delta CODEC
  - 32Bit
  - 108dB Dynamic Range S/N DAC
  - 100dB S/(N+D) DAC
  - 108dB Dynamic Range S/N ADC
  - 92dB S/(N+D) ADC
- 32MBit QSPI Flash
- 5Vdc Operating Voltage

<sup>1</sup> 1 subgroup supported in Software Version 1.0

<sup>2</sup> Feature available in software version 1.1

## 3.5 Interfaces

- Bluetooth Low Energy 5.4
- USB-C Connector
  - 5VDC Power
  - Audio I/O
  - AT Control
- Analog I/O via AKM4558 CODEC
  - 3.5mm TRS Stereo Line Input
  - 3.5mm TRS Stereo Line Output
- 40-pin header (2x20 2.54mm pitch)
  - I2S In/Out
  - Line Audio In/Out
  - USB
  - I2C
  - SPI
  - UART x2
  - GPIO x5
  - PDM multiplexed with GPIO pins
  - +5V DC
- Pushbutton Control
- 2-Color Green/Blue LED
- SWD Programming Interface
- Analog/PCM Audio
  - nRF5340 I2S Controller --> AK4558EN I2S Target --> Line Out
  - Header I2S Controller --> BL5340 I2S Target --> LE Audio
  - Line In --> AK4558EN I2S Controller --> BL5340 I2S Target -> LE Audio

## 4 AW100 Series Hardware Specifications

### 4.1 Part Numbers and Options

| AW100 Series Modules |               |                  |                |               |
|----------------------|---------------|------------------|----------------|---------------|
| Ezurio Part #        | Part #        | I/O Option       | Antenna Option | Availability  |
| 453-00062-K2         | AW100PA-A-INT | Analog + Digital | Internal       | Stock Q3 2025 |
| TBC                  | AW100PA-D-INT | Digital Only     | Internal       | Special Order |
| TBC                  | AW100PA-A-EXT | Analog + Digital | External       | Special Order |
| TBC                  | AW100PA-D-EXT | Digital Only     | External       | Special Order |

