



Nano Socket iWiFi G2 N2

Version 1.1

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WARNING: THE Nano Socket iWiFi G2 N2 IS AN RF MODULE INTENDED FOR EMBEDDING IN A HOST DEVICE. LOCAL RELEVANT RF REGULATIONS SUCH AS ALLOWED FREQUENCIES AND USAGE IN COMMERCIAL FLIGHTS MUST BE OBSERVED. SAFETY INSTRUCTIONS MUST BE INCLUDED IN THE MANUALS OF THE HOST DEVICE. CONNECT ONE ASSUMES NO LIABILITY FOR CUSTOMER FAILURE TO COMPLY WITH THESE PRECAUTIONS.

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Industry Canada Warning Statements:

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes : (1) Ce dispositif ne peut causer d'interférences ; et (2) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil

IC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.

This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body. Cette modulaire doit être installé et utilisé à une distance minimum de 20 cm entre le radiateur et le corps de l'utilisateur.

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 8516A-SMG2N2"

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

2. Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :

(1) Ce dispositif ne peut causer d'interférences ; et

(2) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product

FCC Warning Statements :

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: XM5-SMG2N2 Or Contains

FCC ID: XM5-SMG2N2"

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. 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.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product

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Revision History

Version	Date	Description
1.0	June 1 st 2014	Initial preliminary version
1.1	July 14 th 2014	Adding Security Features

1. Introduction

1) General Description

Nano Socket iWiFi™ G2 N2 is a secure serial-to-Wireless-LAN device module that can perform as a WLAN client or Access Point to connect serial devices to 802.11b/g/n Wireless LANs. It includes the iChip™ CO2144 IP Communication Controller™ chip and Broadcom BCM43362 WiFi chipset. It is packaged 45.21X24.88 RoHS-compliant module with two 1X15 PIN headers and onboard antenna.

Nano Socket iWiFi G2 N2 offers and supports large variety of features which among them:

- Ten simultaneous TCP/UDP sockets
- Two listening sockets
- Webserver with two websites
- SMTP and POP3 clients
- DHCP client/server
- POP3 SMTP client with MIME attachment
- FTP client
- TELNET client
- SerialNET™ mode for serial to IP bridging
- Gateway between a local network on it's LAN/WLAN interfaces and a WAN on any of it's other interfaces
- Switch between it's WLAN interface and the Ethernet interface when acting as a WLAN access point
- An Ethernet to WiFi bridge to connect an ETH client to a WiFi network (cable replacement)
- Security gap between the application and the network

Nano Socket iWiFi G2 N2 supports the SSL3/TLS1 protocol for secure sockets, HTTPS, FTPS and secure web server. On the WLAN interface it supports: WEP, WPA and WPA2 WiFi encryption.

Nano Socket iWiFi G2 N2 minimizes the need to redesign the host device hardware. It easily inserts into a two 1X15 female header connector on the host PCB and requires no external antenna connections. Minimal or no software configuration is needed for Nano Socket iWiFi G2 N2 to access the Wireless LAN.

Connect One's high-level AT+i™ API eliminates the need to add WiFi drivers, security and networking protocols and tasks to the host application. The AT+i SerialNET operating mode offers a true plug-and-play mode that eliminates any changes to the host application.

Nano Socket iWiFi G2 N2 firmware – the IP stack and Internet configuration parameters – are stored in an external FLASH memory.

The II-EVB-363-G2-N2 evaluation board provides an easy environment for testing the Nano Socket iWiFi G2 N2 prior to designing it into your product.

