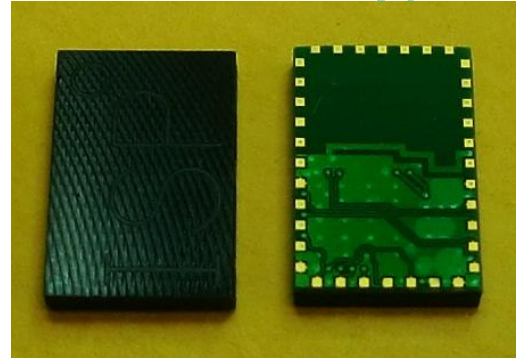


ISP091201 Bluetooth Low Energy Module with Integrated Antenna

Key Features

- Single Mode Bluetooth Low Energy v4.0 Slave
- Based on Nordic Semiconductor family of uBlue products
- Includes transceiver, baseband and software stack
- Ultra Low Power Consumption
- Single 1.9 to 3.6 V supply
- Temperature -40 to 85 °C
- Fully integrated RF matching and Antenna
- Integrated 16 MHz Crystal Clock



Applications

- Space constrained Bluetooth Low Energy Slave Devices
- Sport and fitness sensors
- Health care sensors
- Out of Range (OOR) sensors
- Personal User Interface Devices (PUID)
- Remote controls

Description

This module is based on Nordic Semiconductor nRF8001 uBlue Bluetooth Low Energy Platform. The nRF8001 is a single chip transceiver with an embedded baseband protocol engine, suitable for ultra low power wireless applications conforming to the Bluetooth Low Energy Specification contained within v4.0 of the overall Bluetooth specification. The nRF8001 includes on-chip flash memory to enable firmware updates during the initial phases of product rollout.

The uBlue transceiver is specifically designed for both PC peripherals and ultra low power applications such as sports and wellness sensors. For sensor applications, the ultra low power consumption and advanced power management enables battery lifetimes up to several years on a coin cell battery.

The ISP091201 module size measures 8 x 12 x 1.45 mm. The module integrates all the decoupling capacitors, the 16 MHz crystal and load capacitors plus the RF matching circuit and antenna in addition to the transceiver. As the module has several end applications, the antenna was designed to be compatible with several ground plane sizes including that of a USB dongle and a cell phone. The module can operate as a standalone Bluetooth sensor node with the addition of a transducer, a small external microprocessor to run application software, a 32 kHz crystal and a DC power source.

Functional Block Diagram

The module high level block diagram is shown in figure 1 below.

