Datasheet

Aurawave AW100 Series

Bluetooth™ Auracast™ and LE Audio Module +

Aurawave Audio Framework v1.0 with AT Command Interface

Version 0.2

Revision History

Version	Date	Notes	Contributors	Approver
0.1	7 May 2025	Initial version.		
0.2	12 May 2025	Ezurio branding	Dave Drogowski	

Contents

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

3.1.1.1 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!

3.1.1.2 Host Mode

- Standard 40-Pin header for easy integration
- Powered via I/O pins or USB
- AT control interface via UART/GPIO or USB[1]
- 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 AT Interface 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[2]
  - Encode up to 2 audio input channels simultaneously

[1] AT interface may only support USB in Software version 0.9

[2] 1 Subgroup in Software Version 0.9

  - 2 x Broadcast Isochronous Streams with one audio channel per BIS
  - Configurable BAP Audio Locations (Mono, Left, Right, Center, etc.)[3]
  - 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] Feature may not be available in Software Version 0.9

3.5 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

3.6 Interfaces

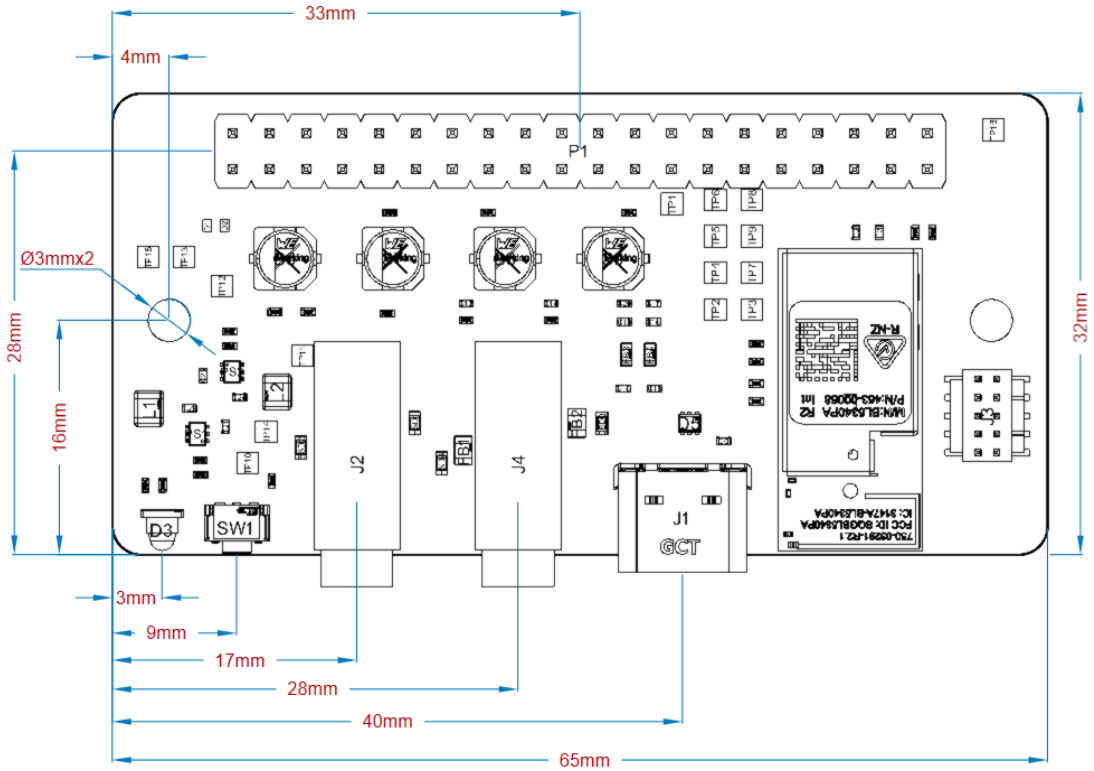
- Bluetooth Low Energy 5.4
- USB-C Connector
  - 5VDC Power
  - Audio I/O
  - AT Control
- Analog I/O via AKM4558 CODEC
  - 3.5mm TRS Stereo Line Input
  - 3.5mm TRS Stereo Line Output
- 40-pin header (2x20 2.54mm pitch)
  - I2S In/Out
  - Line Audio In/Out
  - USB
  - I2C
  - SPI
  - UART x2
  - GPIO 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 --> BL5340I2S 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



