

Nano SocketLAN™

# Nano SocketLAN™



## Data Sheet

Ver. 1.20

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## Revision History

### 11-4200-05

| Version | Date      | Description                             |
|---------|-----------|-----------------------------------------|
| 1.00    | July 2009 | Initial preliminary version             |
| 1.05    | July 2009 | Miscellaneous corrections               |
| 1.10    | July 2009 | Added resistor values for USB connector |
| 1.15    | July 2009 | Updated Mechanical Dimensions           |
| 1.20    | July 2009 | Corrected part number                   |

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# 1 Introduction

## 1.1 General Description

Nano SocketLAN™ is a secure serial-to-LAN device server module that also acts as a bridge to connect serial devices to 10/100 Mbit Ethernet LANs. It includes the iChip™ CO2144 IP Communication Controller™ chip and a 10/100BaseT Ethernet PHY. The Nano SocketLAN is packaged in a RoHS-compliant compact form factor and uses a simple header connector for easy assembly or soldering.

The Nano Socket LAN is Pin compatible with the Nano Socket iWiFi, allowing customers to design a single PCB for an easy switch between LAN and WiFi.

Nano SocketLAN offers much more than many other device servers on the market. It acts as a security gap between the application and the network; supports up to 10 simultaneous TCP/UDP sockets; two listening sockets; a web server with two websites; SMTP and POP3 clients; MIME attachments; FTP and TELNET clients, SerialNET™ mode for serial-to-IP bridging, and many more features.

Nano SocketLAN supports the SSL3/TLS1 protocol for secure sockets, HTTPS and FTPS.

Nano SocketLAN minimizes the need to redesign the host device hardware. It easily inserts into headers on the host PCB and includes an onboard RJ45 connector. Minimal or no software configuration is needed for Nano SocketLAN to access the LAN.

Connect One's high-level AT+i™ API eliminates the need to add 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 SocketLAN firmware – the IP stack and Internet configuration parameters – are stored in an on-board flash memory. The module is power-efficient: the core operates at 1.2V, while I/Os operate at 3.3V.

The II-EVB-363MS evaluation board provides an easy environment for testing the Nano SocketLAN prior to designing it into your product.

## 1.2 Hardware Description

Size: 38.9 x 24.88 x 20.9 mm

Core CPU: Connect One CO2144, low-leakage, 0.13 micron, clocked at 48MHz

Operating Voltage: +3.3V+/-10%

Operating Humidity: 90% maximum (non-condensing)

Operating Temperature Range: -40° to 85°C (-40° to 185°F)

Power Consumption: 130mA (typical)  
30mA (PHY shutdown)

Connector: 2 x 10 pin header 2mm pitch

Host Interface: TTL Serial, SPI and USB device.

10/100BaseT Ethernet

RoHS-compliant; lead-free

## 1.3 Performance Specifications

Host Data Rate/Effective TCP throughput:

- Serial mode: 3Mbps / 3Mbps
- SPI mode: 24Mbps / 5Mbps
- USB mode: 12Mbps / 500Kbps

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, 1.5, or 2 stop bits

Flow Control: Hardware (-RTS, -CTS), software flow control or None.

**Internet Protocols**

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

**Security Protocols**

SSL3/TLS1, HTTPS, FTPS, RSA,  
AES-128/256, 3DES, RC-4, SHA-1, MD-5,  
MD-2

**Protocols Accelerated in HW**

AES, 3DES and SHA

**Application Program Interface**

Connect One's AT+i protocol  
SerialNET mode for transparent serial  
data-to-Internet bridging

**Warranty**

One year

**Installation Requirements**

The Nano SocketLAN must be installed  
within a full-enclosure device that is safety  
certified.



## 2 Features

### 2.1 Protocols

- Up to 10 simultaneous TCP/UDP sockets and two listening sockets
- HTTP/HTTPS client
- HTTP/HTTPS web server with two on-chip websites: Configuration site and Application site
- FTP and TELNET clients
- DHCP client and server
- PPP Host Interface
- Sending and receiving textual email and binary email with MIME attachments

### 2.2 Security

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

### 2.3 Additional Features

- Non-volatile, on-chip operational parameter database
- SerialNET mode for serial-to-IP bridging (port server mode)
- Local firmware update via host interface
- Remote configuration and firmware update over the Internet
- Retrieval of time data from a Network Time Server

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

## 3 Typical Applications

- Add IP communications over LAN to serial embedded devices.
- Seamlessly replace a dialup or cellular connection with a LAN connection.
- Add SSL security to M2M solutions.
- Pin compatible with the Nano Socket iWiFi allowing an easy switch between LAN and WiFi.

