WaveLAN™ 802.11b Chip Set for Standard Form Factors

WaveLAN Chip Set Features

- Low-cost, highly integrated solution for *IEEE*®
  802.11b wireless LAN (WLAN) client and
  infrastructure products:
    — *WaveLAN* WL60010 MAC (media access
       controller).
    — *WaveLAN* N4080 802.11b baseband controller.
    — *WaveLAN* W4050 2.4 GHz ISM band
       transceiver.

- Full implementation of the MAC protocol specified
  in standards *IEEE* 802.11-1999 and 802.11b.

- *IEEE* 802.11(b) standard data rates: 1 Mbit/s,
  2 Mbits/s, 5.5 Mbits/s, and 11 Mbits/s.

- Support for the following host interfaces:
    — Mini PCI Specification Revision 1.0.
    — CardBus.
    — USB Revision 1.1.
    — 16-bit PC Card per PCMCIA release 7.
    — Compact Flash (CF+).

- Internal encryption engine executes *IEEE* 802.11
  WEP (wired equivalent privacy).

- Support for the WPA (*Wi-Fi*™ protected access)
  enhanced security standard:
    — Subset of the draft *IEEE* 802.11i standard.

- *IEEE* 802.11d World Card support with passive
  scanning capability.

- Low power consumption for extended battery life.

- Firmware-based architecture offers complete
  flexibility and quick addition of new features.

- Support for Microsoft *Windows*®*, Linux*®*,* and
  VxWorks® operating systems:
    — *Windows XP*™ Professional and Home Editions.
    — *Windows* 2000.
    — *Windows ME*®.
    — *Windows* CE family.

- 3.0 V to 3.6 V supply.

- Supports *IEEE* 1149.1 boundary scan.

- *WaveLAN* WL60010: 196-pin FSBGA.

- *WaveLAN* N4080: 100-pin TQFP.

- *WaveLAN* W4050: 48-pin TQFP.

WaveLAN 802.11b Reference Designs

- Mini PCI Type 3A

- Mini PCI Type 3B

- PC Card Type II Extended, client version

- PC Card Type II Extended, with external antenna
  connector, client version

- PC Card Type II Extended, access point version

- Compact Flash (CF+) Type II Extended

- USB 1.1

Additional Applications

The *WaveLAN* reference designs represent a portion of the target applications that can be supported by the *WaveLAN* 802.11b chip set. In addition to the reference designs described above, the *WaveLAN* 802.11b chip set can also be used in the following applications:

- CardBus 802.11b WLAN adapter for mobile PCs and embedded applications.

- Compact Flash (CF+) Type I Extended WLAN card for portable applications such as PDAs.

- Communications and Networking Riser (CNR) WLAN card for desktop PCs.

- Advanced Communications Riser (ACR) WLAN card for desktop PCs.

- Multifunction designs, such as a Mini PCI 802.11b adapter with V.90/V.92 modem support.

- Embedded designs that can accept a standard form factor such as PC Card, CardBus, or mini PCI which include:
    — Access points.
    — Residential gateways.
    — Print servers.
    — Broadband routers.

Embedded Designs with the *WaveLAN* WL1141

For embedded designs with chip-down requirements, Agere Systems offers an innovative solution based on the *WaveLAN* WL60010 MAC and the *WaveLAN* 802.11b PHY. The *WaveLAN* 802.11b PHY addresses the complexity of embedded applications by placing the baseband and radio subsystem and all supporting components on a single, fully tested, calibrated, and regulatory standards compliant module. When mated with the *WaveLAN* WL60010 and recommended single-antenna or diversity-antenna pairs, this innovative approach reduces time to market, board-layout complexity, and factory test time. The *WaveLAN* WL1141 PHY is ideally suited for cost-sensitive, chip-down, embedded applications.

Please refer to the *WaveLAN* WL1141 product brief and *WaveLAN* WL1141 data sheet, document numbers PB03-003WCNC-2 and DS02-320WCNC, for additional information.

WaveLAN Product Family

The Agere Systems *WaveLAN* product family consists of low-cost, high-performance chip sets, PHY modules, and reference designs optimized for client (STA), access point (AP), and embedded *Wi-Fi* applications. The *WaveLAN* product family will continue to evolve to meet the growing need for *Wi-Fi* products tailored to specific applications and will continue to evolve as additional standards are deployed.

WaveLAN 802.11b Chip Set Description

The Agere Systems *WaveLAN* 802.11b chip set is a highly integrated, low-cost solution for *IEEE* 802.11b wireless LAN (WLAN) client and infrastructure products based on standard form factors. The chip set has been specifically designed to increase the proliferation of *Wi-Fi* technology into various applications segments. The *WaveLAN* 802.11b chip set leverages the strengths and proven performance of the deployed Agere *WaveLAN* N4080/W4050 802.11b baseband/radio subsystem (i.e., PHY) and introduces a highly integrated WLAN MAC with a rich set of features aimed at varied, cost-sensitive applications. The *WaveLAN* 802.11b chip set comprises the following devices:

- Agere Systems *WaveLAN* WL60010 MAC.

