Our Amazing **Sigfox** **Single Chip Solution**

INTERNET THINGS
For The / Of

UP-LINK and DOWN-LINK
AT command or API versions available
Lowest Power Radio
950 nA sleep current
45 mA TX current at 14 dBm output power
10 mA RX current
-129 dBm sensitivity at 600 bps (PER 10^{-2})
64 kByte FLASH, 8.25 kByte RAM
10-bit 500 ksps ADC, temperature sensor

Overview

The **AX-Sigfox** or **AX-Sigfox-API** are single chip solutions for a node on the Sigfox network. In the Internet of Things the domain of nation wide coverage and ultra low power consumption for smallest amounts of data can not be addressed by established standards such as GPRS or LTE. This void is now filled by Sigfox, the ultra low power cellular connectivity solution.

Easy to use, flexible, small footprint

The **AX-Sigfox** or **AX-Sigfox-API** chips add Sigfox functionality for up-link and down-link to any existing system at the cost of 20x13 mm^2 PCB area. They can also be used as single chip solutions that control small sensor nodes. The **AX-Sigfox** device is fully programmed for immediate operation as a Sigfox node; while the **AX-Sigfox-API** chip addresses applications where the user wants to add additional software.

Functionality

The **AX-Sigfox** and **AX-Sigfox-API** chips are 7x5 mm^2 RF-microcontrollers with an ultra low power AX8052 MCU and an AX5043 transceiver ready to use on the Sigfox network.

The **AX-Sigfox** chip is controlled by the Sigfox AT command interface accessible through a UART, the user cannot add any software to this device. In contrast, the **AX-Sigfox-API** chip addresses applications where the user wants to add software, thus avoiding the need for a second MCU in the system. Here AXSEM offers access to the **AX-Sigfox-Library** via an API (**AX-Sigfox-API**). The **AX-Sigfox-Library** has to be purchased one time. For the latter case, the AXCode::Blocks IDE is used to create a custom application. The MCU has 64 kBytes of FLASH memory of which more than 32 kBytes are available for the custom application. The MCU comes with many peripherals such as SPI master, UART, GPIOs, RTC, ADC, DAC and temperature sensor, which are available to the user program.

Features

The radio part of **AX-Sigfox** and **AX-Sigfox-API** make use of the AX5043 lowest power radio. It can modulate and demodulate the Sigfox protocol in hardware which results in lowest power consumption and MCU overhead. Due to the flexibility of **AX-Sigfox-API** it is possible to add other sub-1G stacks, making the **AX-Sigfox-API** an ideal solution for various application needs.

In the transmit direction +14 dBm can be achieved with 45 mA. On the receive side 10 mA are needed when running from a 1.8 V to 3.6 V supply. The performance is the same regardless of the supply voltage.

### Software development in AXCode::Blocks

For optional software development of single chip applications with the the **AX-Sigfox-API** device, AXCode::Blocks IDE is used. It comes with state of the art development and debugging features as well as with the freely usable SDCC C-compiler.

AXSEM

AX-Sigfox SoC
AX-Sigfox-API SoC

for UP-LINK and DOWN-LINK

Lowest power, longest range, ready to go Sigfox connectivity
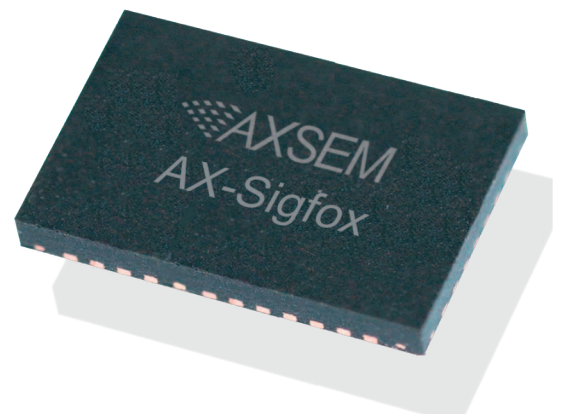
**AXSEM. The most intelligent RF.**

