UG121: BRD4300A User's Guide

Blue Gecko BGM111 Bluetooth® Smart Module Radio Board BRD4300A User's Guide

The Blue Geckofamily of the Silicon Labs' Bluetooth Smart modules delivers a high-performance, low energy and easy-to-use Bluetooth Smart solution integrated into a small form factor package. Blue Gecko Bluetooth Smart modules combine an integrated antenna, a high performance Bluetooth transceiver, an energy efficient 32-bit MCU and a ready to use Bluetooth Smart software and SDK.

The ultra-low power operating modes and fast wake-up times of the Silicon Labs' energy friendly 32-bit MCUs, combined with the low transmit and receive power consumption of the Bluetooth Smart radio, result in a solution optimized for battery powered applications.

The Silicon Labs fully certified Bluetooth Smart modules and software are designed to help developers accelerate time to market and reduce development costs and compliance risks by providing a versatile, plug-and-play Bluetooth solution.

Development and evaluation of the BGM111 Bluetooth Smart module is possible by attaching the BRD4300A board to the Wireless Starter Kit (WSTK) Mainboard. This gives access to the WSTK display, buttons and additional features offered by using the available Expansion Boards.

RADIO BOARD FEATURES

- Bluetooth module: BGM111
- Bluetooth 4.1 compliant (Bluetooth Smart)
- Upgradeable to Bluetooth 4.2
- TX power: up to +8 dBm
- RX sensitivity: down to -93 dBm
- Range: up to 200 meters
- CPU core: 32-bit ARM® Cortex-M4
- Flash memory: 256 kB
- RAM: 32 kB
- SoC used in BGM111: EFR32BG1B232F256GM48
- Fully plug-in compatible with Silicon Labs Wireless Starter Kit Mainboards (BRD4001A)

1. BRD4300A Radio Board Description

The BRD4300A Radio Board contains the BGM111 Blue Gecko Bluetooth Smart Module soldered onto a carrier board with two connectors. The connectors on the carrier board are used for attaching the BRD4300A on to a Silicon Labs Wireless Starter Kit Mainboard BRD4001A and together these two boards and the software in the BGM111 Module make up the Blue Gecko Bluetooth Smart Module Wireless Starter Kit.

The BGM111 Bluetooth Smart module and the software are designed to help developers accelerate time to market with end-product design projects. This versatile plug-and-play Bluetooth solution also reduces development costs and minimizes compliance risks. The BGM111 Module is ideal for applications requiring Bluetooth Smart connectivity such as used in connected home, health and fitness, wearables and point-of-sale terminal applications. The BGM111 includes an energy friendly ARM Cortex M4 MCU.

A major benefit offered by the BGM111 is that no RF or Bluetooth protocol expertise is required. The BGM111 can be used as a peripheral along with an external host MCU or applications may be embedded into the built-in MCU using the Bluegiga BGScript™ scripting language. Complete standalone solutions may thus be created with minimal need for external components.

1.1 BGM111 Module Block Diagram

The BGM111 Module block diagram is illustrated in the figure below.

