AzureWave Technologies, Inc.

AW-BTA03

Bluetooth 5.2 Module

For Automotive Application

Datasheet

Rev. A

DF

(For Standard)

Features

- Single-chip Bluetooth baseband processor with integrated 2.4GHz transceiver
- Complies with Bluetooth Core Specification Version 5.2
- Bluetooth Class 1 or Class 2 transmitter operation
- Supports extended synchronous connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets
- Adaptive frequency hopping (AFH) for reducing radio frequency interference
- Interface support for high-speed UART interface and PCM for audio data
- Ultra-low power consumption

Revision History

Document NO: R2-2A03-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2024/05/08	DCN031199	● Initial Version	QM.Tan	N.C. Chen

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1. Introduction

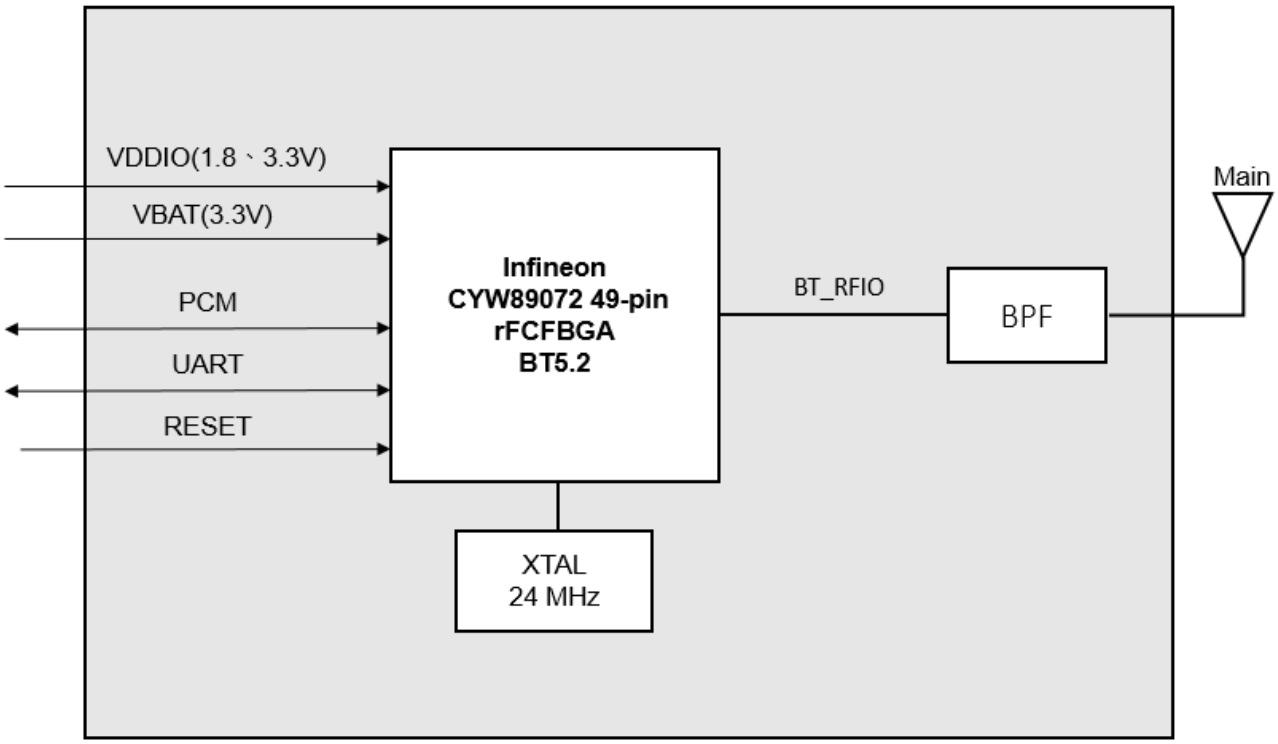
1.1 Product Overview

The AW-BTA03 is a Bluetooth 5.2 compliant, stand-alone baseband processor with an integrated 2.4 GHz transceiver.

Manufactured using the industry's most advanced 40 nm CMOS low-power process, the main chip employs the highest level of integration, eliminating all critical external components, and thereby minimizing the device’s footprint and costs associated with the implementation of Bluetooth solutions. Integrating a Class 1 transceiver, baseband processor on a single die provides the capability to replace function-specific devices with single design that offers all Bluetooth modes of operation.

The AW-BTA03 brings the latest Bluetooth technology to automotive applications and offers automotive Grade 2 (–40°C to +105°C) ambient operating temperature performance.

