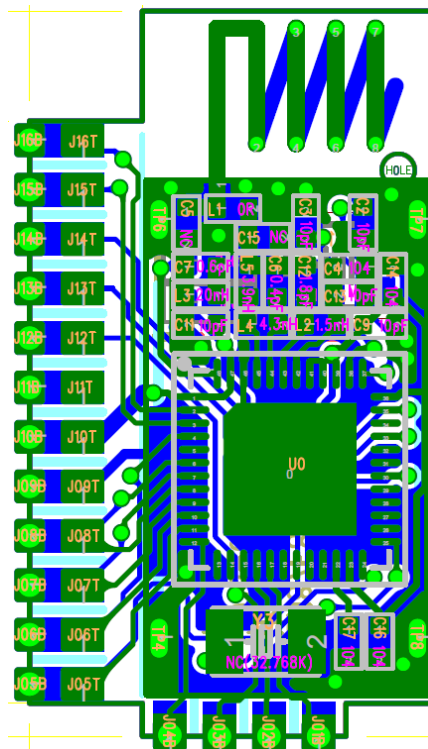


1 Introduction

AVITA BLE MODULE is a Bluetooth low energy module designed by Avita Corporation. This module is based on SH87F8801 BLE chip, which integrates a ultra low power Bluetooth transceiver and a high performance low power 32 bit microprocessor. It is a data transparent transmission module, supports many of the wireless data applications.

1.1 Feature

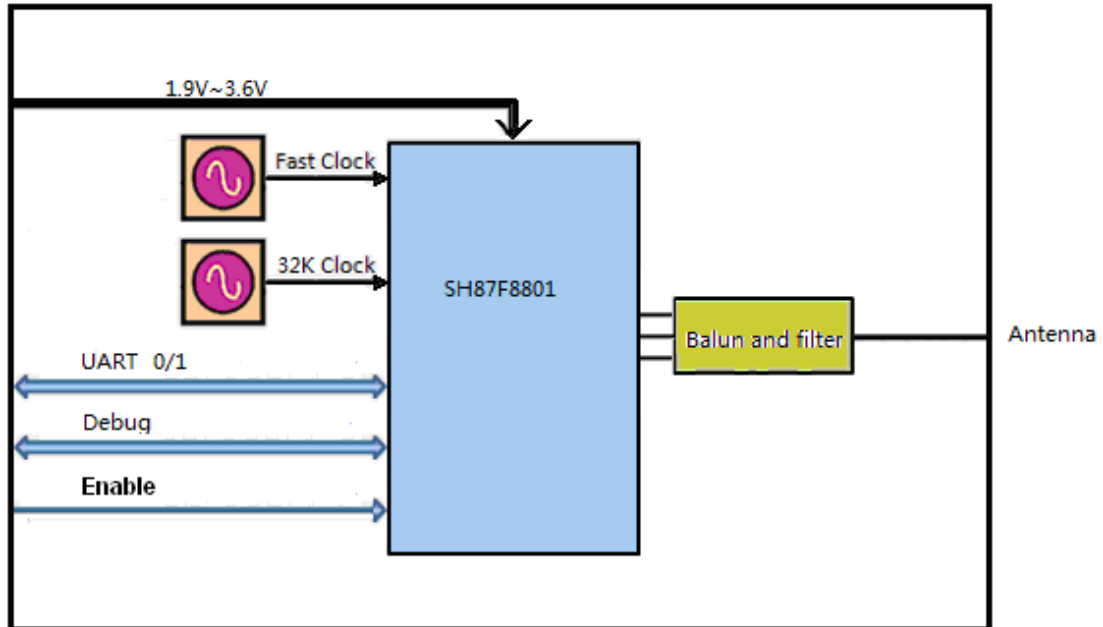
- Frequency range: 2.400~2.4835GHz
- Bluetooth 4.2 specification
- Receive Sensitivity = -87 dBm @ 1.0 Mbps
- Output power range: -20 ~ 0 dBm
- Data Rate = 1 Mbps
- 32-bit CPU core
- Flash ROM: 128KB
- SRAM: 17KB
- Two UART interfaces
- Serial two wire debug interface
- 16.5 mA @ Receive
- 12.1 mA @ 0 dBm Transmit
- 10.1 mA @ -6 dBm Transmit
- Deep Sleep Mode (< 3uA)
- Power Down Mode (< 0.3uA)



