

Model Number : MF5NS Intelligent Wireless-ABGN Mini PCI Module



Introduction

The MF5-NS is a mini PCI solution for IEEE 802.11a/b/g/n wireless LAN. With 802.11n draft compliant 2T3R embedded a MIPS 4KE (266MHz) CPU, the MF5-NS may reduce the load on the host SOC, such as Multimedia Applications, Network Security, VoIP, Video Surveillance, DSL/Cable processors.

The MF5-NS integrates multiple half-duplex direct-conversion radio transceivers designed for IEEE802.11a/b/g/n WLAN systems or other wireless LAN applications operating in 5-6GHz(high-band) and 2.4GHz(low-band) ISM bands.

The MF5-NS 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. 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.

1. Product Features

- 802.11n 2T3R (300Mbps PHY data rate)
- 3 receivers and 2 transmitters
- 2.4-2.5GHz and 4.9-5.9GHz band
- 1x1/1x2/1x3/2x1/2x2/2x3 modes
- 20Mhz/40Mhz channel width
- Legacy and high throughput modes
- Reverse Data Grant (RGD) support
- Compressed Block ACK
- 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



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2. Hardware Architecture

2.1 Main Chipset Information

MAC/BBP : RT2880

Transceivers : RT2850

2.2 Antenna Connector

Three antenna connectors are provided to support antenna diversity.

3. Software Specification

OS -Linux 2.4/Linux 2.6

Foot print -8MB DRAM (4Mbitx16x1)

Mode - STA and AP

WDS - Lazy/Bridge/Repeater

Wireless Operation Mode - Mixed Mode /Green Field

Wireless Settings -

Protection On/Off

SSID Disable

AP Isolation

Rate Select

Fragmentation

Wireless Security -

WPA-personal/WPA-enterprise

WPA2-personal/WPA2-enterprise

QoS - WMM

Usability- WiFi Protected Setup (PIN/PBC)

4. Specifications

- Form Factor: Mini PCI Type 3B
- Frequency band:
 - A Mode: 5.15~5.35 & 5.725~ 5.825 GHz for US
4.9~5.25 GHz for Japan (Subject to change)
5.15~5.35 & 5.47~5.725 GHz for ETSI
 - B/G Mode: 2400~2483.5 MHz (for US, Canada, ETSI, and Japan)
2471~2497 MHz (for Japan)
 - N Mode : 5.15~5.35 & 5.725~ 5.825 GHz for US
4.9~5.25 GHz for Japan (Subject to change)
5.15~5.35 & 5.47~5.725 GHz for ETSI
2400~2483.5 MHz (for US, Canada, ETSI, and Japan)
2471~2497 MHz (for Japan)
- Channel Spacing:
 - A Mode: 20MHz
 - B/G Mode: 10MHz
 - N Mode : 20/40MHz
- Modulation:
 - A Mode: OFDM with BPSK, QPSK, QAM, and 64QAM
 - B Mode: DSSS with DBPSK, DQPSK, and CCK
 - G Mode: OFDM with BPSK, QPSK, QAM, and 64QAM DSSS with DBPSK, DQPSK, and CCK
 - N Mode: BPSK,QPSK,QPSK,16-QAM,64-QAM