2) Hardware Description

Size:	45.21 x 24.88 x 9.00 mm
Core CPU:	32-bit RISC ARM7TDMI, Low-leakage, 0.13 micron, at 48MHz
Operating Voltage:	+3.3V+/-10%
Operating Humidity:	90% maximum (non-condensing)
Operating Temperature Range:	-30°C to +85°C -22°F to 185°F
Power Consumption (max):	Transmit – 350mA@11Mbps, 310mA@54Mbps, 310mA@72Mbps Receive – 130mA
Antenna:	Onboard 2DBi PACB type
Connection:	Two 1X15 pin header
Host Interface:	Serial, SPI, USB Device
A/D Input	
10/100 Base T LAN Interface:	RMII (w/ext. PHY)

3) Performance Specifications

Host Data Rate:	Up to 3Mbps in serial mode
Serial Data Format (AT+i mode):	Asynchronous character; binary; 8 data bits; no parity; 1 stop bit
SerialNET mode:	Asynchronous character; binary; 7 or 8 data bits; odd, even, or no parity; 1 stop bit
Flow Control:	Hardware (-RTS, -CTS) and software flow control.

4) Internet Protocols

ARP, ICMP, IP, UDP, TCP, DHCP, DNS, NTP, SMTP, POP3, MIME, HTTP, FTP and TELNET

5) Security Protocols

SSL3/TLS1, HTTPS, FTPS, RSA, AES-128/256, 3DES, RC-4, SHA-1, MD-5, WEP, WPA and WPA2

Accelerated in HW: AES, 3DEC and SHA

6) Application Program Interface (API)

Connect One's AT+i protocol

7) Wireless Specifications

Standards supported:	IEEE 802.11b/g/n
Frequency:	USA: 2.412-2.462GHz Canada: 2.412–2.462GHz
Channels:	USA: 11 channels Canada: 11 channels

8) Certification

Radio & EMC:

USA

FCC Limited Modular Approval

CFR Title 47 FCC Part 15, Subpart B and C

Canada

Industry Canada Limited Module Approval

Industry Canada ICES-003, RSS-Gen, RSS-210

EU

EN 300 328

EN 301 489

Safety:

UL 60950

CAN/CSA-C22.2 No. 60950

EN 60950, Low Voltage Directive

9) Installation Requirements

The Nano Socket iWiFi N2 G2 must be installed within a full-enclosure device that is safety certified.

2. Features

1) Security

- Acts as a security gap between the host application and the network
- One secure SSL3/TLS1 socket
- Provides WEP, WPA and WPA2 Wireless LAN security
- Supports multiple Certificate Authorities and both client-side and server-side authentication
- Secure FTP and HTTP clients (over SSL3)
- Secure Web Server
- Includes a true hardware random number generator
- AES, 3DES and SHA accelerated in hardware

2) Protocols

- Up to 10 simultaneous TCP/UDP sockets and two listening sockets
- HTTP client
- HTTP web server with two on-chip websites: configuration site and application site
- FTP and TELNET clients
- DHCP client and server
- POP3 or SMTP client allows sending and receiving textual and binary email with MIME attachments

3) Additional Features

- Supports infrastructure Wireless LAN networks
- SerialNET mode for serial-to-IP bridging (port server mode)
- Local firmware update
- Remote configuration and firmware update over the Internet

Note: For a detailed description of all available features, see the *AT+i Programmer's Manual*.

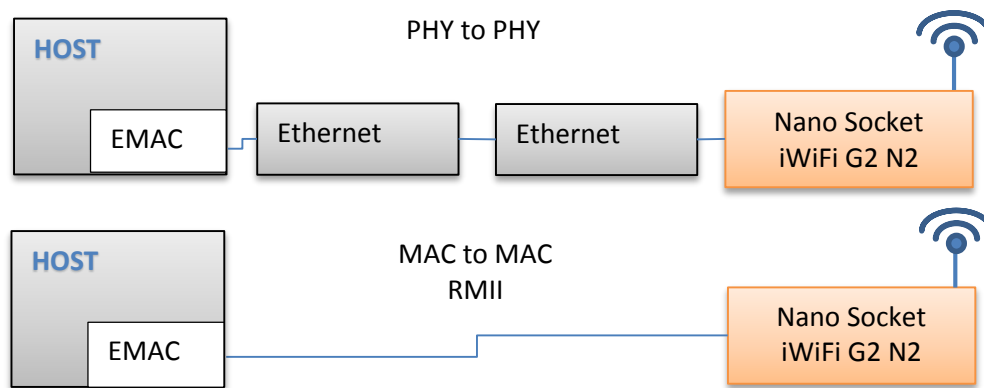
3. Typical Applications

Adding IP communications over WiFi to serial embedded devices.