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

4.3 System Architecture

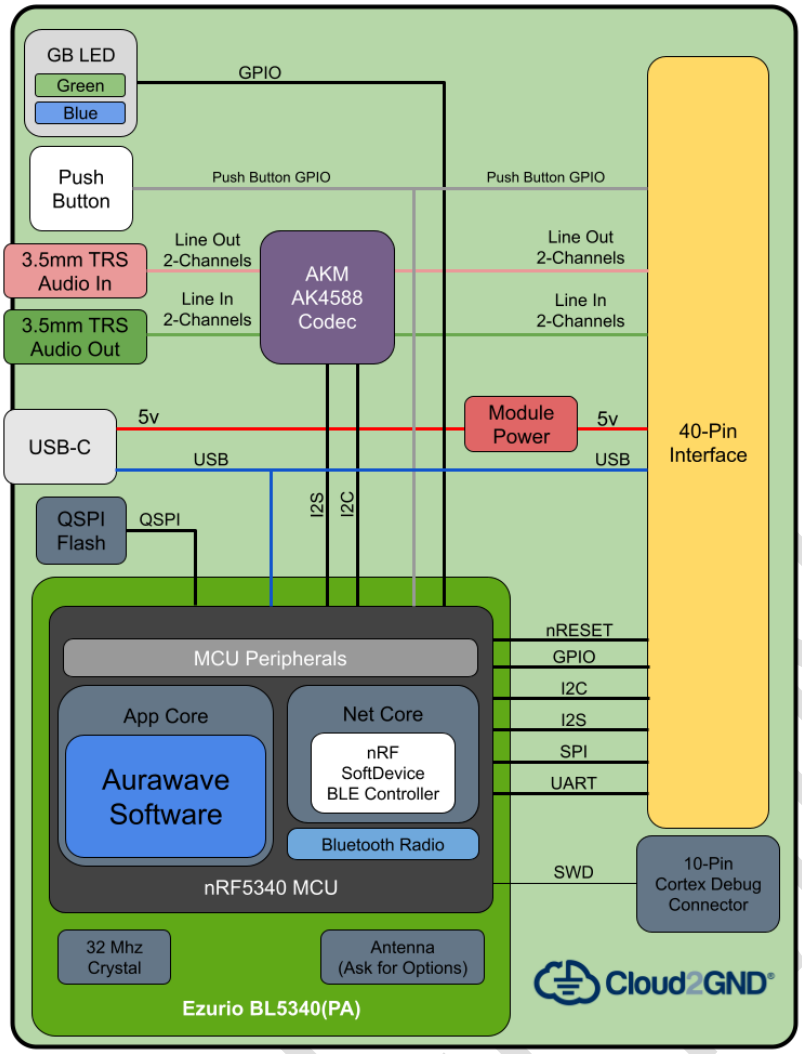


Figure 1 - Aurawave AW100 System Architecture

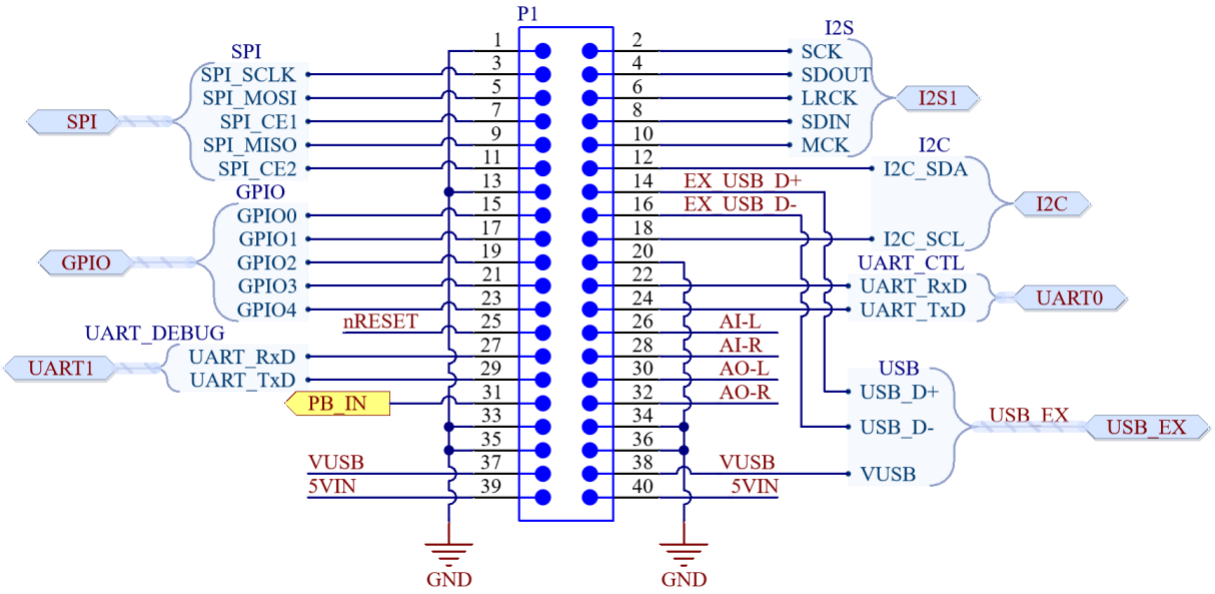
4.4 Electrical Specifications

- 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_IL	Input Low Voltage		0		0.99	V
V_IH	Input High Voltage		2.31		3.3	V
V_OL	Output Low Voltage		0		0.4	V
V_OH	Output High Voltage		2.9		3.3	V
I_OL	Output Low Current	Std. Drive High-Drive	1 6	2	4	mA
I_OH	Output High Current	Std. Drive High-Drive	1 6	2	3	mA

