

802.11b/g/n Wireless LAN INIC Card

User's Manual

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Federal Communication Commission Interference Statement

FCC Part 15

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. 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:

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

FCC Caution

This equipment must be installed and operated in accordance with provided instructions and a minimum 20 cm spacing must be provided between computer mounted antenna and person's body (excluding extremities of hands, wrist and feet) during wireless modes of operation.

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.

Federal Communication Commission (FCC) Radiation Exposure Statement

This equipment complies with FCC radiation exposure set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The equipment version marketed in US is restricted to usage of the channels 1-11 only.

R&TTE Compliance Statement

This equipment complies with all the requirements of DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of March 9, 1999 on radio equipment and telecommunication terminal Equipment and the mutual recognition of their conformity (R&TTE).

The R&TTE Directive repeals and replaces in the directive 98/13/EEC (Telecommunications Terminal Equipment and Satellite Earth Station Equipment) As of April 8, 2000.

Safety

This equipment is designed with the utmost care for the safety of those who install and use it. However, special attention must be paid to the dangers of electric shock and static electricity when working with electrical equipment. All guidelines of this and of the computer manufacture must therefore be allowed at all times to ensure the safe use of the equipment.

EU Countries Intended for Use

The ETSI version of this device is intended for home and office use in Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

The ETSI version of this device is also authorized for use in EFTA member states: Iceland, Liechtenstein, Norway, and Switzerland.

EU Countries Not intended for use

None.



1. Introduction

- Scope

This document describes the IN-7858Mn 802.11b/g/n INIC card hardware and software specifications.

- Product Features

- Comply with 802.11n draft and 802.11b/g standards.
- High data transfer rate - up to 300Mbps.
- Supports farther coverage, less dead spaces and higher throughput with MIMO technology.
- Supports 11n Router, 11n ADSL Router, 11n IAD Router, etc. applications.
- Supports WPS (WiFi Protected Setup) interface.
- Supports Linux kernel 2.4/2.6.
- Support Mini-PCI/RGMII/MII interface.