AVITA BLE MODULE

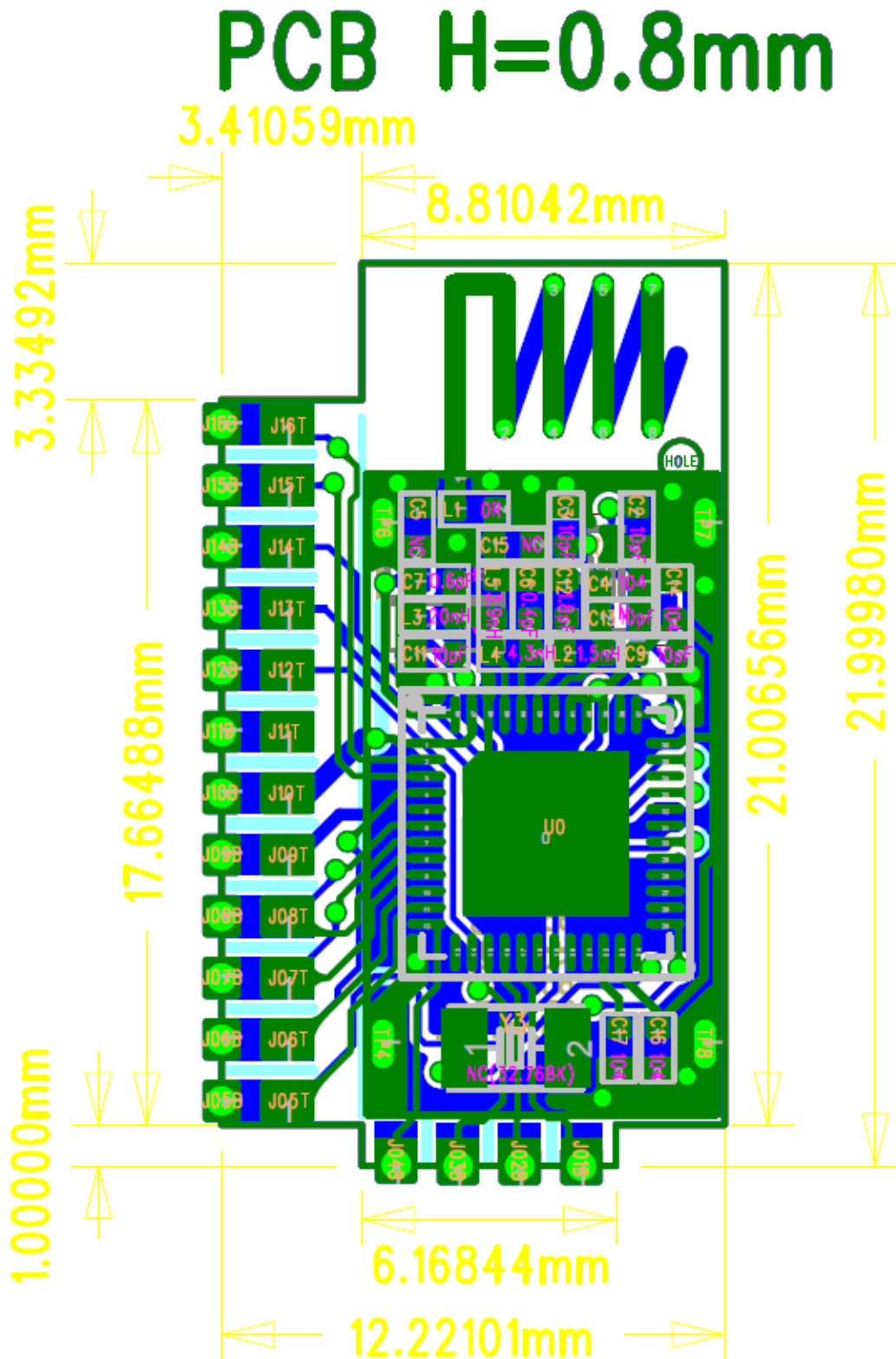
2 Description

2.1 Block diagram



AVITA BLE MODULE

2.2 Module Size



AViTA BLE MODULE

2.3 Module Pin assignment

Pin#	Name	Type	Description	Note
J01B	P15	Digital I/O	GPIO 15/ TDA	
J02B	P14	Digital I/O	GPIO 14/ TCK	
J03B	P13	Digital I/O	GPIO 13/RSTN	
J04B	P10	Digital I/O	GPIO 10/PWM2	
J05B	P26	Digital I/O, Analog	GPIO 26/AIN5	WakeUp
J05T	P09	Digital I/O	GPIO 09/PWM1	
J06B	P02	Digital I/O	P02	LINK
J06T	P08	Digital I/O	GPIO 08/PWM0	
J07B	P05	Digital I/O	GPIO 05/TXD 0	TX
J07T	P07	Digital I/O	GPIO 07/TXD 1	
J08B	P04	Digital I/O	GPIO 04/RXD 0	RX
J08T	P06	Digital I/O	GPIO 06/RXD 1	
J09B	GND	Power	Ground	
J10B	VDD	Power	Power supply	Default 3.3V
J11B, J09T, J10T, J11T, J12T, J13T, J14T, J15T, J16T	NC		Not connected	
J12B	RESET	Digital I/O	GPIO 13/RSTN	
J13B	P29	Digital I/O , Analog	GPIO 29/AIN2	
J14B	P31	Digital I/O , Analog	GPIO 31/AIN0	
J15B	P01	Digital I/O	P01	
J16B	P00	Digital I/O	P00	

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2.4 Module BOM

Item	Quant	Reference	Value	Description	MPN	VENDOR
1	2	C6, C7	0.5pF	CAP CER, 0.4PF, 50V, $\pm 0.1pF$, NPO, 0402	CC0402ERNP09BNOR5	Yageo
2	1	C12	1.8pF	CAP CER, 1.8PF, 50V, $\pm 0.25pF$, NPO, 0402	CC0402CRNP09BN1R8	Yageo
3	5	C2, C3, C9, C11, C13	10pF	CAP CER, 10PF, 50V, $\pm 5%$, NPO, 0402	CC0402JRNPO9BN100	Yageo
4	4	C4, C14, C16, C17	0.1uF	CAP CER, 0.1UF, 10V, $\pm 10%$, X5R, 0402	CC0402KRX7R7BB104	Yageo
5	2	C1, C10	10uF	CAP CER, 10UF, 6.3V, $\pm 20%$, X5R, 0603	CC0603MRX5R5BB106	Yageo
6	1	L1	0	RES FILM, 0ohm, $\pm 5%$, 1/16W, 0402	RC0402JR-070RL	Yageo
7	1	L2	1.5nH	IND CER, 1.5nH, $\pm 0.3nH$, 300mA, 0402	SDCL1005C1N5STDJF	Sunlord
8	1	L5	3.9nH	IND CER, 3.9nH, $\pm 0.3nH$, 300mA, 0402	SDCL1005C3N9STDJF	Sunlord
