Wireless LAN

Mini PCI Card

Introduction

The Mini PCI Card is an 11 Mbit/s wireless networking card with a range of up to 550 m (1750 ft).

With its small size, light weight, and low power consumption, it is ideally suited to integration in a wide range of OEM devices.

The Mini PCI Card uses Direct Sequence Spread Spectrum (DSSS) technology, and implements DBPSK, DQPSK and CCK modulation, as defined in the IEEE802.11b standard. This gives a very robust radio channel, which is made even better by the excellent receiver sensitivity and delay spread robustness.

In an environment with radio interference, the Mini PCI Card, because of its 'acknowledgment protocol' and its option to be tuned to another frequency channel, keeps on running.

Superior 'echo path management' makes it suitable for areas with a large delay spread, for example, warehouses. This reduces the number of cells required and therefore reduces the total cost of ownership.

Security against eavesdropping is provided for by RC4, using a 128-bit key.

The Mini PCI Card is complemented by drivers and networking tools for Linux and various versions of the Windows operating system.

Agere provides extensive technical documentation on integration issues, such as: antenna design, customizing drivers, and management software.



Features

- Automatic fallback: 11 Mbit/s, 5.5 Mbit/s, 2 Mbit/s or 1 Mbit/s
- Low power consumption
- Automatic power management to reduce battery use
- Software held in upgradeable flash memory
- Easy integration into mobile and handheld platforms, with freedom of design and antenna placement
- No protruding antenna
- External antenna diversity
- Conforms to IEEE802.11 and IEEE802.11b specification
- Interoperable with other IEEE802.11b compliant systems
- Conforms to industry-standard Mini PCI Card Type IIIA specification
- Compatible with Windows and Linux systems
- WHQL certification for Windows operating systems

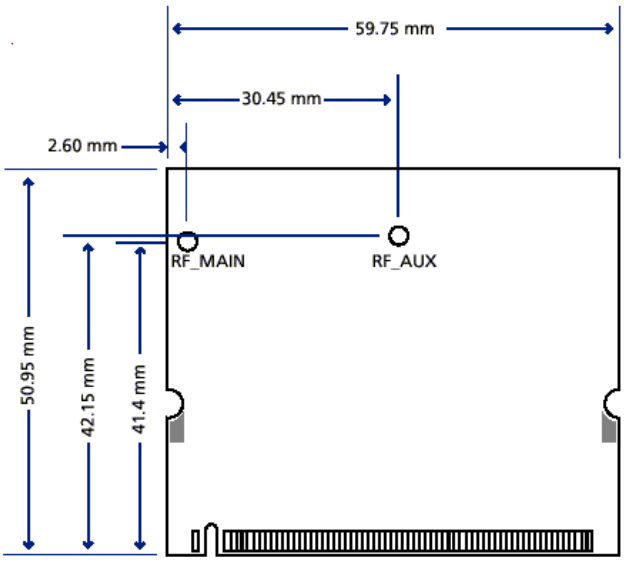
Physical Dimensions/Packaging

The Mini PCI Card has been designed to conform to the Mini PCI specification, as defined in *Mini PCI Specification Rev 1.0*.

All dimensions in this section have a tolerance as permitted in the *Mini PCI Specification*.

Dimensions: 59.75 mm x 50.95 mm x 5.0 mm

Weight: 15 g



Mechanically-unique coax connectors for two external antennas.

Shock and Vibration Resilience

The Mini PCI card has been developed for incorporation in other devices, and as such, no shock and vibration tests for the card in isolation have been performed.

Reliability

MTTF 150,000 hours, based on workload of 2040 hours/year within operating conditions.

Operating Conditions

Operating temperature range	0 °C to 60 °C ambient temperature
Relative humidity when operational	95% maximum (non condensing)
Barometric pressure	740 hPa to 1050 hPa

Absolute Maximum Ratings

Storage temperature range	–20 °C to 75 °C ambient temperature
Relative humidity during storage	95% maximum (non condensing)

Barometric pressure	740 hPa to 1050 hPa

Electrical Specification

Supply voltage	3.3 V DC from host (±0.2 V)
Ripple tolerance of supply voltage	120 mV ripple (measured peak-to-peak) with fundamental frequency ≤ 150 kHz
Load capacitance of supply voltage	≤ 150 µF
Power-on to start-up time	≤ 600 ms after switching power supply on. (This includes a delay of max 500 ms for the Flash ROM power up sequence.)
Doze to receive mode start-up time	≤ 75 ms. Transmissions are not allowed during this period.

