BRD4300A Reference Manual

Blue Gecko BGM111 *Bluetooth*® Module Radio Board Reference Manual

The Blue Gecko family of the Silicon Labs' Bluetooth modules delivers a high-performance, low energy and easy-to-use Bluetooth solution integrated into a small form factor package. Blue Gecko Bluetooth modules combine an integrated antenna, a high performance Bluetooth transceiver, an energy efficient 32-bit MCU and a ready to use Bluetooth 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 radio, result in a solution optimized for battery powered applications.

The Silicon Labs fully certified Bluetooth 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 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
- 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 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 Main-board BRD4001A and together these two boards and the software in the BGM111 Module make up the Blue Gecko Bluetooth Module Wireless Starter Kit.

The BGM111 Bluetooth 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 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.

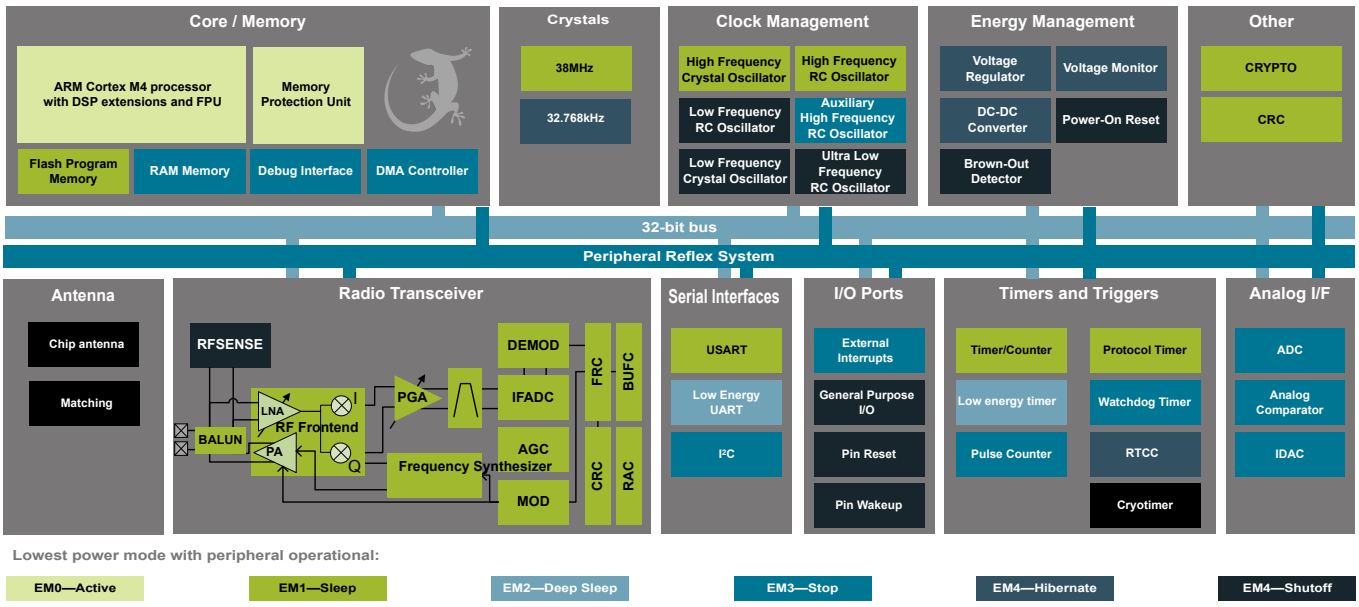


Figure 1.1 Block Diagram

2. System Summary

Integrated Bluetooth radio and energy friendly MCU

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

Low Energy Consumption

- 8.8 mA TX current @ 0 dBm
- 8.7 mA RX current
- 63 µA/MHz in Energy Mode 0 (EM0)
- 1.4 µA EM2 Deep Sleep Current (full RAM retention) and CRYO timer running from ULFRCO
- 1.1 µA EM3 Stop current (State/RAM retention, RFSENSE disabled)
- Wake on Radio with signal strength detection, preamble pattern detection, frame detection and timeout

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 implementing 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
- BGScript development tools
- BGScript and BGLIB example applications

- Profile Toolkit examples
- Documentation

Certifications

- Bluetooth qualified (pending)
- CE, FCC, IC, Japan and South-Korea (pending)

Wide Operating Range

- Supply voltage: 1.85 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

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.