Your key benefits:

- **Ultra-low power consumption for a nationwide bi-directional network node**

- **20x13 mm^2 PCB area (SoC and matching network)**

- **AT command set or API controlled**

- **Seamless integration with AXCode::Blocks IDE and AX-Sigfox development kits**

- **Compatible with freely usable SDCC C-compiler**

- **Capability of running other sub-1G protocols such as wireless M-Bus on the same hardware**

- **Sigfox Ready certified**

Step-by-step generation of a Sigfox system with the AX-Sigfox or AX-Sigfox-API device

Copy the AX-Sigfox reference design onto your hardware
- 20*13 mm2 PCB area
- AX-Sigfox or AX-Sigfox-API device
- TCXO 48 MHz
- 32 kHz watch crystal (optional)
- 7 inductors
- 15 capacitors
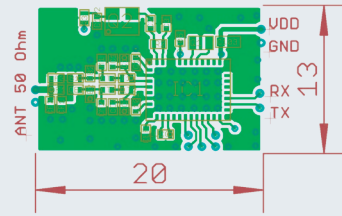
Option A
Use AX-Sigfox as slave of your MCU
- *Works with AT commands only*
- *Development kit AX-Sigfox DVK*
- *Sigfox Ready certification for end products.*
  If the reference design, BOM and SW guide are followed exactly then no other Sigfox certifications are required. If there is a deviation from the recommendations then a reduced HW/SW approval by Sigfox is required.
- *EN 300 220 required*

Finish hardware designs
- Connect power (1.8 to 3.6 V) and ground
- Connect UART RX and TX
- Connect the antenna terminal to an appropriate antenna

Write software for your MCU
- Use Sigfox AT command set to control Sigfox functionality
- Use extended AXSEM AT command set to control low power and arbitrary functionality
- The Sigfox PAC and ID are stored in the AX-Sigfox chip. Enable your subscription via AT commands.

Option B
Use AX-Sigfox-API as a one chip solution
- *AX-Sigfox-Library required*
- *Development kit AX-Sigfox-API DVK (supplied with AX-Sigfox-Library purchase)*
- *Sigfox Ready certification for end products.*
  If the reference design, BOM and SW guide are followed exactly then no other Sigfox certifications are required. If there is a deviation from the recommendations then a reduced HW/SW approval by Sigfox is required.
- *EN 300 220 required*

Finish hardware designs
- Connect power (1.8 to 3.6 V) and ground
- Connect your peripherals to AX-Sigfox-API.
- **Full AX5043 radio functionality available to implement other sub-1G stacks!**
 - Connect the antenna terminal to an appropriate antenna

Write software for AX-Sigfox-API chip
- Use AXCode::Blocks to write your software for AX-Sigfox using the AX-Sigfox-Library
- Use the integrated debugger to develop your code.
- The Sigfox PAC and ID are stored in the AX-Sigfox-API chip. Enable your subscription via API.

READY to GO!

AX-Sigfox-DVK for instant testing via AT commands
- AX-Sigfox module
- 1 UART and programming interface to PC via USB
- 1 year Sigfox subscription with 140 messages per day
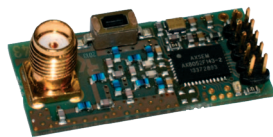
Ordering information
- AX-SIGFOX-1
- AX-SIGFOX-API-1
- DVK-SF-1
- AX-SIGFOX-LIBRARY-1

Specifications
- 1.8 - 3.6 V supply voltage
- -40^0 C - 85^0 C
- 50 nA off current (external wake-up via POR)
- 950 nA sleep current (internal wake up)
- 1600 nA sleep current (wake up via 32k OSC)
- 10 mA RX current
- 45 mA TX current at 14 dBm (selectable)
- 10 mA TX current at 0 dBm (selectable)
- Output power up to 16 dBm
- -129 dBm RX sensitivity @ 600 bps (PER 10^{-2})
- 156 dB link budget to Sigfox gateway

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