BluNor BC832 is a powerful, highly flexible, ultra low power Bluetooth Low Energy (BLE) using Nordic nRF52832 SoC. With an ARMCortex™ M4F MCU, 512KB flash, 64KB RAM, embedded 2.4GHz multi-protocol transceiver, and an integrated chip antenna. It allows faster time to market with reduced development cost.

For applications needing limited number of IO pins, prototyping and production are easier using 16 castellated pins. Additional 24 LGA (Land Grid Array) pins provide full access to 32 GPIOs of nRF52832.

Specifications:

- Nordic nRF52832 with ARM Cortex M4F.
- Complete RF solution with integrated antenna
- Integrated DC-DC converter
- Serial Wire Debug (SWD)
- Nordic SoftDevice Ready
- Over-the-Air (OTA) firmware update
- Flash/RAM: 512KB/64KB.
- 32 General purpose I/O pins
- 12 bit/200KSPS ADC
- 3 SPI Master/Slave (8Mbps)
- Low power comparator
- Two 2-wire Master/Slave (I^2C compatible)
- I2S audio interface
- UART (with CTS/RTS and DMA)

- 20 channel CPU independent Programmable Peripheral Interconnect (PPI).
- Quadrature Demodulator (QDEC)
- 128-bit AES HW encryption
- 5 x 32 bits, 3 x 24 bits Real Time Counters (RTC)
- NFC-A tag interface for OOB pairing
- Receiver Sensitivity: -96 dBm
- TX power: +/- 0 dBm; programmable +4dBm to -20dBm in 4 dB steps.
- Sizes: 7.8x8.8x1.2mm
- Hybrid pins: 16 castellated and 24 LGA.
- Integrated chip antenna
- Operation voltage: 1.7V to 3.6V
- Operation temperature: -40°C to +85°C

Applications

- IoT (Internet of Things)
- Wearable
- Beacons/Proximity
- Fitness/Sports
- Smart toys
- Connected appliances
- Lighting products

- Sensors
- Home and building automation
- Key fobs
- Wrist watches
- Wireless charger
- Interactive entertainment devices

ModelSummaries

module	BC832
SoC	nRF52832-CIAA

Flash/RAM	512KB/64KB
BT Antenna	chip
FCC ID	Pending
Canada IC ID	Pending

Table Of Contents

1.

2. Introduction

BluNor BC832 is powerful, highly flexible, ultra low power Bluetooth Low Energy (BLE) modules using Nordic nRF52832 SoCs. With an ARMCortex™ M4F MCU, 512KB flash, 64KB RAM, embedded 2.4GHz multi-protocol transceiver, and an integrated antenna, it allows faster time to market with reduced development cost.