1.2 Block Diagram



AW-BTA03 Block Diagram

1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	Bluetooth 5.2 Module
Major Chipset	CYW89072 (49-pin rFCFBGA)
Host Interface	BT ● PCM + UART
Dimension	10mm x 10mm x 2.4mm
Form factor	LGA module, 64 pin
Antenna	1T1R ANT0 (Main): Bluetooth → TX/RX

1.3.2 Bluetooth

Features	Description
Bluetooth Standard	BT5.2
Bluetooth VID/PID	N/A
Frequency Rage	2402MHz~2483MHz
Modulation	Header GFSK Payload 2M: 4-DQPSK Payload 3M: 8DPSK
Output Power	

	Min	Typ	Max	Unit
BDR	1	5	9	dBm
EDR	1	5	9	dBm
Low Energy	1	5	9	dBm

Receiver Sensitivity[1]

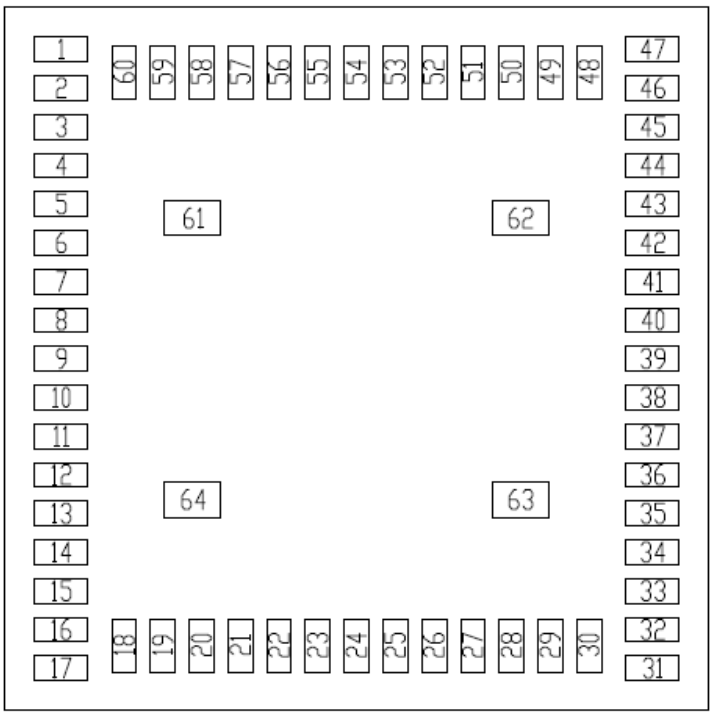
	Min	Typ	Max	Unit
BDR(1DH5)		-90	-85	dBm
EDR(2DH5)		-93	-88	dBm
EDR(3DH5)		-87	-82	dBm
Low Energy		-95	-90	dBm

1.3.3 Operating Conditions

Features	Description
Operating Conditions	
Voltage	VBAT: 3.3V VDDIO: 1.8、3.3V
Operating Temperature	-40℃ to 105℃
Operating Humidity	less than 85% R.H.
Storage Temperature	-40℃ to 125℃
Storage Humidity	less than 60% R.H.
ESD Protection	
Human Body Model	TBD
Charged Device Model	TBD

2. Pin Definition

2.1 Pin Map



AW-BTA03 Top View Pin Map

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	GND	Ground		GND
2	GND	Ground		GND
3	GND	Ground		GND
4	GND	Ground		GND
5	GND	Ground		GND
6	NC	NC		Floating
7	NC	NC		Floating
8	GND	Ground		GND
9	GND	Ground		GND
10	GND	Ground		GND
11	GND	Ground		GND
12	GND	Ground		GND
13	NC	NC		Floating
14	NC	NC		Floating
15	NC	NC		Floating
16	GND	Ground		GND
17	NC	NC		Floating
18	GND	Ground		GND
19	NC	NC		Floating
20	GND	Ground		GND
21	NC	NC		Floating
22	NC	NC		Floating
23	NC	NC		Floating

24	NC	NC		Floating
25	NC	NC		Floating
26	GND	Ground		GND
27	LPO_IN	External LPO Input.		I
28	NC	NC		Floating
29	RESET	Active-low reset input		I
30	GND	Ground		GND
31	GND	Ground		GND
32	NC	NC		Floating
33	GND	Ground		GND
34	NC	NC		Floating
35	GND	Ground		GND
36	VBAT	Power VBAT	3.3V	I
37	VBAT	Power VBAT	3.3V	I
38	GND	Ground		GND
39	VDDIO	Voltage supply for all IO signal	1.8V / 3.3V	I
40	GND	Ground		GND
41	BT_PCM_IN	BT PCM DATA	VDDIO	I
42	BT_PCM_CLK	BT PCM clock signal	VDDIO	I/O
43	BT_PCM_SYNC	BT PCM frame sync	VDDIO	I/O
44	BT_PCM_OUT	BT PCM data out	VDDIO	O
45	GND	Ground		GND
46	BT_HOST_WAKE	BT wake up the host	VDDIO	O
47	BT_DEV_WAKE	Host wake up the BT	VDDIO	I
48	GND	Ground		GND
49	BT_UART_CTS_N	UART clear to send input	VDDIO	I