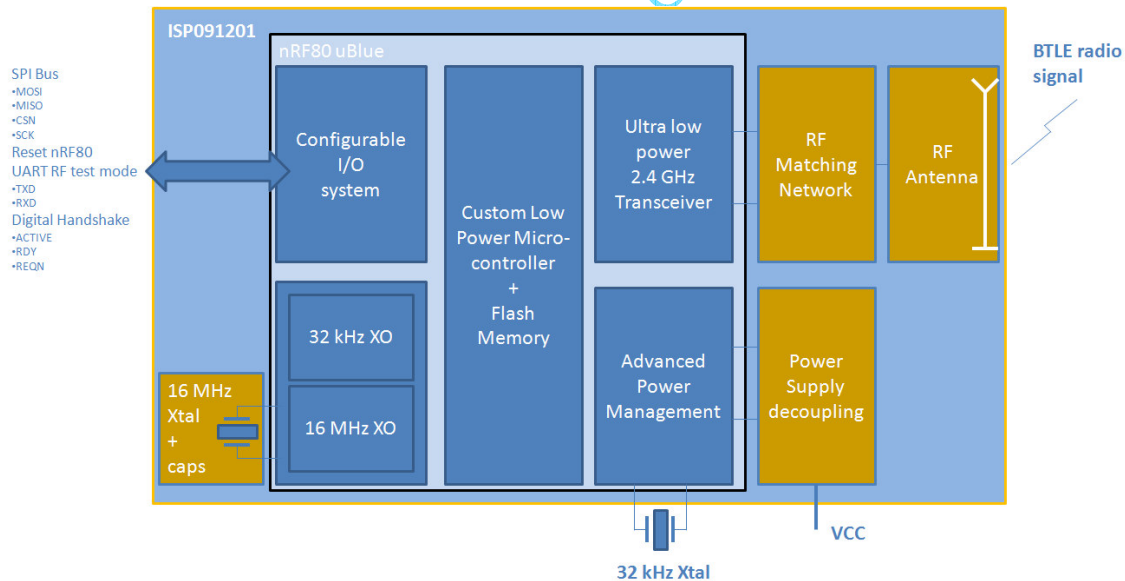


Figure 1: Functional block of the ISP091201

Pin Assignment

| Pin | Name | Pin function | Description |
|-------|--------|----------------|--|
| 1 – 6 | NC | Not Connected | Isolated pad on application PCB for mechanical stability |
| 7 | GND | Ground | Should be connected to ground plane on application PCB |
| 8 | RESET | Digital input | Reset (active low) |
| 9 | GND | Ground | Should be connected to ground plane on application PCB |
| 10 | CSN | Digital input | ACI chip select pin (active low) |
| 11 | MOSI | Digital input | ACI Master Out Slave In |
| 12 | GND | Ground | Should be connected to ground plane on application PCB |
| 13 | VDD | Power | Power supply (1.9 – 3.6V) |
| 14 | TXD | Digital output | UART (transmit) for Bluetooth low energy Direct Test Mode |
| 15 | ACTIVE | Digital output | Device RF front end activity indicator |
| 16 | XL2 | Analog output | Connect to external 32.768kHz crystal oscillator (if internal RC oscillator is enabled then leave not connected) |
| 17 | XL1 | Analog output | Connect to external 32.768kHz crystal oscillator (if internal RC oscillator is enabled then leave not connected) |
| 18 | SCK | Digital input | ACI clock input |
| 19 | GND | Ground | Should be connected to ground plane on application PCB |
| 20 | RXD | Digital output | UART (receive) for Bluetooth low energy Direct Test Mode |
| 21 | REQN | Digital input | ACI request pin (handshaking, active low) |
| 22 | MISO | Digital output | ACI Master In Slave Out |
| 23 | GND | Ground | Should be connected to ground plane on application PCB |
| 24 | RDY | Digital output | ACI device ready indication (handshaking) |
| 25-36 | NC | Not Connected | Isolated pad on application PCB for mechanical stability |