The following is a block diagram of BC832. Antenna circuit and main clock are integrated. All 32 GPIOs of nRF52832 can be accessed from main board. For lower power consumption at idle state, a 32.768 kHz crystal is added on the main board. Connection to an external NFC (Near Field Communication) antenna is provided.
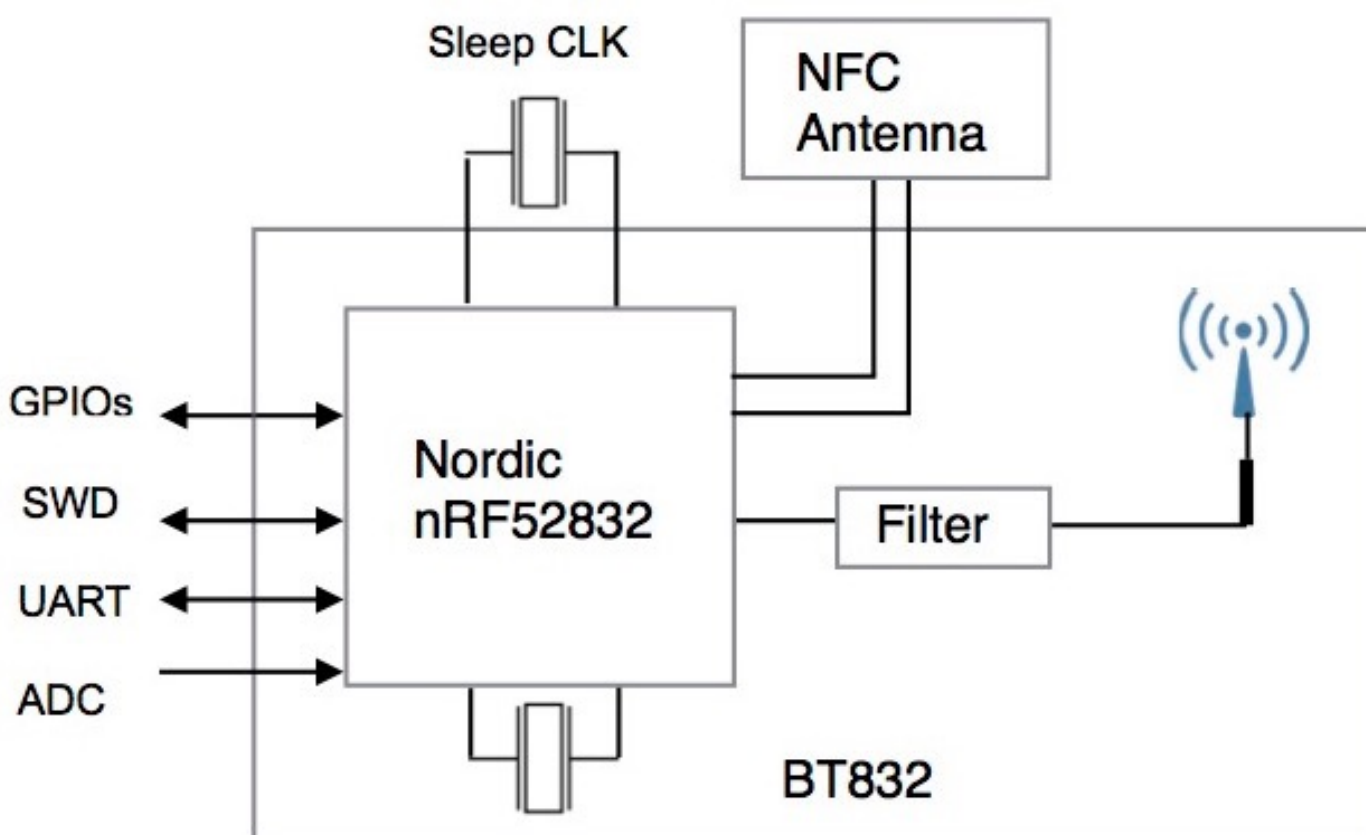
3. Codes Development Using Nordic Tools

Development tools by Nordic and other third party development tools recommended by Nordic should be used .

Easy, fast and safe code development

Nordic development environment for nRF52832 offers a clean separation between application code development and embedded protocol stacks. This means compile, link and run time dependencies with the embedded stack and associated debugging challenges are removed. The Bluetooth low energy is a pre-compiled binary, leaving application code to be compiled stand-alone. The embedded stack interface uses an asynchronous and event driven model removing the need for RTOS frameworks.

Over-The-Air DFU

The nRF52832 is supported by an Over-The-Air Device Firmware Upgrade (OTA DFU) feature. This allows for in the field updates of application software and SoftDevice.

SoftDevices

The Nordic protocol stacks are known as SoftDevices and complement the nRF52 Series SoCs. All nRF52 Series are programmable with software stacks from Nordic. This bring maximum flexibility to application development and allows the latest stack version to be programmed into the SoC.

SoftDevices available from Nordic:

S132: Bluetooth low energy concurrent central/peripheral/observer/broadcaster stack.