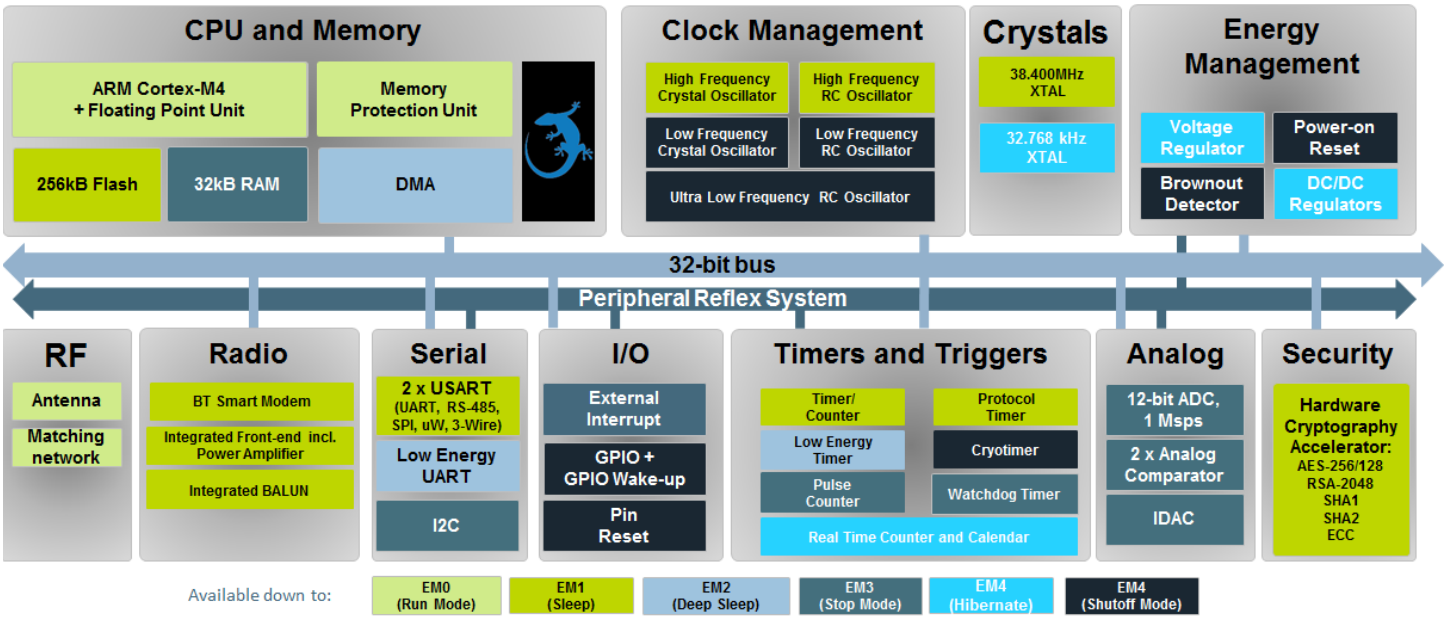


Figure 1.1. Block Diagram

2. System Summary

Integrated Bluetooth radio and energy friendly MCU

- Bluetooth 4.1 compliant and upgradable to Bluetooth 4.2.
- TX power up to +8 dBm
- RX sensitivity down to -93 dBm
- Integrated high-efficiency chip antenna
- 40 MHz Cortex M4 with DSP instructions and floating-point unit for efficient signal processing
- 256 kB Flash memory
- 32 kB RAM

Low Energy Consumption

- 8.2 mA TX current @ 0 dBm
- 7.5 mA RX current
- 59 µA/MHz in Energy Mode 0 (EM0)
- 1.7 µA EM2 Deep Sleep Current (full RAM retention) and CRYO timer running from ULFRCO
- 1.2 µA EM3 Stop current (State/RAM retention, RFSENSE disabled)
- Wake on Radio with signal strength detection, preamble pattern detection, frame detection and timeout
- 0.7 µA EM4 Hibernate/Shutoff mode (128 byte retention, RTCC running)

Wide selection of MCU peripherals

- 12-bit 1 Msamples/s ADC
- 2 x Analog comparator
- IDAC (current output DAC)
- Up to 25 pins connected to analog channels (APORT) shared between analog comparators, ADC and IDAC
- 25 General Purpose I/O pins with output state retention and asynchronous interrupts
- 8-channel DMA controller
- 12-channel Peripheral Reflex System
- Hardware Crypto Acceleration with public key support
- Protocol Timer tightly coupled to the radio
- 2 x 16-bit Timer/Counter
- 3 + 4 Compare/Capture/PWM Channels
- 32-bit Real Time Counter and Calendar
- 16-bit Low Energy Timer for waveform generation
- 16-bit Ultra Low Energy Timer/Counter for periodic wake-up from any Energy Mode
- 16-bit Pulse Counter with asynchronous operation
- Watchdog Timer with dedicated RC Oscillator @ 50 nA
- 2 x Universal Synchronous/Asynchronous Receiver/Transmitter (UART/SPI/Smart Card (ISO 7816) / IrDA/I2S)
- Low Energy UART (LEUART)
- I²C interface with SMBus support and address recognition in EM3 Stop