- Agere Systems *WaveLAN* N4080 baseband controller.

- Agere Systems *WaveLAN* W4050 2.4 GHz ISM band transceiver.

WaveLAN 802.11b Chip Set Description (continued)

Standard Form Factor Architecture
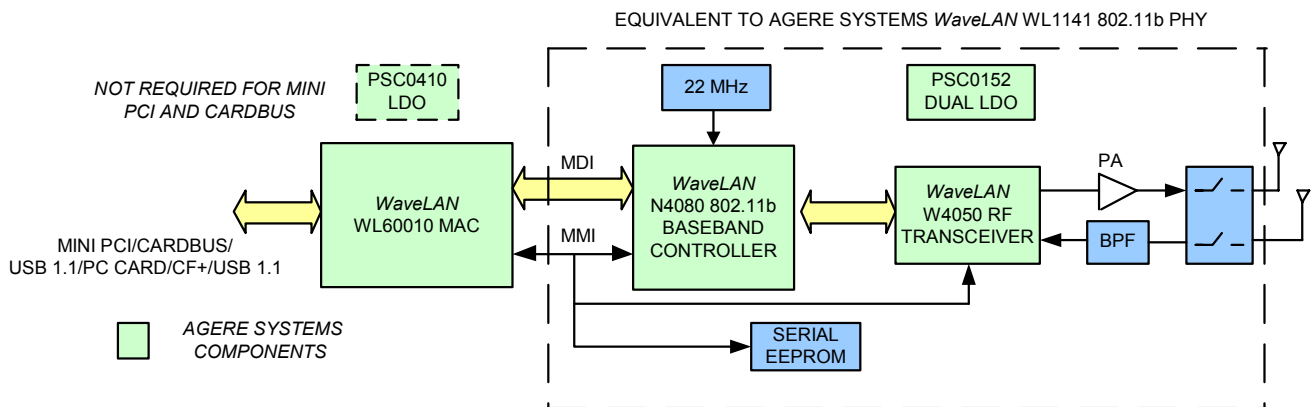
Figure 1. Mini PCI/CardBus/PC Card/CF+/USB 1.1 Client Form Factor Block Diagram

The block diagram in Figure 1 represents the client version of a standard form factor (i.e., Mini PCI, PC Card, CardBus, CF+, or USB). The core functionality of the systems is provided by the *WaveLAN* 802.11b chip set based on the *WaveLAN* WL60010 WLAN MAC, the *WaveLAN* N4080 802.11b baseband controller, and the *WaveLAN* W4050 RF transceiver. The diagram shown above illustrates an internal diversity-antenna-based design, but a design with an external diversity antenna can also be easily supported. In adding to the *WaveLAN* 802.11b chip set, Agere has a family of low-cost LDOs ideally suited for *Wi-Fi* applications. The Agere PSC0152 dual LDO is required for all of the standard form factor designs, and the PSC0410 LDO is only required for systems that only provide 5 V at the mating connector or older systems with 5 V only support (i.e., USB 1.1 and PC Card). The serial EEPROM is used to store the following parameters:

- Radio calibration data.

- Production attributes including MAC address, serial number, and production number.

- Configuration information space (CIS) for PC Card, CardBus, and PCI configuration space parameters.

- USB 1.1 configuration parameters.

A 22 MHz clock oscillator is connected to the *WaveLAN* N4080. The *WaveLAN* WL60010 WLAN MAC can drive two LEDs that indicate the association or power state and the network activity. In addition, a cost-effective power amplifier design, based on discrete components and optimized for power and performance, has been developed for use with the *WaveLAN* 802.11b chip set.

The block diagram in Figure 2 represents the AP version of a standard form factor (e.g., Mini PCI, PC Card, CardBus) that can be used in an AP with modular capability (i.e., support for a standard form factor). The functionality is the same as above with the following additions. An additional external SRAM is required to increase the size of the 802.11b packet storage buffer. The firmware for the *WaveLAN* 802.11b chip set is stored in system nonvolatile memory and then downloaded via the host interface (i.e., Mini PCI, CardBus, or PC Card). The area highlighted with the dotted line represents the equivalent functionality provided by the *WaveLAN* 802.11b PHY.