Development Tools

Nordic Semiconductor provides a complete range of hardware and software development tools for the nRF52 Series devices. nRF52 DK board is recommended for firmware development.
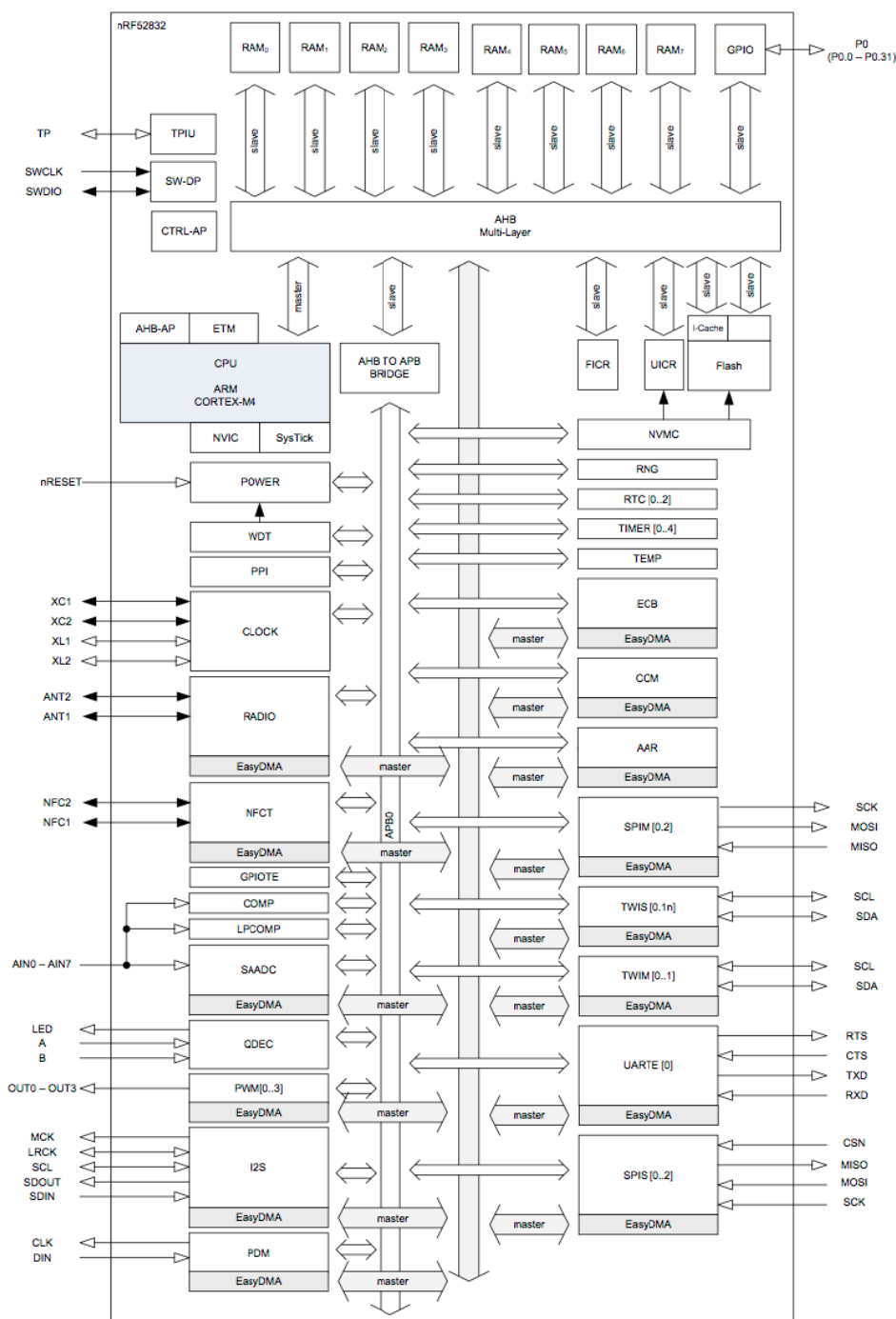
4. Product Overview

Brief description of nRF52832 SoC is provided. For full description of the SoC, please download from Nordic Semiconductor website.

https://www.nordicsemi.com/eng/Products/Bluetooth-low-energy

Block Diagram

The following is a block diagram of Nordic nRF52832 Bluetooth Low Energy (BLE) SoC.