Power consumption	Doze mode	Receive mode	Transmit mode
Typical for Mini PCI Card	16 mA	185 mA	285 mA
Max for Mini PCI Card	45 mA	250 mA	350 mA

RF Specification

Frequency range	2400 MHz to 2462 MHz
Frequency stability	within 25 kHz of nominal value
Transmitter output power	15 dBm ±2 dB
Over-driving levels	tolerated up to +17 dBm at the antenna connector
Nominal antenna port impedance	50 Ω
Media Access Protocol	CSMA/CA with ACK
Modulation technique	Direct Sequence Spread Spectrum
	CCK (11 Mbit/s and 5.5 Mbit/s)
	DQPSK (2 Mbit/s)
	DBPSK (1 Mbit/s)
Spreading	11-chip Barker sequence

Data Rate	Receiver Sensitivity (Bit Error Rate < 10^{-5})	Delay spread robustness (FER < 1%)
11 Mbit/s	-82 dBm	65 ns
5.5 Mbit/s	-87 dBm	225 ns
2 Mbit/s	-91 dBm	400 ns
1 Mbit/s	-94 dBm	500 ns

Antenna Specification

The Mini PCI Card is available in two variants as regards antenna diversity: on-board diversity switch, and external diversity switch.

On-board Diversity Switch

This variant of the Mini PCI Card has connectors for two external passive antennas: MAIN and AUX. One of the antennas is used for transmission, and the DSP selects which of the two to use for reception, based on signal strength.

The coax connectors for the antennas are mechanically unique, such that no off-the-shelf connector will fit (FCC requirement).

Switch electronics for selection between the two antennas for reception of the stronger receive signal is provided onboard.

External Diversity Switch

This variant of the Mini PCI Card has one active connector (MAIN) which is designed to take an external antenna diversity unit. Nothing must be connected to the AUX connector.

The coax connectors for the antennas are mechanically unique, such that no off-the-shelf connector will fit (FCC requirement).

The MAIN antenna select signal is a bias voltage that has 3.3 V CMOS levels; high for selecting the transmit/receive antenna and low for selecting the second receive antenna.

High (V_{CC}=3.3 V nominal)	transmit/receive mode using main antenna of external diversity antenna
Low (V_{CC} = 0 V nominal)	receive mode using auxiliary antenna of external diversity antenna

Security

RC4-128: 104-bit key plus 24-bit Initialization Vector

Performance

Characteristics at Different Rates

The typical ranges in this section are given for a bit error rate better than 10^{-5}, and assume an adequate antenna design by the OEM.

	11 Mbit/s	**5.5 Mbit/s**	**2 Mbit/s**	**1 Mbit/s**
Typical range in open environment	160 m (525 ft)	270 m (885 ft)	400 m (1300 ft)	550 m (1750 ft)
Typical range in semi-open environment	50 m (165 ft)	70 m (230 ft)	90 m (300 ft)	115 m (375 ft)
Typical range in closed environment	25 m (80 ft)	35 m (115 ft)	40 m (130 ft)	50 m (165 ft)
Typical throughput (excluding headers, etc.) using TCP/IP	5.04 Mbit/s	3.44 Mbit/s	1.59 Mbit/s	0.82 Mbit/s

Mini PCI Card Pinout

The Mini PCI Card connects to a host through the Mini PCI interface bus. The connector pinout is defined in the *Mini PCI Specification*.

The following implementation-specific aspects for the Mini PCI Card should be noted.

- The AC97-Link bus, the System Audio bus and the LAN bus are not supported, with the exception of LED signals.
- Pins 3 to 8 are used for the DSP's test interface; pins 9 and 10 are used for programming the EEPROM which holds the configuration information; pins 11 and 12 are used for LED signals; and pin 13 is used as a hardware radio on/off switch.

