
NM6000 Developer's Guide

Version 1.3

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1. Introduction

NM6000 is the 802.11b WLAN Module for mainly WIZnet customers who are using one of WIZnet solutions and are asking for WLAN connectivity with minimum change in their application system.

NM6000 will go together with subsidiary boards, NM7001 for replacement of NM7010A (old named IIM7010A), NM6000-IF for quick test of NM6000, and EVB8051-NM6000 for NM6000 evaluation.

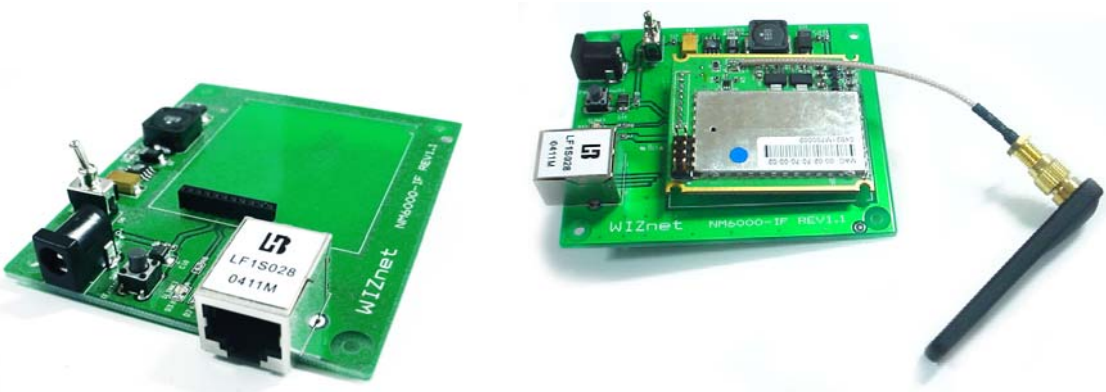
For quick test, NM6000-IF (interface board plugged NM6000) provides RJ45 interface and can be connected directly to RJ45 interface of existing Ethernet application by crossed UTP cable.

For easy development, NM7001 provides an interface to be connected to NM6000 directly with ten-wired cable and is pin-compatible with NM7010A for replacement of NM7010A.

For new developer, EVB8051-NM6000 provides development environment for Wireless LAN Internet connectivity.



< Figure 1-1. NM6000 >



< Figure 1-2. NM6000-IF >



< Figure 1-3. NM7001 >



< Figure 1-4. EVB8051-NM6000 >

1.1. NM6000 Feature

NM6000 has following features.

- GSV Prism 3.0 Chipset
- Support IEEE 802.11b & 802.3 Standards
- Support Access Point & AP Client Modes
- Support Ad-hoc and Infrastructure both network architecture
- Easy to embed with simple interface
(Compact size & Ethernet interface)
- Easy Installation
- Web based management

1.2. Hardware Specification

1.2.1. General Specification

1. Wired standard	IEEE 802.3 10Mbps Ethernet
2. Wireless Standard	IEEE 802.11b Standard Compliant
3. Interface	- One Wireless Link/Activity LED pin - One Factory reset pin - Four Ethernet PHY signal line (TX+, TX-, RX+, RX-) pins - Two 5V supply pins - Two Ground pins - One antenna port

1.2.2. RF Characteristics

RF Characteristics	Minimum	Typical	Maximum
1. Chip set	GSV / Intersil Prism III		
2. Operating mode	Access point or Client mode by factory setting		
3. Data rate	11, 5.5, 2, 1 Mbps (CCK, DQPSK, DBPSK)		
4. Channel Assignment	- 11 Channels for US and CA (center frequency: 2412 ~ 2462MHz) - 13 Channels for EU (center frequency: 2412 ~ 2472MHz) - 14 channels for Japan (center frequency: 2412 ~ 2484MHz) - 4 channels for France (center frequency: 2457 ~ 2472MHz) - 2 channels for Spain (center frequency: 2457 ~ 2462MHz)		
5. Antenna Support	External antenna port (SMA female)		
6. TX output power	16dBm (39.8mW)	18dBm(63.1mW)	20dBm (100mW)
7. Adjacent Channel Rejection	-	39dB	-
8. RX sensitivity	-	- 84dBm at 11Mbps	-
9. Coverage (1024 bytes file transfer with dipole antenna)	- Open Space : 150m(500ft) at 11Mbps, 200m(660ft) at 2Mbps - Closed Office: 30m(100ft) at 11Mbps, 50m(160ft) at 2Mbps		

