Intel® PRO/Wireless 3945a/b/g Network Connection Mini PCI Express WLAN Adapter

Functional Overview

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Introduction

The primary purpose of this document is to communicate the Intel® PRO/Wireless 3945a/b/g Network Connection features and specifications. The Intel® PRO/Wireless 3945a/b/g Network Connection is Intel's third generation of wireless Local Access Network (LAN) products supporting the 802.11a,b,g IEEE specifications.

This document defines the functional characteristics of the Intel® PRO/Wireless 3945a/b/g Network Connection Mobile Unit (MU). It is intended to inform PC OEM customers of the technical characteristics and assist in the evaluation of this product. This adapter is based upon the Intel 82534 chipset for 802.11a,b,g.

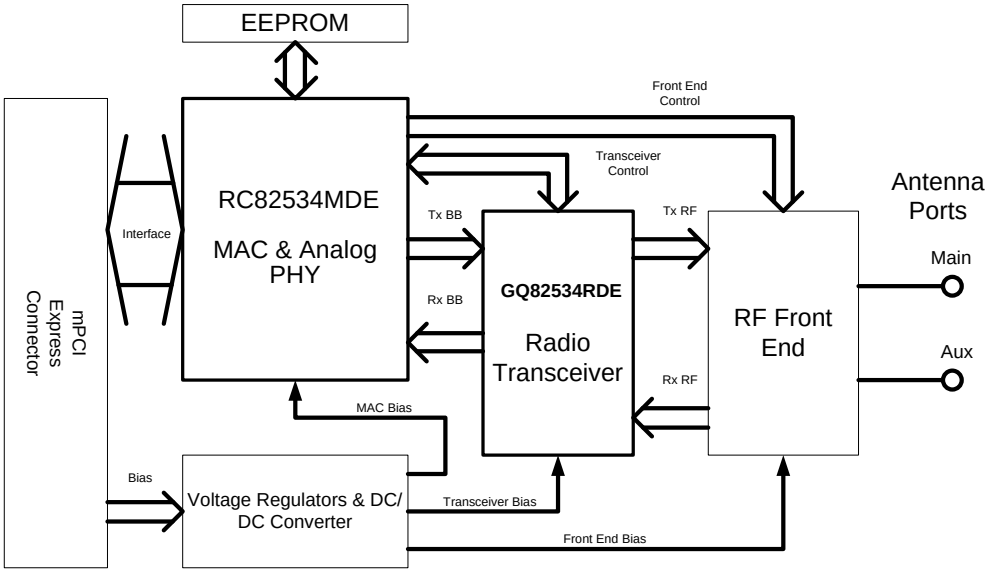
Intel® PRO/Wireless 3945a/b/g Network Connection Product Overview

The Intel® PRO/Wireless 3945a/b/g Network Connection transfers data at fast wireless speeds (up to 54Mbps instantaneous data rate) over the air between two or more users or between a user and the wired network. The Intel® PRO/Wireless 3945a/b/g Network Connection communicates to the wired LAN through 802.11a,b,g compatible Access Points (APs). The Intel® PRO/Wireless 3945a/b/g Network Connection supports the Mini PCI Express form factor which is designed for notebook computer systems where overall thickness must be kept to an absolute minimum. The Intel® PRO/Wireless 3945a/b/g Network Connection is 802.11a,b,g compliant, PCI **2.x**, ACPI 2.0, WHQL compliant, and WiFi certified**.

**Pending WiFi certification.

System Architecture

The dual-band 2.4/5.2 GHz 802.11a,b,g Wireless LAN Mini PCI Express card is a single PCB design using Intel's 825xx 802.11a,b,g Wireless LAN chipset. The solution consists of two main IC's RC82534MDE and GQ82534RDE. The RC82534MDE IC provides the processor, the OFDM and CCK modulation/demodulation and digital control for the radio. GQ82534RDE provides the RF to Baseband conversion In addition to these chips, the RF front-end consists of additional components such as antenna connectors, diversity/transmit/receive switch, bandpass filters, baluns, power amplifier (PA), and low-noise amplifier (LNA). Intel® PRO/Wireless 3945a/b/g Network Connection supports mPCI Express interface and consists of high speed serial data as well as SMBus control signals.



Component Descriptions

GQ82534RDE Radio Transceiver

The GQ82534RDE is a single IC radio transceiver designed for Dual Band wireless LAN applications. It acts as a slave to the physical layer (PHY) and media access control (MAC) components in RC82534MDE for all 802.11a,b,g modes. The transmitter combines baseband in-phase (I) and quadrature (Q) signals, up-converts them to the desired frequency channel, and drives the RF signal off-chip through the integrated Front End Module power amplifier. The GQ82534RDE is a direct conversion radio architecture and combines a low-noise automatic gain control (AGC), receive and transmit filters, and input/output buffers into a single IC.