Replacing a LAN cable with a WiFi connection.

Adding SSL security to M2M solutions.

LAN to WiFi Bridge - allowing transparent bridging of LAN client over WiFi (Cable replacement), using direct RMII connection to existing MAC hardware or direct PHY-to-PHY connection.

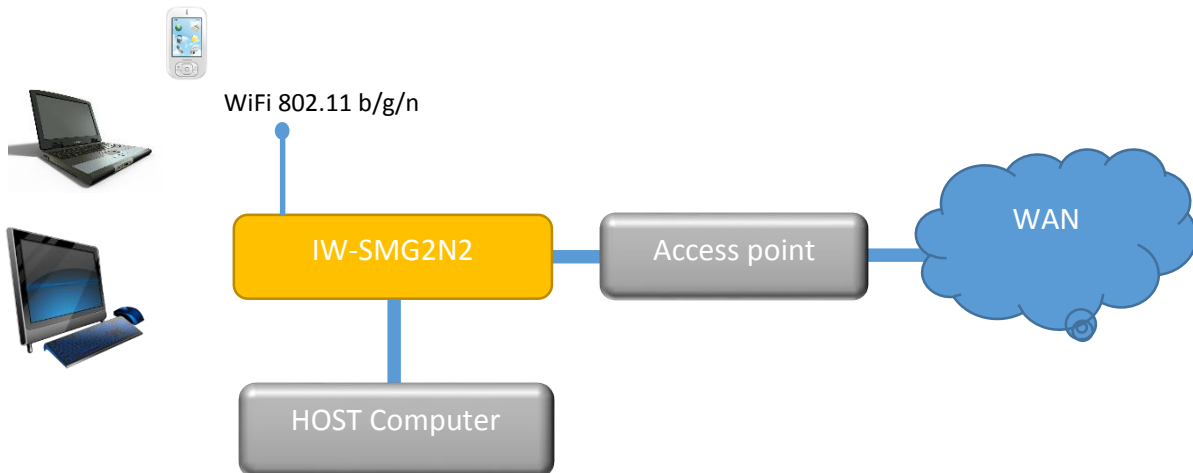


SerialNet™ Serial to WiFi Bridge - allowing transparent bridging of Serial over WiFi, using a 3Mbps fast UART. This is a true plug-and-play mode that eliminates any changes to the host application.

PPP modem emulation – allowing existing (i.e. modem) designs currently using PPP to connect transparently over WiFi.

Full Internet Controller mode – allowing simple MCU to use the Nano Socket iWiFi G2 N2's rich protocol and application capabilities to perform complex Internet operations such as E-mail, FTP, SSL, embedded Web server and others. It also acts as a firewall, providing a security gap between the application and the network.

LAN ↔ WiFi / WiFi ↔ LAN Gateway – allowing local systems, communicating over LAN and/or WiFi, to gain WAN access to the Internet. The WAN can be implemented using WiFi / LAN. A user configurable parameter allows the WAN to be configured to one of the iChip network interfaces. This mode includes a DHCP server and NAT to support multiple local systems communicating over a single link.



