BC870FNA Bluetooth Module

Features

- Class2 (max 4dBm) Bluetooth Module
- CSR BC8670 chip with 16Mb Flash and 80MIPS Kalimba DSP
- Low current consumption
- 3.3V operations
- Up to 500mA fast charging for 3.7V lithium battery
- High quality 16bit stereo codec
- LED drivers and faders
- Differential analog and PCM digital audio interfaces
- Support analog and digital MEMS microphones
- Support S/PDIF audio processing
- Support of noise and echo cancellation (licensing required)
- SBC, MP3, AAC, Faststream, APTX codec support
- A2DP, AVRCP, HSP, HFP, SPP, PBAP Classic profile support
- Support 802.11 WiFi co-existence
- RoHS / REACH compliant
- Dimension:
    - 16.5 x 22.5 x 2.3 mm

Applications

- Wireless headphones/headsets
- Wireless speakers and sound bars
- TV and home theaters
- AV Receivers
- Professional musical equipments
- Wearable audio
- Audio transmitters and receivers
- Hands-free car kit
- VoIP handsets

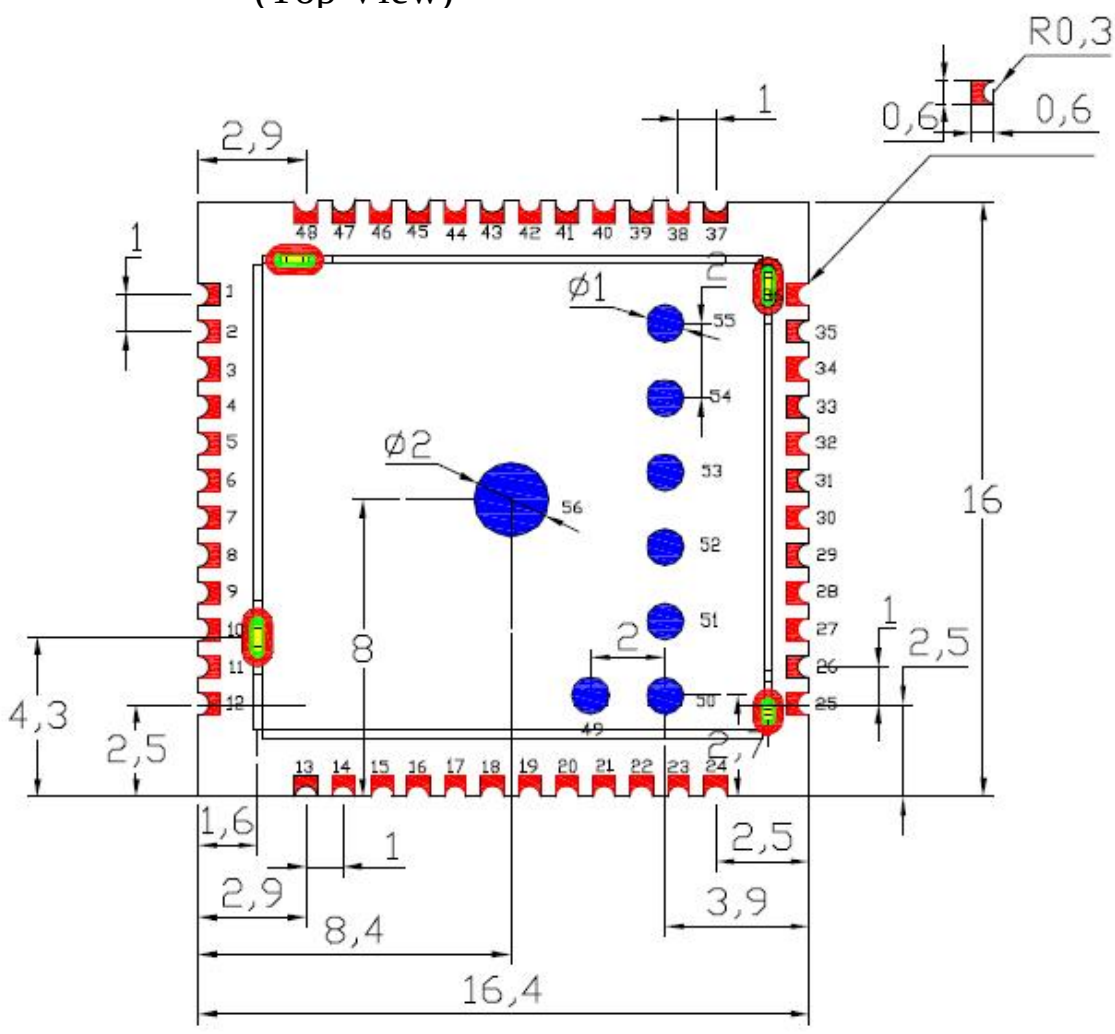
BC870FNA is a Bluetooth Class2 (max 4dBm) module. It is based on the most advanced CSR BC8670 chip set and the latest ADK standard. The new RISC MCU core and 80MIPS Kalimba DSP Co-Processor enable not the existing Bluetooth multi-media function such as stereo audio (A2DP audio) communications but also extended features for future. The highly integrated hardware includes high quality stereo DAC, high current (200/500mA) battery charger, thus saving costs of external components. The host Interfaces include USB, I2S, SPI and UART, that are programmable for data communication, module control or firmware upgrade.

