BGM220P Wireless Gecko Bluetooth Module Data Sheet

The BGM220P is a module designed and built to meet the performance, security, and reliability requirements of battery-powered IoT products running on Bluetooth networks.

Based on the EFR32BG22 SoC, the BGM220P enables Bluetooth® Low Energy connectivity while delivering best-in-class RF range and performance, future-proof capability for feature and OTA firmware updates, enhanced security features, and low energy consumption.

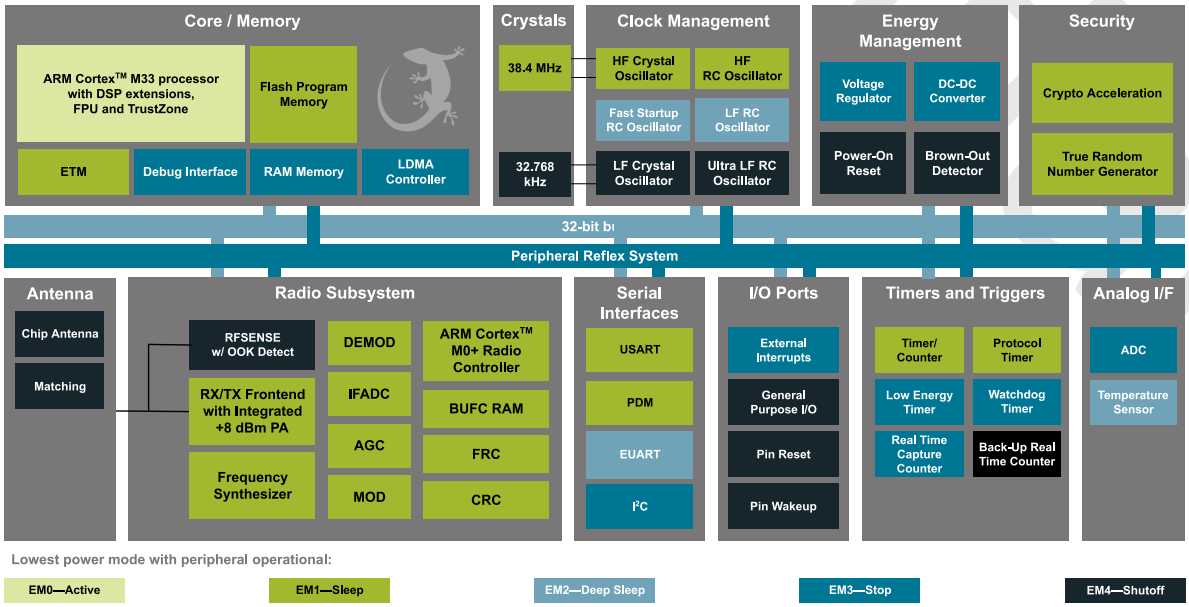
BGM220P modules are a full solution that comes with fully-upgradeable, robust software stacks, world-wide regulatory certifications, advanced development and debugging tools, and support that will minimize and simplify the engineering and development of your end-products helping to accelerate their time-to-market.

The BGM220P is intended for a broad range of applications, including:

- Asset Tags and Beacons
- Sports, Fitness, and Wellness devices
- Portable Medical
- Connected Home
- Industrial and Building Automation
- Bluetooth mesh Low Power Node

KEY FEATURES

- Bluetooth 5.2
- Bluetooth mesh Low Power Node
- Built-in antenna
- Up to 8 dBm TX power
- -98.9 dBm BLE RX sensitivity at 1 Mbps
- 32-bit ARM Cortex-M33 core at up to 76.8 MHz
- 512/32 kB of Flash/RAM memory
- Optimal selection of MCU peripherals
- Up to 25 GPIO pins
- 12.9 mm x 15.0 mm



