

INSIGMA INC

# Bluetooth Module BTIN0011 user manual

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User manual

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## 1 Purpose

- This product specification document describes the Insigma Inc. make Nordic Semiconductor nRF52832 based, Bluetooth Low Energy module.

## 2 Definition(s) and Abbreviation(s)

Name	Abbreviation
BLE	Bluetooth Low Energy
ARM	Advanced RISC Machines
RAM	Random Access Memory
RSSI	Received signal strength indicator
FIFO	First in- first out
DMA	Direct memory access
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
PDM	Pulse density modulation
ECB	electronic codebook
AAR	Accelerated address resolver
QFN/WLCSP	Quad Flat No-leads / Wafer Level Chip Scale Package
IoT	Internet of Things
OOB	Out of Band
SAADC	Successive approximation analog-todigital
COMP	Comparator
LPCOMP	Low power comparator
LFXO	low frequency crystal oscillator
NFC	Near Filed Communication
ESD	Electrostatic Discharge
LDO	Low Dropout
GFSK	Gaussian Frequency Shift Keying

## 3 Reference(s)

Document No.	Title
1	nRF52832_v1.0.pdf

## 4 Key Features

- Multi-protocol 2.4GHz radio
- 32-bit ARM Cortex M4F processor, 512kB flash + 64kB RAM
- Software stacks available as downloads
- Application development independent from protocol stack
- On-air compatible with nRF51, nRF24AP and nRF24L Series
- Programmable output power from +4dBm to -20dBm
- RSSI
- RAM mapped FIFOs using Easy DMA
- Dynamic on air payload length up to 256 Bytes
- Flexible and configurable 32 pin GPIO
- Programmable Peripheral Interface – PPI
- Simple ON/OFF global power modes
- Full set of digital interfaces including: SPI/2-wire/UART/PDM/I2S, all with Easy DMA
- 12-bit/200KSPS ADC
- 128-bit AES ECB/CCM/AAR co-processor
- Quadrature demodulator
- Low cost external crystal 32MHz  $\pm$  40ppm for Bluetooth,  $\pm$  50ppm for ANT
- Low power 32MHz crystal and RC oscillators
- Ultra low-power 32kHz crystal and RC oscillators
- Wide supply voltage range (1.7 V to 3.6 V)
- On-chip DC/DC buck converter
- Individual power management for all peripherals
- Package options: 48-pin 6x6 QFN/WL-CSP

## 5 Applications for the Module

### All Embedded Wireless Applications

- IoT
  - Home automation
  - Sensor networks
  - Building automation
- Personal Area Networks
  - Health/fitness sensor and monitor devices
  - Medical devices
  - Key-fobs + wrist watches
- Interactive entertainment devices
  - Remote control
  - Gaming controller
- Beacons
- A4WP wireless chargers and devices
- Remote control toys

### Computer peripherals and I/O devices

- Mouse
- Keyboard
- Multi-touch track pad

## 6 Descriptions for the Module

BTIN0011 is a short range module, for implementing Bluetooth Low Energy functionality into various electronic devices.

The nRF52832 is a powerful multiprotocol single chip solution for ultra low power wireless applications. It incorporates Nordic’s latest best-in class performance radio transceiver, an ARM® Cortex™ M4F CPU and 512kB flash and 64kB RAM memory.

The nRF52832 supports Bluetooth® Smart (formerly known as Bluetooth low energy), ANT and 2.4GHz proprietary protocol stacks. The device also has a NFC-A tag interface for OOB pairing.

### 6.1 Pin Detail

Sr. #	Pin Name	Pin Type	Description
1	GND	Ground	Ground Pin must be connected to solid GND plane
2	GND	Ground	Ground Pin must be connected to solid GND plane
3	GND	Ground	Ground Pin must be connected to solid GND plane
4	P0.25	Digital I/O	General purpose I/O pin
5	P0.26	Digital I/O	General purpose I/O pin
6	P0.27	Digital I/O	General purpose I/O pin
7	P0.28 AIN4	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
8	P0.29 AIN5	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
9	P0.30 AIN6	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
10	P0.31 AIN7	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
11	DEC4	Power	1V3 regulator supply decoupling Input from DC/DC regulator Output from 1.3 V LDO* <sup>1</sup>
12	DCC	Power	DC/DC regulator output pin* <sup>2</sup>
13	VCC	Power	Power Supply pin* <sup>3</sup>
14	GND	Ground	Ground Pin must be connected to solid GND plane
15	P0.00 XL1	Digital I/O Analog input	General purpose I/O pin Connection for 32.768 kHz crystal (LFXO)
16	P0.01 XL2	Digital I/O Analog input	General purpose I/O pin Connection for 32.768 kHz crystal (LFXO)
17	P0.02 AIN0	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
18	P0.03 AIN1	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
19	P0.04 AIN2	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input