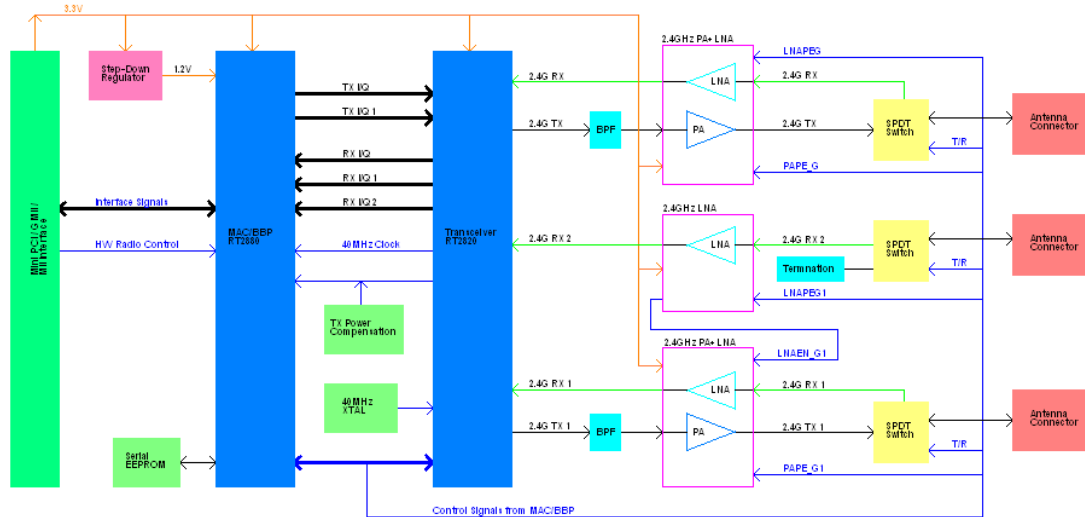


2. Product Specification

Product	802.11b/g/n Wireless LAN INIC Card Model Name: IN-7858MN
Standard	IEEE 802.11 b/g and IEEE 802.11n Draft 2.0
Interface Type	Mini-PCI/RGMII/MII
Frequency Band	2.4000~2.4835GHz (Industrial Scientific Medical Band)
Modulation	OFDM with BPSK, QPSK, 16QAM, 64QAM (11n) OFDM with BPSK, QPSK, 16QAM, 64QAM (11g) BPSK, QPSK, CCK (11b)
Data Rate	11n (20MHz): MCS0-15, 32 with Half Guard Interval Support (up to 144Mbps) 11n (40MHz): MCS0-15, 32 with Half Guard Interval Support (up to 300Mbps) 11g: 54/48/36/24/18/12/9/6 11b: 11/5.5/2/1Mbps auto fallback
Antenna	I-PEX Connector x 3
OS	Linux Kernel 2.4/2.6
Transmit Power	2.4GHz -11b:17~18dBm -11g:14~15dBm -11n:13~15dBm
Receive Sensitivity	2.4GHz -300Mbps OFDM, 10% PER, -65dBm -54Mbps OFDM, 10% PER, -74.5dBm -11Mbps CCK, 8% PER, -89dBm
Dimension	59.75(W) x 54.73(D) x 1.0(H)mm
Temperature	32~122°F (0~50°C)
Humidity	Max.95% (NonCondensing)

3. Hardware Architecture

- Block Diagram



- Main Chipset Information

Item	Model Number	Vendor
MAC/BBP/CPU	RT2880	Ralink
11b/g/n Transceiver	RT2820	Ralink

- Main Chipset Specification

MAC/Baseband Processor

The RT2880 SOC combines Ralink's 802.11n draft compliant 2T3R MAC/BBP, a high performance 266-MHz MIPS4KEc CPU core, a Gigabit Ethernet MAC and a PCI host/device, to enable a multitude of high performance, cost-effective 802.11n applications. The RT2880 has two RF companion chips, the RT2820 for 2.4G-band operation and the RT2850 for dual band 2.4G or 5G operation. In addition to the traditional AP/router application, the chipset can be implemented as an WLAN "intelligent" NIC, drastically reducing the load on the host SOC, such as DSL/Cable or Multimedia Applications processors. Users can treat the WLAN iNIC as a simple Ethernet device for easy porting and guaranteed 802.11n WLAN performance without the need to upgrade to an expensive host SOC.

RT2880 MAC/BBP/CPU Features

- 802.11n MAC/BBP Interface
 - 2T3R 802.11n MAC/BBP
 - 300Mbps PHY data rate
 - 1x1/1x2/1x3/2x1/2x2/2x3 modes
 - 20Mhz/40Mhz channel width
 - Legacy and high throughout modes
 - Reverse Data Grant (RDG) support
 - Compressed Block ACK
 - Dual-band: 2.4Ghz or 5Ghz
 - Up to 256 clients
 - Multiple BSSID (up to 8)
 - WEP64/128, WPA, WPA2 engines
 - QOS - WMM, WMM Power Save Hardware frame aggregation
 - Cisco CCX Support
 - International Regulation - 802.11d + h
- MIPS4KEc Core
 - 266 MHz
 - 16K I Cache, 16K D Cache
- Gigabit Ethernet MAC interface
 - 10/100/1000Mbps auto detection
 - Support RGMII/MII interface
 - Scatter-Gather DMA
 - Interrupt mitigation
 - IEEE 802.3x Flow control
 - Full/Half duplex
 - High/Low priority queues
- 33/66Mhz PCI Host Controller
 - Embedded PCI Arbiter
 - Supports 2 PCI devices
 - PCI v2.2 Compliant
- PCI Device interface (WLAN iNIC)
 - 33/66Mhz x 32-bit DMA master
 - Scatter-Gather DMA
 - Interrupt Mitigation
 - Simple Ethernet-like driver
 - Ensures wireless LAN peak throughput
 - High/Low priority queues
- Peripherals

- UART x2
- GPIO x24 (shared)
- SPI/PCM
- I2C
- JTAG
- MDC/MDIO
- Packaging
 - 17mm x 17mm BGA-292 Package
 - I/O : 3.3V/2.5V(RGMII), 3.3/5V PCI I/O

