PRELIMINARY | Data Sheet | September 2001 | File Number FNXXXX

PRISM 2.5 11Mbps Wireless Local Area Network USB Card

The Intersil ISL37300XU WLAN USB-card is a complete wireless high speed Network Interface Card (NIC) utilizing the Intersil PRISM® 2.5 Direct Sequence Spread Spectrum Wireless Transceiver chip set. It provides a complete PRISM 2.5 reference design evaluation platform of hardware and software to system providers or integrators requiring wireless data communications capability and is ideal for integration into computer platforms.

The Evaluation kit (ISL37300XU-EVAL) includes two WLAN USB-cards designed to Intersil's Prism reference design, Microsoft Windows® Driver, Local Area Network evaluation software, Prism Test Utilities (PTU) (note 1) software and documentation to complete the evaluation. It supports the IEEE 802.11b network specification for Direct Sequence Spread spectrum DSSS signaling, providing data rates of 1, 2, 5.5, and 11 Mbps. Evaluation kit software updates are available on the Intersil Web Site.

In addition to the evaluation kit, a complete PRISM chipset WLAN reference design package (ISL37300XU-CD) is available. It contains all the documentation needed for manufacturing of the Prism 2.5 USB wireless network card including: Cadence/Allegro Layout, Gerber files, Concept schematic, Bill of Materials, assembly and mechanical drawings, test plan, and even a copy of the application for FCC equipment authorization. Customers who license the reference design also receive password access to FCC Intersil's Premier Web site for up to the minute updates on hardware and software.

Features

- Certified Under Part 15 to Operate in 2.4GHz ISM Band (Approval Pending)
- Support for 11, 5.5, 2 and 1 Megabit Per Second (Mbps) Data Rates
- Supports the lEEE 802.11 Direct Sequence Specification
- Driver Supports Microsoft® Windows® 95, 98, 98SE, 2000, NT and ME
- Supports Dual Diversity Antennas
- Advanced RAKE Receiver Design with Decision Feedback Equalizer combats multipath fading
- Provides Wireless Data Communications at Full Ethernet Speed
- Designed to Fully Support USB specification 1.1 Defined Mechanical and Environmental Stress Conditions
- Intelligent Power Control, Including IEEE 802.11 Power Save Mode
- Complete Reference Design, the ISL37300XU CD is available to ensure Minimum Time-to-Market

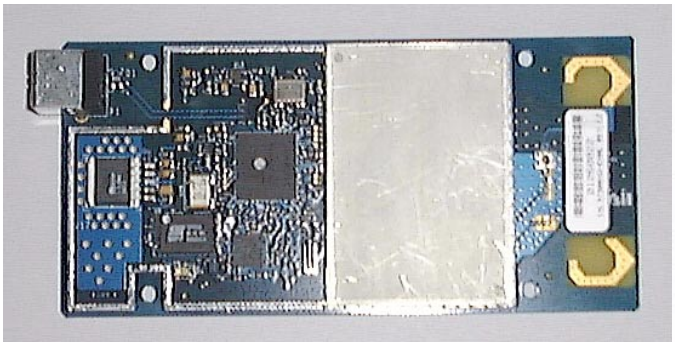
NOTES:

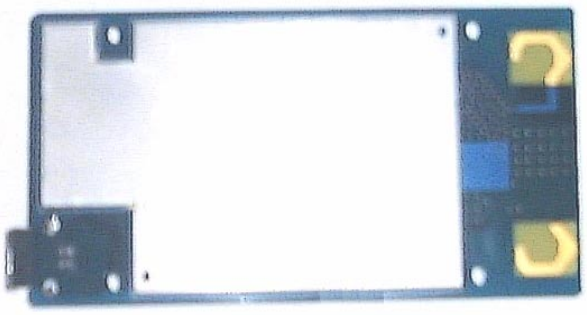
1. At present, PTU supports Windows 95, 98 and 98SE. An upgrade is in process which will add support for NT.
2. The range will vary in different operating environments due to effects such as building construction

Ordering Information

PART NUMBER	DESCRIPTION	CARDS/SET
ISL37300XU-EVAL	WLAN Evaluation Kit	2

Packaging





PRELIMINARY

CAUTION: These devices are sensitive to electrostatic discharge; follow proper IC Handling Procedures.
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Access Points will be available from a number of suppliers, enabling a totally wireless network solution. Typical operating ranges are shown in Table 1..