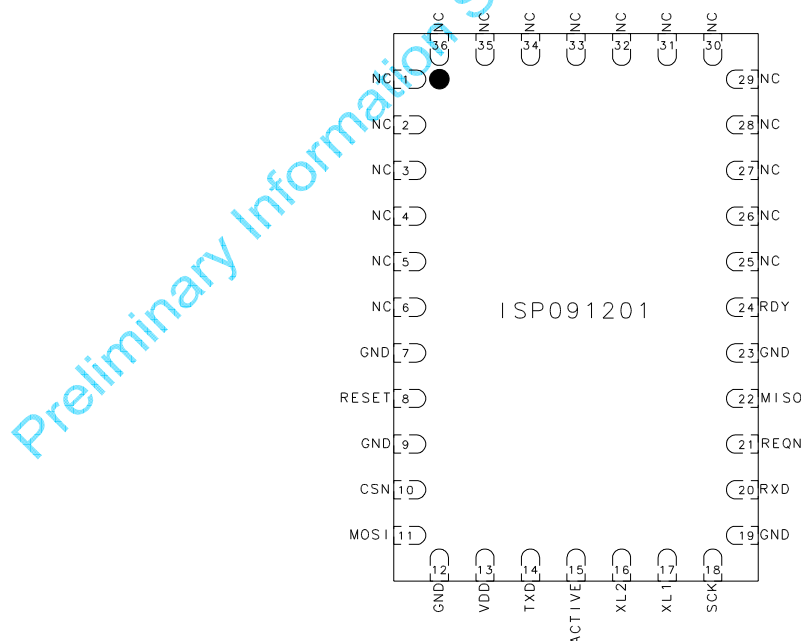


Figure 2: ISP091201 pin assignment (top view) for the LGA QFN package

Electrical Specifications

Temperature range -40 to +85 °C

| Parameter | Value | Unit |
|---|-------------------|------|
| Supply voltage | | |
| Min. Supply Voltage | 1.9 | V |
| Current consumption | | |
| Static levels | | |
| Peak current, receiver active | 17* / <i>13.5</i> | mA |
| Peak current, transmitter active | 16* / <i>12</i> | mA |
| Current drain, connection-less state | 0.5 | μA |
| Current drain between connection events | 3 | μA |

*These values are based on measured values of nRF80 uBlue based prototypes. Estimates for production devices are given in Italics

RF performances

| Parameter | Value | BT V4 standard limit | Unit | Condition |
|------------------------|-------------------|----------------------|--------|---------------------|
| Output Power | -1.6 | -20 to 10 | dBm | Channels 0 to 39 |
| RF Frequency tolerance | Better than +/-20 | +/- 50 | Hz | Channel 0 to 39 |
| RX sensitivity | -80 | -70 | dBm | Level for BER <0,1% |
| Max range | ≥ 40 | | m | |
| EIRP | -2 | | dBm | |
| Antenna Gain | 0 | | dBi | |
| Rx sensitivity | 59 | | dBμV/m | |

