



# World's First Fully Integrated Single-Cell Battery 2.4 GHz Transceiver

## Description

The EM9201/02 is a low-voltage 2.4GHz transceiver IC with built-in link-layer logic permitting proprietary wireless links in the 2.400 ... 2.485 GHz ISM band. It has a radio core with a low-IF architecture and GFSK modulation scheme being compliant with the emerging Bluetooth low energy technology standard.

Control of the link-layer logic is possible through the SPI interface using an external host-controller. An FPGA bridge is included in the circuit such that with an external FPGA any protocol compatible with the RF characteristics can also be emulated through the SPI port of the EM9201/02. The EM9201/02 can be operated from a single 1.5V battery by making use of the on-chip step-up (boost) DC/DC converter. This converter is designed to support an extra load such as a low-power microcontroller (host) or sensor interface circuit with a dedicated application profile. The EM9201/02 can also operate without the DC/DC converter, when supplied from a 3 V battery or any other source such as an external LDO regulator. No external coil is needed then.

**EM9201:** up to 1 Mb/s on air data rate

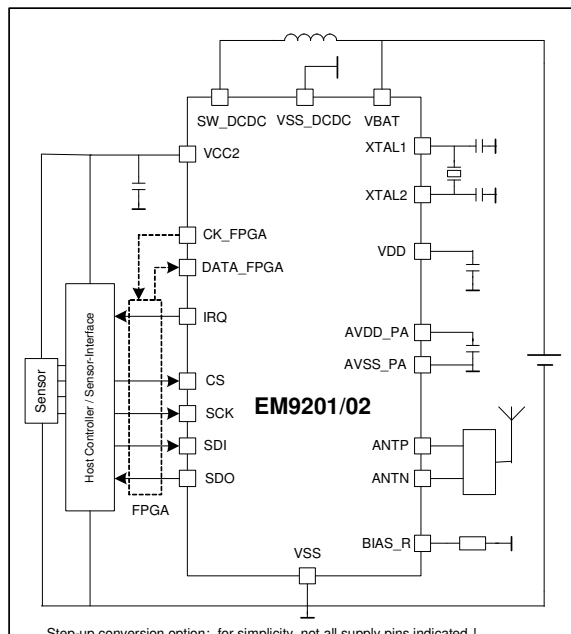
**EM9202:** up to 2 Mb/s on air data rate

Chip versions, programmable by metal mask option:

V1: with DC/DC converter for 1.5V battery

V2: w/o DC/DC converter for any voltages 1.9 – 3.6V

## Typical Application Schematic



## Features

- Single cell 1.5V battery operation (Alkaline AA, AAA)
- Operation down to  $V_{BAT} = 0.8\text{ V}$  (for start-up --> 1.0V)
- 3 V Lithium battery as alternative
- Bluetooth Low Energy-compliant GFSK modulation
- Low drift of PLL frequency by design
- On air data rate: 1Mb/s for EM9201, configurable 1Mb/s or 2Mb/s for EM9202.
- Programmable RF output level:  
-20 dBm ... +4dBm in 8 steps
- No antenna matching elements needed through appropriate PCB antenna design :
- 200  $\Omega$  differential impedance of antenna port
- Low-cost 26MHz Xtal
- BLD function: battery level detection in accordance with selected battery
- Current consumption (on  $V_{CC}$ ,  $V_{CC} = 2.1\text{V}$ , 2Mb/s)  
12.5 mA in RX  
11.5 mA in TX (0dBm output power)  
3.0  $\mu\text{A}$  in sleep-mode (DC/DC running on RCosc) <sup>1)</sup>  
0.8  $\mu\text{A}$  in power-down mode (3V version, DC/DC off)  
<sup>1)</sup> External load reduced to < 500 $\mu\text{A}$
- MLF24 4x4 package

## Applications

- Remote sensing in general
- Wireless mouse, keyboard etc.
- Wireless sensors in watches
- Wireless sports equipment
- Alarm and security systems

## Pin Assignment