TABLE 1. TYPICAL OPERATING RANGE (NOTE 2)

DATA RATE (Mbps)	INDOOR RANGE	OUTDOOR RANGE
11	120 feet (37 meters)	500 feet (152 meters)
5.5	200 feet (61 meters)	800 feet (243 meters)
2	240 feet (73 meters)	1300 feet (396 meters)
1	300 feet (91 meters)	1750 feet (533 meters)

Functional Overview

The WLAN USB-Card is designed to operate in the 2.4GHz ISM frequency band, channels 1 to 11, as specified by the FCC in the USA. The card will also operate on channels 12 through 14, where permitted by local regulatory authorities. Radio equipment must be certified in a country prior to use. Refer to Table 4 for a list of countries and agencies that have approved the ISL37300XU-EVAL for operation.

The Intersil PRISM Chip Set allows for high level integration for reduced size, increased throughput, improved radio performance and faster time to market. The WLAN USB-card implements Direct Sequence Spread Spectrum DSSS technology providing superior noise and signal jamming immunity including less severe impact from unintentional radiators such as microwave ovens. The user can connect the USB-card in an ad-hoc peer to peer networking scheme, allowing for instant network setup in any office environment. By using an access point, the wireless LAN can be set up to allow for a greater number of users to interconnect, and to increase the coverage area. With a portal (i.e. Access Point), the wireless LAN can be easily connected into an existing wired LAN, allowing for easy expansion of the service.

Compared to the PRISM II chip set, the PRISM 2.5 generation offers:

- Low loss front end designed for maximum range
- Higher level of chip integration and less peripheral components to reduce material costs
- Support of optional IEEE 802.11 Short Preamble for significantly increased data throughput

A complete Reference Design for the ISL37300XU is available to ensure minimum time-to-market. This information contains details for manufacturing a USB-card WLAN assembly, including Gerber PC board files, a Bill of Material with component sourcing, mechanical drawings, a detailed Radio Description with debug directions and a test plan.

The ISL3873 Media Access Controller (MAC) Protocol Handler

The ISL3873 MAC/Baseband Processor and its firmware are responsible for running the IEEE 802.11 protocol in the WLAN card. This section describes the features of IEEE 802.11 that are implemented.

The functions supported by the STA (station) Firmware are:

- CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) with Random Backoff
- WEP Security
- Short/Long Preamble with multirate
- RTS/CTS Handshake (Ready To Send/Clear To Send) and NAV Management (Network Allocation Vector)
- MAC Level Acknowledgments (Media Access Control)
- Re-Transmission of Unacknowledged Frames
- Duplicate Detection and Rejection
- Broadcast and Multicast Frames
- Fragmentation and Re-Assembly
- Power Management (Planned)
- Timestamp Synchronization
- DCF (Distributed Coordination Function)
- Beacon Generation in an Ad-Hoc Network
- Probe Response Generation in an Ad-Hoc Network

Card Information Structure

The standard Intersil WLAN USB-card will be supplied with information embedded in the PDA for use in enumeration. Table 2 shows the Plug Record and the default information. Customization of the enumeration values can be performed by modifying the PDA plug records and reflashing the PDA, Primary, and Secondary. Please refer to the Prism Driver Programmers Manual for more information.

TABLE 2.

Plug Record Contents	Usage	Default
401	Vendor/Product ID	XXXX XXXX
407	Bus/Self Powered	Bus Powered (value XXXX)

IEEE 802.11 International Agreement and Frequency Assignments

The IEEE 802 LAN committee has forged an international agreement providing for wireless data communication standards for the frequency range of 2.4GHz to 2.4835GHz, as allocated by the FCC in the USA, and in the 2.471GHz to 2.497GHz frequency range, as specified by the regulatory authority in Japan. These standards are designed to focus the industry to develop highly integrated, low cost, interoperable WLAN equipment, of which the ISL37300XU-EVAL is a prime example.