1. Feature List

- **Supported Protocols**
  - Bluetooth Low Energy (Bluetooth 5.2)
    - Direction finding
    - 1M, 2M and LE Coded PHYs
  - Bluetooth mesh Low Power Node
- **Wireless System-on-Chip**
  - 2.4 GHz radio
  - TX power up to +8 dBm
  - High-performance 32-bit ARM Cortex-M33® with DSP instruction and floating-point unit for efficient signal processing
  - 512 kB flash program memory
  - 32 kB RAM data memory
  - Embedded Trace Macrocell (ETM) for advanced debugging
- **High-Receiver Performance**
  - -106.7 dBm sensitivity (0.1% BER) at 125 kbps GFSK
  - -102.5 dBm sensitivity (0.1% BER) at 500 kbps GFSK
  - -98.9 dBm sensitivity (0.1% BER) at 1 Mbps GFSK
  - -96.2 dBm sensitivity (0.1% BER) at 2 Mbps GFSK
- **Low-Energy Consumption**
  - 4.3 mA RX current at 1 Mbps GFSK
  - 4.8 mA TX current at 0 dBm output power
  - 10.8 mA TX current at 8 dBm output power
  - 26 µA/MHz in Active Mode (EM0)
  - 1.40 µA EM2 DeepSleep current (RTCC running from LFXO, Full RAM retention)
- **Regulatory Certifications**[1]
  - FCC
  - CE
  - IC/ISEDC
  - MIC/TELEC
  - KCC
- **Wide Operating Range**
  - 1.8 to 3.8 V
  - -40 to +105°C
- **Dimensions**
  - 12.9 mm x 15.0 mm x 2.2 mm
- **Security Features**
  - Secure Boot with Root of Trust and Secure Loader (RTSL)
  - Hardware Cryptographic Acceleration for AES128/256, SHA-1, SHA-2 (up to 256-bit), ECC (up to 256-bit), ECDSA, and ECDH
  - True Random Number Generator (TRNG) compliant with NIST SP800-90 and AIS-31
  - ARM® TrustZone®
  - Secure Debug with lock/unlock
- **Wide Selection of MCU Peripherals**
  - 12-bit 1 Msps SAR Analog to Digital Converter (ADC)
  - Up to 25 General Purpose I/O pins with output state retention and asynchronous interrupts
  - 8 Channel DMA Controller
  - 12 Channel Peripheral Reflex System (PRS)
  - 4 × 16-bit Timer/Counter with 3 Compare/Capture/PWM channels
  - 1 × 32-bit Timer/Counter with 3 Compare/Capture/PWM channels
  - 32-bit Real Time Counter
  - 24-bit Low Energy Timer for waveform generation
  - 1 × Watchdog Timer
  - 2 × Universal Synchronous/Asynchronous Receiver/Transmitter (UART/SPI/SmartCard (ISO 7816)/IrDA/I^2S)
  - 1 × Enhanced Universal Asynchronous Receiver/Transmitter (EUART)
  - 2 × I^2C interface with SMBus support
  - Digital microphone interface (PDM)
  - RFSENSE with selective OOK mode

1. Available at the BGM220P Full-Production release.

2. Ordering Information

Table 2.1. Ordering Information

Ordering Code	Protocol Stack	TX Power Rating	Antenna	RF Shield	Flash (kB)	RAM (kB)	LF Clock	GPIO	Temp Range
BGM220PC22HNA2	Bluetooth 5.2 • Direction finding	8 dBm	Built-in	Yes	512	32	Crystal	24	-40 to 105 °C
BGM220PC22WGA2	Bluetooth 5.2	8 dBm	Built-in	Yes	352	32	Precision LFRCO	25	-40 to 85 °C

Note:

1. LE Long Range (125 kbps and 500 kbps) PHYs are only supported on part numbers which include direction-finding capability.
2. End-product manufacturers must verify that the module is configured to meet regulatory limits for each region in accordance with the formal certification test reports.
3. Devices are pre-programmed with BGAPI UART DFU bootloader.
4. Throughout this document, the devices in the table above may be referred to by their product family name (e.g. BGM220P), by model name (BGM220P22A), or by full ordering code.

3.2 EFR32BG22 SoC

The EFR32BG22 SoC features a 32-bit ARM Cortex M33 core, a 2.4 GHz high-performance radio, 512 kB of flash memory, a rich set of MCU peripherals, and various clock management and serial interfacing options. Consult the EFR32xG22 Wireless Gecko Reference Manual and the EFR32BG22 Data Sheet for details.

3.3 Antenna

BGM220P modules include a ceramic chip antenna on board with the characteristics detailed in the table below.

Table 3.1. Antenna Efficiency and Peak Gain

Parameter	With optimal layout	Note
Efficiency	-1 dB	Antenna efficiency, gain and radiation pattern are highly dependent on the application PCB layout and mechanical design. Refer to Design Guidelines for recommendations to achieve optimal antenna performance.
Peak gain	1.86 dBi	

3.4 Power Supply

The BGM220P requires a single nominal supply level of 3.0 V to operate. All necessary decoupling and filtering components are included in the module.