### 4.2 Mechanical Specifications

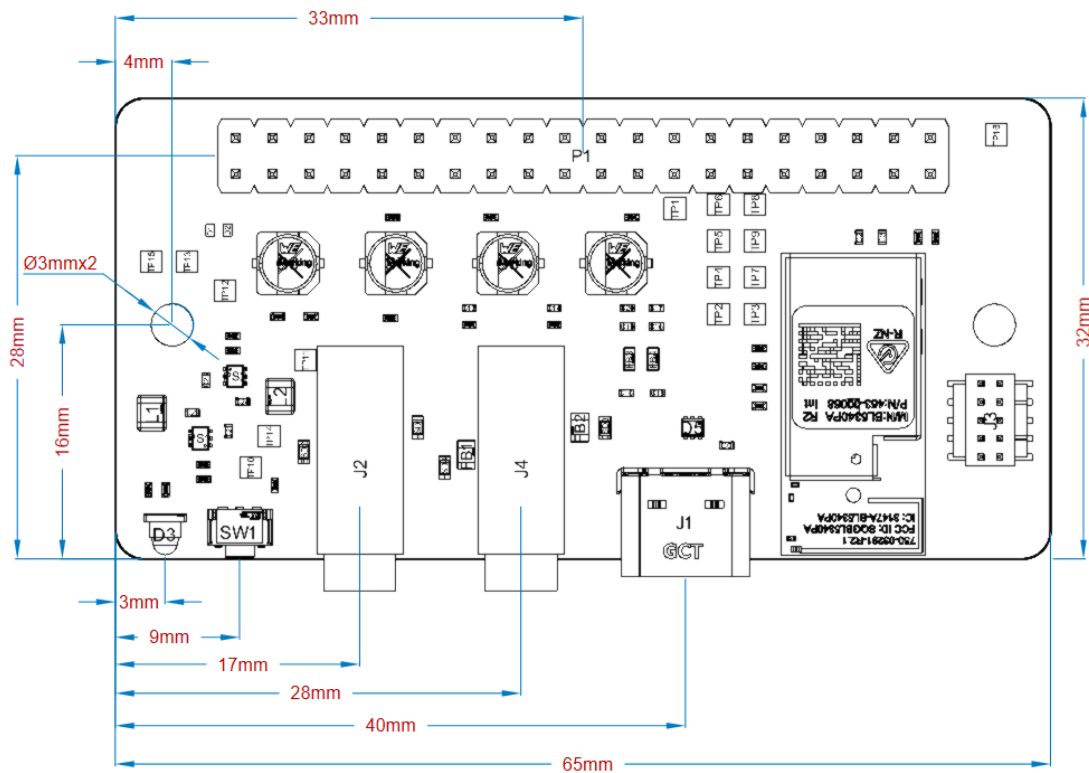


Figure 1 - Aurawave AW100 Dimensions

- 65mm x 32mm
- 2x 3mm mounting holes
- -20C - 70C operating temperature
- RoHS Process
- 1.62mm 6-layer PCB

### 4.3 System Architecture

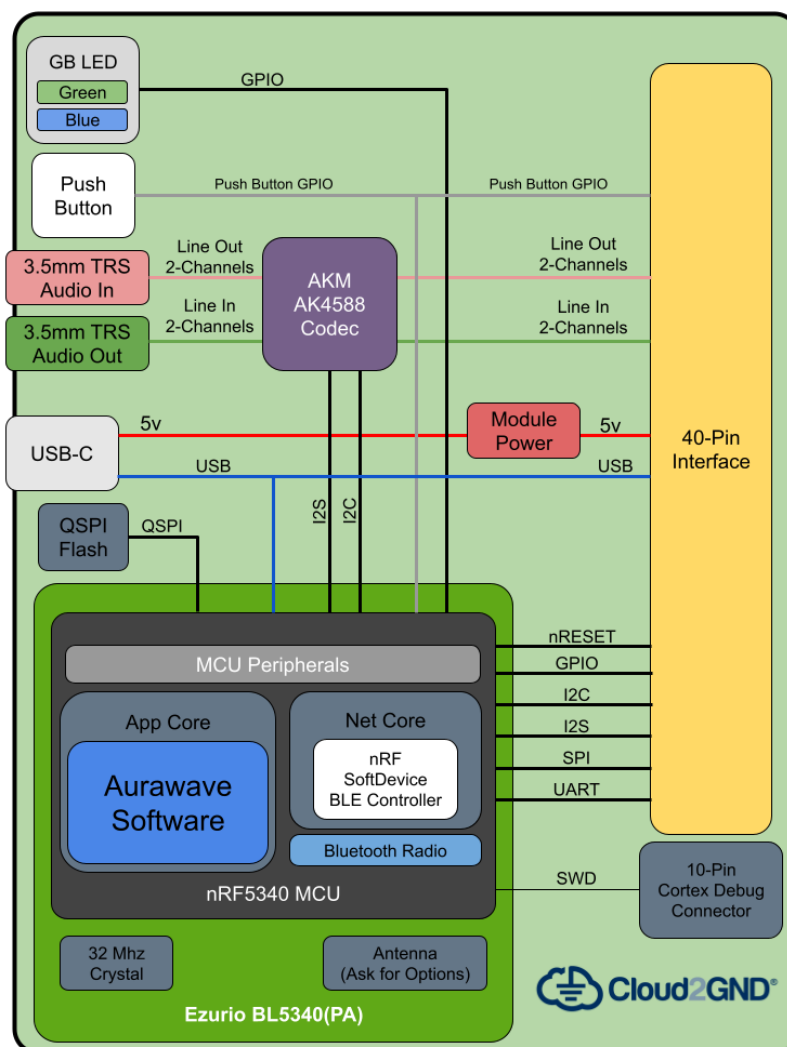


Figure 2 - Aurawave AW100 System Architecture

## 4.4 Electrical Specifications

- 5Vdc operating voltage
- UART, I2C, and I2S lanes operate at 3.3V

### OPERATING PARAMETERS

| Parameter      | Min  | Typ | Max | Unit |
|----------------|------|-----|-----|------|
| VDD            | 4.8  | 5   | 5.5 | V    |
| VBUS - USB     | 4.35 | 5   | 5.5 | V    |
| VDD Max Ripple | -    | -   | 10  | mV   |