Nano SocketLAN supports several operational modes:

- **SerialNet™ Serial to LAN Bridge** - allowing transparent bridging of Serial or USB over LAN, 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 LAN.
- **Full Internet Controller mode** – allowing simple MCU to use the Nano SocketLAN'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.
- **Embedded IP Routing** - allowing a single Nano SocketLAN to route data between multiple LAN clients over a single Dialup/Cellular connection (note: SPI must be used as host interface).

## 4 Connector Pin Description

The Nano SocketLAN module includes the iChip CO2144 IP Communication Controller and 10/100 Ethernet PHY with magnetics mounted on a socket form-factor module. Two 10pin headers (J8 and J9) provide Serial, USB or SPI host interfaces and mechanical reinforcement. The module may be soldered or plugged into mating Female headers.

### 4.1 Pin Numbers

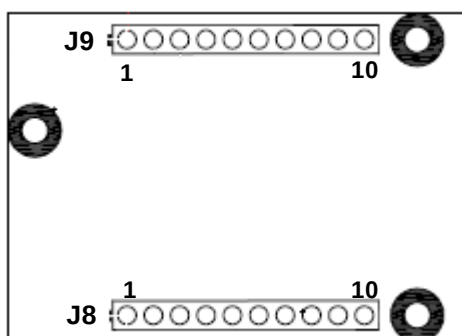


Figure 3-4-1: Pin-out for Nano SocketLAN (Bottom View)

**Connector:** 2 x 10pin Header Male 2mm pitch

**Mate with:** 2 x 10pin Header Female 2mm pitch:

|                |                     |
|----------------|---------------------|
| Samtec         | # SQT-110-01-F-S    |
| Morethanall    | # S-D63-1x10-LF     |
| Weitronic      | # 136-1010-10-10-60 |
| or compatible. |                     |

## 4.2 J8 Pin Functional Description

| Pin | Signal          | type   | Description                         |
|-----|-----------------|--------|-------------------------------------|
| 1   | GND             | Power  |                                     |
| 2   | V <sub>DD</sub> | Power  |                                     |
| 3   | RXD0            | Input  | UART 0 receive                      |
| 4   | TXD0            | Output | UART 0 transmit                     |
| 5   | nCTS0           | Input  | UART 0 clear to send                |
| 6   | nRTS0           | Output | UART 0 request to send              |
| 7   | DATA_RDY        | Output | Data ready <sup>1</sup>             |
| 8   | MSEL            | Input  | Mode select <sup>2</sup>            |
| 9   | nRESET          | Input  | Reset Module. At Least 10mSec pulse |
| 10  | ACT_LINK        | Output | LAN Link LED indicator              |

Table 3-1: J8 Connector Signal Description

## 4.3 J9 Pin Functional Description

| Pin | Signal    | type   | Description                                   |
|-----|-----------|--------|-----------------------------------------------|
| 1   | nSPI1_CS  | Input  | SPI 1 chip select for host                    |
| 2   | SPI1_CLK  | Input  | SPI 1 clock for host (Max 12MHz)              |
| 3   | SPI1_MISO | Output | SPI 1 slave out for host master in            |
| 4   | SPI1_MOSI | Input  | SPI 1 slave in for host master out            |
| 5   | SPI1_INT  | Output | SPI 1 have data on his buffer                 |
| 6   | Readiness | Output | iChip Ready <sup>3</sup>                      |
| 7   | DDM       | Analog | USB device negative                           |
| 8   | DDP       | Analog | USB device positive                           |
| 9   | SPEED     | Output | Speed LED indicator. "0" - 100M ;<br>"1" -10M |
| 10  | GND       | Power  |                                               |

Table 3-2: J9 Connector Signal Description

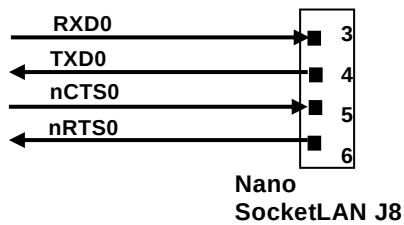
<sup>1</sup> Indicates new network data is waiting to be read. Details in status report AT+iRP7.  
May be left unconnected.