Frequency stability: The 40MHz clock has a maximum of 20ppm. It is multiplied up to generate the transmit signal. Hence when operating in the b/g band at 2.412GHz we will have an error of 2.412GHz*20ppm when tuned to the lower channel and at the extreme it will be 2.484GHz * 20ppm when tuned to the upper channel. When operating in the a band it has an error of the frequency of operation*20 ppm.

RC82534MDE MAC and Baseband Processor

The RC82534MDE chip incorporates media access control (MAC) logic, baseband processing functions, and an mPCI Express host interface, as well as analog-to-digital and digital-to-analog converters (ADC and DAC). This fully integrated digital processor eliminates the need for external RAM and flash memory.

The RC82534MDE implements a half duplex CCK and OFDM baseband processor. The RC82534MDE is supporting all IEEE 802.11 mandatory and optional data rates from 1 Mbps to 54 Mbps using several modulation schemes: binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), complementary code keying (CCK), 16 quadrature amplitude modulation (16 QAM), and 64 QAM.

The RC82534MDE is compliant with 802.11a,b,g protocols. The upper level MAC controls the non-real time protocols such as roaming and scanning the transmit/receiver (Tx, Rx) queues. The lower level MAC controls the real time channel access, the DSP, and the radio.

Data transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets (ACKs, CTS, PSPoll, etc...) are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted.

Hardware Environment

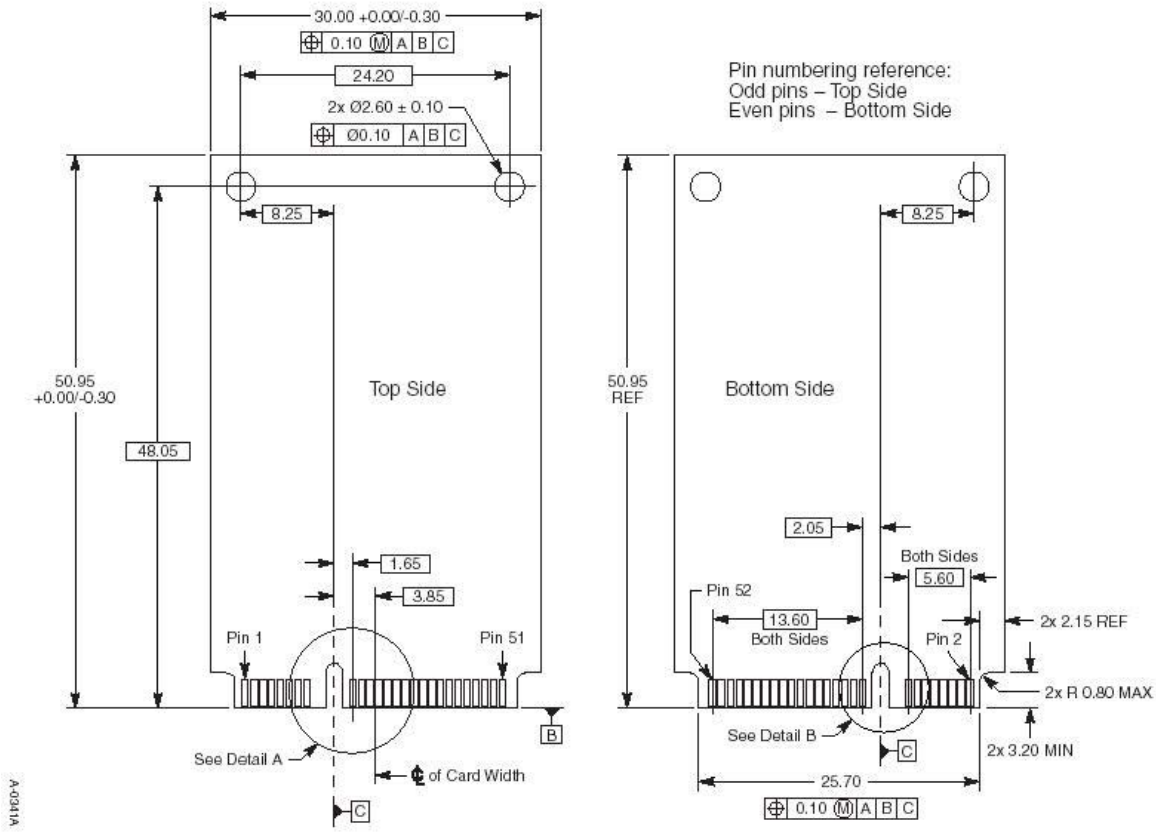
Overview

The Intel® PRO/Wireless 3945a/b/g Network Connection can be used in both notebook and tablet PCs with Mini PCI Express and antenna support to provide wireless network access. The Mini PCI Express card communicates over the air between two or more users or between a user and the wired network via an Access Point. The Intel® PRO/Wireless 3945a/b/g Network Connection implements the IEEE 802.11a,b,g physical (RF) specifications. It operates at 1,2,5.5,6,9,11,12,18,24,36,48 and 54 Mbps at both the 2.4GHz and 5.2GHz bands. The Mini PCI Express card uses the RC82534MDE for modulation, demodulation, spreading, dispreading and processing, while the GQ82534RDE acts as a direct conversion radio of the RF-Base Band signals.