### GPIO ELECTRICAL SPECIFICATIONS

| Symbol          | Parameter           | Conditions               | Min    | Typ | Max  | Unit |
|-----------------|---------------------|--------------------------|--------|-----|------|------|
| V <sub>IL</sub> | Input Low Voltage   |                          | 0      |     | 0.99 | V    |
| V <sub>IH</sub> | Input High Voltage  |                          | 2.31   |     | 3.3  | V    |
| V <sub>OL</sub> | Output Low Voltage  |                          | 0      |     | 0.4  | V    |
| V <sub>OH</sub> | Output High Voltage |                          | 2.9    |     | 3.3  | V    |
| I <sub>OL</sub> | Output Low Current  | Std. Drive<br>High-Drive | 1<br>6 | 2   | 4    | mA   |
| I <sub>OH</sub> | Output High Current | Std. Drive<br>High-Drive | 1<br>6 | 2   | 3    | mA   |

## 4.5 40-Pin Connector Pinout

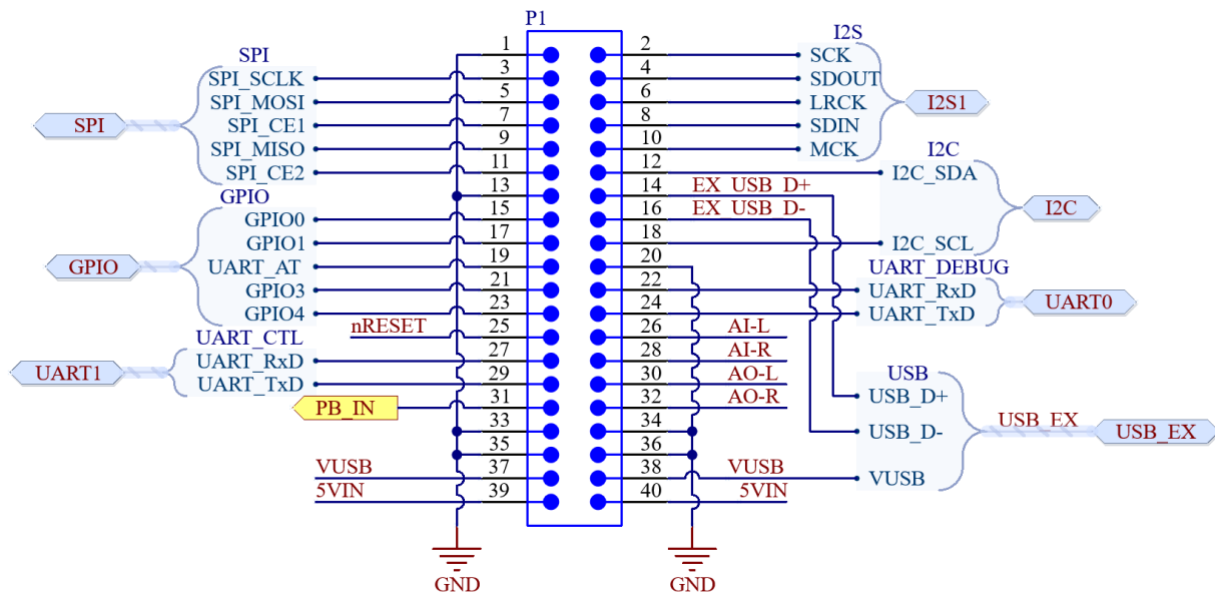


Figure 3 - Aurawave AW100 40-Pin Connector Pinout

### 40-Pin Connector Pinout (P1)

| Pin | Function  | Pin | Function | Pin | Function   | Pin | Function   |
|-----|-----------|-----|----------|-----|------------|-----|------------|
| 1   | GND       | 11  | SPI_CE2  | 21  | GPIO3      | 31  | Pushbutton |
| 2   | I2S_SCK   | 12  | I2C_SDA  | 22  | UART0_RxD  | 32  | Line Out-R |
| 3   | SPI_CLK   | 13  | GND      | 23  | GPIO4      | 33  | GND        |
| 4   | I2S_SDOUT | 14  | USB_D+   | 24  | UART0_TxD  | 34  | GND        |
| 5   | SPI_MOSI  | 15  | GPIO0    | 25  | nRESET     | 35  | GND        |
| 6   | I2S_LRCK  | 16  | USB_D-   | 26  | Line In-L  | 36  | GND        |
| 7   | SPI_CE1   | 17  | GPIO1    | 27  | UART1_RxD  | 37  | VUSB       |
| 8   | I2S_SDIN  | 18  | I2C_SCL  | 28  | Line In-R  | 38  | VUSB       |
| 9   | SPI_MISO  | 19  | GPIO2    | 29  | UART1_TxD  | 39  | 5Vdc       |