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- Host interface: Mini PCI V1.0
- Channels Support:
 - A Mode: US: 12 (Ch:36,40,44,48,52,56,60,64,149,153,157, 161)
Japan: 4 (Ch:34,38,42,46)and 7(4.92, 4.94, 4.96,4.98, 5.04, 5.06, 5.08GHz)
(Subject to change)
ETSI:19(Ch:36,40,44,48,52,56,60,64,100,104,108,
112,116,120,124,128,132,136,140)
 - B/G Mode: US/Canada: 11 (1~11)
ETSI: 13 (1~13)
France: 4 (10~13)
Japan: 14 (1~14) for 11b mode
Japan: 13(1~13) for 11g mode
 - N @ 5GHzMode: US: 12 (Ch:36,40,44,48,52,56,60,64,149,153,157, 161)
Japan: 4 (Ch:34,38,42,46)and 7(4.92, 4.94, 4.96,4.98, 5.04, 5.06, 5.08GHz)
(Subject to change)
ETSI:19(Ch:36,40,44,48,52,56,60,64,100,104,108,
112,116,120,124,128,132,136,140)
 - N@2.4GHz Mode: US/Canada: 11 (1~11)
ETSI: 13 (1~13)
France: 4 (10~13)
Japan: 13(1~13)
- Supply Voltage: 3.3V±5% DC
- Current Consumption:
 - A Mode: Tx: 362mA~ 427mA @ 2T (54Mbps@13.2dBm)
Rx :481mA~283mA(54Mbps@11a)
 - B Mode: Tx: 344mA~582mA@1T(11Mbps@18.3dBm)
Rx: 482mA~ 252mA(11Mbps@11b)
 - G Mode: Tx: 361mA~ 453mA@2T(54Mbps@15.6dBm,11g)
Rx : 482mA~252mA(54Mbps@11g)
 - N Mode: Tx: 368mA~ 370mA(MCS15,40MHz@2.4GHz)
Tx : 368mA~361mA(MCS15,40MHz@5GHz)
Rx : 591mA~252mA(MCS15,40MHz@2.4GHz)
Rx :591mA~285mA(MCS15,40MHz@5GHz)
- Radio Power:
 - A Mode: +18dBm @ 6Mbps
+18dBm@ 9Mbps
+16.6dBm@12Mbps
+16.7dBm@18Mbps
+14.9dBm@24Mbps
+14.9dBm@36Mbps
+13.0dBm@48Mbps
+13.0dBm@54Mbps
 - B Mode: +18dBm @ 1&2Mbps
+18dBm @ 5.5&11Mbps
 - G Mode: +20dBm @ 6Mbps
+19.9dBm@9Mbps
+18.4dBm@12Mbps

All specifications are subject to change without notice

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- +18.5dBm@18Mbps
- +16.6dBm@24Mbps
- +16.7@36Mbps
- +15.0@48Mbps
- +15.0@54Mbps

- N Mode:
 - +20dBm@MCS0
 - +19.9dBm@MCS1
 - +18.4dBm@MCS2
 - +18.5dBm@MCS3
 - +16.8dBm@MCS4
 - +16.9dBm@MCS5
 - +15.0dBm@MCS6
 - +14.7dBm@MCS7
 - +20.0dBm@MCS8
 - +20.0dBm@MCS9
 - +18.5dBm@MCS10
 - +18.7dBm@MCS11
 - +16.9dBm@MCS12
 - +16.8dBm@MCS13
 - +15.2dBm@MCS14
 - +15.1dBm@MCS15

● Sensitivity:

- A Mode:
 - 91dBm @ 6Mbps
 - 91dBm@9Mbps
 - 91dBm@12Mbps
 - 90dBm@18Mbps
 - 89dBm@24Mbps
 - 85dBm@36Mbps
 - 81dBm@48Mbps
 - 79dBm@54Mbps

- B Mode:
 - 95dBm @ 1Mbps
 - 95dBm @ 2Mbps
 - 95dBm@5.5Mbps
 - 91dBm@11Mbps

- G Mode:
 - 95dBm @ 6Mbps
 - 94dBm @ 9Mbps
 - 93dBm@12Mbps
 - 91dBm@18Mbps
 - 88dBm@24Mbps
 - 86dBm@36Mbps
 - 82dBm@48Mbps
 - 80dBm@54Mbps

- N Mode:
 - 94dBm @ MCS0
 - 92dBm @ MCS1
 - 90dBm@MCS2
 - 88dBm@MCS3
 - 85dBm@MCS4
 - 81dBm@MCS5
 - 79dBm@MCS6

