

AW8001 Bluetooth 4.0 module Specification

Version 1.0

2013-7-25

1.1 Introduction

The AW8001 Module is designed to be used in conjunction with an external microcontroller running the application. The AW8001 integrates a complete PHY, Link Controller and Host single mode *Bluetooth* low energy subsystem and features a simple SPI based interface to the application microcontroller. Qualified profiles, APIs and example application are provided as part of the μ Blue SDK which is easily portable to a range of different application microcontrollers. This system segmentation allows the AW8001 to be used with the best-fit microcontroller for a specific application as well as ease integration and end product qualification as application and protocol stack does not share the same microcontroller.

1.2 Features

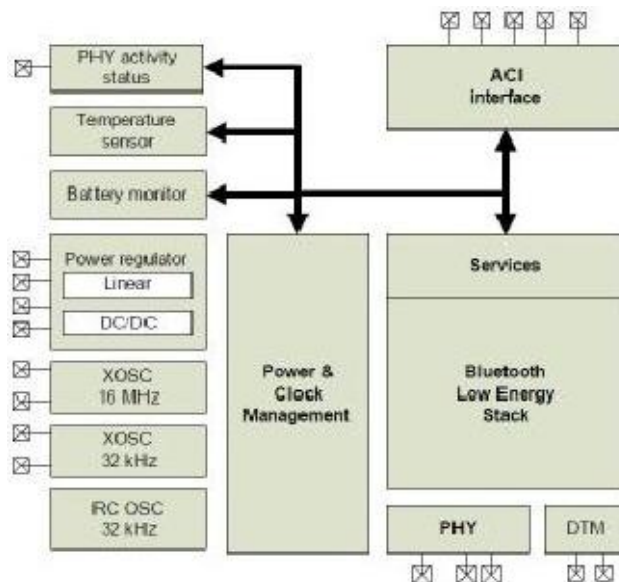
- Bluetooth Specification v4.0 compliant single mode low energy solution
- Complete PHY, Link Controller and Host subsystem
- Profiles and example applications provided in μ Blue SDK
- Cost and power optimized for slave operation
- Simple SPI based Application Controller Interface (ACI)
- Full Link Controller and Host security
- 1.9 to 3.6V operation
- Linear voltage regulator
- Step-down DC/DC voltage regulator providing up to 20% peak current reduction
- Sub 14mA peak current with linear voltage regulator
- Supports sub 10 μ A average current operation
- Battery voltage monitor
- Temperature sensor

1.3 APPLICATIONS

- Sports and fitness sensors
- Healthcare and medical sensors
- Continua™ Version Two certified products
- Remote controls
- Watches
- Mobile phone peripherals
- Automation sensors
- Proximity tags

2.1 Product Information

AW8001 is a BT4.0 Module , It's main physical features are the Bluetooth low energy PHY and the Bluetooth low energy stack that handles the link controller and host stack. It also includes additional analog sub-systems needed for the Bluetooth low energy operation, such as power management and several oscillator options.



AW8001 block diagram

AW8001 has on-chip non-volatile memory for storing service configurations. This on-chip storage lets you select and combine the necessary services for your application, reducing the requirements on your application controller for handling all real-time operations related to the Bluetooth low energy communication protocol.

AW8001 includes a power supply voltage monitor and a temperature sensor that further reduces the requirements to the application controller. These features are accessible through the Application Controller Interface (ACI).

AW8001 also offers an optional output signal that is activated before the radio becomes active. This timing signal enables you to control the peak current drain of your application, avoiding overload of your power supply (for most applications this is usually a small battery). You can also use this timing signal to control the application circuitry, avoiding noise interference when the AW8001 radio is operating.

A separate serial interface (UART) gives you access to the Bluetooth low energy Direct Test Mode (DTM). This interface is used to control the Bluetooth low energy radio (RF PHY) and is supported by commercially available Bluetooth test equipment used for Bluetooth qualification. This serial interface also enables you to test radio performance and to optimize your antenna.