11b/g/n Transceiver

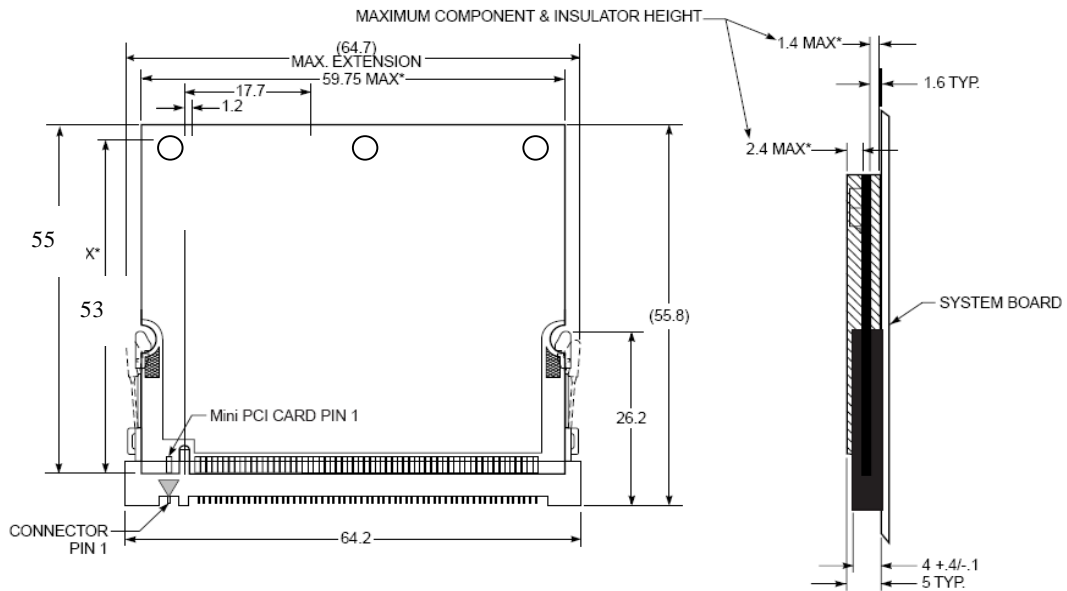
RT2820 is a monolithic SiGe RF IC that integrates multiple half-duplex direct-conversion radio transceivers designed for IEEE802.11b/g/n WLAN systems or other wireless LAN applications operating in 2.4GHz ISM bands. The IC has two concurrent transmit channels and three concurrent receive channels. The multiple channels are designed to improve robustness and throughput during wireless operation. Each receive channel achieves low noise figure, high input sensitivity, high linearity, and high output power while consuming low DC power. Each receive path features a gain selectable, low-noise amplifiers (LNA), followed by RF-to-baseband I/Q demodulators, discrete-step variable-gain amplifiers and integrated channel-selection filters. The transmit chain includes integrated reconstruction filters, a baseband-to-RF I/Q modulator, discrete-step variable-gain amplifiers for power-level control, and pre-drivers for external power amplifiers. The modulator and demodulator are driven by internal VCO. The VCO is phase-locked by an internal 3-wire-interface PLL. The bandwidth of the integrated channel-selection filters and the reconstruction filters can be programmed to narrow-band (10MHz) and wide-band (20MHz). Their bandwidth is calibrated by an internal autonomous calibration circuit. To help IQ mismatch calibration, a baseband transmit-to-receive loopback feature is provided. A crystal oscillator using external crystal and three low dropout regulators (LDO) are also integrated. The RT2820 is housed in a 76-pin 9x9mm² leadless QFN package and is well suited for PCMCIA, MiniPCI, PCI, USB boards or embedded applications. It is designed to work seamlessly with RT2860B and RT2880 baseband/Mac IC.