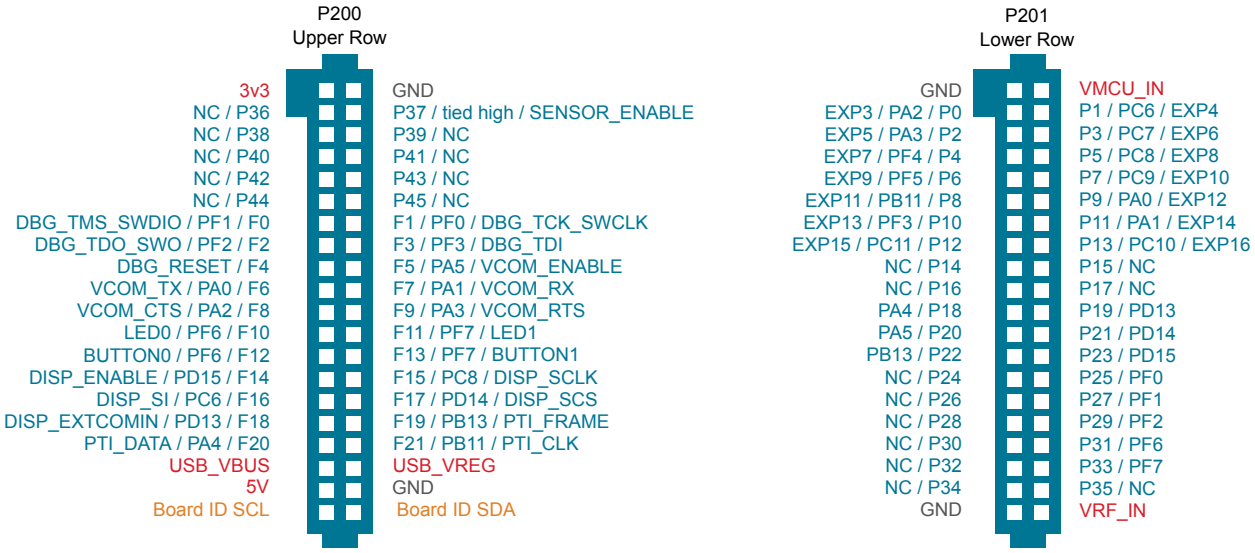


Figure 3.1 Radio Board Connectors

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* Module board is illustrated in the figures below.

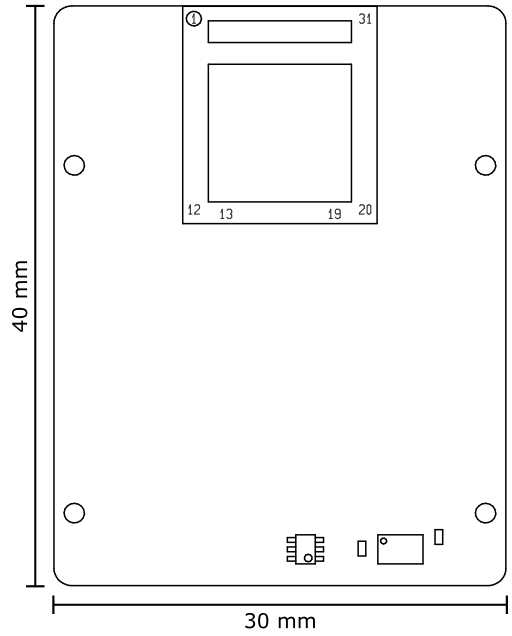


Figure 4.1 BRD4300A Top View

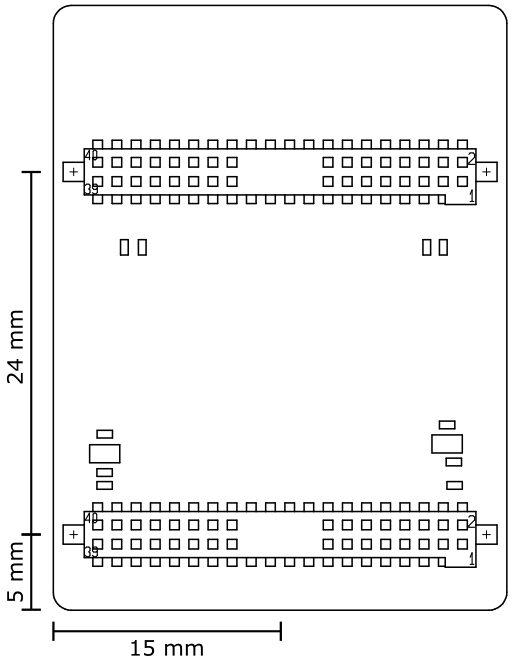


Figure 4.2 BRD4300A Bottom View

5. Board Revision History and Errata

5.1 Revision History

Radio Board revision is printed on the backside of the BRD4300A Radio Board.