50	BT_UART_RTS_N	UART request to send output	VDDIO	O
51	BT_UART_RXD	UART receive data	VDDIO	I
52	BT_UART_TXD	UART transmit data	VDDIO	O
53	GND	Ground		GND
54	GND	Ground		GND
55	BT_ANT	BT 2.4G RF I/O		RF
56	GND	Ground		GND
57	GND	Ground		GND
58	GND	Ground		GND
59	NC	NC		Floating
60	GND	Ground		GND
61	GND	Ground		GND
62	GND	Ground		GND
63	GND	Ground		GND
64	GND	Ground		GND

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	DC supply for the VBAT and PA driver supply	-0.5	-	3.795	V
VDDIO	DC supply voltage for digital I/O	-0.5	-	3.795	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	Power supply for Internal Regulator and FEM	3.0	3.3	3.6	V
VDDIO	DC supply voltage for digital I/O	1.62	1.8	1.98	V
		2.97	3.3	3.63	

External 32.768 kHz Sleep Clock Specifications	
input frequency	32.768 kHz
Frequency accuracy	±250 ppm

3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
Digital I/O pins, VDDIO=1.8V					
V_{IH}	Input high voltage	1.1	-	-	V
V_{IL}	Input low voltage	-	-	0.6	V
V_{OH}	Output high voltage	VDDIO – 0.4	-	-	V
V_{OL}	Output Low Voltage	-	-	0.40	V
Digital I/O pins, VDDIO=3.3V					
V_{IH}	Input high voltage	2.00	-	-	V
V_{IL}	Input low voltage	-	-	0.80	V
V_{OH}	Output high voltage	VDDIO – 0.4	-	-	V
V_{OL}	Output low Voltage	-	-	0.40	V

3.4 Host Interface

3.4.1 UART Interface

The UART physical interface is a standard, 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 38400 bps to 6 Mbps. During initial boot, UART speeds may be limited to 750 kbps. The baud rate may be selected via a vendor-specific UART HCI command. The CYW8X072 has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support enhanced data rates. The interface supports the Bluetooth UART HCI (H4) specification. The default baud rate for H4 is 115.2 kbaud.The UART clock default setting is 24 MHz, and can be configured to run as high as 48 MHz to support up to 6 Mbps. The baud rate of the CYW8X072 UART is controlled by two values. The first is a UART clock divisor (set in the DLBR register) that divides the UART clock by an integer multiple of 16. The second is a baud rate adjustment (set in the DHBR register) that is used to specify a number of UART clock cycles to stuff in the first or second half of each bit time. Up to eight UART cycles can be inserted into the first half of each bit time, and up to eight UART clock cycles can be inserted into the end of each bit time.

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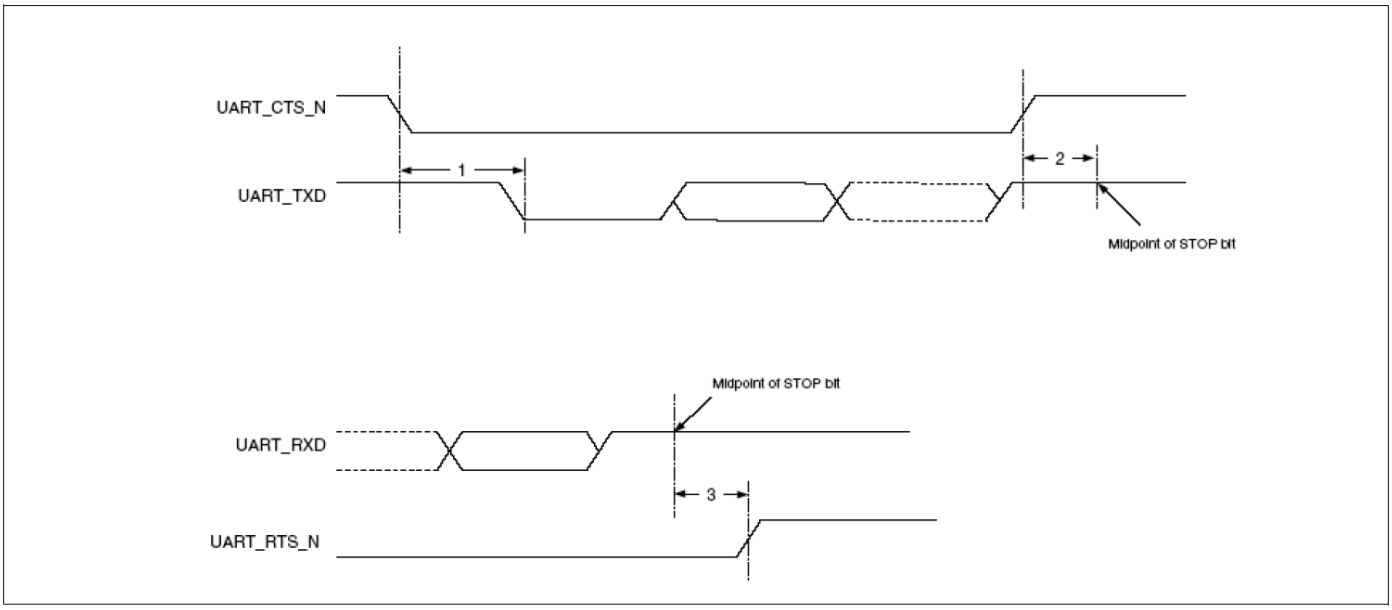
UART Interface Signals