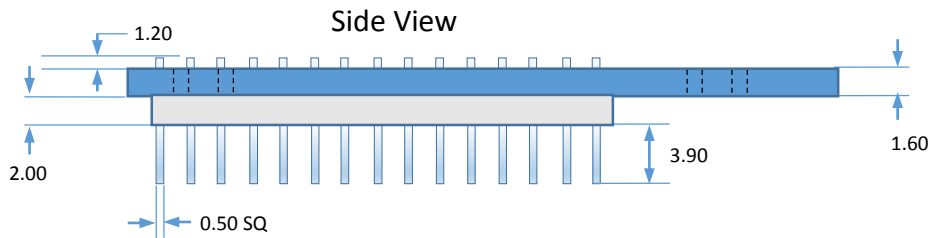
4. AT+i Command Set

The iW-SMG2N2 is configured and controlled using proprietary AT+i protocol. You can create a quick configuration using our AT+i Configuration Wizard located in Connect One's website <http://www.connectone.com>. In addition, the AT+i Programmer's Manual includes commands description and format of the entire AT+i command set.

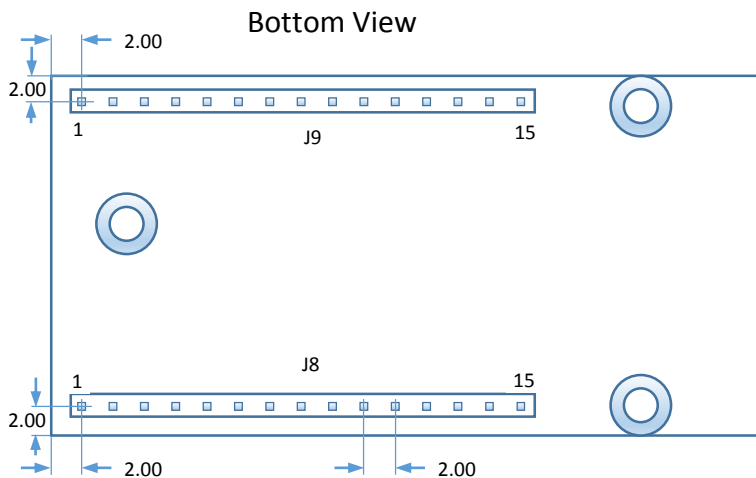
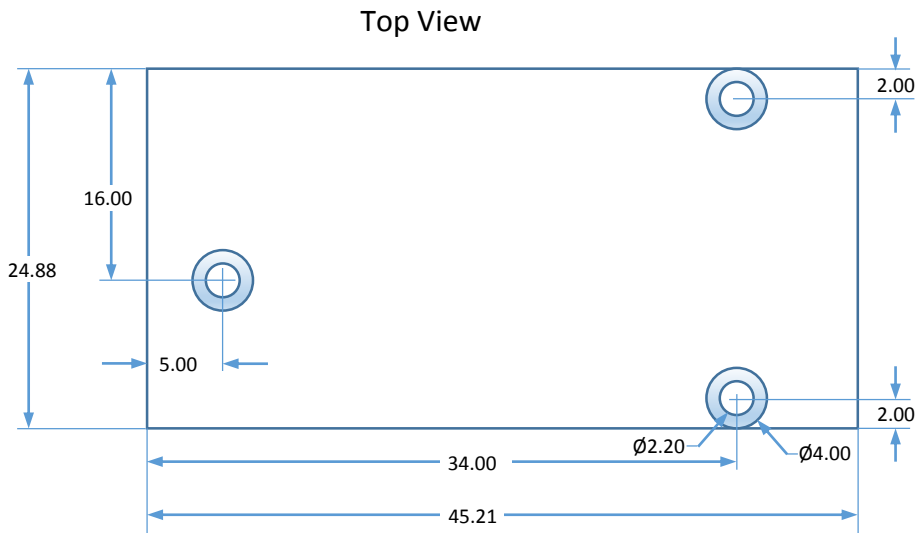
Please refer to Appendix B for examples of module configuration using AT+i command set.