In the U.S., there are 11 channels specified by the FCC in the 2.412GHz to 2.462GHz range. In Japan, one channel at 2.484GHz is authorized. The ETSl (European) regulatory body conforms to the USA (FCC) channel assignments with the exception that channels 12 and 13 are also allowed. Some countries in Europe, notably France and Spain have unique channel restrictions.

Although information contained in Table 3 is deemed to be accurate, local regulatory authorities should be consulted before using such equipment.

The ISL37300XU is shipped with FCC-compliant firmware. In order to ensure regulatory-compliant channel usage in a particular country, special geographic-specific firmware is available for customer production assemblies which restricts channel usage. Examples include ETSI-compliant firmware, etc. Since the end user does not have the ability to alter this firmware, regulatory compliance is ensured

The available channels of operation in the 2.4GHz to 2.4835GHz and 2.471GHz to 2.497GHz ranges are as follows:

TABLE 3. IEEE 802.11 CHANNELS

CHANNEL NUMBER	CHANNEL FREQUENCY	GEOGRAPHIC USAGE
1	2412MHz	US, CA, ETSI, MKK
2	2417MHz	US, CA, ETSI, MKK
3	2422MHz	US, CA, ETSI, MKK
4	2427MHz	US, CA, ETSI, MKK
5	2432MHz	US, CA, ETSI, MKK
6	2437MHz	US, CA, ETSI, MKK
7	2442MHz	US, CA, ETSI, MKK
8	2447MHz	US, CA, ETSI, MKK
9	2452MHz	US, CA, ETSI, MKK
10	2457MHz	US, CA, ETSI, MKK, FR, SP
11	2462MHz	US, CA, ETSI, MKK, FR, SP
12	2467MHz	ETSI, FR, MKK
13	2472MHz	ETSI, FR, MKK
14	2484MHz	MKK

KEY:

US = United States, CA = Canada, ETSI = European countries (except France and Spain),
FR = France, SP = Spain, MKK = Japan

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Agency and Regulatory Body Approvals

The WLAN USB-card will comply to the standards shown in Table 4:

TABLE 4. COMPLIANCE STANDARDS

COUNTRY	APPROVAL	NOTES
USA	FCC part 15, Sec. 15.247, Sec. 15.107 and 15.109	Approval pending for Intentional Radiators & Computer Peripheral
Canada	ICAN RSS-210	Designed for compliance
Europe	EN 60950 EN 301 489-1 V1.2.1 (2000-08) EN 301 489-17 V1.1.1 (2000-09) EN 300 328 Part 1 V1.2.2 (2000-07) EN 300 328 Part 2 V1.1.1 (2000-07)	Designed for compliance
Japan	ARIB STD-T66 ARIB STD-33	Designed for compliance

FCC Information to user

This product does not contain any user serviceable components and is to be used with approved antennas only. Any product changes or modifications will invalidate all applicable regulatory certifications and approvals.

FCC Electronic Emission Notices

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC Radio Frequency Interference statement

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this equipment in a residential area may cause harmful interference in which case the user will be required to correct the interference at his own expense.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

References

For Intersil documents available on the internet, see web site http://www.intersil.com

or

Intersil AnswerFAX (321) 724-7800.

[1] TB337 Tech Brief, Intersil Corporation, *"A Brief Tutorial on Spread Spectrum and Packet Radio"*, AnswerFAX document No. 82337.

[2] TB382 Tech Brief, Intersil Corporation, "*Measurement of WLAN Receiver Sensitivity*"

[3] AN9850 Application Note, Intersil Corporation, "*Complementary Code Keying Made Simple*"

[4] TB395, Tech Brief, Intersil Corporation, *"RF Probing of the ISL37300P and the ISL37300XU"*

[5] AN9829 Application Note, Intersil Corporation, "*Brief Tutorial on IEEE 802.11 Wireless LANs*"

[6] AN9820 Application Note, Intersil Corporation, "*A Condensed Review of Spread Spectrum Techniques for ISM Band Systems*"

Further information can be found in the following:

- Intersil PRISM 2.5 data sheets, web home page, http://www.intersil.com/design/prism/ser-p25-11mbps.asp
- IEEE 802.11 Standards Project (available from the IEEE, New York, USA).