2.2 Operating conditions

The operating conditions are the physical parameters that nRF8001 can operate within.

Symbol	Parameter (condition)	Notes	Min	Nominal	Max	Units
VDD	Supply voltage		1.9	3.0	3.6	V
VDD _{DC}	Supply voltage with DC/DC converter enabled		2.3	3.0	3.6	V
t _{R,VDD}	Supply rise time (0V to 1.9V)		1μs		50ms	μs and ms
T _A	Operating temperature		-40		+85	°C

2.3 Digital I/O signal levels

The digital I/O signal levels are defined Table. The operating conditions are: VDD = 3.0V, TA = 40oC to +85oC (unless otherwise noted).

Symbol	Parameter (condition)	Test level	Min	Nom	Max	Unit
V _{IH}	Input high voltage	I	0.7×VDD		VDD	V
V _{IL}	Input low voltage	I	VSS		0.3×VDD	V
V _{OH}	Output high voltage (I _{OH} = 0.5 mA)	II	VDD-0.3			V
V _{OL}	Output low voltage (I _{OL} = 0.5 mA)	II			0.3	V

2.4 Radio characteristics

nRF8001 electrical characterization is defined in Table . The operating conditions are: VDD = 3.0V, TA = 40oC to +85oC (unless otherwise noted).

Symbol	Parameter (condition)	Test level	Notes	Min	Nom	Max	Unit
f _{OP}	Frequency operating range	I		2402		2480	MHz
f _{XTAL}	Crystal frequency	I			16		MHz
Δf	Frequency deviation	I			250		kHz
R _{GFSK}	On air data rate	I			1		Mbps
PLL _{RES}	RF channel spacing	I			2		MHz

Symbol	Parameter (condition)	Test level	Notes	Min	Nom	Max	Unit
P _{RF}	Maximum output power	I	1		0	4	dBm
P ₋₆	Output power setting				-6		dBm
P ₋₁₂	Output power setting				-12		dBm
P ₋₁₈	Output power setting				-18		dBm
BW _{20dB}	20dB signal bandwidth	I			670		kHz
P _{RF1.1}	1st adjacent channel power	I			TBD		
P _{RF2.1}	2nd adjacent channel power	I			TBD		

1. Antenna load impedance = 15Ω + j88

Table 11. Radio transmitter electrical characteristics

Symbol	Parameter (condition)	Test level	Notes	Min	Nom	Max	Unit
$P_{RX\ max}$	Maximum input signal strength at PER $\leq 30.8\%$	1			0		dBm
$P_{sens\ IT}$	Receiver sensitivity: ideal transmitter	1			-87		dBm
$P_{sens\ DT}$	Receiver sensitivity: dirty transmitter	1	1		-86		dBm
$P_{sens\ DC}$	Receiver Sensitivity DC/DC Converter Enabled: dirty transmitter	1			-85		dBm
C/I_{CO}	Co-channel rejection	1			-13		dB
C/I_{1st}	Adjacent channel selectivity: 1 MHz offset	1	1.		-7		dB
C/I_{2nd}	Adjacent channel selectivity: 2 MHz offset	1	1.		23		dB
C/I_{3+n}	Adjacent channel selectivity: (3+n) MHz offset [n=0, 1, 2...]	1	1.		51		dB
C/I_{Image}	Image frequency rejection	1	1. and 2		26		dB
P_{IM}	IMD performance ($P_{in}=64\ dBm$)	1	1.		-38		dBm