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- 78dBm@MCS7
- 93dBm@MCS8
- 90dBm@MCS9
- 88dBm@MCS10
- 85dBm@MCS11
- 81dBm@MCS12
- 77dBm@MCS13
- 76dBm@MCS14
- 74dBm@MCS15

- Media Access Protocol: CSMA/CA with ACK

5.2 Environmental Spec.

- Operating Temperature Range: 0degree C~70degree C
- Storage Temperature Range: -20degree C~80degree C
- Operating Humidity Range: 5%~90%

5. EQT Test Items and Result

Table (1) 2.4GHz band Transmitter power test results @ 25°C

Mode	Rate	Ch		Ch		Ch	
		Tx0	Tx1	Tx0	Tx1	Tx0	Tx1
11b CCK	1Mbps	17.6	18.1	17.5	17.6	17.3	17.9
	2Mbps	17.5	18.0	17.4	17.6	17.2	17.8
	5.5Mbps	17.5	18.0	17.4	17.6	17.2	17.9
	11Mbps	17.5	18.0	17.5	17.6	17.3	17.9
11g OFDM	6Mbps	19.5	19.9	19.5	19.6	19.3	20.0
	9Mbps	19.4	19.9	19.4	19.6	19.3	19.9
	12Mbps	17.9	18.4	17.9	18.1	17.7	18.4
	18Mbps	18.0	18.5	17.9	18.1	17.8	18.5
	24Mbps	16.1	16.7	16.1	16.3	15.9	16.6
	36Mbps	16.2	16.8	16.1	16.4	16.0	16.7
	48Mbps	14.4	15.0	14.3	14.6	14.3	15.0
	54Mbps	14.4	15.0	14.4	14.6	14.3	15.0
11n 20MHz	MCS	19.4	20.0	19.4	19.7	19.3	19.9
	MCS	19.4	19.9	19.4	19.7	19.2	19.9
	MCS	17.9	18.4	17.8	18.1	17.7	18.4
	MCS	18.0	18.5	17.9	18.2	17.8	18.5
	MCS	16.1	16.8	16.1	16.4	16.0	16.7
	MCS	16.2	16.9	16.2	16.5	16.0	16.8
	MCS	14.4	15.0	14.3	14.6	14.2	15.0
	MCS	14.1	14.7	14.1	14.4	14.0	14.7
	MCS	19.7	20.0	19.6	19.7	19.4	20.0
	MCS	19.6	20.0	19.6	19.7	19.4	20.0



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	MCS10	18.0	18.5	18.0	18.2	17.9	18.5
	MCS11	18.2	18.7	18.2	18.3	18.0	18.6
	MCS12	16.4	16.9	16.4	16.6	16.2	16.8
	MCS13	16.4	16.8	16.4	16.5	16.3	16.8
	MCS14	14.6	15.2	14.5	14.7	14.3	15.1
	MCS15	14.6	15.1	14.6	14.8	14.4	15.1

Table(2) 2.4GHz Band Receiver sensitivity test results

Rate		Result(dBm)		
		CH1	CH6	CH11
11b	1M	-95	-95	-95
	2M	-95	-95	-95
	5.5M	-95	-95	-95
	11M	-91	-91	-91
11g	6M	-95	-94	-94
	9M	-94	-94	-94
	12M	-93	-93	-93
	18M	-91	-91	-91
	24M	-88	-89	-89
	36M	-86	-85	-85
	48M	-82	-81	-82
	54M	-80	-80	-80
11n 20MHz	MCS0	-94	-94	-94
	MCS1	-92	-92	-92
	MCS2	-90	-90	-90
	MCS3	-88	-88	-88
	MCS4	-85	-84	-84
	MCS5	-81	-80	-80
	MCS6	-79	-79	-79
	MCS7	-78	-77	-77
	MCS8	-93	-92	-92
	MCS9	-90	-90	-90
	MCS10	-88	-87	-88