Name (Mini PCI Pin Number)	Used for	
ETD0 (#3) Mapped to LAN bus (8PMJ-3)	DSP test interface signals	
ETCK (#4) Mapped to LAN bus (8PMJ-1)		
ETD1 (#5) Mapped to LAN bus (8PMJ-6)		
ETSYN (#6) Mapped to LAN bus (8PMJ-2)		
ETD2 (#7) Mapped to LAN bus (8PMJ-7)		
ENGTEST (#8) Mapped to LAN bus (8PMJ-4)		
SDA (#9) Mapped to LAN bus (8PMJ-8)	Used for programming EEPROM with configuration information	
SCL (#10) Mapped to LAN bus (8PMJ-5)		
LED1_GRNP (#11)	Network activity LED	LED control signals (active when high)
LED2_YELP (#12)	Power/network connection LED	
LED1_GRNN (#13)	Radio on/off switch. When tied to ground, the radio is disabled. This can be compared to an out-of-range situation.	
Ground (#101)	Used as open signal.	

Function Configuration Register

The Configuration Option Register (COR) is located in the attribute memory space at address 3E0h. The host software should obtain this address from CISTPL_CONFIG.

b7	b6	b5	b4	b3	b2	b1	b0
CRESET	LevIREQ	Configuration Index					

CRESET

COR reset bit. Setting this bit places the card in reset state. This is equivalent to the host asserting HRESET, except that this bit is not cleared. The host clears this bit by writing 00h to the COR register in order to assure that the card continues as memory-only card after the software reset.

LevIREQ

When set, level-mode interrupts are generated: when cleared, pulse-mode interrupts are generated. Level-mode interrupts are generated by default.

Configuration index

The card is configured as memory-only card if the configuration index is 00h. The card is configured as I/O card by writing 01h to the configuration index. By default, the card is configured as I/O card by writing 41h to the COR register.

International Channel Frequencies

The Mini PCI Card uses frequencies in the 2.4 to 2.5 GHz ISM band, as defined by IEEE802.11.

Channel numbers 1 to 11 are available and can be used world-wide.

Channel Number	1	2	3	4	5	6	7	8	9	10	11
Frequencies (MHz)	2412	2417	2422	2427	2432	2437	2442	2447	2452	2457	2462

CIS Strings

The Manufacturer Name in the CIS is 'Wireless'.

The Product Name in the CIS is 'Wireless'.

System Requirements

The Mini PCI Card cannot be used simultaneously with any other wireless card in the same system.

The system in which the card is integrated must have a BIOS which is compatible with the TI1410 PCI Controller.

Operating System Compatibility

Drivers are available for the following operating systems:

Windows 98, 98SE, Millennium Edition

For these versions of Windows the NDIS 5 Miniport Driver is used. Windows built-in networking software provides network support.

Windows 2000 (Service Pack 1)

For Windows 2000 the NDIS 5 Miniport Driver is used. Windows built-in networking software provides network support.

Linux

The driver sources and a support library are supplied, which are compatible with Linux kernel versions 2.0.x to 2.2.x for the Intel architecture.

This includes the following Linux distributions, for example:

- Red Hat versions 5.2, 6.0, 6.1, 6.2 and 7.0
- Suse versions 6.1, 6.3 and 6.4

Regulatory Body Approvals/Compliance

Agere provides a device which complies to international regulations: approval is a matter for the OEM once the device is integrated into a host platform.

Electromagnetic Compatibility	USA	FCC CFR47 Part 15
	Europe	ETS 300 826 (1999/5/EC R&TTE Directive)
	Japan	Not Applicable - covered by radio regulations
Product Safety	USA	IEC 60950, UL1950, CB
	Europe	EN 60950
	International	IEC 60950, CB
Radio Regulations	USA	FCC CFR47 Part 15 C, para 15.247
	Europe	EN 300-328 (1999/5/EC R&TTE Directive)
	Japan	ARIB STD-T66
	Canada	IC RSS 210

Contact Agere Systems Inc for the current position as regards certification world-wide.

Related Products

- None

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September 2001
Document: 018598
Revision: A
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