



Technical Description

Broadcom 802.11g Wireless LAN PCI-E Mini Card Model BCM94312HMG

Overview

The Broadcom BCM94312HMG is a PCI-E Half-minicard form factor Wireless LAN module that is compliant with IEEE Std 802.11(b) – 1999 and IEEE Std 802.11(g) - 2002. This device operates in the 2.4GHz unlicensed Industrial, Scientific and Medical band and uses Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency Division Multiplexing (OFDM) communication techniques. BCM94312HMG provides wireless data communications at rates of up to 54Mbps, depending on the coding techniques employed and the range of the system.

The average power in packet is limited to less than 100mW or 20dBm (average) 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 BCM94312HMG is based on Broadcom's integrated 802.11b/g solution, namely the BCM4312 chipset.

The BCM4312 is an integrated transceiver device that has been optimized for use in 2.4GHz wireless systems. It has been designed to provide low-power, low-cost, and robust communications for applications operating in the globally available 2.4GHz unlicensed ISM band. It is fully compliant with the 802.11b and 802.11g specifications and meets or exceeds the requirements where appropriate to provide the highest communication link quality of service.

This integrated radio 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 2.4GHz band for both the transmitter and receiver. The PLL is locked to a 20-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 2.4GHz ISM band.

The receiver consists of a full integrated front end module, 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 BCM4312 series of baseband/MAC components.

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The transmit signal is input through the I/Q input from the baseband. It is then filtered and up-converted 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 integrated radio 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 integrated radio is in a 64-pin LPCC package.

The BCM4312 provides IEEE 802.11b/g 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 VISTA, 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:	3.3Vdc @ 225mA																										
Environmental:																											
Operating Temperature	0 to 70°C																										
Relative Humidity	10 to 90% (non-condensing)																										
Physical:																											
Height	3mm																										
Width x Depth	26.8mm x 30mm																										
Weight	0.010Kg																										
Transmission/Reception Frequencies:																											
Channels 1-13	2400 – 2483.5MHz																										
Channel 14 (Japan)	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 (OFDM rates)	+19dBm at antenna connector																										
Nominal (CCK rates)	+19dBm at antenna connector																										
Receive Sensitivity:																											
Nominal @ 25°C	<table><thead><tr><th>Data rate (Mbps)</th><th>Sensitivity (dBm)</th></tr></thead><tbody><tr><td>54</td><td>-73</td></tr><tr><td>48</td><td>-75</td></tr><tr><td>36</td><td>-80</td></tr><tr><td>24</td><td>-83</td></tr><tr><td>18</td><td>-86</td></tr><tr><td>12</td><td>-89</td></tr><tr><td>11</td><td>-88</td></tr><tr><td>9</td><td>-89</td></tr><tr><td>6</td><td>-90</td></tr><tr><td>5.5</td><td>-91</td></tr><tr><td>2</td><td>-93</td></tr><tr><td>1</td><td>-96</td></tr></tbody></table>	Data rate (Mbps)	Sensitivity (dBm)	54	-73	48	-75	36	-80	24	-83	18	-86	12	-89	11	-88	9	-89	6	-90	5.5	-91	2	-93	1	-96
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Data Transmission Rates 802.11b:																											
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)																										
Data Transmission Rates 802.11g:																											
54,48,36,24,18,12,9 & 6Mbits/s	Orthogonal Frequency Division Multiplexing (OFDM)																										
Antenna (highest gain):																											
Type:	Integral to host																										
Maximum Gain (at 2400-2500MHz):	3.9dBi																										