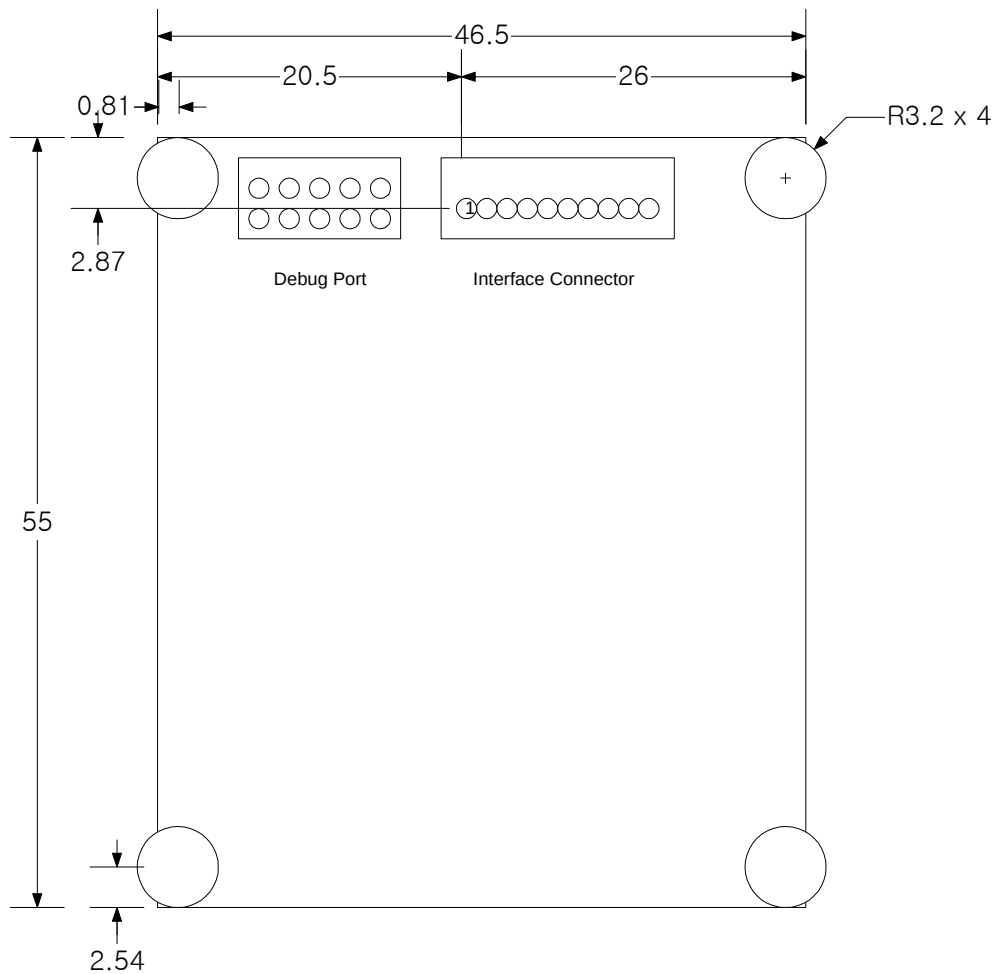
*Note : Sensitivity based upon 1024 Bytes frame length, 11 Mbps data rate, 8% PER

1.2.3. Electrical Characteristics

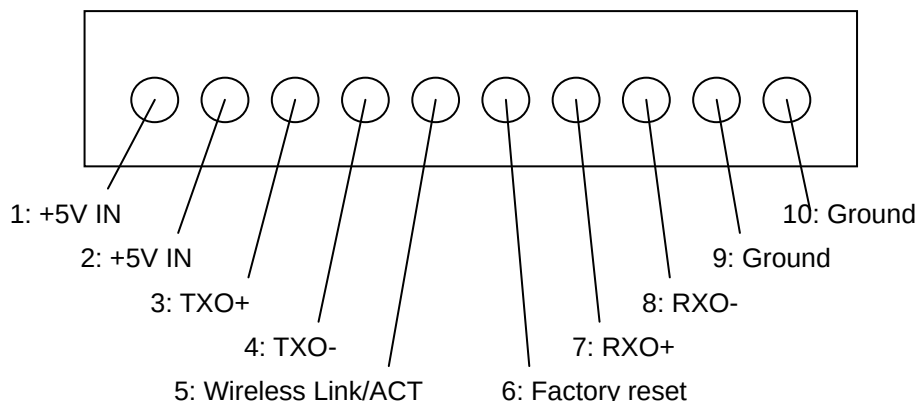
1. Operating Voltage	5V +/- 0.5%
2. Power Consumption	Under 600mA