The powerful and flexible design allows the module to support HSP/HFP/A2DP/AVRCP SPP, PBAP and most Bluetooth Classic profiles, at the same handling LE profiles for applications like battery reporting, remote control and HID. Furthermore, the APTX, AAC, MP3 HIFI audio streaming are also supported.

The complete module design relieves host system developers from handling complex Bluetooth operations and compatibility issues. Furthermore, BC870FPA has built-in PCB antenna. It eliminates the need of antenna design, matching and testing in host system development, also reduces the RF test requirements of end-product production.

Physical Layout

BC870FNA Dimensions in mm
(Top View)



Pins Configurations

PIN	NAME	TYPE	FUNCTIONS
1	GND	GND	Ground
2	MIC_BIAS_A	Power	Microphone bias A
3	MIC-LN	Analogue	Left Microphone negative input
4	MIC-LP	Analogue	Left Microphone positive input
5	MIC_BIAS_B	Power	Microphone bias A
6	MIC-RN	Analogue	Right Microphone negative input
7	MIC-RP	Analogue	Right Microphone positive input
8	SPK-LN	Analogue	Differential negative left speaker output
9	SPK-LP	Analogue	Differential positive left speaker output
10	SPK-RN	Analogue	Differential negative right speaker output
11	SPK-RP	Analogue	Differential positive right speaker output
12	GND	GND	Ground
13	UART_RX	CMOS Input	UART Data Input
14	UART_TX	CMOS Input	UART Data Output
15	LED(0)	Open Drain	LED driver
16	LED(1)	Open Drain	LED driver
17	PIO(0)	Bi-directional	Programmable Input/Output line
18	PIO(1)	Bi-directional	Programmable Input/Output line
19	PCM_IN/ PIO17	Bi-directional	Synchronous data output, alternative function PIO
20	PCM_OUT/ PIO18	Bi-directional	Synchronous data output, alternative function PIO
21	PCM_SYNC/ PIO19	Bi-directional	Synchronous data sync, alternative function PIO
22	PCM_CLK/ PIO20	Bi-directional	Synchronous data clock, alternative function PIO
23	USB_DP	Bi-directional	USB data +ve
24	USB_DN	Bi-directional	USB data –ve
25	GND	GND	Ground
26	PIO(12)	Bi-directional	Programmable Input/Output line
27	PIO(13)	Bi-directional	Programmable Input/Output line
28	VOUT_1v8	Power	1.8v switching regulator output
29	VPAD	Power	Power Supply Input for PIO, SPI and UART pins
30	VBAT	Power	Battery input
31	VBAT_SENSE	Analogue	Battery charger sense input.
32	VCHG	Power	5v charger input
33	CHG_EXT	Analogue	External battery charger control.
34	VREG	CMOS Input	Module power on input
35	AIO(0)	Bi-directional	Analogue programmable Input/Output Line.
36	GND	GND	Ground
37(1)	RESETB	CMOS input	Reset if low. Input de-bounce must be low for >5ms to cause a reset
38(1)	QSPI_CSB/ PIO23	Bi-directional	SPI flash chip select, alternative function PIO.
39(1)	QSPI_CLK/ PIO21	Bi-directional	SPI flash clock, alternative function PIO.
40(1)	QSPI_IO1/ PIO26	Bi-directional	Data input from SPI flash, alternative function PIO.
41(1)	QSPI_IO0/ PIO25	Bi-directional	Data output to SPI flash, alternative function PIO.
42(1)	SPI_CLK	CMOS Input	Serial Peripheral Interface Clock
43(1)	SPI_MISO	CMOS Output	Serial Peripheral Interface Data Output
44(1)	SPI_MOSI	CMOS Input	Serial Peripheral Interface Data Input
45(1)	SPI_CSB	CMOS Input	Chip Select For Synchronous Serial Interface active low
46(1)	GND	GND	Ground
47(1)	RF_IN	Analogue	RF input port
48(1)	GND	GND	Ground
49(2)	PIO(9)	Bi-directional	Programmable Input/Output line
50(2)	RESETB	CMOS input	Reset if low. Input debounced so must be low for >5ms to cause a reset
51(2)	GND	GND	Ground
52(2)	SPI_CLK	CMOS Input	Serial Peripheral Interface Clock

