



Technical Description

Broadcom Wireless LAN mini-PCI Card, Model BCM94301MP

Overview

The Broadcom Wireless LAN mini-PCI card, model BCM94301MP is a type IIIA¹ mini-PCI card, compliant with IEEE Std 802.11(b) – 1999. This device operates in the 2.4GHz unlicensed Industrial, Scientific and Medical band and uses Direct Sequence Spread Spectrum communication techniques. BCM94301MP provides wireless data communications at rates of up to 11, 5.5, 2 and 1Mbps, depending on the coding techniques employed and the range of the system.

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

At maximum power, the range of communication is up to 100 meters

Functional Description

The BCM94301MP is based on Broadcom's two chip CMOS based 802.11b solution, namely the BCM4301 Baseband/MAC & System Interface and the BCM2051 IEEE 802.11b Radio chipsets, plus the SiGe SE2520L power amplifier.

The BCM2051 802.11b zero IF Radio is an integrated transceiver device that has been optimized for use in 2.4-GHz 802.11b 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 specification and meets or exceeds the requirements where appropriate to provide the highest communication link quality of service.

The BCM2051 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 of 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.

¹ Mini PCI Specification, Revision 2.2 : 2000 refers.

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An overall noise figure of 6 dB is achieved along with 85-dB gain which can achieve -84-dBm sensitivity for 11-Mbps CCK modulation.

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.

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 BCM2051 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 BCM2051 is in a 64-pin LPCC package.

The BCM4301 provides IEEE 802.11b MAC and baseband functions and interfaces to the BCM2051 to provide wireless LAN connectivity supporting data rates from 1 Mbps to 11 Mbps. Broadcom's direct conversion architecture virtually eliminates the additional external components typically required for 802.11b 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.

Capable of operating at a duty cycle of 100 percent, the SE2520L delivers up to +20dBm of linear output power at a typical power consumption level of 110mA. Its silicon germanium structure, combined with an exposed-die package soldered to the system PCB, provides high thermal conductivity and, as a result, a low junction temperature.

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 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 @ 275mA

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 1-13 2400 – 2483.5MHz
Channel 14 2471 – 2497MHz

Channel bandwidth 22 MHz
Channel carrier frequencies (MHz) 2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462, 2467, 2472 and 2484

Transmission Power:

Nominal +15dBm at antenna connector

Receive Sensitivity:

Nominal @ 25°C -92, -90, -88 and -85dBm @ 1, 2, 5.5 & 11Mbit/s respectively

Data Transmission Rates:

11 and 5.5 Mbit/s 8-chip complementary code keying (CCK)
2 Mbit/s 11-chip differential quadrature phase shift keying (DQPSK)
1 Mbit/s 11-chip differential binary phase shift keying (DBPSK)

Antenna (highest gain):

Type: Foxconn FX-01L03-P1
Maximum Gain (at 2400-2500MHz): +3.0dBi