20	P0.05 AIN3	Digital I/O Analog input	General purpose I/O pin SAADC/COMP/LPCOMP input
21	P0.06	Digital I/O	General purpose I/O pin
22	P0.07	Digital I/O	General purpose I/O pin
23	P0.08	Digital I/O	General purpose I/O pin
24	P0.09 NFC1	Digital I/O NFC input	General purpose I/O pin NFC antenna connection
25	P0.10 NFC2	Digital I/O NFC input	General purpose I/O pin NFC antenna connection
26	GND	Ground	Ground Pin must be connected to solid GND plane
27	P0.11	Digital I/O	General purpose I/O pin
28	P0.12	Digital I/O	General purpose I/O pin
29	P0.13	Digital I/O	General purpose I/O pin
30	P0.14 TRACEDATA[3]	Digital I/O	General purpose I/O pin Trace port output
31	P0.15 TRACEDATA[2]	Digital I/O	General purpose I/O pin Trace port output
32	P0.16 TRACEDATA[1]	Digital I/O	General purpose I/O pin Trace port output
33	P0.17	Digital I/O	General purpose I/O pin
34	P0.18 TRACEDATA[0] SWO	Digital I/O	General purpose I/O pin Trace port output Single Wire output
35	P0.19	Digital I/O	General purpose I/O pin
36	P0.20 TRACECLK	Digital I/O	General purpose I/O pin Trace port clock output
37	P0.21 RESET	Digital I/O	General purpose I/O pin Configurable as pin reset
38	SWDCLK	Digital input	Serial Wire Debug clock input for debug and programming
39	SWDIO	Digital I/O	Serial Wire Debug I/O for debug and programming
40	P0.22	Digital I/O	General purpose I/O pin
41	P0.23	Digital I/O	General purpose I/O pin
42	P0.24	Digital I/O	General purpose I/O pin
43	GND	Ground	Ground Pin must be connected to solid GND plane

Note:

- 1) Use 1  $\mu$ F capacitor to ground at DEC4 pin number 11.
- 2) Use 0.1  $\mu$ F capacitor to ground at VCC pin number 13.
- 3) Use 15  $\eta$ H, 10  $\mu$ H at DCC pin number 12 for DC/DC Regulator setup.

## 7 Electrical Specification

### Absolute Maximum Ratings <sup>(1)</sup>:

Over operating free-air temperature range (unless otherwise noted)

		Min	Max	Unit
Supply Voltage	All supply pin must have same voltage	-0.3	3.9	V
Voltage on any digital pin	Vi/o, VDD ≤ 3.6 V	-0.3	Vdd+0.3	V
	Vi/o, VDD > 3.6 V	-0.3	3.9 V	
Storage Temp Range		-40	+125	°C
NFC antenna pin current, I <sub>NFC1/2</sub>			80	mA
Radio, RF Input level			10	dBm
MSL	Moisture Sensitivity Level		2	
ESD <sup>(2)</sup>	All pins, according to human-body model, JEDEC STD 22, 1 kV method A114		4	kV
	According to charged-device model, JEDEC STD 22, method C101		750	V
Flash memory Endurance		10000		Write/erase cycles
Flash memory retention		10 years at 40°C		

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions are not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) CAUTION: ESD sensitive device. Precautions should be used when handling the device in order to prevent permanent damage.



**Operating Condition summary:**

Items	Specification
Supply Voltage (VDD), independent of DCDC enable	1.7 V min to Max. +3.6V
Ambient Temperature range	-40 °C to 85 °C