53(2)	SPI_MISO	CMOS Output	Serial Peripheral Interface Data Output
54(2)	SPI_MOSI	CMOS Input	Serial Peripheral Interface Data Input
55(2)	SPI_CSB	CMOS Input	Chip Select For Synchronous Serial Interface active low
56(2)	GND	GND	Ground

Notes :
(1) : Pins 37 to 48 are only available in BC870FNA version
(2) : Pins 49 to 56 are test pads on the bottom side of the module, available in both BC870FNA and BC870FPA versions.

General Electrical Specification

Absolute Maximum Ratings		
Ratings	Min.	Max.
Storage Temperature	-40 ℃	+85 ℃
Supply Voltage at VCHG, VBAT and VREG	-0.4 V	5.75 V
Supply Voltage at VPAD	-0.4V	3.60V
Recommended Operating Condition		
Operating Condition	Min.	Max.
Operating Temperature range	0 ℃	+55 ℃
Supply Voltage at VCHG	4.75 V	5.75 V
Supply Voltage at VBAT and VREG	0 V	4.25 V
Supply Voltage at VPAD	1.70 V	3.60 V

Parameter	Description	Min.	Typ.	Max.	Units
Current Consumption - Discover	Already Paired	-	TBD	-	mA
	New Pairing	-	5	-	mA
Current Consumption - Playing	Dist = 1m	-	44	-	mA
	Dist = 10m	-	50	-	mA
Current Consumption - Pause	Dist = 1m	-	8	-	mA
	Dist = 10m	-	8	-	mA
Current Consumption - Sleep		-	60	-	uA

Radio Characteristics

General Radio Characteristics		
Operating Frequency	2400 to 2483.5 MHz	
RF Output Power	0 – 4 dBm	
RX Sensitivity	-85dBm (Typ)	
Receiving Signal Range	10 m	
Lower quad band	2 MHz	
Upper quad band	3.5 MHz	
Carrier frequency	2402 to 2480 MHz, 1 MHz step, 79 channels	
Modulation Method	GFSK (1 Mbps) Pie/4 DQPSK (2 Mbps) 8DQPSK (3Mbps)	
Hopping	1600 hops/s, 1 MHz channel space	
Maximum data rate	GFSK	Asynchronous: 732.2 kbps / 57.6 kbps Synchronous: 433.9 kbps / 433.9 kbps
	Pie/4 DQPSK	Asynchronous: 1448.5 kbps / 115.2 kbps Synchronous: 869.7 kbps / 869.7 kbps
	8DQPSK	Asynchronous: 2178.1 kbps / 177.2 kbps Synchronous: 1306.9 kbps / 1306.9 kbps