Typical Antenna Pattern & return loss

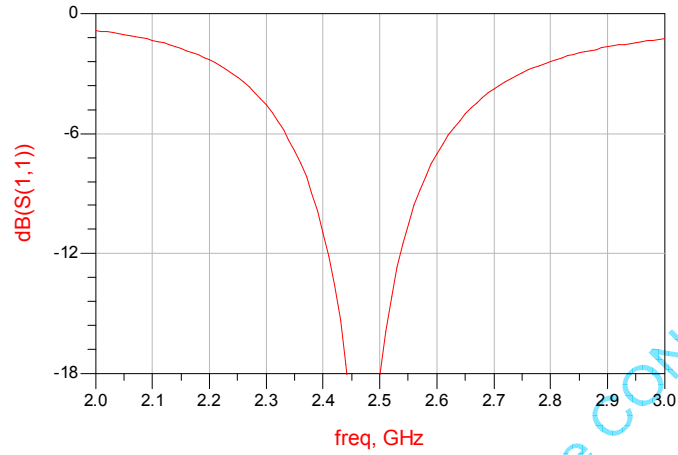


Figure 4: Antenna return loss measurement

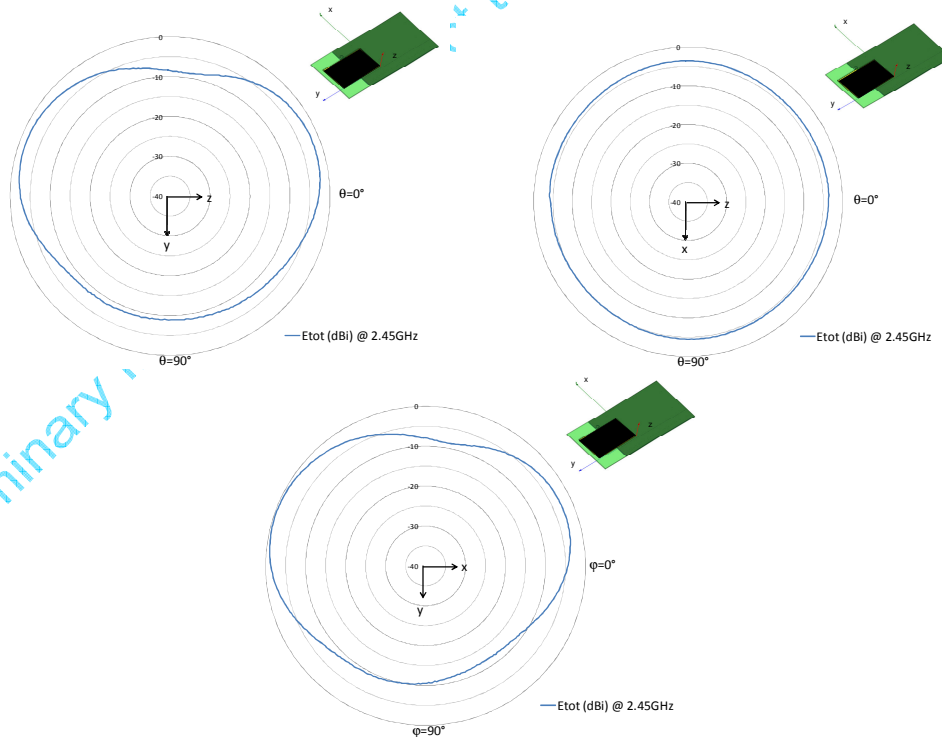


Figure 5: Radiation pattern in 3 planes

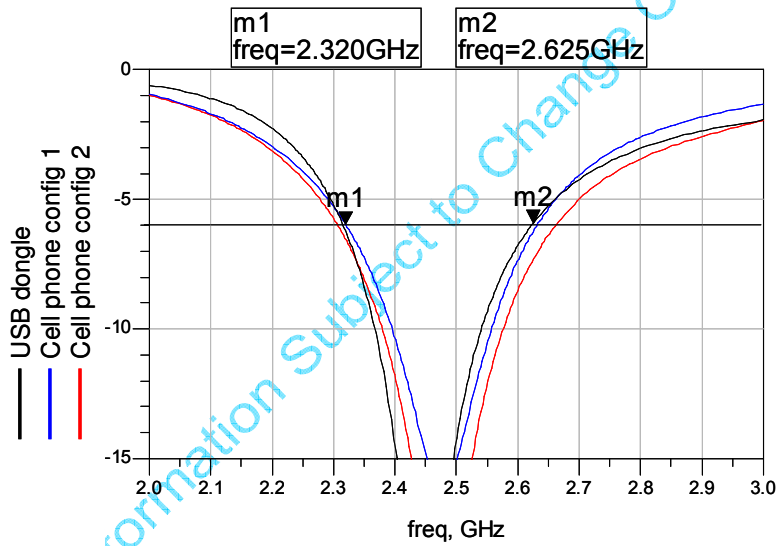
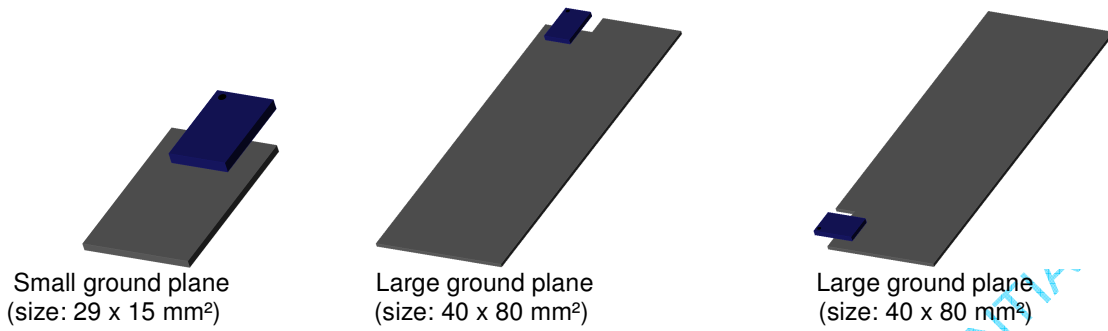


Figure 6: Ground plane effect simulation