5. Layout, Mechanical Dimensions and Pin Description

1) Layout and Mechanical Dimensions



Headers: Two 1X15pin Male 2mm pitch
 Mate with: Two 1X15 Female 2mm Pitch
 Samtec Part Number: #SQT-115-01-F-S
 Or compatible



All measurements are in mm. Tolerance:
 Length/Width ± 0.15 mm, PCB thickness $\pm 10\%$, Plated bores: ± 0.075 mm, Non-Plated bores: 0.05mm, Bore positions: ± 0.1 mm

2) Pin Functional Description

<u>J8 Pin Assignment</u>			
Pin	Signal	Type	Description
1	ERX0	Input	RMII Receive Data 0
2	ERX1	Input	RMII Receive Data 1
3	EMDC	Output	Management Data Clock
4	ERXER	Input	RMII Receive Error
5	RMII REFCLK	Input	RMII 50Mhz Reference Clock
6	GND	Power	Ground
7	VDD	Power	VDD
8	RXD0	Input	UART 0 Receive
9	TXD0	Output	UART 0 Transmit
10	nCTS0	Input	UART 0 Clear To Send
11	nRTS0	Output	UART 0 Request To Send
12	DATA RDY	Output	Data Ready - High when data rec. from Internet is buffered
13	MSEL	Input	Mode Select – Rescue and force F/W update
14	nReset	Input	Reset Module – Pull LOW for 100mSec to Reset
15	nRF LED	Output	RF LED Indicator
<u>J9 Pin Assignment</u>			
1	ETX0	Output	RMII Transmit Data 0
2	ETX1	Output	RMII Transmit data 1
3	EMDIO	In/out	Management data I/O
4	CRSDV	Input	RMII Carrier Sense and Data Valid
5	ETXEN	Output	RMII Transmit Enable
6	nSPI CS	Input	SPI1 Host Chip Select for host
7	SPI1 CLK	Input	SPI1 Clock for host (Max 12MHz)
8	SPI1 MISO	Output	SPI1 Slave Out for host master in
9	SPI1 MOSI	Input	SPI1 Slave in for host master out
10	SPI1 INT	Output	SPI1 have data on buffer
11	Readiness	Output	High when iChip Ready for commands

12	DDM	Analog	USB Device Negative
13	DDP	Analog	USB Device Positive
14	N.C.		Not Connected
15	GND	Power	Ground

6. Interfaces

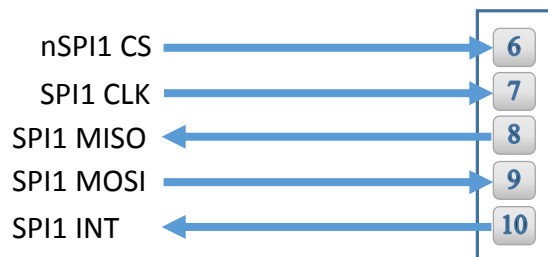
1) Serial Interface



Nano G2 N2 J8

Note: If UART is not used, leave TXD0 and RXD0 N.C and short nCTS0 to nRTS0

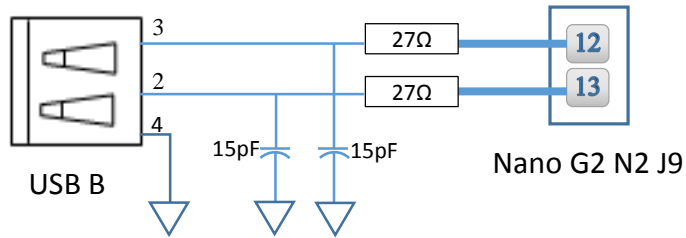
2) SPI Interface



Nano G2 N2 J9

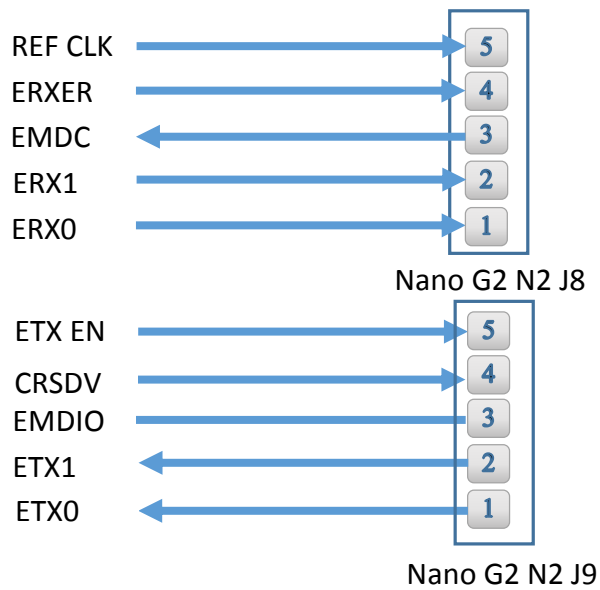
Note: If SPI is not used leave all signals N.C