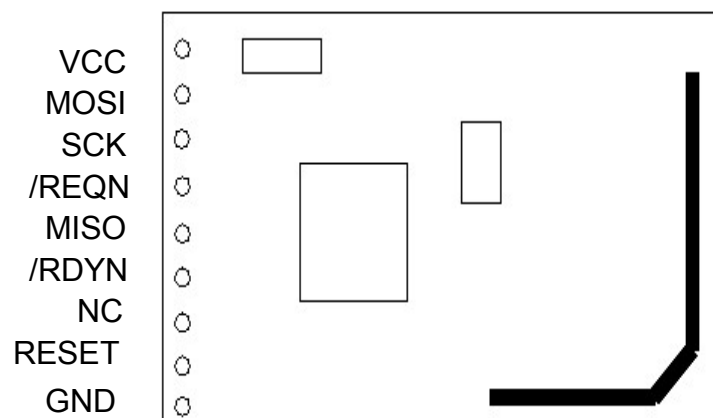
1. As defined in Bluetooth V4.0 Volume 6: Core System Package [Low Energy Controller Volume].
2. Image frequency = $f_{RX} + 4\ MHz$.

Table 12. Radio receiver electrical characteristics

3.1 Mechanical Information

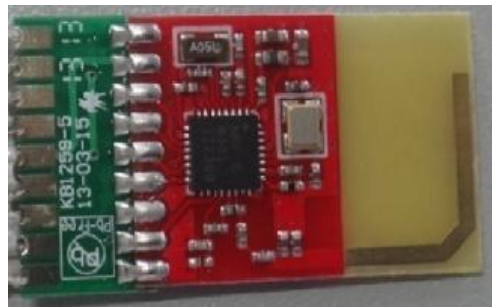


3.2 PIN Information



3.3 Module Installation

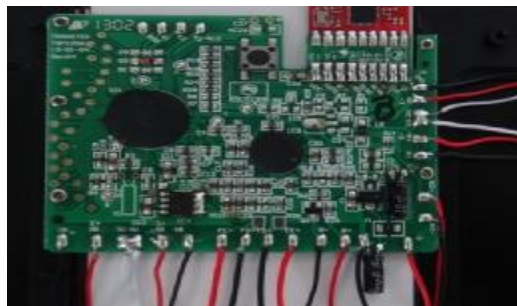
Step1: Connect the Module to the connector , this connector can be a PCB or Pin header or another , see following picture



Step2: Connect the Module PCBA to the Main PCBA , see following picture



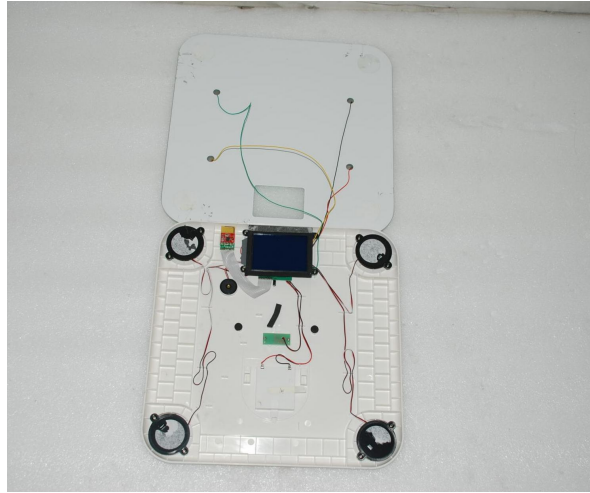
Step3: Install the Main PCBA to the Product ,see following picture



Caution: When install the module , you must pay attention to the temperature of the soldering iron(the soldering iron should be connect to Ground) , the temperature should be set at about 380℃ ; you must pay attention to the electrostatic too , take action to avoid electrostatic . And you must avoid short circuit when you connect the module.

Module FCC ID: OU9AW8001-LS

Step4: The final Product, see following picture



Make sure that the module is fixed in the host and does not allow users to replace or demolition.

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

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.

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.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment.

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

The module in this product is labeled with its own FCC ID and the FCC ID is not visible when the module is installed inside another device. To satisfy FCC exterior labeling requirements, the following text must be placed on the exterior of the end product.

Contains Transmitter Module FCC ID: OU9AW8001-LS