PIN No.	Name	Description	Type
52	BT_UART_TXD	Bluetooth UART Serial Output. Serial data output for the HCI UART Interface	O
51	BT_UART_RXD	Bluetooth UART Series Input. Serial data input for the HCI UART Interface	I
50	BT_UART_RTS_N	Bluetooth UART Request-to-Send. Active-low request-to-send signal for the HCI UART interface	O
49	BT_UART_CTS_N	Bluetooth UART Clear-to-Send. Active-low clear-to-send signal for the HCI UART interface.	I



UART Timing

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	Delay time, UART_CTS_N low to UART_TXD valid	–	–	24.0	Baud out cycles
2	Setup time, UART_CTS_N high before midpoint of stop bit	–	–	10.0	ns
3	Delay time, midpoint of stop bit to UART_RTS_N high	–	–	2.0	Baud out cycles

UART Timing SPEC

3.5 Power up Timing Sequence

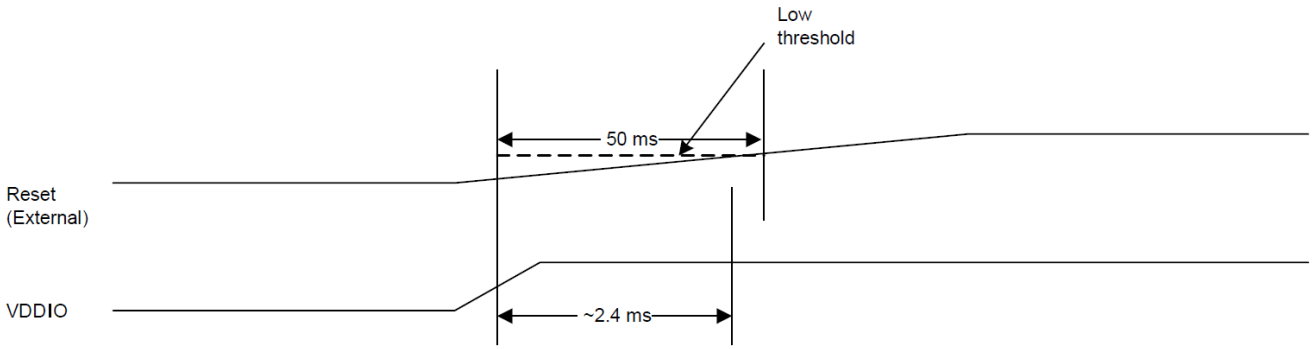
■ **RESET**:

An external active-low reset signal, reset, can be used to put the AW-BTA03 in the reset state. An external voltage detector reset

Module with 50 ms delay is needed on the reset. The reset should be released only after the VDDIO supply voltage level has been stabilized for 50 ms

Note:

The Reset signal should remain below this threshold 50 ms after VDDIO is stable. Note that the representation of this signaling diagram is extended and not drawn to scale.