Table 5.1. Radio Board Revision History

Radio Board Revision	Released	Description
A02	2016-03-28	BGM111 Initial production. Certifications pending.
A01	2015-07-01	Updated BGM111 to first release version. Reduced RF performance.
A00	2015-06-01	Pre-production series with early version of BGM111. This version does not have full RF performance.

5.2 Errata

Rev. A02

No known errata for this board revision.

Rev. A01

Reduced RF performance.

Rev. A00

RF range reduced due to sub-optimal antenna matching on the BGM111-A module.

6. Document Revision History

Revision 1.10

2016-03-28

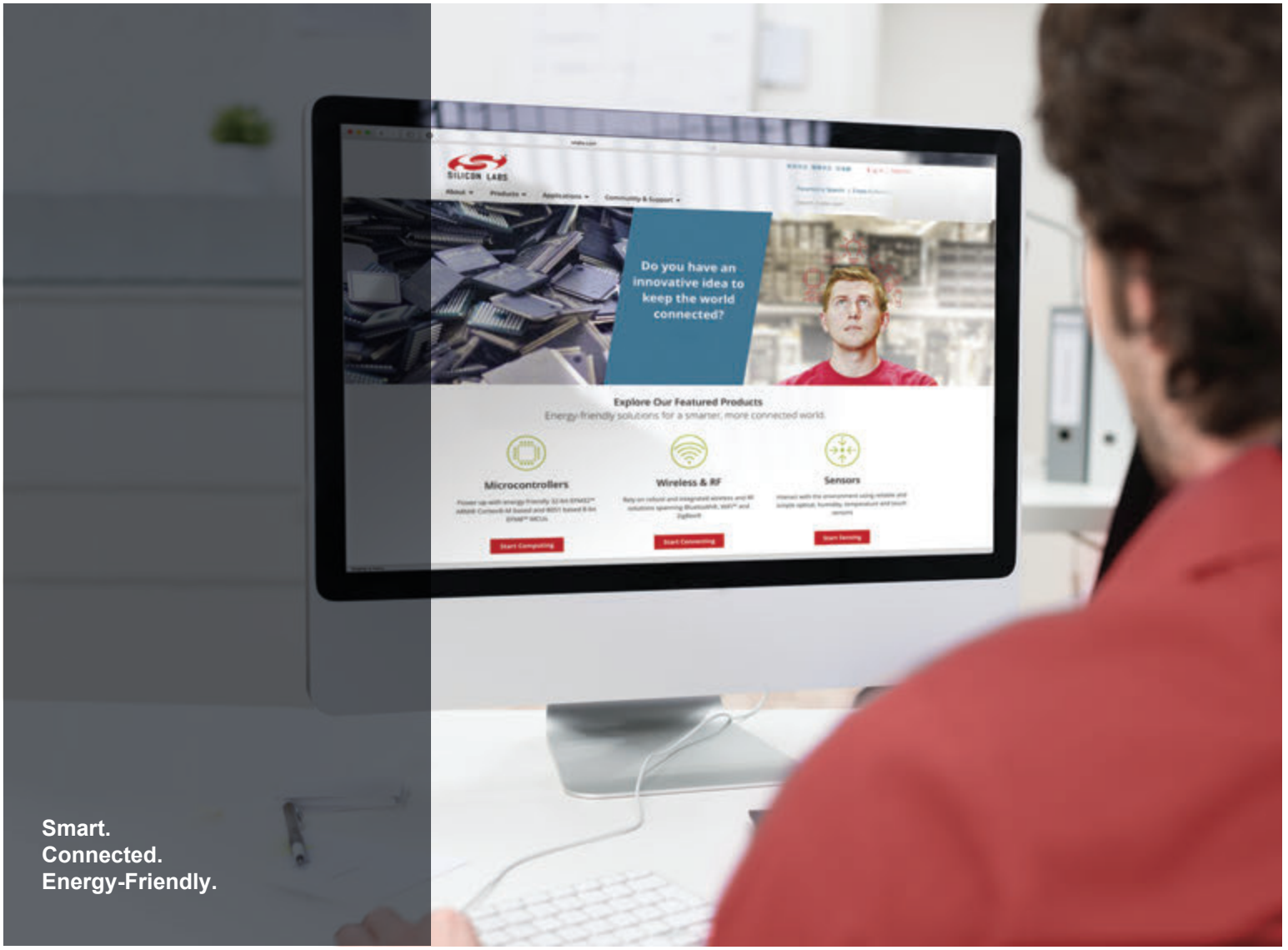
Updated block diagram

Updated system summary

Revision 1.00

2015-07-08

Initial document revision.



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