RT2820 Transceiver Features

- 3 receivers and 2 transmitters
- 2.4-2.48 GHz band
- Low noise figure
- High linearity
- Low power consumption
- Integrated channel-selection filters
- Integrated reconstruction filters
- Power management/standby mode
- Integrated low dropout regulators
- Single supply 3.0 to 3.6V operation

4. Hardware Specification

- Mechanical Form Factor



- Transmit Power

Channel	Channel 1	Channel 7	Channel 13
11b	17.75	17.41	17.51
11g	15.13	15.23	15.35
11n (20MHz)*	15.4/15.2	15/15	15.1/15

Channel	Channel 3	Channel 6	Channel 9
11n (40MHz)*	13.6/13.5	13.6/13.4	13.9/13.9

- Receiver Sensitivity

Channel	Channel 1	Channel 7	Channel 13
11b	-89	-89	-89
11g	-74.5	-74.5	-74.5
11n (20MHz)	-68	-68	-68

Channel	Channel 3	Channel 6	Channel 9
11n (40MHz)	-65	-65	-65

5. Pin Specification

- Pin Description

Pin	Name	Pin	Name
1	NC	2	NC
3	NC	4	NC
5	NC	6	NC
7	NC	8	Wireless LED
9	AP Mode	10	Reset Default
11	LED ACT	12	LED 2.4G
13	NC	14	LED 5G
15	CHSGND	16	Soft Reset
17	INTB#	18	NC
19	3.3V	20	INTA#
21	NC	22	MA17
23	GND	24	3.3AUX
25	CLK	26	RST#
27	GND	28	3.3V
29	REQ#	30	GNT#
31	3.3V	32	GND
33	AD31	34	NC
35	AD29	36	NC
37	GND	38	AD30
39	AD27	40	3.3V
41	AD25	42	AD28
43	MDC	44	AD26
45	C/BE3#	46	AD24
47	AD23	48	IDSEL

Pin	Name	Pin	Name
49	GND	50	GND
51	AD21	52	AD22
53	AD19	54	AD20
55	GND	56	PAR
57	AD17	58	AD18
59	C/BE2#	60	AD16
61	IRDY#	62	GND
63	3.3V	64	FRAME#
65	CLKRUN#	66	TRDY#
67	SERR#	68	STOP#
69	GND	70	3.3V
71	PERR#	72	DEVSEL#
73	C/BE1#	74	GND
75	AD14	76	AD15
77	GND	78	AD13
79	AD12	80	AD11
81	AD10	82	GND
83	GND	84	AD9
85	AD8	86	C/BE0#
87	AD7	88	3.3V
89	3.3V	90	AD6
91	AD5	92	AD4
93	GE_RXDV	94	AD2
95	AD3	96	AD0
97	NC	98	DISABLE_RF_TX
99	AD1	100	WPS
101	GND	102	GND

Pin	Name	Pin	Name
103	GE_RXD1	104	MA11
105	GE_RXD2	106	GE_RXD0
107	GE_RXD3	108	GE_RXCLK
109	GE_TXEN	110	GE_TXCLK
111	GE_TXD3	112	GE_TXD0
113	GND	114	GND
115	GE_TXD1	116	GE_TXD2
117	GND	118	GND
119	GND	120	GND
121	MDIO	122	MPCIACT#
123	NC	124	3.3V

- RGMII/MII interface

Pin	Name	I/O	Description
22	HOST	I	MII/PCI Select. 1: RGMII/MII (Pull High) 0: PCI (Pull Low)
43	MDC	O	PHY Management Clock
93	GE_RXDV	I	RGMII/MII RX Data Valid
103	GE_RXD1	I	RGMII/MII RX Data bit #1
105	GE_RXD2	I	RGMII/MII RX Data bit #2
106	GE_RXD0	I	RGMII/MII RX Data bit #0
107	GE_RXD3	I	RGMII/MII RX Data bit #3
108	GE_RXCLK	I/O	RGMII/MII RX Clock
109	GE_TXEN	O	RGMII/MII TX Data Enable
110	GE_TXCLK	I/O	RGMII/MII TX Clock
111	GE_TXD3	O	RGMII/MII TX Data bit #3
112	GE_TXD0	O	RGMII/MII TX Data bit #0
115	GE_TXD1	O	RGMII/MII TX Data bit #1
116	GE_TXD2	O	RGMII/MII TX Data bit #2
121	MDIO	I/O	PHY Management Data (RGMII/MII Select. 1: RGMII (Pull High) 0:MII (Pull Low))