Reset Timing

3.6 Power Consumption*

3.6.1 Bluetooth

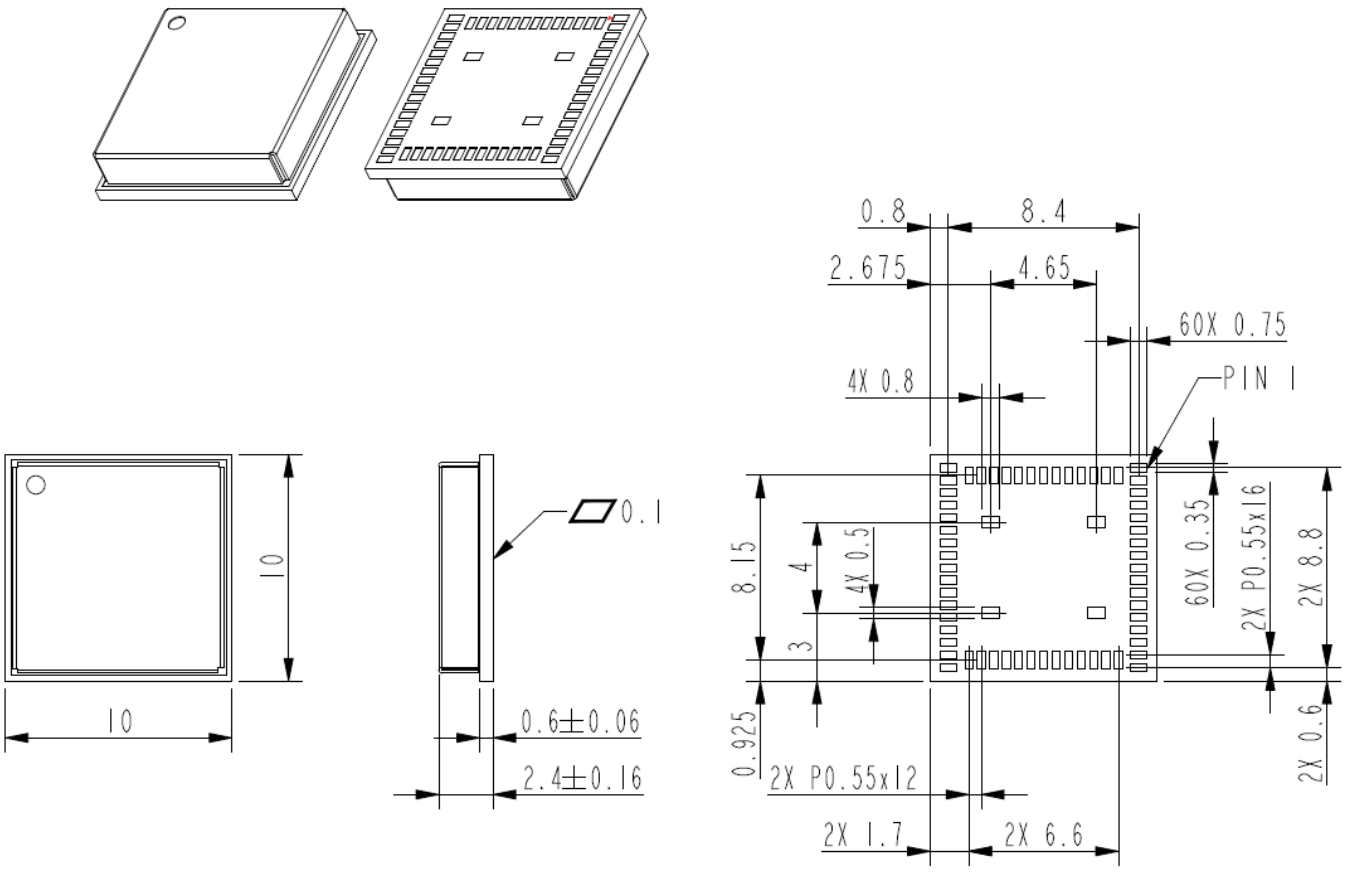
No.	Mode	Packet Type	RF Power (dBm)	VBAT=3.3 V	
				Max.	Avg.
1	Sleep	n/a	n/a	TBD	TBD
2	Transmit *(1)	DH5 / 3-DH5	8	TBD	TBD
3	Receive *(1)	DH5 / 3-DH5	n/a	TBD	TBD
No.	**Mode**	**Packet Type**	**RF Power (dBm)**	**VBAT=1.8V**	
				Max.	**Avg.**
1	Sleep	n/a	n/a	TBD	TBD
2	Transmit *(1)	DH5 / 3-DH5	8	TBD	TBD
3	Receive *(1)	DH5 / 3-DH5	n/a	TBD	TBD

(1) BlueTool BB_Packet_Length=65535
(2) BlueTool Length_of_Test_Data=37

* The power consumption is based on Azurewave test environment, these data for reference only.

4. Mechanical Information

4.1 Mechanical Drawing



5. Packaging Information