4.16.1 Antenna Radiation and Efficiency

Typical BGM220P radiation patterns and efficiency for the on-board chip antenna under optimal operating conditions are plotted in the figures that follow. Antenna gain and radiation patterns have a strong dependence on the size and shape of the application PCB the module is mounted on, as well as on the proximity of any mechanical design to the antenna.

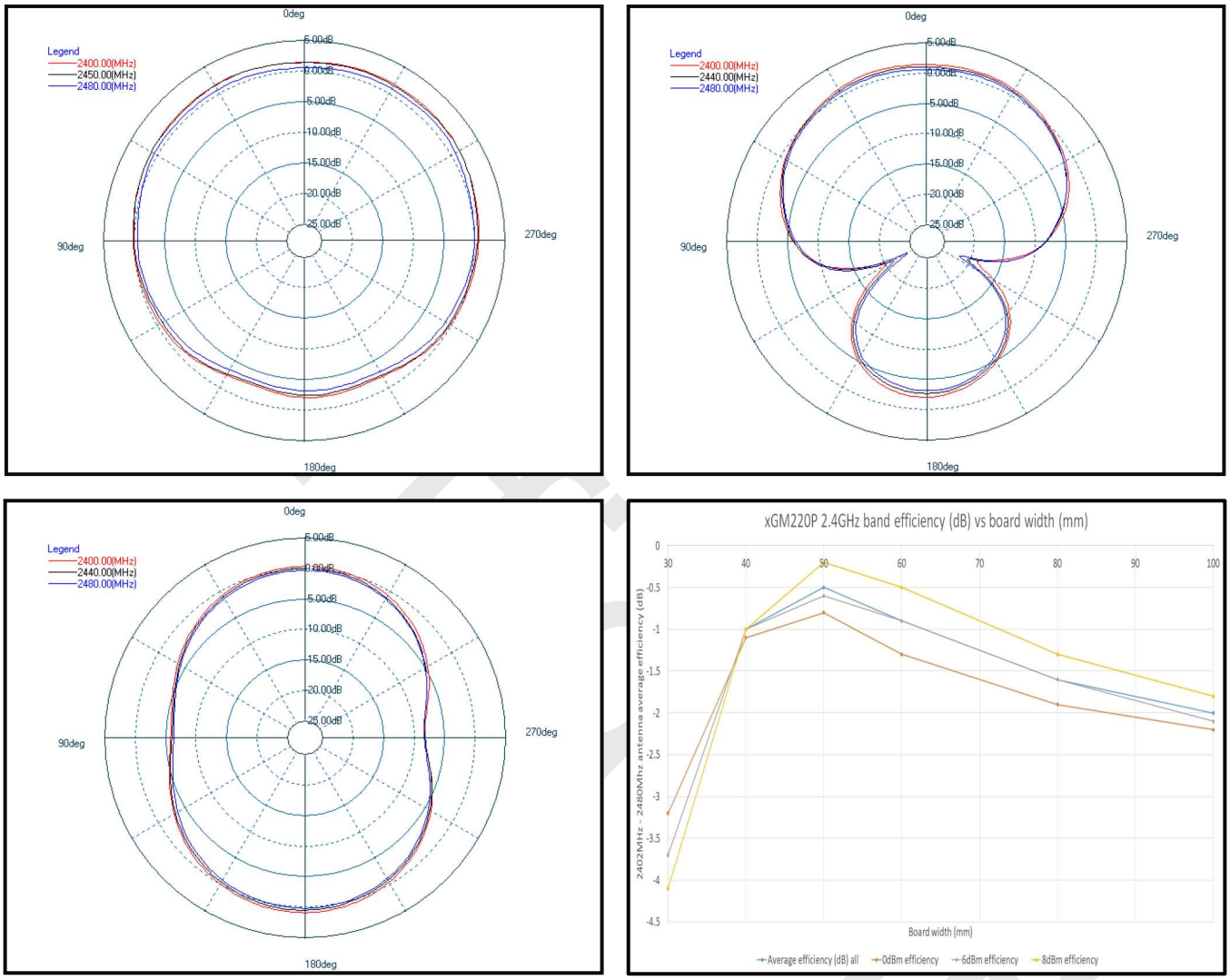


Figure 4.3. Typical 2D Antenna Radiation Patterns and Efficiency

Top Left: Phi 0°, Top Right: Phi 90°, Bottom Left: Theta 90°, Bottom Right: Radiation Efficiency vs Application Board GND Plane Width