BGW211 Low-power WLAN SiP

Complete, single-package 802.11g solution for mobile phones and portable consumer devices

Optimized for use in battery-powered handheld devices, the BGW211 System-in-a-Package (SiP) delivers complete 802.11g functionality with the industry's lowest standby and operating power consumption. It requires no external components and uses only 150 mm^2 of board area for the total 802.11g solution.

Semiconductors

The BGW211 is Philips' third-generation System-in-a-Package (SiP) solution for low-power 802.11 Wireless LAN (WLAN). Supporting complete 802.11g functionality, it enables consumers to access data and multimedia content through WLAN networks up to five times faster than current 802.11b products without compromising battery life.

The BGW211 delivers industry-leading standby and operating power in a package that measures only 150 mm^2 and requires no external components for operation. Extensive support for Quality of Service (QoS) and coexistence with Bluetooth wireless make it robust enough for very demanding portable applications.

The latest SiP technology from Philips allows all of the components needed for a complete 802.11g WLAN subsystem to be contained in a single, low-profile HVQFN package that measures only 10 x 15 x 1.3 mm. The SiP contains the industry's first 90-nm CMOS 802.11g baseband/MAC and a silicon-germanium BiCMOS radio transceiver. Unlike other "one-chip" solutions, which require the use of external receive LNAs, transmit power amplifiers, and/or additional components, the BGW211 SiP requires no external components to meet the range and throughput performance requirements of mobile handsets and network operators.

By providing complete system functionality in a single package, the SiP format delivers quicker design cycles, reduces risk, simplifies manufacturing, and reduces the bill of materials. Also, because the SiP offers fully tested functionality, it lets the customer's development team focus their energy on innovative product design instead of the complex issues related to RF layout.

Key features

- Advanced, single-package WLAN 802.11g optimized for mobile handheld devices
  - No RF-critical design required
  - Low total cost of ownership
- Lowest-power consumption in standby (< 2 mW) and operating modes (PA, RF, baseband/MAC)
- Ultra-small form factor
  - Low-profile 68-pin HVQFN-like SiP package (10 x 15 x 1.3 mm)
  - No external components required
- Ideal mobile architecture
  - No WLAN related processor load in all operating modes
  - Integrated ARM7 controller with associated memories
- Comprehensive QoS
  - All mandatory 802.11e features, plus DLS, Block ACK, APSD
  - Optimized for real-time applications with minimal system power consumption
- Co-exists with Bluetooth®
- Seamless upgrade path from BGW200 802.11b SiP
- Complete software drivers, utilities, and diagnostic tools

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Applications

- Smartphones, cellular phones, VoIP wireless phones
- PDAs, handheld computing devices, WLAN adapter cards (Secure Digital)
- Portable audio/video devices, MP3 players
- Other handhelds and electronic devices for wireless digital, audio, multimedia, and telephony

Industry's lowest power consumption

The BGW211 builds on an established position as the industry's lowest standby power mobile Wi-Fi solution to significantly reduce receive and transmit power during operation. It consumes 30%

less power in 802.11b mode than its BGW200 predecessor and in 802.11g mode provides the lowest system power consumption available while delivering −73 dBm receiver sensitivity at 54 Mbps and 15 dBm transmit output power at the antenna port. Receiver power consumption in 802.11b mode is 300 mW and in 802.11g mode is 400 mW. Transmit power at 15 dBm is 550 mW for 802.11b and 600 mW for 802.11g.

Several features combine to minimize power consumption. There is an integrated ARM7 processor, 1.25 Mbytes of SRAM, 256 Kbytes of ROM, optimized host interfaces (SDIO/SPI), and integrated power management hardware/software algorithms. The result is the lowest
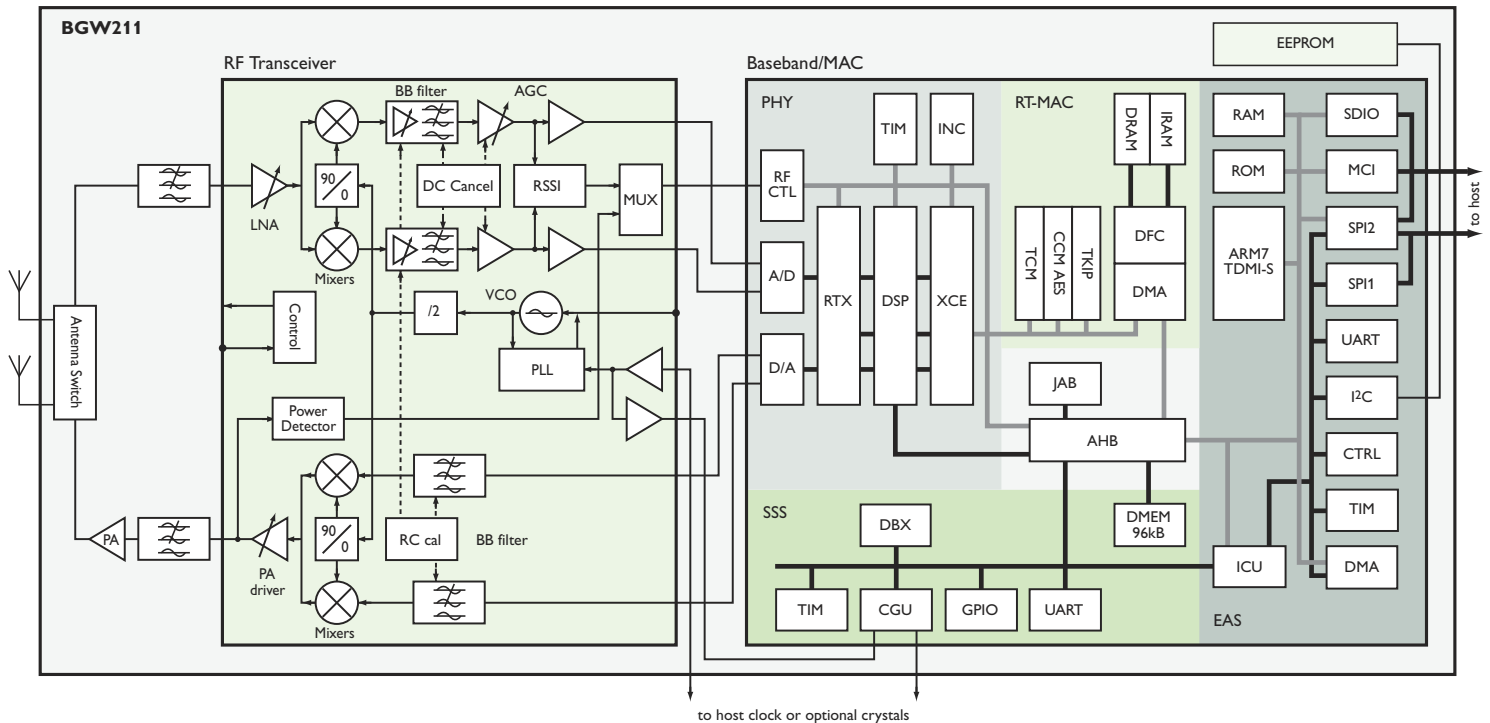
BGW211 functional block diagram