9	1	L4	4.3nH	IND CER, 4.3nH, $\pm 0.3nH$, 300mA, 0402	SDCL1005C4N3STDJF	Sunlord
10	1	L3	22nH	IND CER, 22nH, $\pm 5%$, 300mA, 0402	SDCL1005C22NJTDF	Sunlord
11	1	Y1	26MHz	Crystal, 26MHz, 10pF, $\pm 10ppm$, 3.2*2.5mm	S3225A 26MHZ	Yoketant
12	1	Y3	32768Hz	Crystal, 32768Hz, 12.5pF, \pm	S3215C 32.768KHZ	Yoketant
13	1	U0	SH87F8801	IC, BLE chip, QFN48, 6*6mm	SH87F8801	Sinowealth

AViTA BLE MODULE

3 Electrical characters

3.1 Absolute Maximum Ratings

Parameter	Min.	Typ.	Max.	Unit
Supply Voltage			3.6	V
VIN (Input Voltage)	1.9	3.3	3.6	V
Operating Temperature	-40		85	°C
Storage Temperature	-40		125	°C

Table 1. Absolute Maximum Ratings

3.2 DC Electrical Specifications

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage Range	V _{DD}	Supply voltage	1.9	3.3	3.6	V
Current Consumption	I _{POWERDOWN}	Power down current	-	0.2	0.3	μA
	I _{deep_sleep}	RC32K active	-	3	6	μA
		RC32K off	-	2	4	μA

Table 2. DC Electrical Specifications

3.3 Synthesizer Electrical Specifications

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Frequency Range	F _{SYN}		2400	-	2483.5	MHz
Frequency Resolution	F _{RES}		-	400	-	Hz
Reference Frequency	F _{REF}		-	26	-	MHz
Reference Frequency tolerance	F _{TOL}		-	-	±40	ppm

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Synthesizer Settling Time	t_{LOCK}		-	-	30	μs
Synthesizer Wake up Time	$T_{\text{WAKE-UP}}$	Including references, calibrations and synthesizer lock	-	-	80	μs
Phase Noise at offset	$L_{\phi}(f_M)$	$\Delta F = 1 \text{ MHz}$	-	-106	-	dBc/Hz
	$L_{\phi}(f_M)$	$\Delta F = 2 \text{ MHz}$	-	-111	-	dBc/Hz
	$L_{\phi}(f_M)$	$\Delta F = 3 \text{ MHz}$	-	-114	-	dBc/Hz
RMS Phase Error	Φ_{RMS}	Integrated from 1kHz to 13MHz	-	2.0	-	Deg