| 10  | I2S_MCK   | 20  | GND      | 30  | Line Out-L | 40  | 5Vdc       |

## 5 Aurawave Audio Framework

### 5.1 Software Architecture

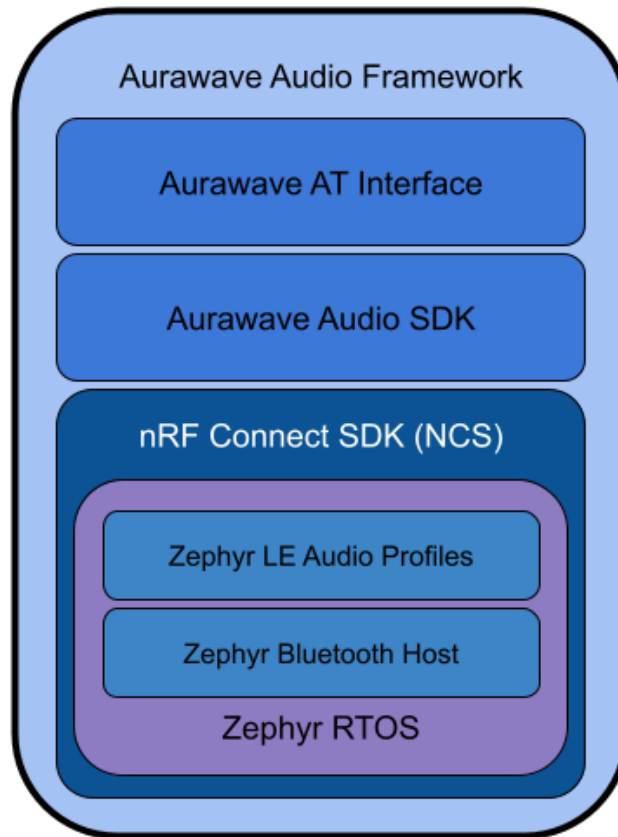


Figure 4 - Aurawave AW100 Software Architecture

### 5.2 Software Pin Assignments

| AT Software - 40-Pin Connector Functions (P1) |           |     |           |     |             |     |            |
|-----------------------------------------------|-----------|-----|-----------|-----|-------------|-----|------------|
| Pin                                           | Function  | Pin | Function  | Pin | Function    | Pin | Function   |
| 1                                             | GND       | 11  | UNUSED    | 21  | UNUSED      | 31  | Pushbutton |
| 2                                             | I2S_SCK   | 12  | I2C_SDA   | 22  | UNUSED      | 32  | Line Out-R |
| 3                                             | UNUSED    | 13  | GND       | 23  | UNUSED      | 33  | GND        |
| 4                                             | I2S_SDOUT | 14  | USB_D+    | 24  | UNUSED      | 34  | GND        |
| 5                                             | UNUSED    | 15  | UNUSED    | 25  | nRESET      | 35  | GND        |
| 6                                             | I2S_LRCK  | 16  | USB_D-    | 26  | Line In-L   | 36  | GND        |
| 7                                             | UNUSED    | 17  | UNUSED    | 27  | UART_AT_RxD | 37  | VUSB       |
| 8                                             | I2S_SDIN  | 18  | I2C_SCL   | 28  | Line In-R   | 38  | VUSB       |
| 9                                             | UNUSED    | 19  | AT_SELECT | 29  | UART_AT_TxD | 39  | 5Vdc       |
| 10                                            | I2S_MCK   | 20  | GND       | 30  | Line Out-L  | 40  | 5Vdc       |