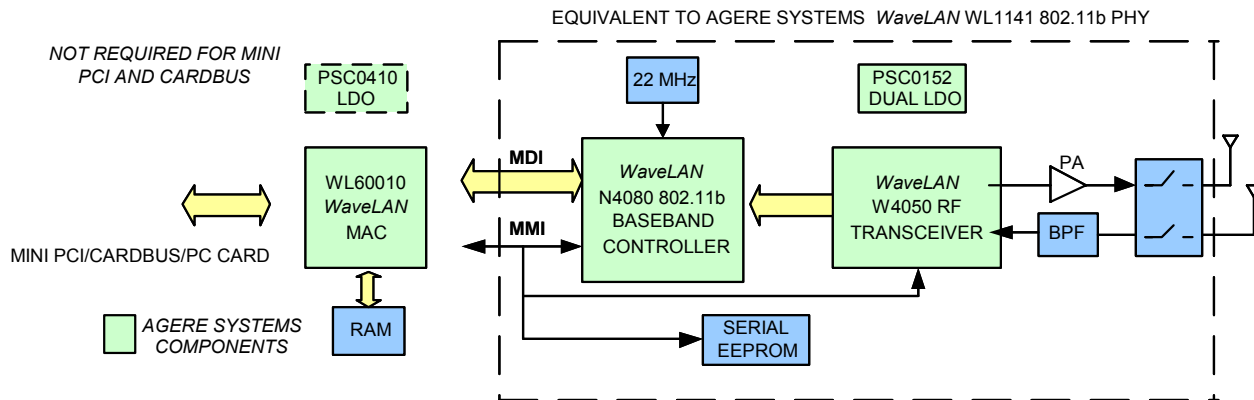## *WaveLAN* 802.11b Chip Set Description (continued)

EQUIVALENT TO AGERE SYSTEMS *WaveLAN* WL1141 802.11b PHY

Figure 2. Standard Form Factor in Access Point Configuration Block Diagram

Wave*LAN* Chip Set: Firmware Overview

The *WaveLAN* chip set supports a firmware-based architecture for complete flexibility with respect to the addition and implementation of new features. For example, in the *WaveLAN* client products, the firmware is downloaded by the driver into the on-chip RAM of the *WaveLAN* WL60010, eliminating the need for an external ROM or flash memory. Optionally, a local ROM or Flash memory can be used for code storage. A separate utility is no longer required to update the firmware in the case of standard PC form factors.

The existing *WaveLAN* firmware implements the full *IEEE* 802.11b Wireless LAN MAC protocol including the following features:

- Support for WEP 64-bit encryption.
- Support for RC4 128-bit encryption.
- 802.11b compliant power management and enhanced power management.
- Support for 802.11 compliant BSS and IBSS networks.
- Support for 802.11 compliant AP functions.
- Support for 802.1x.
- Fallback rate algorithm that sets the optimum transmission rate based on actual signal to noise ratio and packet loss information.
- Support for seamless roaming between access points.
- Support for WPA.
- Support for 802.11d passive scanning.
- Support for RTS/CTS.
- Support for packet fragmentation and defragmentation.
- Support for automatic beacon monitoring.

Additional firmware functions specific to access point applications are also available for the *WaveLAN* chip set.

Performance

The performance of the *WaveLAN* reference designs is shown in Table 1 (15 dBm typical transmit output power).

Table 1. Performance Data

Data Rate	Sensitivity	Estimated Range (Open Office)	Estimated Range (Open Field)
11 Mbits/s	–84 dBm	55 m	160 m
5.5 Mbits/s	–87 dBm	70 m	270 m
2 Mbits/s	–90 dBm	85 m	400 m
1 Mbit/s	–93 dBm	105 m	550 m

Operating Frequencies

U.S./Canada	2.412 MHz—2.462 MHz FCC & IC (11 channels)
Europe	2.412 MHz—2.472 MHz (13 channels)
Japan	2.412 MHz—2.472 MHz and 2.484 MHz (14 channels)

Supported Operating Systems

Drivers are supplied for the following operating systems:

- *Windows XP*. The NDIS 5.1 driver is used. *XP* zero configuration is used to install and configure the card for use. *Windows XP IEEE* 802.1x MD5 and TLS are supported.
- *Windows* 2000. The NDIS 5 miniport driver is used.
- *Windows ME*. The NDIS 5 miniport driver is used.
- *Windows* 98 and *Windows* 98SE. The NDIS miniport driver is used.
- *Windows* CE family.
- *Linux:* The driver sources and a support library are supplied.
- *VxWorks.*

Reference Design Support

Agere Systems will provide comprehensive, mass-production-ready *WaveLAN* 802.11b design kits that will provide an ODM or OEM with the necessary collateral to quickly deploy a standard form factor for quick time to market or develop a derivative product based on the *WaveLAN* 802.11b reference designs. These reference designs are *Wi-Fi* certified and meet the regulatory requirements of the major standards bodies including the U.S./Canada, Europe, and Japan. The reference design kits are a complete solution that includes the following:

- Standard form factor reference design sample

- Design guidelines

- Schematic diagrams

- Gerber files

- Bills of material

- Radio calibration procedures

- Manufacturing test guidelines

- EEPROM configuration tools

- WHQL'd driver

In addition, Agere has worldwide, dedicated, local field applications engineers to provide timely support for the *WaveLAN* 802.11b chip set.

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