<sup>2</sup> Enables Rescue Mode / Firmware Update / Force User-profile. May be left unconnected.

<sup>3</sup> Indicates that the boot sequence has completed. May be left unconnected

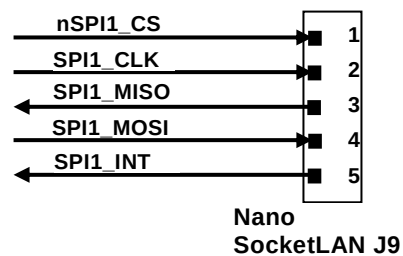
## 5 Interfaces

### 5.1 J8 Serial Interface



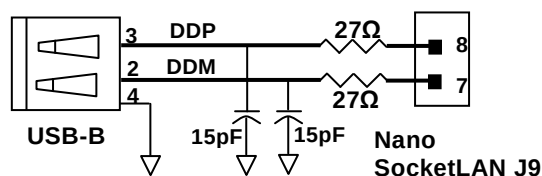
Note: If UART is not used leave TXD0 and RXD0 N.C. and short nCTS0 to nRTS0

### 5.2 J9 SPI Interface



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

### 5.3 J9 USB Interface



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

## 6 Electrical Specifications

### 6.1 Absolute Maximum Ratings

| Parameter                                 | Rating                          |
|-------------------------------------------|---------------------------------|
| Voltage at any pin with respect to ground | -0.3V to +3.6V                  |
| Operating temperature                     | -40°C to 85°C (-40°F to 185°F)  |
| Storage temperature                       | -65°C to 125°C (-85°F to 257°F) |

Table 4-1: Absolute Maximum Ratings

### 6.2 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                       |             | 130     | 170         | mA    |
| Power supply current when Ethernet PHY is shut down |             | 30      |             | mA    |
| Input Capacitance                                   |             |         | 5.3         | pF    |

Table 4-2: DC Operating Characteristics

(\*) Note: Power supply current as measured in firmware version i2128d804B05.