The 32 bit ARM Cortex M4F MCU with hardware supports for DSP instructions and floating point operations, code density and execution speed are higher than other Cortex M MCU. The Programmable Peripheral Interconnect (PPI) system provides a 20-channel bus for direct and autonomous system peripheral

communication without CPU intervention. This brings predictable latency times for peripheral to peripheral interaction and power saving benefits associated with leaving CPU idle. The device has 2 global power modes ON/OFF, but all system blocks and peripherals have individual power management control which allows for an automatic switching RUN/IDLE for system blocks based only on those required/not required to achieve particular tasks.

The NFC block supports NFC-A tags with proximity detection and Wake-on-field from low power mode. The NFC enables Out-Of-Band (OOB) Bluetooth pairing of devices and thus greatly simplifying deployment.

Mechanical Drawing

The following is a mechanical drawing of BC832. Two types of pins are available to meet different application requirements.

- 16 castellated pins for application needing limited number of IOs. SMT equipment is not required for soldering castellated pins.
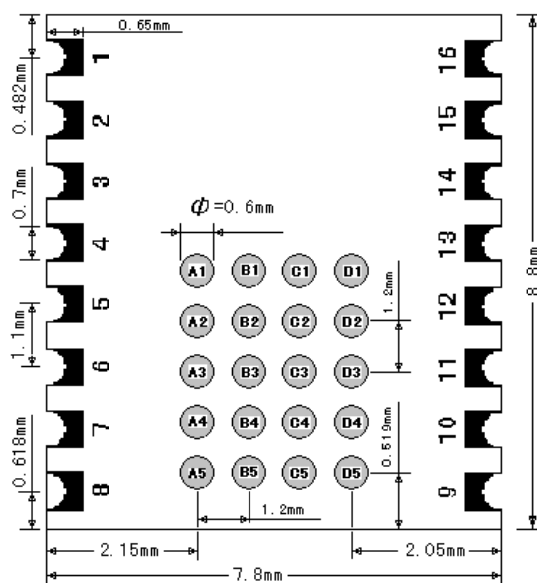
- 24 LGA (Land Grid Array) pins to access all 32 GPIOs of nRF52832 when needed.

BC832 Photo

Pin Assignments of BC832

The followings are BC832 pin assignment. Pin functions are in a table in next section. Please refer to Nordic nRF52832 Product Specifications for detailed descriptions and features supported.
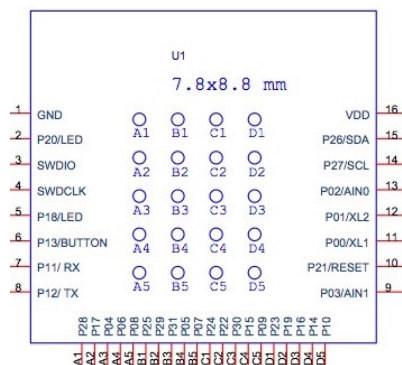
http://infocenter.nordicsemi.com/pdf/nRF52832_PS_v1.1.pdf

BC832		nRF52832 CIAA		
pin#	pin name	pin#	pin name	Descriptions
1	GND	C5	VSS	Ground
2	P20	G2	P0.20	GPIO, LED pin on EV-BC832
3	SWDIO	G1	SWDIO	GPIO, connection for 32.768kHz crystal
4	SWDCLK	F1	SWDCLK	Serial Wire Debug I/O
5	P18	H2	P0.18	GPIO, LED pin on EV-BC832
6	P13	G4	P0.13	GPIO, button pin on EV-BC832
7	P12	H6	P0.12	UART TX
8	P11	F4	P0.11	UART RX
9	P03/AIN1	D6	P0.03	GPIO, Analog input 1
10	P21/RESET	H1	P0.21	configured as reset on EV-BC832
11	P00/XL1	D7	P0.00	GPIO, connection for 32.768kHz crystal
12	P01/XL2	C7	P0.01	GPIO, connection for 32.768kHz crystal
13	P02/AIN0	C6	P0.02	GPIO, Analog input 0
14	P27/SCL	B4	P0.27	GPIO, configured as I2C SCL on EV-BC832
15	P26/SDA	D3	P0.26	GPIO, configured as I2C SDA on EV-BC832
16	VDD	A7	VDD	DC power supply, 1.7V to 3.6V
A1	P28	A3	P0.28	GPIO
A2	P17	G3	P0.17	GPIO
A3	P04	E6	P0.04	GPIO
A4	P06	F7	P0.06	GPIO
A5	P08	G7	P0.08	GPIO
B1	P25	B3	P0.25	GPIO
B2	P29	A4	P0.29	GPIO
B3	P31	B5	P0.31	GPIO
B4	P05	E7	P0.05	GPIO

