



Aistin NB-IoT Sensor Unit

Sensing The Internet of Things



Aistin NB-IoT Sensor Unit

PRELIMINARY

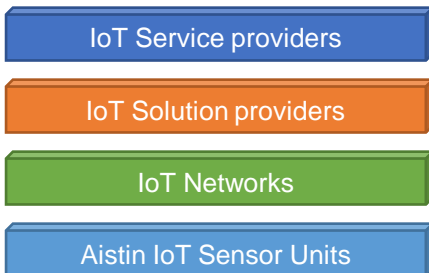
The Aistin NB-IoT Sensor Unit model BTB1000NB with *Nordic Semiconductor nRF9160* is new member in the Aistin Blue family. It is delivered with complete Aistin IoT software ready to use with several cloud service providers. It is a low energy wireless IoT device with onboard and external sensors. Usage time is from months to several years depending on your application. Aistin NB-IoT Sensor Unit is available in different component and configuration set-ups depending on the customers case and needs. Now also GPS/GNSS location service is introduced.

The Aistin NB-IoT Sensor Unit supports Bluetooth 5, 4G NB-IoT/CatM1 and provides radio connectivity with its integrated PCB antenna and connector for an external antenna. Smart power control enables long usage times with rechargeable batteries or with primary batteries, from months to several years depending on your application.

The Aistin Sensor Unit is equipped with versatile sensors, measuring distance, 3D-acceleration, 3D-magnetism, 3D-rotation, on-board temperature, air pressure and GPS/(GNSS), all of this integrated onto the same unit. There is also option for external sensors via I²C M8 interface like concrete drying sensor and NFC TAG functionality with separate NFC antenna.



Aistin NB-IoT Sensor Unit is available with IP65 and optionally with custom order IP67 mechanics. IP65 mechanics (picture above) is with plastic covers.



Aistin Sensor Unit can communicate with most IoT Solution providers like MS Azure, Cumulocity, Things Networks. We can also provide whole end-to-end IoT system with our Aistin Cloud Services.

USE CASES

The Aistin Sensor Units can be used in several application areas. Here are just few examples:

- Environment monitoring
- Building conditions and automation
- Light level
- Food safety
- Air quality
- Burglar alarming
- Movement and tilt angle measurements

With the Aistin Sensor Scanner Application, you can read sensor values over the Bluetooth. Local configuration and setup is also possible using the Bluetooth connection.

Setup and configuration using cloud services is also upcoming feature.



- Pressure measurements in open air and in containers
- Container and well fluid level measurements
- Leakage monitoring
- Predict motor or pump failure with vibration measurements
- NB-IoT Network monitoring
- Concrete and construction moisture monitoring
- Parking space free/occupied info
- Location tracking

TECHNICAL SPECIFICATION

The Aistin NB-IoT Sensor Unit has support for I²C M8 interface for external cable systems. Also concrete moisture sensor probe can be attached using this interface.

The Aistin NB-IoT Sensor Unit has support for:

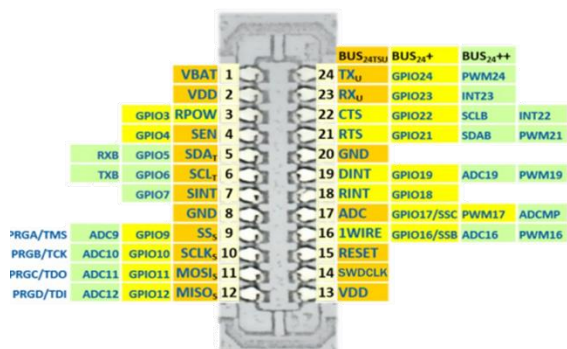
- Upcoming BT5.1 MESH network
- Upcoming Device Management using cloud services
- nRF9160 4G, 4G NB IoT/ CatM1
- eSIM/ SIM card holder
- Accurate 3D acceleration measurements and variable other sensor solutions
- Firmware updating over-the-air
- In future will have option for ARMmbed OS operating system

Aistin NB-IoT Sensor Unit features:

- Dimensions 101 x 57 x 22/32 mm
- Operating temperature -25 - +60 °C
- Nordic Semiconductor nRF52840 (SoC) Bluetooth 5, ARM Cortex-M4F with 64 MHz Clock Speed
- Nordic Semiconductor Nordic nRF9160 (SoC)
- Memory 1 MB flash, 256 KB RAM (SoC), external SPI 256Mb NOR Flash memory (or up to 4Gb NAND Flash)
- NB-IoT LWM2M
- Aistin BUS₂₄ connectors for add on boards, 1 pc
- Separate Aistin BUS₂₄ peripheral powering

Aistin BUS₂₄ is an open standard and includes all necessary signals for further expanding the board's capabilities. The primary and alternative pin usages are shown in the chart.