3) USB 2.0 Device Interface



Note: If USB is not used leave all signals N.C

4) RMII Interface



Note: If RMII is not used leave all signals N.C

7. Electrical Specifications

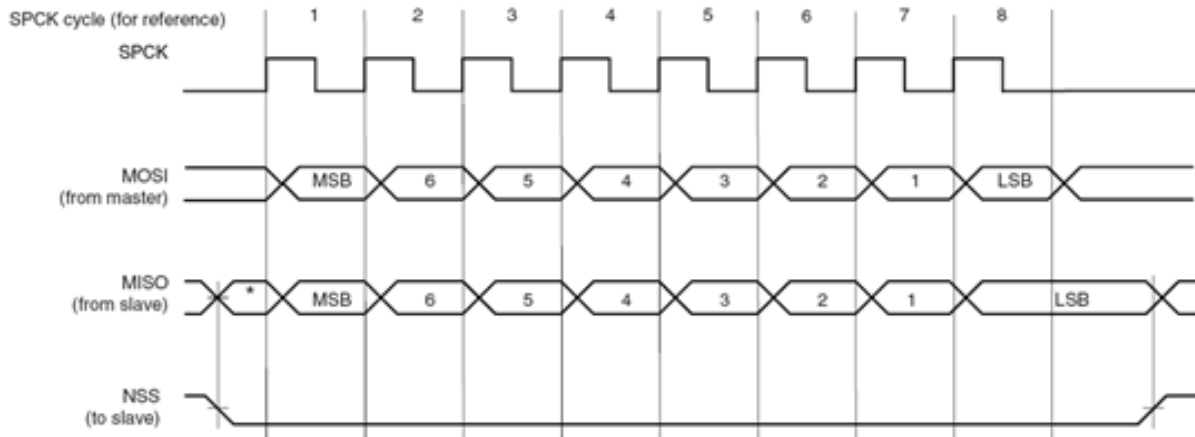
1) Absolute Maximum Ratings

Parameter	Rating
Voltage at any pin with respect to ground	-0.3V to +3.6V
Operating Temperature	-30°C to +85°C -22°F to +185°F
Storage Temperature	-40°C to +85°C -40°F to +185°F

2) DC Operating Characteristics

Parameter	Min	Typical	Max	Units
VDD	3.0	3.3	3.6	Volts
High Level Input	2.0		VDD I/O +0.3	Volts
Low Level Input	-0.3		0.8	Volts
High Level Output @2mA	VDD I/O -0.4			Volts
High Level Output @0mA	VDD I/O-0.2			Volts
Low Level Output @2mA			0.4	Volts
Low Level Output @0mA			0.2	Volts
Input Leakage Current			10	μA
Power Supply Current from VDD (Tx. Mode)			350	mA
Power Supply Current from VDD (Rcv. Mode)			130	mA
Power Supply Current from VDD (Power Save Mode)			TBD	mA
Input Capacitance			5.3	pF
Radio Frequency Range	2.412		2.462	GHz

3) AC Operating Characteristics



4) Transmit Specification

Transmit Error vector Magnitude	802.11b	11Mbps		-13	-11	dB
		1Mbps		-13	-11	dB
	802.11g	54Mbps		-30	-25	dB
		6Mbps		-30	-22	dB
	802.11n	HT20M@MCS0		-30	-22	dB
		HT20M@MCS0		-30	-28	dB

