



Operational Description

Broadcom Wireless LAN mini-PCI Card, model BCM94306MP, for use in Dell PP05L, PP02X and PP07L Laptops Models

Overview

The above listed laptops include the Broadcom Wireless LAN mini-PCI card, model BCM94306MP, which is a type IIIA¹ mini-PCI card, compliant with IEEE Std 802.11(b) – 1999 and draft IEEE Std 802.11g - 2002. This device operates in the 2.4GHz unlicensed Industrial, Scientific and Medical band and used Direct Sequence Spread Spectrum and OFDM communication techniques. BCM94306MP provides wireless data communications at rates of up to 54Mbps, depending on the coding techniques employed and the range of the system.

Maximum power output is limited to less than 100mW or 20dBm (average at the connector) in the frequency range 2400 to 2483.5MHz. In some countries power and available bandwidth may be further reduced to meet regulatory requirements.

Functional Description

The BCM94306MP is based on Broadcom's two chip CMOS based 802.11b/g solution, namely the BCM4306 Baseband/MAC & System Interface and the BCM2050 Radio chipsets.

The BCM2050 zero IF Radio is an integrated transceiver device that has been optimized for use in 2.4-GHz wireless systems. It has been designed to provide low-power, low-cost, and robust communications for applications operating in the globally available 2.4-GHz unlicensed ISM band. It is fully compliant with the 802.11b and draft 802.11g specifications and meets or exceeds the requirements where appropriate to provide the highest communication link quality of service.

The BCM2050 features a simple, innovative shared LO architecture that allows a high-performance radio implementation in a single CMOS chip. A proprietary PLL design generates quadrature LO signals in the 2.4-GHz band for both the transmitter and receiver. The PLL is locked to a 12-MHz free running crystal oscillator. A proprietary self-calibrating VCO is fully integrated frequency agile LO, ensures the lowest phase noise performance and covers the full 2.4-GHz ISM band.

The receiver front end consists a low noise amplifier, a single side band mixer and on-chip low pass filter, which provide good performance without a costly external IF band pass filter. Because the entire receive channel is one chip, all sensitive components are eliminated from the board design and this leads to the most robust and noise-immune design, optimal for integration in laptop computers and embedded applications.

The internal lowpass filter structure also features DC cancellation loop and self-calibration circuitry, which automatically adjusts circuit elements to compensate for any process variation. This eliminates tuning and ensures that the devices are uniform across process variation and temperature. An RSSI signal is also generated in these amplifiers for the system to determine signal strength. The output is a stable I/Q output for direct interface to the BCM430X series of baseband/MAC components.

¹ Mini PCI Specification, Revision 2.2 : 2000 refers.

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The transmit signal is input through the I/Q input from the baseband. It is then filtered and upconverted to RF using the quadrature LO signals. The signal is then boosted to a minimum 1-mW output power level by an internal power amplifier. The output signal is optimized to enable easy integration with widely available power amplifiers and minimizes the linearity requirements for these devices. Output power control is digitally programmable from full power to low power in 4-dB steps.

The BCM2050 is controlled directly from the baseband and MAC through a fully digital control interface. This interface provides control for the various sections of the chip, defines data transfers and allows access to the various internal registers of the device.

The BCM2050 is in a 64-pin LPCC package.

The BCM4306 provides IEEE 802.11b/g MAC and baseband functions and interfaces to the BCM2050 to provide wireless LAN connectivity supporting data rates from 1 Mbps to 54Mbps. Broadcom's direct conversion architecture virtually eliminates the additional external components typically required for 802.11b/g implementations, resulting in significant cost, power, and footprint savings. Additionally, industry-standardized WEP and WEP2 encryption coupled with IEEE 802.1x support is provided to ensure the security of transmitted data.

Product Features

- WHQL certifies drivers for Windows XP, Windows Millennium Edition, Windows 2000, and Windows 98SE.
- Meets PCI power management interface v1.1 (ACPI)
- IEEE 802.11b/g compliant MAC and baseband
- WECA Wi-Fi November 2001 compliant
- 24-bit IV and 40-bit key WEP encryption support
- 24-bit IV and 104-bit key WEP encryption support
- 128-bit IV and 128-bit key WEP2 encryption support
- Software support for 128-bit OCB mode AES
- IEEE 802.1x and LEAP support

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Specifications

Power Consumption:

Voltage 3.3Vdc @ 225mA

Environmental:

Operating Temperature 0 to 85°C
Relative Humidity 10 to 90% (non-condensing)

Physical:

Height 3.4mm
Width 59.75mm
Depth 50.95mm
Weight 0.014Kg

Transmission/Reception

Frequencies:

Channels 1-11 2412 – 2462MHz
Channel carrier frequencies (MHz) 2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462

Transmission Power:

Nominal <20dBm (average at antenna connector)

Receive Sensitivity:

| Nominal @ 25°C | Data rate | Sensitivity |
|----------------|-----------|-------------|
| | 54Mbits/s | -69 |
| 48 | | -72 |
| 36 | | -77 |
| 24 | | -81 |
| 18 | | -85 |
| 12 | | -87 |
| 11 | | -85 |
| 9 | | -88 |
| 6 | | -88 |
| 5.5 | | -88 |
| 2 | | -90 |
| 1 | | -92 |

Data Transmission Rates

802.11b:

11 and 5.5 Mbit/s

2 Mbit/s

1 Mbit/s

8-chip complementary code keying (CCK)

11-chip differential quadrature phase shift keying (DQPSK)

11-chip differential binary phase shift keying (DBPSK)

Data Transmission Rates

802.11g:

54,48,36,24,18,12,9 & 6Mbits/s

Orthogonal Frequency Division Multiplexing (OFDM)

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Antenna model:

In Dell PP05L: Wistron NeWeb CA5-Q, peak gain = 2.26dBi or
Hitachi HFT01-DL01, peak gain = 1.2dBi

In Dell PP02X: Hitachi HFT04-DL01, peak gain = 1.1dBi
Wistron NeWeb CA9-C, peak gain = 2.39dBi

In Dell PP07L: Wistron NeWeb CAA-C, peak gain = 2.55dBi
Phycomp 4313 334 01250 & 4313 334 02250 = 2.2dBi