Aistin Bus24 Signal Chart



- Indicator color led, 1 RGB, red charging
- 2 x 3,6V AA Batteries
- Battery voltage measurement
- Firmware-over-the-air support
- GPS/(GNSS)
- Humidity
- 3D-accelerometer
- 6D-accelerometer/gyroscope
- 6D-accelerometer/magnetometer
- Barometer
- Temperature
- Optional sensors
 - Differential air pressure
 - Construction moisture
 - IR laser distance
 - TVOC air quality
 - CO₂
- Aistinbus24
 - I²C-buses, 3 pc (1 internal, 2 external)
 - SPI-bus
 - UART
 - Separate I²C/SPI
- Optional connectors:
 - I²C M8, microUSB
 - NFC antenna connector
 - external BT/NB-IoT antennas,
 - Tag connect for flashing and debug (SWD)
- Optional one sensor powering
- Optional USB Charging
- Optional Direct USB to SOC connection

CUSTOMER SPECIFIC VARIANTS

4G NB-IoT/ CatM1 all bands

- Nordic nRF9160
- Optional u-Blox Sara, special variants 2G, 3G

Aistin Sensor Unit casing

- IP65*
- IP67*

*note that some sensors need to be external in these IP classes

Sensor Unit Radio variants

- Bluetooth 5 only
- nRF9160 NB-IoT/CatM1 single
- Bluetooth 5 MESH network NB-IoT gateway
- NFC tag

Aistin Sensor Unit setup

- Full setup
- Furnished with sensors selected by customer

REFERENCES

Accelerometer and Magnetometer

- G range up to $\pm 16g$
- Output Data Rate up to 25600Hz
- Low Power or High Resolution modes
- Digital I2C up to 3.4MHz and Digital SPI up to 10MHz
- High Shock Survivability
- Digital Bit Depth 16 bits

Accelerometers

- Sensitivity Accuracy $\pm 5\%$
- Signal Bandwidth (-3dB) 3500 (xy) 1800 (z) Hz
- Integral Non-Linearity 1 % of FS
- Cross Axis Sensitivity % of FS
 - -2 (XY)
 - 0.1 (XZ)
 - 2.7 (YX)
 - -0.7 (YZ)
 - -0.8 (ZX)
 - 1.4 (ZY)
- Noise RMS 0.75 mg, Density 130 $\mu g/\sqrt{Hz}$

Magnetometer

- Sensitivity Accuracy $\pm 20\%$
- Integral Non-Linearity 0.5 % of FS
- Noise μT (RMS)
- Cross Axis Sensitivity % of FS
 - 2 (XY)
 - 0.5 (XZ)
 - 0.3 (YX)
 - 0.2 (YZ)
 - 0.9 (ZX)
 - 0.2 (ZY)
- Maximum Exposed Field 500000 μT

Barometers

- Pressure Range: 300hPa to 1100hPa
- Relative Pressure Accuracy: $\pm 0.12hPa$ (Typ)
- Absolute Pressure Accuracy: $\pm 1hPa$ (Typ)

Differential Pressure

- Measurement range $\pm 500Pa$
- Zero point accuracy 0.1Pa
- Span accuracy 3% of reading
- Resolution 16bit
- Flow step response time < 3ms

Distance

- Up to 400 cm distance measurement
- Up to 50 Hz ranging frequency
- Typical full field-of-view (FoV): 27 °
- Emitter: 940 nm invisible laser (Class1)
- Maximum ranging distance is impacted by ambient light
- Short distance mode is more immune to ambient light, but its maximum ranging distance is typically limited to 1.3 m

Gyroscope Mechanical

- Zero Rate Output Stability $\pm 1\%$ of FS
- Zero Rate Output Variation over Temperature $\pm 0.4 dps / ^\circ C$
- Sensitivity (16-bit) counts/deg/sec
 - RSEL1 = 0, RSEL0 = 0, $\pm 256 deg/sec$ 128
 - RSEL1 = 0, RSEL0 = 1, $\pm 512 deg/sec$ 64
 - RSEL1 = 1, RSEL0 = 0, $\pm 1024 deg/sec$ 32
 - RSEL1 = 1, RSEL0 = 1, $\pm 2048 deg/sec$ 16
- Sensitivity Variation over Temperature $\pm 0.04\%$ / $^\circ C$
- Noise Density 0.03 deg/sec/ \sqrt{Hz}
- Output Noise (10 Hz BW) 0.096 dps-rms
- Non-Linearity 0.5 % of FS
- Cross Axis Sensitivity $\pm 1\%$
- Bandwidth 10-160 Hz

Humidity

- Accuracy of $\pm 1.5\%$ RH and $\pm 0.1\ ^\circ C$
- Resolution 0.01 %RH
- Hysteresis at 25 $^\circ C$ $\pm 0.8\%$ RH

Temperature

- Range -40 - +80 $^\circ C$
- Accuracy $\pm 0.1\ ^\circ C$
- Resolution 0.01 $^\circ C$

TVOC

- Detect hazardous materials and unhealthy conditions (e.g. fumes from construction materials)
- Ethanol 0-1000ppm
- Three operation modes, air quality (standard and low power) and odor

CO₂

- Measurement range 400ppm to 10000ppm
- Accuracy $\pm 30ppm + 3\%$



Aistin Sensor Unit using M8 interface for external cable connection to construction moisture sensor

* The information in this document is subject to change without notice