5) Receive Specifications

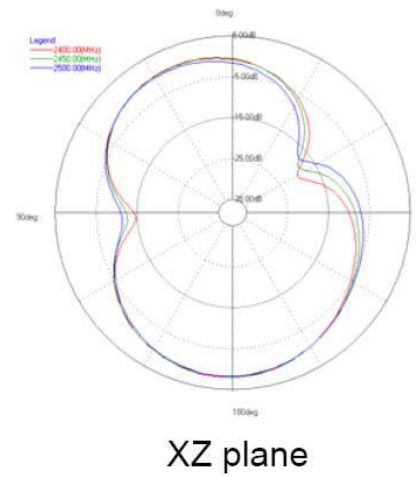
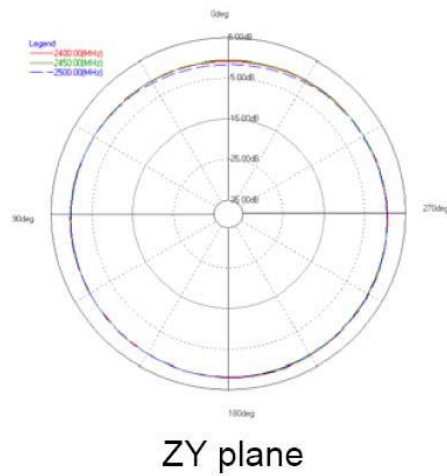
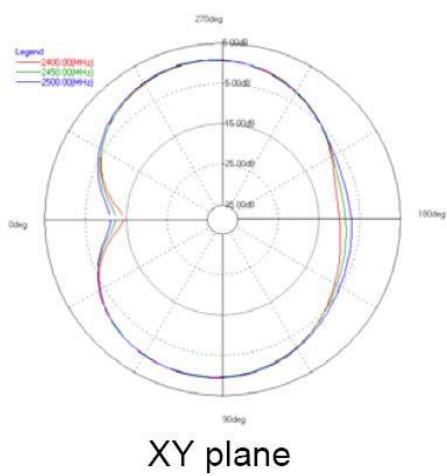
Item	Condition	Min	Typ	Max	Unit
Receiver Minimum Input Level Sensitivity	802.11b Data Rate = 11Mbps PER < 8%		-87	-83	dBm
	802.11b Data Rate = 1Mbps PER < 8%		-94	-89	dBm
	802.11g Data Rate = 54Mbps PER <10%		-73	-68	dBm
	802.11g Data Rate = 6Mbps PER <10%		-86	-81	dBm
	802.11n MCS0 PER <10%		-86	-81	dBm
	802.11n MCS7 PER <10%		-70	-65	dBm

8. On Board Antenna

1) Specifications

- Designed for: 2.4Ghz operation
- Peak Gain: 2.1DBi
- Avg. Efficiency: 75%
- Max Return Loss: -11DBi
- Max VSWR: 1.8:1

Antenna Patterns:



9. Evaluation Board

The II-EVB-363-G2-N2 evaluation board enables you to evaluate the Nano Socket iWiFi G2 N2 without changing anything in your current development environment. Using a simple Windows-based application on a PC, you can issue AT+i commands.

AT+i commands are used to configure parameter values into iChip’s flash memory and activate Internet tasks such as email send, sockets, FTP sessions, configuration, and more.

A full description of AT+i commands can be found in the *AT+i Programmer’s Manual* on Connect One’s website.

To help you evaluate the Nano Socket iWiFi G2 N2, Connect One supplies the iChip Config Utility. This is a Windows-based application that contains intuitive dialog boxes to fully configure iChip CO2144. It doesn’t require any knowledge of AT+i commands. It also contains local firmware update tools. The iChip Config Utility allows you to perform specific Internet communication tasks such as sending and receiving emails, activating iChip’s websites, entering SerialNET mode, and more. The latest iChip Config Utility version and user manual can be found on Connect One’s website under the Support section.