## 6.3 AC Operating Characteristics

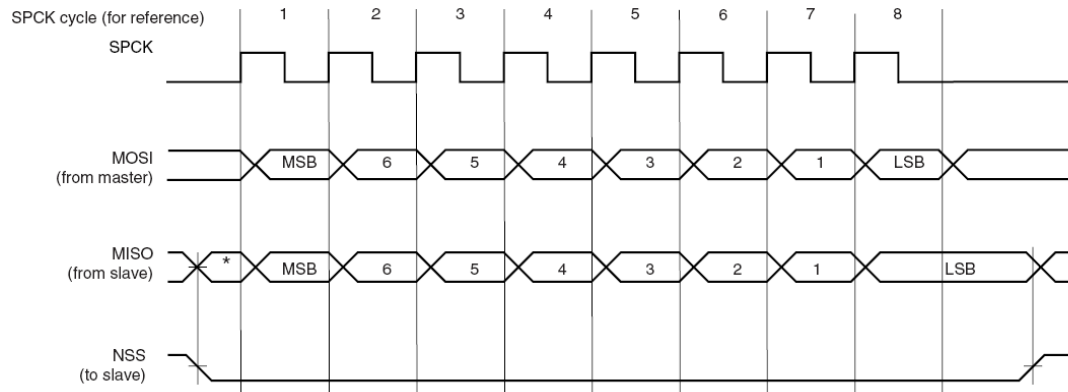
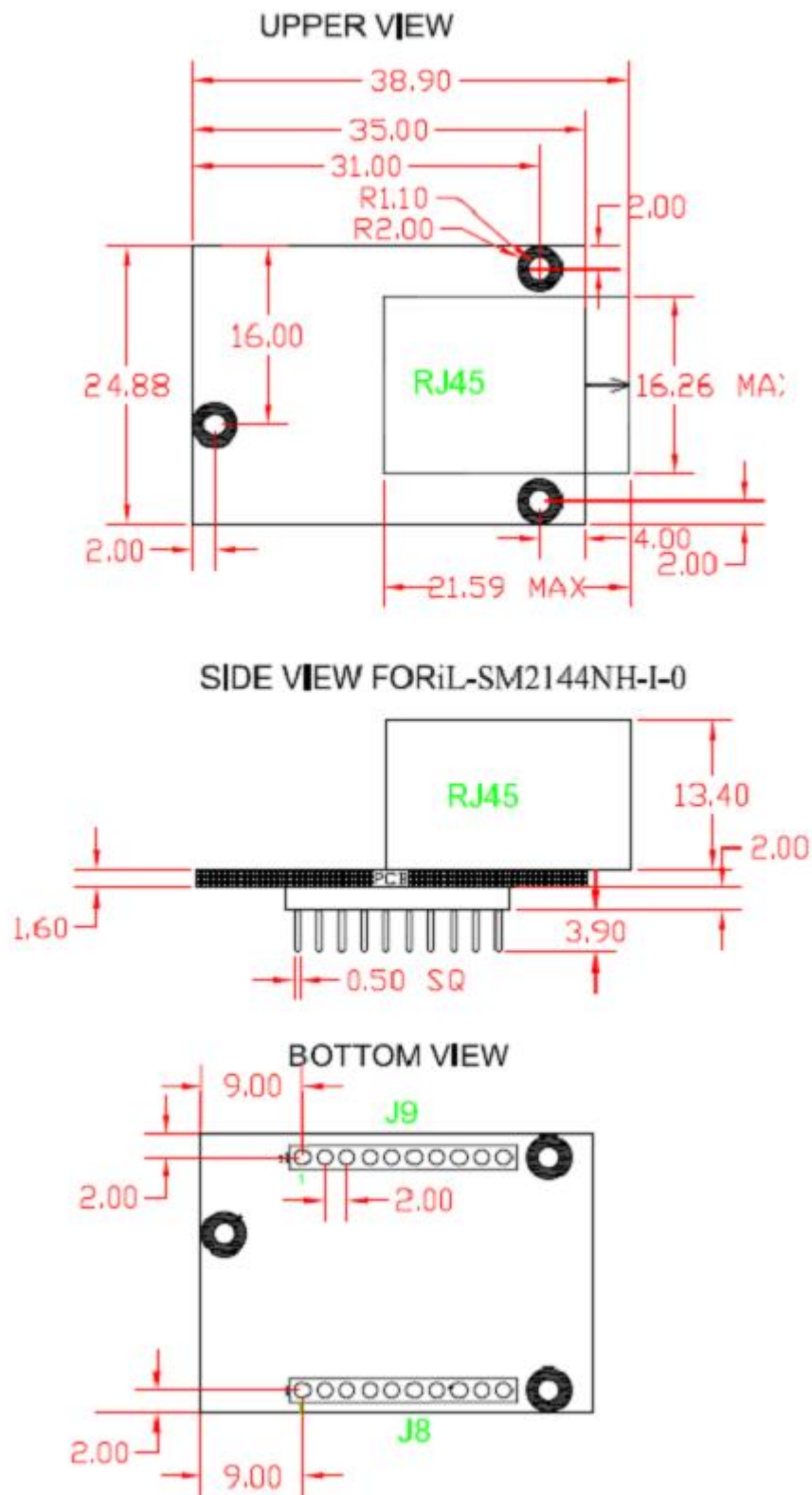


Figure 6-1: SPI Interface Waveforms

## 7 Mechanical Dimensions



**Note:** All measures are in millimeters

Figure 5-7-1: Mechanical Dimensions



## 8 Evaluation Board

The II-EVB-363-MS evaluation board enables you to evaluate the Nano SocketLAN without changing anything in your current development environment. Using a simple Windows-based application on a PC, you can issue AT+i commands to the iChip CO2144 and get responses.

*Note: The evaluation board supports serial host data rates of up to 1Mbps.*

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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 at:

<http://www.connectone.com/support.asp?did=35>

To help you evaluate the Nano SocketLAN, Connect One supplies the iChipConfig 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 functionality. The iChipConfig 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 iChipConfig 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

## 9 Ordering Information

| Ordering Information    |                                                                                                                                                                                                                                                                                          |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part Number             | Description                                                                                                                                                                                                                                                                              |
| iL-SM2144NH-I           | Nano SocketLAN module, 2x10 pin header connector                                                                                                                                                                                                                                         |
|                         |                                                                                                                                                                                                                                                                                          |
| II-EVB-363MS-US-110/220 | Evaluation board for Nano SocketLAN. Includes Nano SocketLAN attached to a motherboard's 2x10 pin header connector. The main board includes one male-female RS-232 DB-9 connector for high speed USART, RJ-45, USB, SPI and DC power connector. Specify 110V or 220V power supply. RoHS. |

# 10 Internet Protocol Compliance

Nano SocketLAN 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                                                        |

*Table 10-1: Internet Protocol Compliance*