B5	P07	F6	P0.07	GPIO
C1	P24	E1	P0.24	GPIO
C2	P22	F2	P0.22	GPIO
C3	P30	A5	P0.30	GPIO
C4	P15	H4	P0.15	GPIO
C5	P09	G6	P0.10	GPIO
D1	P23	E2	P0.23	GPIO
D2	P19	F3	P0.19	GPIO
D3	P16	H3	P0.16	GPIO
D4	P14	H5	P0.14	GPIO
D5	P10	G5	P0.10	GPIO

Pin Functions

Mounting BC832 on the Host PCB
The following figure shows recommended mounting of BC832 module on the host PCB.

- For the best Bluetooth range performance, the antenna area of module shall extend 3.2 mm outside the edge of a ground plane.

- The next choice is to place module on a corner of host PCB. No ground place directly below the 3.2x7.8mm antenna area of module.

- For wearable, it is acceptable to place a coin battery directly below the antenna area of module. Bluetooth range is reduced but acceptable when pairing with a smartphone on the antenna side. Bluetooth signal is
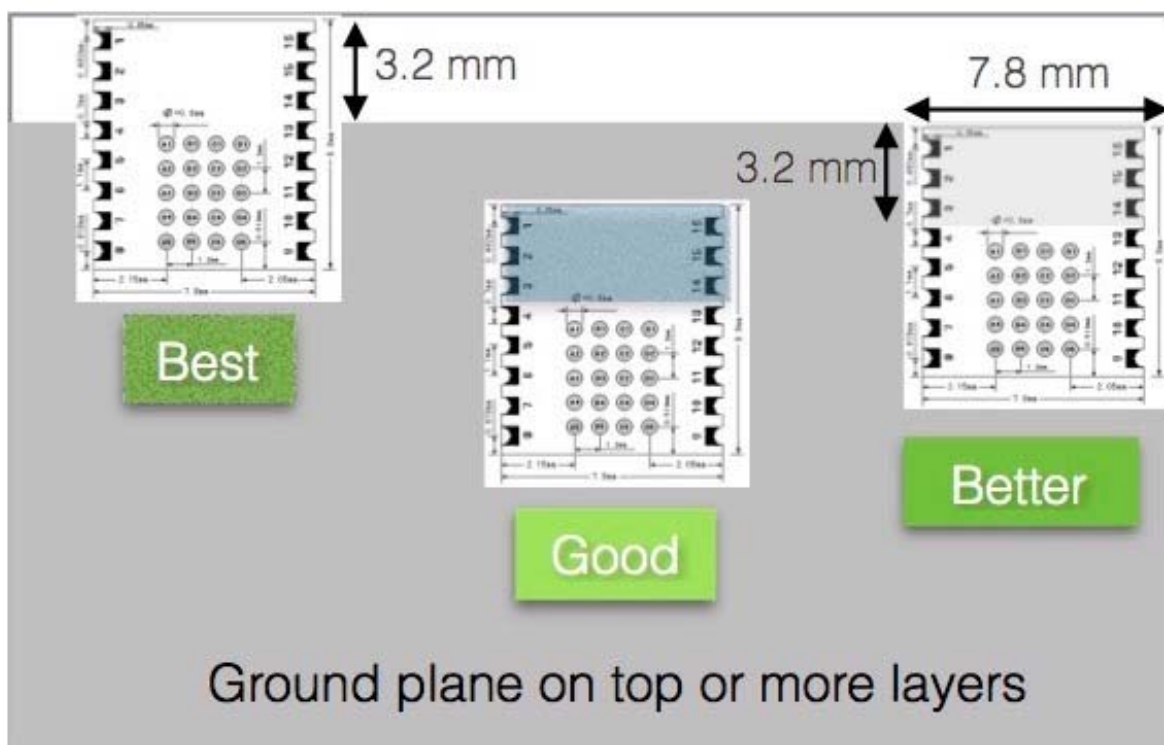
1. BC832 module extends 3.2 mm from ground plane of the host PCB board.
2. No ground plane on all layers in the 3.2x7.8mm antenna area.
3. A coin battery can be mounted directly below antenna area with reduced range performance

blocked on the battery side.