On board connectors allow a choice of Host interfaces:

- RS232 COM port
- SPI
- USB Device

10. Ordering Information

Part Number	Description
iW-SMG2N2	Nano Socket iWiFi G2 N2 WiFi Module

Appendix A - Internet Protocol Compliance

Nano Socket iWiFi G2 N2 complies with the Internet standards listed in the following table

RFC 768	User datagram protocol (UDP)
RFC 791	Internet protocol (IP)
RFC 792	ICMP – Internet control message protocol
RFC 793	Transmission control protocol (TCP)
RFC 821	Simple mail transfer protocol (SMTP)
RFC 822	Standard for the format of ARPA Internet text messages
RFC 826	Ethernet address resolution protocol (ARP)
RFC 959	File transfer protocol (FTP)
RFC 854	TELNET protocol specification
RFC 857	Telnet ECHO option
RFC 858	Telnet suppress go-ahead option
RFC 1034	Domain names (DNS) - concepts and facilities
RFC 1035	Domain names (DNS) - implementation and specification
RFC 1073	Telnet window size option
RFC 1091	Telnet terminal type option
RFC 1321	MD5 message digest algorithm
RFC 1939	Post office protocol - version 3 (POP3)
RFC 1957	Some observations on the implementations of the post office protocol (POP3)
RFC 2030	Simple network time protocol (SNTP)
RFC 2045	Multipurpose Internet mail extensions (MIME) part one: internet message body format
RFC 2046	MIME part two: media types
RFC 2047	MIME part three: message header extensions for non-ASCII text
RFC 2048	MIME part four: registration procedures
RFC 2049	MIME part five: conformance criteria and examples
RFC 2068	Hypertext transfer protocol HTTP/1.1
RFC 2131	Dynamic host configuration protocol (DHCP)
RFC 2132	DHCP options (only relevant parts)
RFC 2228	FTP security extensions
RFC 2246	The TLS protocol version 1.0

Appendix B – AT+I Configuration Examples

Automatically connect to a specific Access Point:

AT+iFD	(restore to factory defaults)
AT+iHIF=1	(set the serial interface to RS232)
AT+iBDRF=9	(fix baud rate to 115200 after power cycle)
AT+iRP20	(list visible networks)
AT+iWLSI=My_WiFi	
AT+iWST0=4	(WPA2 security)
AT+iWPP0=<WPA2 passphrase>	
AT+iAWS=1	(enable website upon reboot)
AT+iDOWN	(reboot to apply settings)

Create an Access Point to allow connection from mobile devices:

AT+iFD	(restore to factory defaults)
AT+iHIF=1	(set the serial interface to RS232)
AT+iBDRF=9	(fix baud rate to 115200 after power cycle)
AT+iWLSI=My_AP	
AT+iDIP=10.0.0.1	(IP address)
AT+iDPSZ=8	(Enable internal DHCP server, up to 8 clients)
AT+iWST0=0	(open security)
AT+iAWS=1	(enable website upon reboot)
AT+iDOWN	(reboot to apply settings)

LAN – WiFi switch mode - merges Ethernet station(s) with WiFi client(s) into one logical subnet

AT+iFD	(restore to factory defaults)
AT+iHIF=1	(set the serial interface to RS232)
AT+iBDRF=9	(fix baud rate to 115200 after power cycle)
AT+iwlsi=SWITCH	
AT+idpsz=8	(Enable internal DHCP server, up to 8 clients)
AT+iwst0=0	(open security)
AT+ilty=4	(LAN type: WiFi+Ethernet)
AT+idip=192.168.0.1	(WiFi side IP address)
AT+isnet=255.255.255.0	(WiFi side subnet mask)

AT+iedip=192.168.0.100	(Ethernet side IP address)
AT+iesnt=255.255.255.0	(Ethernet side subnet mask)
AT+istap=1	(WiFi in Access Point mode)
AT+iswen=1	(Enable Switch Mode)