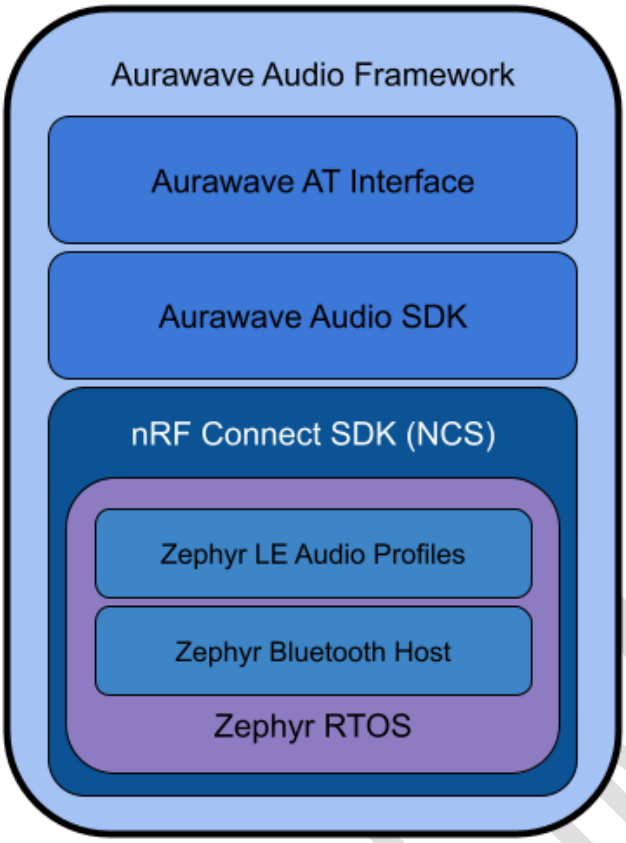
4.5 40-Pin Connector Pinout



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	UART2_RxD	32	Line Out-R
3	SPI_CLK	13	GND	23	GPIO4	33	GND
4	I2S_SDOUT	14	USB_D+	24	UART2_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



5.2 Software Pin Assignments

40-Pin Connector AT Software Pin Functions							
Pin	**Function**	**Pin**	**Function**	**Pin**	**Function**	**Pin**	**Function**
1	GND	17-19	Unused	25	nRESET	31	Pushbutton
2 -12	Unused	20	GND	26	Line In-L	32	Line Out-R
13	GND	21	Unused	27	UART AT RX	33-36	Unused
14	USB_D+	22	Unused	28	Line In-R	37-38	VUSB
15	Unused	23	Unused	29	UART AT TX	39	5Vdc
16	USB_D-	24	UART Logs TX	30	Line Out-L	40	5Vdc

5.3 AT Command Interface

- See *Aurawave AT Interface Specification*
- Hosted via USB CDC (115200 Baud) by default
- Can be configured to operate via UART exposed on 40-Pin header[4]

5.4 Log Interface

- Hosted on UART Logs TX Pin , 115200 Baud
- Collecting logs may prove helpful for support requests

5.5 Audio Input

- Analog or USB input
- Audio input channels are assigned to broadcast streams during stream configuration
- Sample rate configured based on LE Audio configuration

5.6 Firmware Update

- See AW100 Firmware Upgrade Procedure 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
- Future firmware version will enable entering firmware update mode via AT command
- Updates are transferred via USB CDC serial port
- Future firmware version will enable update transfers over UART on 40-Pin Header

5.7 Button Functions

Function	Context	Action
Factory Reset	Anytime after boot	Press and hold
Firmware Update mode	Before and as power is applied	Press and hold

5.8 LED Indications

Indication	LED State
Firmware Update Mode	CYAN ON
Firmware Update In Progress	CYAN Blink
Firmware Update Failed	CYAN Rapid Blink
Auracast Active	BLUE ON
Factory Reset Ready	GREEN Fast Blink
Unknown Error	GREEN & BLUE Alternating
Unpowered	OFF

[4] Feature may be unavailable in Software version 0.9

6 References

Ref	Information
A	*AW100 Product Brief (link TBD)*
B	*Aurawave AT Interface Specification (Link TBD)*
C	*Datasheet - BL5340PA Series | Ezurio*
D	*nRF5340 Product Specification*
E	*nRF21540 Product Specification*
F	*AK4558 English Datasheet*
G	*AW100 Firmware Upgrade Procedure (Link TBD)*

7 Additional Information - Ezurio

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

Headquarters	Ezurio 50 S. Main St. Suite 1100 Akron, OH 44308 USA
Website	http://www.ezurio.com
Technical Support	http://www.ezurio.com/resources/support
Sales Contact	http://www.ezurio.com/contact

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

8 Additional Information – Cloud2GND

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Website	http://www.cloud2gnd.com/
Technical Support	https://cloud2gnd.com/contact/

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