5. AT Commands

BC832 module is available with firmware supporting AT commands. Part number is BC832-AT.

Brief description of AT commands

- Each command line consists of a prefix, a body and a terminator.

- All command lines begin with the prefix AT (ASCII 065, 084) or at (ASCII 097, 116).

- The body is a string of characters in the ASCII range 032-255. Control characters other than <CR>(carriage return; ASCII 013) and <BS> (back space; ASCII 008) in a command line are ignored.

- The terminator is <CR>.

- There is no distinction between upper-case and lower-case characters. A command line can have a maximum length of 80 characters. It is automatically discarded if the input is longer. Corrections are made

- AT command is case-insensitive, following /r/n for end code.

- The default baud rate is 9600 one stop bit and no parity

Command mode

When P0.02 of nRF52832 (pin 13 of BC832) is pulled high, it is set to AT command mode. In AT command mode, the host processor communicates with the processor on BC832.

Command	Response	Parameter	example
AT	OK or FAIL	none	AT/r/n OK/r/n
AT+RESET	OK or FAIL	none	AT+RESET/r/n OK/r/n
AT+VERSION?	+VERSION:<param> OK	Software version number	AT+VERSION?/r/n +VERSION140804 OK/r/n
AT+NAME?	+NAME:<param> OK	Device name	AT+NAME?/r/n +NAME:EZPro OK/r/n
AT+NAME=<param>	OK or FAIL	Device name	AT+NAME=Fanstel/r/n Or AT_Name="Fanstel"/r/n

			OK/r/n
AT+UART?	+UART:<param>,<param2>,<param3> OK	Baud rate, Stop bit, Parity	AT+UART?/r/n +UART:115200,1,0 OK/r/n
AT+UART=<parm>	+UART:<parm>	Baud rate	AT+UART=115200/r/n +UART:115200,1,0 OK/r/n 1200 2400 4800 9600 default 19200 38400 57600 115200 230400 460800 921600 1000000
AT+ADDR?	+ADDR:<param> OK	Device MAC address	AT+ADDR?/r/n +ADDR:abb5:cd:604ace OK/r/n
AT+REGISTER	OK or FAIL	none	AT+REGISTER/r/n OK/r/n
AT+QUITREGISTER	OK or FAIL	none	AT+QUITREGISTER/r/n OK/r/n
AT+RX?	+Name:<parm> +UART:<parm> +ADDR:<parm>	none	AT+RX?/r/n +NAME:EZPro/r/n +UART:115200,1,1/r/n +ADDR:abb5:cd:604ace/r/n
AT+DEFAULT	OK or FAIL	none	AT+DEFAULT/r/n OK/r/n

AT_RFPW?	+RFPW:parm	+4~-8	AT+RFPW?/r/n +RFPW:-4 OK/r/n 0:+4 1:+0 default 2:-4 3:-8
AT_RFPW=<parm>	OK or FAIL	+4~-8	AT+RFPW= 1/r/n OK/r/n 0:+4 1:+0 2:-4 3:-8
AT+PIO=<param><param1>	OK or FAIL	P00-P05 1=High ,0=low	AT+PIO=05, 0\r\n OK/r/n
AT+PIS=<param><param1>	OK or FAIL	P00-P05 1=output, 0=input	AT+PIS=05, 1\r\n OK/r/n

Data Mode

When P0.02 of nRF52832 (pin 13) of BC832 is pulled low, it is set to data mode. In data model, BC832 provides transparent data transfer between the host processor and a remote device, for example, a smartphone.

6. BC832 Evaluation Board

Communicating with a PC

A quick and easy way to evaluate BC832 is to use a PC as the host processor. Connect the development board EV-BC832 to a PC with an USB cable. Then,

☐ Set S1, BC832 is set to command mode. PC will communicate with BC832.