overall standby and operating power consumption in the industry: standby mode operation of the entire system, including the power amplifiers, the radio, and the baseband/MAC typically requires less than 2 mW.

Superior "No Host Load" Architecture

To extend battery life without impacting performance, the BGW211 is designed to place no load on the host processor. The entire IEEE 802.11 protocol stack resides within the BGW211 so that it can independently listen for and process incoming traffic without host processor assistance. In standby mode, the host processor is only activated when a valid data packet arrives – thereby allowing maximum battery life without compromising application performance. A common high-level application programming interface (API) enables rapid software integration and backwards compatibility with the BGW200 for fast time to market. To offload the host processor even further, the MAC protocol runs on the BGW211's integrated ARM7 processor, which uses an instruction prefetch unit to enhance performance. To support new MAC protocol features, the BGW211 is also designed to allow for firmware upgrades.

Advanced RF subsystem

The integrated RF transceiver supports transmit output power control from +8 to +18 dBm at the antenna port, enabling optimal range, throughput, and power consumption. The integrated RF transceiver uses a direct conversion radio architecture that minimizes external components and eliminates the need for an IF filter. For additional component reduction, the integrated PA is internally matched to the ZIF radio. The BGW211 also integrates an Rx/Tx diversity switch, bandpass filter, balun, power supply decoupling, and other passive components.

Comprehensive QoS

The BGW211 offers comprehensive QoS features that enhance performance in real-time applications like VoIP and non-real-time applications like email and web surfing. In addition to supporting all the mandatory elements of 802.11e, the BGW211 also supports optional QoS features like Direct Link Setup (DLS), Block Acknowledgement (ACK), and Automatic Power Save Delivery (APSD). Advanced Link Adaptation techniques optimize QoS for real-time applications and Adaptive Transmit Power control algorithms minimize system power consumption in all modes. A proprietary link adaptation algorithm

ensures selection of the best bit-rate prior to complete loss of link, thereby increasing the overall system throughput.

The BGW211 also offers advanced security features, including 40- and 128-bit WEP, WPA, Cisco CCX, TKIP, and AES.

Bluetooth coexistence

The BGW211 is designed to support collaborative coexistence between 802.11 and Bluetooth. A dedicated software and hardware interface implements Packet Traffic Arbitration (PTA) with voice priority between the BGW211 and the Bluetooth system. An auto shutdown feature ensures that Bluetooth voice takes priority over other signals and there is special support for burst and fragmented frames. Bluetooth 1.2 enhances coexistence further, by adding independent Advanced Frequency Hopping (AFH) capability. The Philips BGB20x family of Bluetooth SiPs coexists seamlessly with the BGW211.

Easy BGW200 upgrade path

The new Philips BGW211 low-power 802.11g SiP is pin- and software-compatible with second-generation Philips BGW200 low-power 802.11b SiP, thereby facilitating an easy migration path for existing customers to design in the higher speed capability in future phones and handheld devices without board-level layout changes. Also, to make the switch even easier, special software modules make the driver upgrade completely transparent.

Reference designs and eval kits

Reference design software drivers support PocketPC™ and Linux™ operating systems. Drivers for other operating systems are in development. The BGW211 is backed by a complete set of software utility and diagnostic tools, and is available in evaluation kits.

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BGW211 specifications

Frequency bands	2.4 to 2.5 GHz
Modulations	DBPSK, DQPSK, CCK (DSSS), OFDM
Data rates	1, 2, 5.5, 11 Mbps 6, 9, 12, 18, 24, 36, 48, 54 Mbps
Receive power	300 mW (802.11b) 400 mW (802.11g)
Transmit power (15 dBm)	550 mW (802.11b) 600 mW (802.11g)
Power consumption for PA, RF, baseband/MAC (typical)	Standby: < 2 mW

BGW211 order information

Description	Size	Part number
Low-power 802.11g SiP	10 x 15 x 1.3 mm	BGW211

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