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	MCS11	-85	-85	-85
	MCS12	-81	-81	-81
	MCS13	-77	-76	-77
	MCS14	-76	-74	-75
	MCS15	-74	-73	-73

Table (3) 2.4GHz 40MHz Bandwidth Receiver sensitivity test results

Rate		Result(dBm)		
		CH3	CH6	CH9
11n 40MHz	MCS0	-92	-92	-92
	MCS1	-90	-90	-90
	MCS2	-88	-88	-88
	MCS3	-85	-85	-85
	MCS4	-82	-82	-82
	MCS5	-78	-78	-78
	MCS6	-76	-76	-76
	MCS7	-74	-74	-74
	MCS8	-90	-90	-90
	MCS9	-87	-87	-87
	MCS10	-85	-85	-85
	MCS11	-82	-82	-82
	MCS12	-78	-78	-78
	MCS13	-73	-73	-73
	MCS14	-72	-72	-72
MCS15	-70	-70	-70	

Rate		Result(dBm)		
		CH36	CH100	CH161
11a	6M	-91	-91	-91
	9M	-91	-91	-91
	12M	-90	-91	-91
	18M	-89	-89	-90
	24M	-87	-87	-89
	36M	-84	-84	-85
	48M	-79	-80	-81
	54M	-78	-78	-79



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Table (4) 5GHz band Receiver sensitivity test results

Rate		Result(dBm)		
		CH36	CH100	CH161
11n 20MHz	MCS0	-91	-91	-91
	MCS1	-90	-90	-91
	MCS2	-88	-89	-90
	MCS3	-86	-86	-88
	MCS4	-83	-83	-84
	MCS5	-78	-79	-80
	MCS6	-77	-77	-78
	MCS7	-75	-76	-77
	MCS8	-91	-92	-91
	MCS9	-89	-90	-89
	MCS10	-87	-88	-87
	MCS11	-84	-84	-83
	MCS12	-80	-81	-80
	MCS13	-76	-76	-75
	MCS14	-74	-75	-74
MCS15	-72	-73	-72	
11n 40MHz	MCS0	-88	-89	-88
	MCS1	-88	-88	-88
	MCS2	-87	-86	-86
	MCS3	-84	-84	-84
	MCS4	-81	-81	-81
	MCS5	-77	-77	-77
	MCS6	-75	-76	-75
	MCS7	-74	-74	-73
	MCS8	-89	-89	-88
	MCS9	-87	-87	-86
	MCS10	-84	-8	-83
	MCS11	-81	-8	-80
	MCS12	-77	-7	-77
	MCS13	-72	-7	-72
	MCS14	-71	-7	-70
MCS15	-68	-6	-68	

Mode	Rate	Ch3		Ch6		Ch9	
		Tx0	Tx1	Tx0	Tx1	Tx0	Tx1
11n 40MHz	MCS0	19.5	19.9	19.5	19.7	19.4	19.6
	MCS1	19.5	20.0	19.6	19.7	19.5	19.7
	MCS2	18.1	18.6	18.0	18.3	17.9	18.2
	MCS3	18.1	18.6	18.1	18.3	18.0	18.3
	MCS4	16.3	16.9	16.4	16.6	16.3	16.5
	MCS5	16.4	16.9	16.4	16.6	16.2	16.6
	MCS6	14.6	15.2	14.5	14.8	14.4	14.8
	MCS7	14.3	14.9	14.4	14.6	14.2	14.6
	MCS8	19.7	20.1	19.7	19.9	19.6	19.8
	MCS9	19.7	20.0	19.7	19.8	19.6	19.8
	MCS10	18.1	18.6	18.1	18.3	18.0	18.3
	MCS11	18.2	18.7	18.2	18.4	18.1	18.5
	MCS12	16.5	17.0	16.5	16.7	16.4	16.7
	MCS13	16.5	17.0	16.5	16.7	16.5	16.7
	MCS14	14.7	15.2	14.7	14.9	14.5	14.8
MCS15	14.7	15.3	14.7	15.0	14.5	14.9	