Table 3. Synthesizer Electrical Specifications

3.4 Transmitter Electrical Specifications

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
TX Frequency Range	F_{TX}	World Wide	2400	-	2483.5	MHz
FSK Data Rate	DR_{FSK}		-	1.0	-	Mbps
Modulation Deviation	Δf			250		kHz
20dB signal bandwidth (1Mbps)	$BW_{20\text{dB}}$			0.95	1.2	MHz
Output Power Range	P_{TX}		-20	-	+2	dBm
Current Consumption	I_{TX2}	Supply current @ +2dBm	-	13.4	-	mA
	I_{TX0}	Supply current @ 0dBm	-	12.1	-	mA
	$I_{\text{TX-6}}$	Supply current @ -6dBm	-	10.1	-	mA
TX RF Output Steps	$\Delta P_{\text{TX-OUT}}$	Controlled by 3bits	-	2	-	Db
TX Power Variation	$\Delta P_{\text{TX-TEMP}}$	-40 to +85 °C	-	± 0.5	-	Db

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vs. Temperature						
TX Power Variation vs. VDD	ΔP_{TX-VDD}	From 1.9 to 3.6V	-	± 1	-	Db
TX Power Variation vs. Frequency	$\Delta P_{TX-FREQ}$	Measured across any frequency band (2400–2483.5 MHz)	-	± 1	-	Db
Transmit Modulation Filtering	BT	Gaussian filter bandwidth time product	-	0.5	-	
In band Spurious		Frequency offset $\cong 2\text{MHz}$		-20		dBm
		Frequency offset $\cong 3\text{MHz}$		-30		dBm
Out of band Spurious Emissions		POUT = 0 dBm, Frequencies <2.4 GHz	-	-	-52	dBm
		2.4~12 GHz, excluding harmonics	-	-	-50	dBm
Harmonics	2HARM	POUT = 0 dBm, using of-chip Harmonic filter	-	-	-40	dBc
	3HARM	POUT = 0 dBm, using of-chip Harmonic filter	-	-	-42	dBc

Table 4. Transmitter Electrical Specifications

3.5 Receiver Electrical Specifications

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
RX Frequency Range	F_{TX}	World Wide (Not Supported)	2400	-	2483.5	MHz
Intermediate frequency	F_{LIF}	1Mbps data rate, RX BW 1MHz		1		MHz
RX Sensitivity (BER < 0.1%)	$P_{RX-1MHz}$	Sensitivity at 1.0 Mbps, GFSK $\Delta f = \pm 250 \text{ kHz}$,	-	-87		dBm

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		channel-spacing = 2 MHz				
Maximum Receiving Power	P_{RX-MAX}		-	-10	-	dBm
Current Consumption	I_{RX}	Synthesizer & Receiver enabled	-	16.5	-	mA
RX Channel Bandwidth	BW	Depends on the input data rate	-	1.0	-	MHz
RSSI Resolution	RES_{RSSI}	Analog RSSI		2		dB
Selectivity (For Desired signal at -67dBm)	$C/I_{co-channel}$	Desired Ref Signal 3 dB above sensitivity, BER < 0.1%. Interferer and desired modulated with the desired data rate and channel spacing accordingly, GFSK with BT = 0.5	-	21	-	dB
	C/I_{1MHz}		-	15	-	dB
	C/I_{2MHz}		-	-17	-	dB
	$C/I_{\geq 3MHz}$				-27	
Blockers (For Desired signal at -67dBm)	P_{BLOCK1}	Blockers from 30 to 2000 MHz	-	-30	-	dBm
	P_{BLOCK2}	Blockers from 2003 to 2399 GHz	-	-35	-	dBm
	P_{BLOCK3}	Blockers from 2.484 to 2.997 GHz	-	-35	-	dBm
	P_{BLOCK4}	Blockers from 3.0 to 12.75 GHz	-	-30	-	dBm

Table 5. Receiver Electrical Specifications

4 Software introduction

Please contact **SINOWEALTH Electronic LTD.** for detailed software application documents.

AViTA BLE MODULE

FCC warning

Compliance Information:

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, 2. This device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications to this device not expressly approved by AViTA Corporation. For compliance could void the user's authority to operate the equipment.

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 technician for help.

If the module's FCC ID is not visible when installed in the host, or if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: “Contains Transmitter Module FCC ID: UV3BMW-18XX” or “Contains FCC ID: UV3BMW-18XX” must be used.