Absolute Maximum Ratings

Supply Voltage . . . . . -0.3V to 5.5V (Max)
Storage Temperature (Note 3). . . . . -20^oC to 85^oC

Operating Conditions

Temperature Range . . . . . $0^oC \le T_A \le 70^oC$
Supply Voltage Range. . . . . 4.5V to 5.5V

Caution: These are the absolute maximum ratings for the USB-card product. Exceeding these limits could cause permanent damage to the card.
NOTE:

3. All temperature references refer to ambient conditions.

Electrical Specifications — Test Conditions: Supply Voltage (V_{CC}) = 5.0V, Ambient Temperature (T_A) = 25^oC, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
CURRENT CONSUMPTION						
Initialization Current	I_{CC}		-	-	-	mA
Average Current (2% TX; 8% RX; 90% Power Save)	I_{CC}		-	-	-	mA
Continuous Transmit Mode	I_{CC}		-	346	-	mA
Continuous Receive Mode	I_{CC}	Receiving Valid Packets	-	237	-	mA
Current in IEEE 802.11 Power Save Mode	I_{CC}		-	TBD	-	mA
USB LOGIC LEVELS						
		Required at target connector input				
Differential “1”		(D+) - (D-) > 200mV and D+ > Vih		3.3		V
Differential “0”		(D-) - (D+) > 200mV and D- > Vih		3.3		V
RF SYSTEM SPECIFICATIONS						
Transmitter Power Output	P_{out}	Using Murata probe (MXGS83RK3000) at J1 and series blocking capacitor	-	16	-	dBm
EIRP	EIRP	@ -30 dB 1st Side Lobes	-	18.7	-	dBm
Receive Sensitivity	RX_S	1Mbps, 8% PER	-	-93	-	dBm
		2Mbps, 8% PER	-	-90	-	dBm
		5.5Mbps, 8% PER	-	-89	-	dBm
		11Mbps, 8% PER	-	-85	-	dBm
Multipath Delay Spread using Naftali Model	(T_{Delay})	2Mbps, 8% PER		TBD		nSec
		5.5Mbps, 8% PER		TBD		nSec
		11Mbps, 8% PER		TBD		nSec
Multipath Receive Sensitivity using JTC models (note 5)	RX_S_{JTC}	1Mbps, 8% PER, Office C Delay spread = 450ns		TBD		dBm
		2Mbps, 8% PER, Commercial B Delay spread = 150ns		TBD		dBm
		5.5Mbps, 8% PER, Commercial B Delay spread = 150ns		TBD		dBm
		11Mbps, 8% PER, Commercial B Delay spread = 150ns		TBD		dBm
Maximum Receive Level	RX_MAX	PER <8% (11 Mbps)		>10		dBm

Electrical Specifications Test Conditions: Supply Voltage (V_{CC}) = 5.0V, Ambient Temperature (T_A) = 25^{o}C, Unless Otherwise Specified **(Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Third Order Intercept Point (Input)	IIP3_HG	High gain mode		-10		dBm
	IIP3_LG	Low gain mode		TBD		dBm
Carrier Suppression	TX_sup	Test Mode	-51	-41	-35	dB
Image Rejection	IR	PER <8%		45		dB
IF Rejection	IFR	PER <8%		>84		dB
Adjacent Channel Rejection	ACR	PER <8%, 11Mbps signal w/ 11 Mbps jammer 25 MHz offset (Note 4)	46	47	49	dB
Data Rate (Physical Layer)	Rate			1, 2, 5.5 and 11		Mbps

4. The adjacent channel measurement is carried out on two channels separated by 25MHz (5 channels).
5. The jammer signal is a continuos DSSS 11 Mbps waveform with -40dBc first sidelobes

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CAUTION:

To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.