Integrated Bluetooth Smart Software

- Bluetooth 4.1 compliant
- Central and peripheral roles
- Up to 8 simultaneous connections
- L2CAP, ATT, GAP, SM and GATT
- Any GATT based Bluetooth Smart profile
- 100 kbps throughput

Flexible easy to use APIs

- BGAPI™ serial protocol API over UART for modem usage
- BGLIB™ host API/library which implementin BGAPI serial protocol
- BGScript™ scripting language for standalone usage
- Profile Toolkit for creating GATT based services

Free Software Development Kit (SDK)

- BGLIB C source code
- BGScipt development tools

- BGScript and BGLIB example applications
- Profile Toolkit examples
- Documentation

Fully Qualified

- Bluetooth qualified hardware and software
- CE, FCC, IC, Japan and South-Korea certifications

Wide Operating Range

- Supply voltage: 1.8 V to 3.8 V with DC/DC bypass mode
- Supply voltage: 2.4 V to 3.8 V with DC/DC enabled
- Temperature range: -40°C to +85°C

3. BRD4300A Connector

The board-to-board connector scheme allows access to all BGM111 Bluetooth Smart Module GPIO pins as well as to the RESETn signal. For more information on the functionalities of the available pins please see the Blue Gecko BGM111 Bluetooth Smart Module Data Sheet.

3.1 BRD4300A Connector Pin Associations

The figure below shows the pin mapping on the connector to the radio pins and their corresponding function on the Wireless Starter Kit Mainboard.