Card Dimensions

The Intel® PRO/Wireless 3945ABG Network Connection complies with the dimensions of a Mini PCI Express card as specified in the PCI-SIG generated specification. The length is 50.95±0.30 mm and the width is 30.00±0.30 mm. Refer to the diagram below.

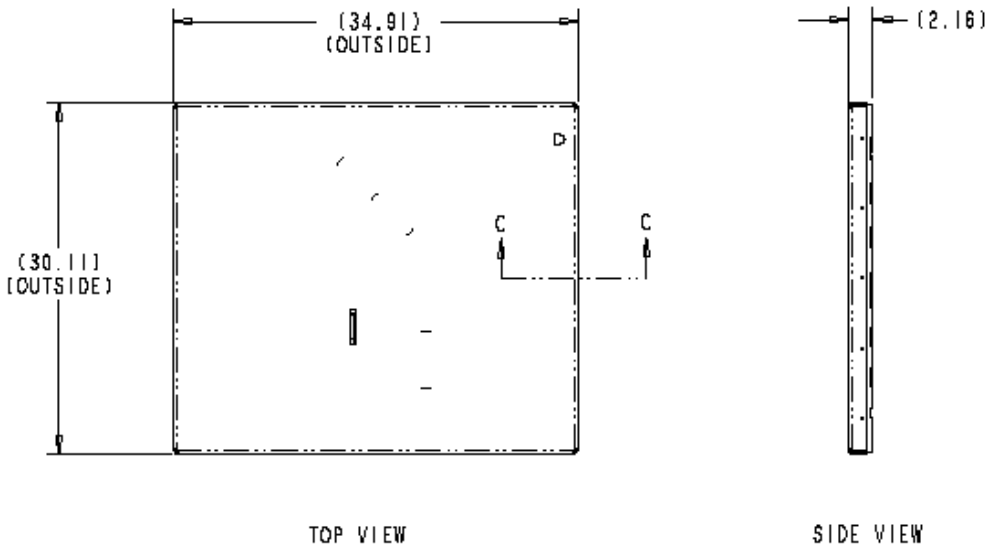
Mini PCI Express:



The Hirose U.FL-R-SMT connector will be used on Intel® PRO/Wireless 3945ABG Network Connection to mate with cable connector U.FL-LP-066.

Shield for mPCIe:

The shield shown below will be placed on the component side (top).



Connector Interface

Below is the mechanical information for the Mini PCI Express edge connector as it is specified within the Mini PCI Express rev. 1.0 specification.

Intel® PRO/Wireless 3945ABG Network Connection will implement the following bevel finish design to avoid possible connector damage.

Mini PCI Express System Connector Pins

The Mini PCI edge connector pin-out definition as described in the Mini PCI Specification, Revision 1.0, as shown below. The Intel® PRO/Wireless 3945ABG Network Connection complies with this pin-out except for deviations as noted in this section.

Table 1: Mini PCI Card Type III System Connector Pin-out

Pin #	Name	Pin #	Name
51	Reserved*	52	+3.3V
49	Reserved*	50	GND
47	Reserved*	48	+1.5V
45	Reserved*	46	LED_WPAN#
43	Reserved*	44	LED_WLAN#
41	Reserved*	42	LED_WWAN#
39	Reserved*	40	GND
37	Reserved*	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	Reserved***
17	Reserved	18	GND
Mechanical Key			
15	GND	16	Reserved**
13	REFCLK+	14	Reserved**
11	REFCLK-	12	Reserved**
9	GND	10	Reserved**
7	CLKREQ#	8	Reserved**
5	Reserved****	6	1.5V
3	Reserved****	4	GND
1	WAKE#	2	3.3V

* Reserved for future second PCI Express Lane (if needed)
** Reserved for future Subscriber Identity Module (SIM) interface (if needed)
*** Reserved for future wireless disable signal (if needed)
**** Reserved for future wireless coexistence control interface (if needed)

Operating Channels:

Band	Channel	Lower Frequency	Upper Frequency
802.11b/g	1-11	2.401 GHz	2.473 GHz
802.11b/g	12-13	2.467 GHz	2.483 GHz
802.11a	34-46	5.08 GHz	5.22 GHz
802.11a	36-48	5.150 GHz	5.250 GHz
802.11a	52-64	5.250 GHz	5.350 GHz
802.11a	100-140	5.470 GHz	5.725 GHz
802.11a	149-161	5.725 GHz	5.825 GHz
802.11a	165	5.815 GHz	5.835 GHz
The Intel WM3945ABG card has the ability to operate in all these channels.			