Radio Characteristics, VDD = 3.3V Temperature =+20°C						
	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.1% BER	2.402	-	-83	-82	< - 70	dBm
	2.441	-	-83	-82		dBm
	2.480	-	-83	-82		dBm
Maximum received signal at 0.1% BER	2.402	-	-6	0	> - 20	dBm
	2.441	-	-6	0		dBm
	2.480	-	-6	0		dBm
RF transmit power [1]	2.402	-	+2	-	-6 to +4 [2]	dBm
	2.441	-	+2	-		dBm
	2.480	-	+2	-		dBm
Initial carrier frequency tolerance	2.402	-	12	20	±75	kHz
	2.441	-	10	20		kHz
	2.480	-	9	20		kHz
20dBm bandwidth for modulated carrier	2.402	-	879	1000	< 1000	kHz
	2.441	-	816	1000		kHz
	2.480	-	819	1000		kHz
Drift (single slot packet)	2.402	-	10	20	<25	kHz
	2.441	-	10	20		kHz
	2.480	-	10	20		kHz
Drift (five slot packet)	2.402	-	14	20	<40	kHz
	2.441	-	14	20		kHz
	2.480	-	14	20		kHz
Drift Rate	2.402	-	11	15	20	kHz/50µs
	2.441	-	-	15		kHz/50µs
	2.480	-	-	15		kHz/50µs
RF power control range		16	35	-		
RF power range control resolution		-	1.8	-	-	dB
△f1avg “Maximum Moudulation”	2.402	145	165	175	140<△f1avg <175	kHz
	2.441	145	165	175		kHz
	2.480	145	165	175		kHz
	2.402	115	150	-	115	kHz
	2.441	115	150	-		kHz

△f2maz “Minimum Modulation”	2.480	115	150	-		kHz
C/I co-channel		-	10	11	<= 11	dB
Adjacent channel selectivity C/I F=F0 +1 MHz [3 5]		-	-4	0	<= 0	dB
Adjacent channel selectivity C/I F=F0 - 1MHz [3 5]		-	-4	0	<= 0	dB
Adjacent channel selectivity C/I F=F0 +2 MHz [3 5]		-	-35	-30	<= - 30	dB
Adjacent channel selectivity C/I F=F0 - 2MHz [3 5]		-	-21	-20	<= - 20	dB
Adjacent channel selectivity C/I F>=F0 +3 MHz [3 5]		-	-45	-	<= - 40	dB
Adjacent channel selectivity C/I F<=F0 -5 MHz [3 5]		-	-45	-	<= - 40	dB
Adjacent channel selectivity C/I F=Fimage [3 5]		-	-18	-9	<= - 9	dB
Adjacent channel transmit power F=F0±2MHz [4 5]		-	-35	-20	<= - 20	dBc
Adjacent channel transmit power F=F0±3MHz [4 5]		-	-45	-40	<= - 40	dBc

Notes:

[1] PSR configuration setting maintains the transmit power to be within the Bluetooth specification v2.0 limits

[2] Class 2 RF transmit power range, Bluetooth specification v2.0

[3] Up to five exceptions are allowed in v2.0 of the Bluetooth specification

[4] Up to three exceptions are allowed in v2.0 of the Bluetooth specification

[5] Measured at F0 = 2441MHz

FCC Statement

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 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note 1: Compliance of this device in all final host configurations is the responsibility of the Grantee. OEM integrators are responsible to satisfy RF exposure requirements. SAR evaluation is valid for protble applications.

Note 2: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

Note 3: The device must not transmit simultaneously with any other antenna or transmitter.

Note 4: To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, Nextan Pte Ltd shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

Note 5: FCC ID label on the final system must be labeled with "Contains FCC ID: B4OHS-BC870FNA"

The transmitter module must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the host product. GT-tronics HK Ltd is responsible for the compliance of the module in all final hosts.