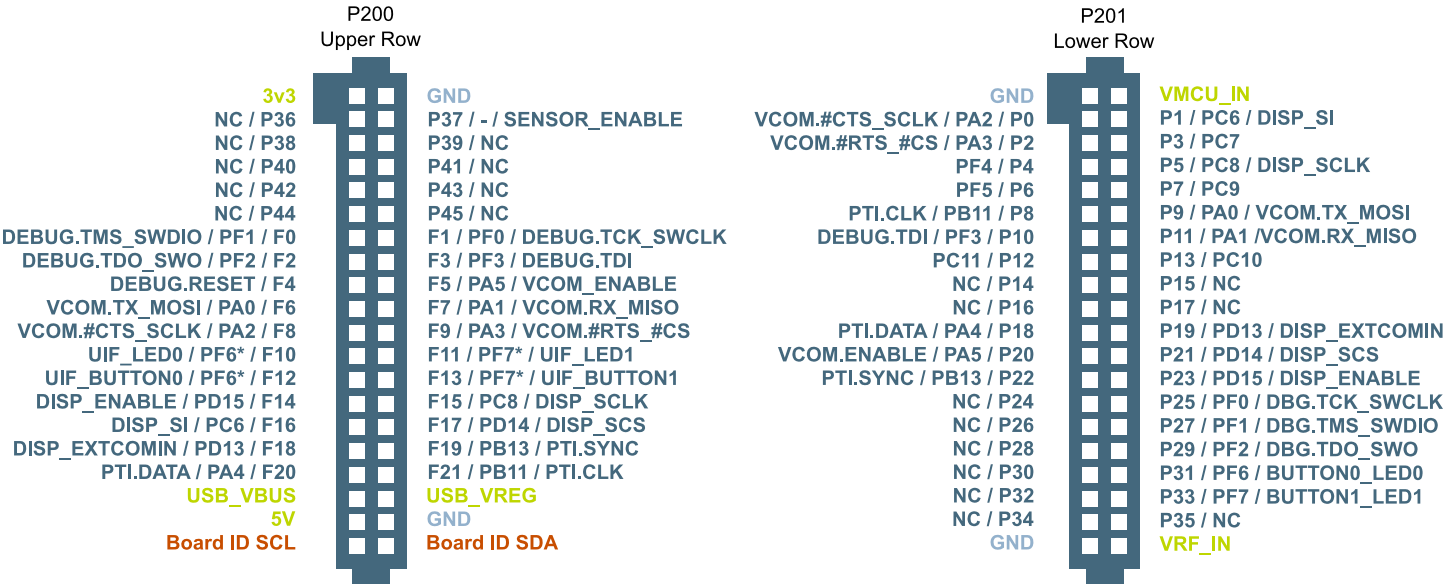


Figure 3.1. Simplicity Connector

3.2 BRD4300A Connector Type

BRD4300A contains two dual-row, female socket, 0.05" pitch polarized connectors (P/N: SFC-120-T2-L-D-A-K-TR) which provide the interface to the Wireless Starter Kit Mainboard. The Mainboard has the corresponding male header pin connectors (P/N: TFC-120-02-F-D-LC-ND).

4. Mechanical Details

The BGM111 Bluetooth Smart Module board is illustrated in the figures below.

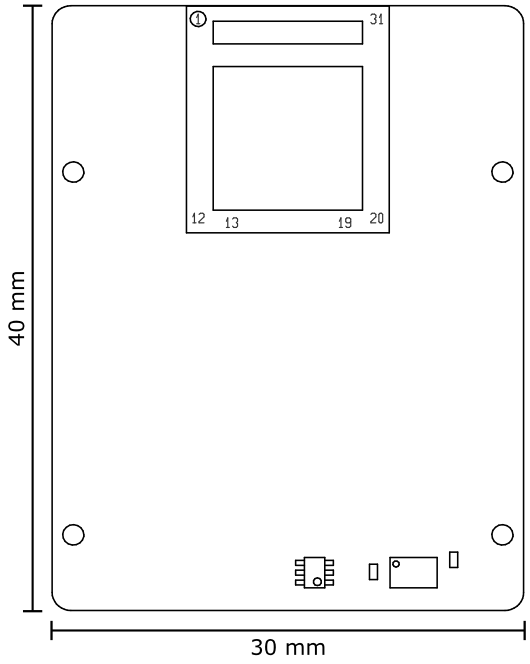


Figure 4.1. BRD4300A top view

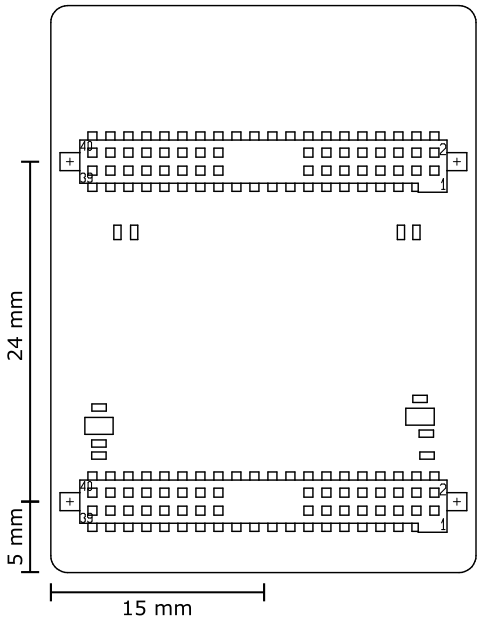


Figure 4.2. BRD4300A bottom view

5. Board Revision History

Radio Board revisions A00 and A01 can distinguished by the marking on the BGM111 module itself.

- A00: Module is unmarked.
- A01: BGM111-A part number is etched in on the RF shielding can.