## 5.3 AT Command Interface

- See [Aurawave AW100 Series AT Command Specification](#)
- Hosted via USB CDC (115200 Baud) by default
- Can be configured to operate via UART exposed on 40-Pin header (UART\_CTL)

### 5.3.1 AT Command Interface Selection

To configure the AT interface to use UART\_CTL instead of the USB CDC port use the following procedure:

- Ensure Aurawave module is unpowered
- Short Pin 19 to GND. Pin 20 of 40-Pin Header is convenient
- Apply power to Aurawave module
- Use 3.3v logic when writing to UART\_AT\_RxD (P1 - Pin 27) and reading from UART\_AT\_TxD (P1 -Pin 29)

## 5.4 Audio Input

- Analog or USB input
- Analog through 3.5mm jacks or 40-pin connector (selected automatically on jack insertion)
- Audio input device selectable via AT command and can be changed mid-broadcast

## 5.5 Firmware Update

- See [Aurawave AW100 Series Firmware Upgrade Guide](#) for instruction
- Firmware update mode can be entered by holding the module's button while applying power and until the LED indicates firmware update mode has been entered
- Firmware update mode also activated via AT command
- Updates are transferred via USB CDC serial port & MCUmgr protocol

## 5.6 Button Functions

| Function             | Context                        | Action                     |
|----------------------|--------------------------------|----------------------------|
| Factory Reset        | Anytime after boot             | Press and hold (5 Seconds) |
| Firmware Update mode | Before and as power is applied | Press and hold             |

## 5.7 LED Indications

| Indication           | LED State       |
|----------------------|-----------------|
| Firmware Update Mode | GREEN ON        |
| Auracast Active      | BLUE ON         |
| Factory Reset Ready  | CYAN Fast Blink |
| Unpowered            | OFF             |

## 6 References

| Ref | Information                                                 |
|-----|-------------------------------------------------------------|
| A   | <i>AW100 Product Brief (EZ-PB-AW100-Series)</i>             |
| B   | <i>Aurawave AW100 Series AT Command Specification</i>       |
| C   | <a href="#"><i>Datasheet - BL5340PA Series   Ezurio</i></a> |
| D   | <a href="#"><i>nRF5340 Product Specification</i></a>        |
| E   | <a href="#"><i>nRF21540 Product Specification</i></a>       |
| F   | <a href="#"><i>AK4558 English Datasheet</i></a>             |
| G   | <i>Aurawave AW100 Series Firmware Upgrade Guide</i>         |

## 7 Additional Information - Ezurio

Please contact your local sales representative or our support team for further assistance:

|                   |                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------|
| Headquarters      | Ezurio<br>50 S. Main St. Suite 1100<br>Akron, OH 44308 USA                                    |
| Website           | <a href="http://www.ezurio.com">http://www.ezurio.com</a>                                     |
| Technical Support | <a href="http://www.ezurio.com/resources/support">http://www.ezurio.com/resources/support</a> |
| Sales Contact     | <a href="http://www.ezurio.com/contact">http://www.ezurio.com/contact</a>                     |

**Note:** Information contained in this document is subject to change.

## 8 Additional Information – Cloud2GND

|                   |                                                                             |
|-------------------|-----------------------------------------------------------------------------|
| Headquarters      | Cloud2GND<br>4500 Bowling Blvd #100<br>Louisville, KY 40207                 |
| Website           | <a href="http://www.cloud2gnd.com/">http://www.cloud2gnd.com/</a>           |
| Technical Support | <a href="https://cloud2gnd.com/contact/">https://cloud2gnd.com/contact/</a> |

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