**Current Consumption Summary:**

Measurement done at TA = 25 °C, VDD = 3V

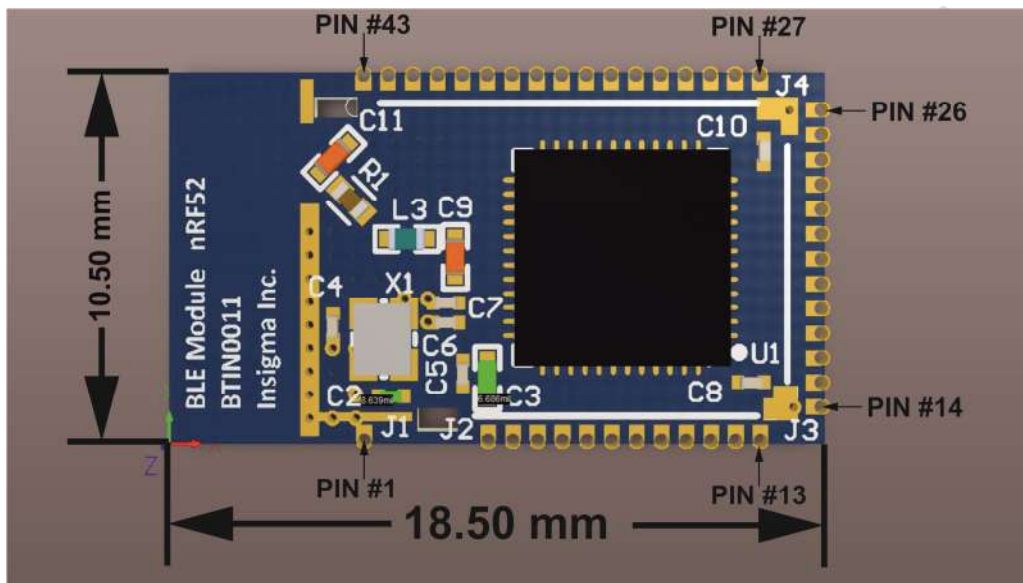
Items	Specification
System current consumption	0.4µA – No RAM retention, 1.2µA – All peripherals in IDLE mode, 1.6µA – All peripherals in IDLE mode and 32KHz XO and RTC running, 40nA per 4KB - RAM retention
Radio RX @ 1 Mb/s Bluetooth Low Energy mode, Clock = HFXO	6.5 mA
0 dBm TX @ 1 Mb/s Bluetooth Low Energy mode, Clock = HFXO	7.1 mA

**RF Specification Summary:**

Items	Specification
Frequency band	2.402 – 2.480 GHz
Data rate and Modulation	1 Mbps, GFSK
Number of Channel	40: 37 data /3 advertising
Sensitivity	-96dBm Bluetooth, -92.5dBm at 1Mbs ANT, -89dBm at 2Mbs, -30dBm whisper mode
Radio current consumption LDO at 1.8V	15.2mA – TX at +4dBm output power, 10mA – TX at 0dBm output power, 10.4mA – RX at 1Mbs
Radio current consumption DC-DC at 3V	7.7mA – TX at +4dBm output power, 5.5mA – TX at 0dBm output power, 5.5mA – RX at 1Mbs
Output power	-20 to +4 dBm

## 8 Mechanical Specification

No.	Item	Dimension	Tolerance
1.	Length	18.5 mm	+/- 0.20
2.	Width	10.5 mm	+/- 0.20
3.	Height	2.7 mm	+/- 0.20



Note: All Dimensions are in mm.



## 9 Regulatory Statement

### 9.1 FCC Statement:

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.

The module in this product is labeled with its own FCC ID No. The FCC ID and is not visible when the module is installed inside another device. Therefore, the outside of the device into which the module is installed must also display a label referring to the module. The final end device must be labeled in a visible area with the following

“Contains FCC ID: 2AKR8BTIN00”

### 9.2 FCC Caution:

The user is cautioned that changes or modifications not expressly approved by the Inigma responsible for compliance could void the user's authority to operate the 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

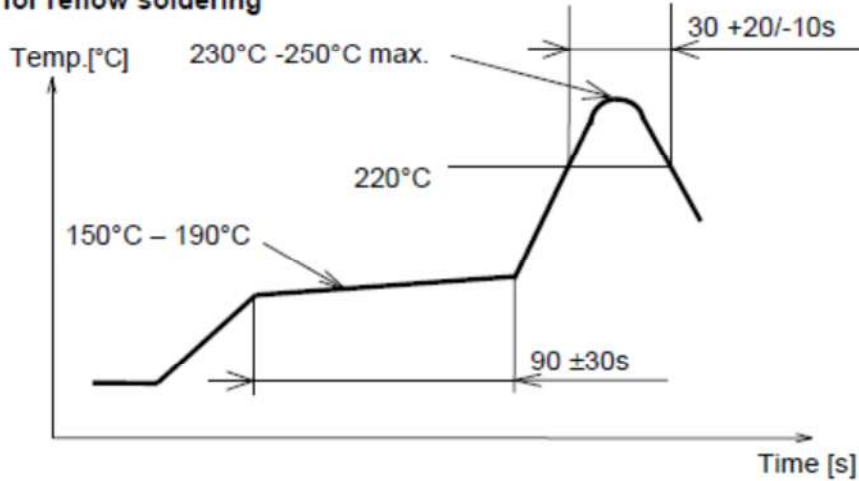
### 9.3 FCC Radiation Exposure Statement:

This equipment complies with FCC 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.

## 10 Soldering Temperature Profile

Our used temp. profile  
for reflow soldering



Reflow permissible cycle: 2  
Opposite side reflow is prohibited due to module weight.

## 11 Document History

Version	Date completed	Written by	Reviewed by	Approved by
1.0	08/24/2016	Hiren Jayani		
	➤ Initial version			
1.1	12/15/2016	Manish Patel		
	➤ Change in Mechanical Specification			
1.2	01/23/2017	Ravi Chaudhari		
	➤ Updated FCC statement.			