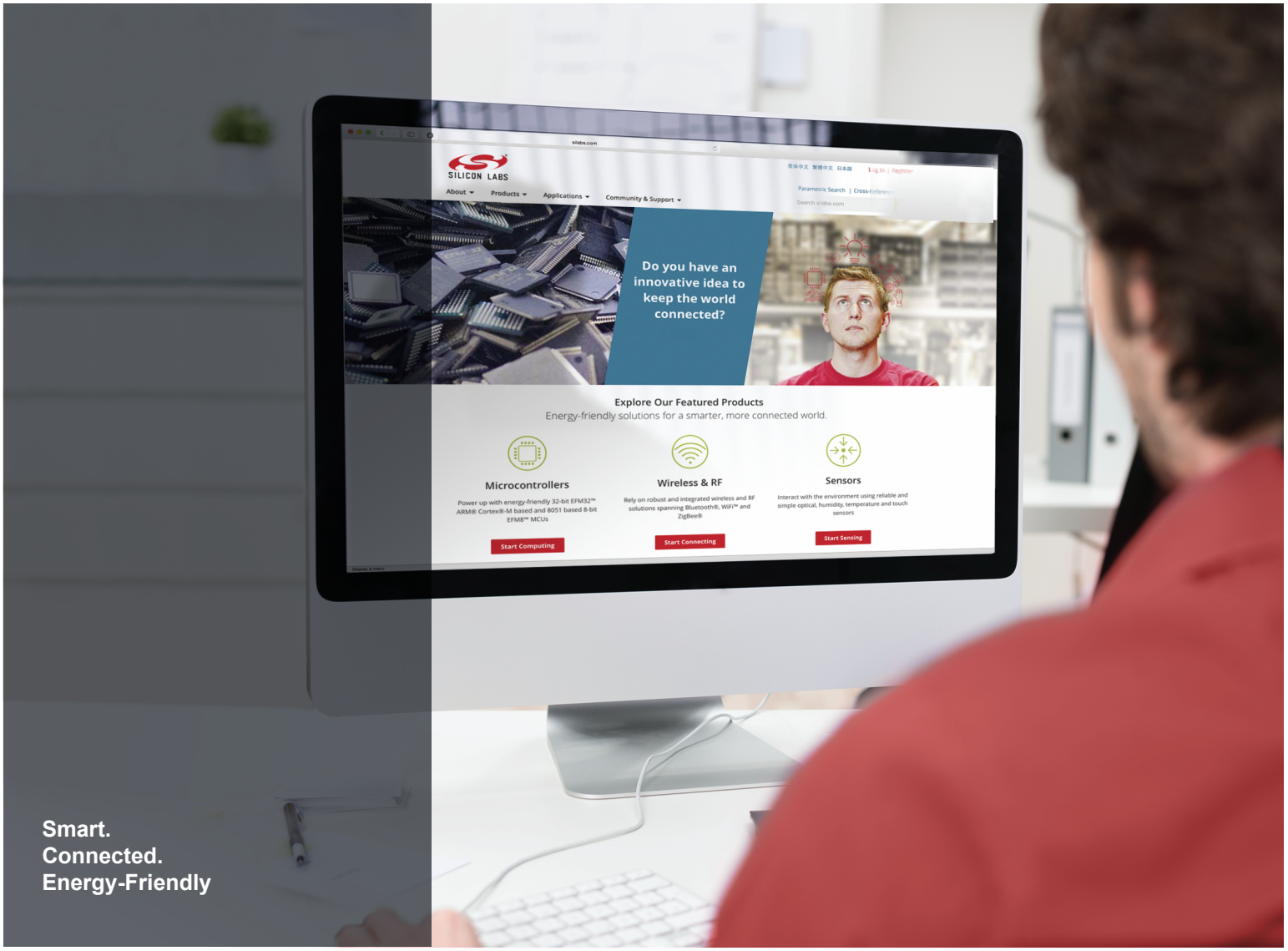
Table 5.1. Radio Board Revision History

Radio Board Revision	Released	Description
A01	01.07.2015	Updated BGM111-A to first release version. Reduced RF performance.
A00	01.06.2015	Pre-production series with early version of BGM111-A. This version does not have full RF performance.

6. Errata

Table 6.1. BRD4300A Radio Board Errata

Radio Board Revision	Problem	Description
A00	Reduced RF range	RF range reduced due to sub-optimal antenna matching on the BGM111-A module.



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