☐ Set switch S1 to the other position, BC832 is set to data mode. PC will communicate with a remote device through BC832 Bluetooth wireless connection.

Docklight is a testing, analysis and simulation tool for serial communication protocols (RS232, RS485/422 and others). It allows you to monitor the communication between two serial devices or to test the serial communication of a single device. Docklight significantly increases productivity in a broad range of industries, including automation and control, communications, automotive, equipment manufacturers, and embedded / consumer products. Docklight is easy to use and runs on almost any standard PC using Windows 10, Windows 8, Windows 7, Windows Vista or Windows XP operating system.

Docklight software can be downloaded from the following:

http://www.docklight.de/download_en.htm

Communicating with a Host Processor

To be provided

Suggestion for Battery Power Application

Standby current consumption is important for battery-powered product. We suggest adding a 32.768 kHz crystal and 2 capacitors as shown in the upper left corner of the evaluation board schematics. The 32MHz main clock won't be active at idle state to save power.

7. Miscellaneous

- DON'T USE A MODULE WITH INTERNAL ANTENNA INSIDE A METAL CASE.
- USE A MODULE WITH EXTERNAL ANTENNA INSIDE A METAL CASE. ANTENNA MUST BE OUTSIDE OF A METAL CASE.
- FOR PCB LAYOUT:
  - AVOID RUNNING ANY SIGNAL LINE BELOW MODULE WHENEVER POSSIBLE,
  - NO GROUND PLANE BELOW ANTENNA,
  - IF POSSIBLE, CUT-OFF THE PORTION OF MAIN BOARD PCB BELOW ANTENNA.
- CONNECT MODULE GROUND TO BATTERY GROUND.

8. Contact Us

United States:

Fanstel Corp.

7466 E. Monte Ctisto Ave. Scottsdale AZ 85260

Tel. 1 480-948-4928

Fax. 1-480-948-5459

Email: module@fanstel.com

Website: www.fanstel.com

Taiwan:

Fanstel Corp.

10F-10, 79 Xintai Wu Road

Xizhu, New Taipei City, Taiwan 22101

泛世公司

臺灣省新北市汐止區新臺五路 79 號 10 樓之 10, 22101

Tel. 886-2-2698-9328

Fax. 886-2-2698-4813

Email: tp@fanstel.com

Website: www.fanstel.com

China:

Fanstel Technologies Corp.

11 Jiale Street

Ping-Dih, Long-Gang, Shen Zhen, GD 518117

泛世康科技(深圳)有限公司

廣東省深圳市龍崗區坪地鎮佳樂街 11 號

Tel. 86-755-8409-0928

Fax. 86-755-8409-0973

QQ. 3076221086

Email: sz@fanstel.com

Website: www.fanstel.com

Federal Communications Commission (FCC) Statement

15.21
You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)
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 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

of the device.

FCC RF Radiation Exposure Statement

1) This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2) This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed.

Note: The end product shall has the words "Contains Transmitter Module FCC ID: X8WBC832

Canada, Industry Canada (IC)

This Class B digital apparatus complies with Canadian ICES-003
Cet appareil numérique de classe B est conforme à la norme NMB-003.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject

to the following two conditions: (1) this device may not cause interference, and (2) this device

must accept any interference, including interference that may cause undesired operation of the

Le present appareil est conforme aux CNR d'Industrie Canada applicables auxappareils radio exempts de licence.L'exploitation est

autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage adioélectrique subi, même si le brouillage est susceptible d'en compromettre

le fonctionnement.

Canada, avis d'Industry Canada (IC)

"Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

(Modular approval) End Product Labeling:

The final end product must be labeled in a visible area with the following: "Contains IC: 4100A-BC832".

Caution: Exposure to Radio Frequency Radiation.

To comply with RSS 102 RF exposure compliance requirements

OEM statement

The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labeled with its own FCC ID number. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment

The end product with this module may subject to perform FCC part 15 unintentional emission test requirement and be properly authorized.
This device is intended for OEM integrator only.