*Cable loss: 3dB

Table (5) 5GHz band Transmitter power test results @ 25°C

Mode	Rate	Ch 36		Ch 100		Ch 161	
		Tx0	Tx1	Tx0	Tx1	Tx0	Tx1
11a OFDM	6Mbps	17.9	18.1	17.3	18.1	17.7	17.4
	9Mbps	17.8	18.1	17.3	18.1	17.6	17.4
	12Mbps	16.2	16.4	15.6	16.6	15.9	15.6
	18Mbps	16.2	16.5	15.6	16.7	16.0	15.7
	24Mbps	14.4	14.6	13.9	14.9	14.1	13.9
	36Mbps	14.3	14.7	13.9	14.9	14.2	13.9
	48Mbps	12.6	13.0	12.2	13.0	12.4	12.2
	54Mbps	12.6	12.9	12.2	13.0	12.4	12.2

Table (5) 5GHz band Transmitter power test results @ 25°C

Mode	Rate	Ch36		Ch100		Ch161	
		Tx0	Tx1	Tx0	Tx1	Tx0	Tx1
11n 20MHz	MC	17.8	18.1	17.2	18.1	17.6	17.4
	MC	17.7	18.1	17.2	18.1	17.5	17.4
	MC	16.1	16.4	15.5	16.6	15.8	15.7
	MC	16.2	16.5	15.6	16.8	16.0	15.9
	MC	14.4	14.7	13.9	14.9	14.2	14.0
	MC	14.4	14.8	13.9	15.0	14.3	14.1
	MC	12.6	13.0	12.3	13.1	12.5	12.3
	MS	12.3	12.6	12.2	12.8	12.3	12.2
	MC	18.0	18.2	17.5	18.4	17.8	17.5
	MC	17.9	18.1	17.5	18.3	17.8	17.5
	MCS10	16.3	16.4	15.8	16.7	16.1	15.8
	MCS11	16.5	16.7	16.0	16.9	16.4	16.0
	MCS12	14.6	14.8	14.2	15.0	14.5	14.2
	MCS13	14.6	14.8	14.2	15.0	14.5	14.1
	MCS14	12.7	13.1	12.3	13.1	12.7	12.3
	MCS15	12.9	13.0	12.5	13.1	12.8	12.4

Mode	Rate	Ch36		Ch100		Ch161	
		Tx0	Tx1	Tx0	Tx1	Tx0	Tx1
11n 40MHz	MCS0	18.0	18.1	17.5	18.4	17.9	17.6
	MCS1	18.0	18.1	17.5	18.4	17.9	17.7
	MCS2	16.4	16.5	15.8	16.8	16.3	16.0
	MCS3	16.5	16.5	15.9	16.9	16.4	16.1
	MCS4	14.6	14.7	14.1	15.1	14.5	14.2
	MCS5	14.6	14.7	14.1	15.1	14.6	14.3
	MCS6	12.9	13.0	12.4	13.1	12.8	12.5
	MCS7	12.5	12.7	12.3	13.0	12.5	12.2
	MCS8	18.1	18.2	17.7	18.5	18.1	17.7
	MCS9	18.2	18.2	17.7	18.5	18.0	17.7
	MCS10	16.5	16.5	16.2	16.9	16.4	16.1
	MCS11	16.6	16.6	16.2	17	16.5	16.2
	MCS12	14.8	14.9	14.3	15.1	14.7	14.4
	MCS13	14.8	14.9	14.4	15.1	14.8	14.4
	MCS14	12.9	13.0	12.5	13.1	12.9	12.6
	MCS15	13.0	13.1	12.6	13.1	13.0	12.6

*Cable loss: 5dB(Ch36), 5dB(Ch100), 6dB(Ch161)