1.2.4. Mechanical Characteristics

1. Dimension	46.5mm×55.0mm×8.0mm(exclude Connector height)
2. Weight	35g
3. Interface Connector	2mm pitch, 1 row, 10Pin Header



1.2.5. Pin Assignment (Interface Connector)

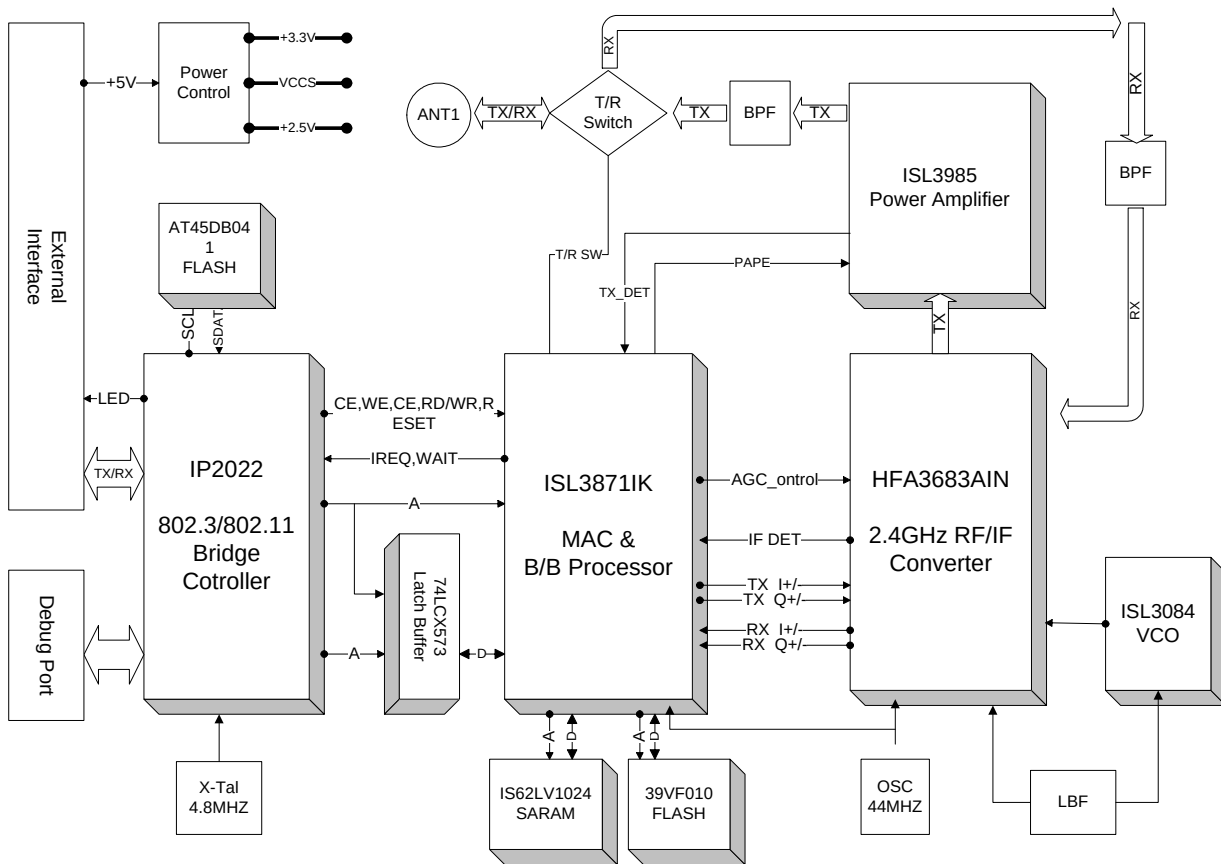


- Wireless Link/ACT : Active High
- Factory reset : Active Low

1.2.6. Environmental requirements

1. Operating temperature	-0°C ~ +55°C
2. Storage temperature	-25°C ~ +70°C
3. Operating humidity	95% (Non-Condensing)

1.2.7. Block Diagram



1.3. Software Specification

1. Network	Infrastructure & Ad-hoc (Default mode is Ad-hoc) DHCP client for Internet
2. Data rate	Fixed 11, 5.5, 2Mbps Auto rate control
3. ESSID	Support hidden ESSID
4. Security	64bit/128bit WEP key MAC Filtering
5. Management	Web Based management Authorized User Access Firmware upgrade via HTTP protocol Factory default. Self configuration

1.4. Antenna Specification

1.4.1. NM6000-ANT1

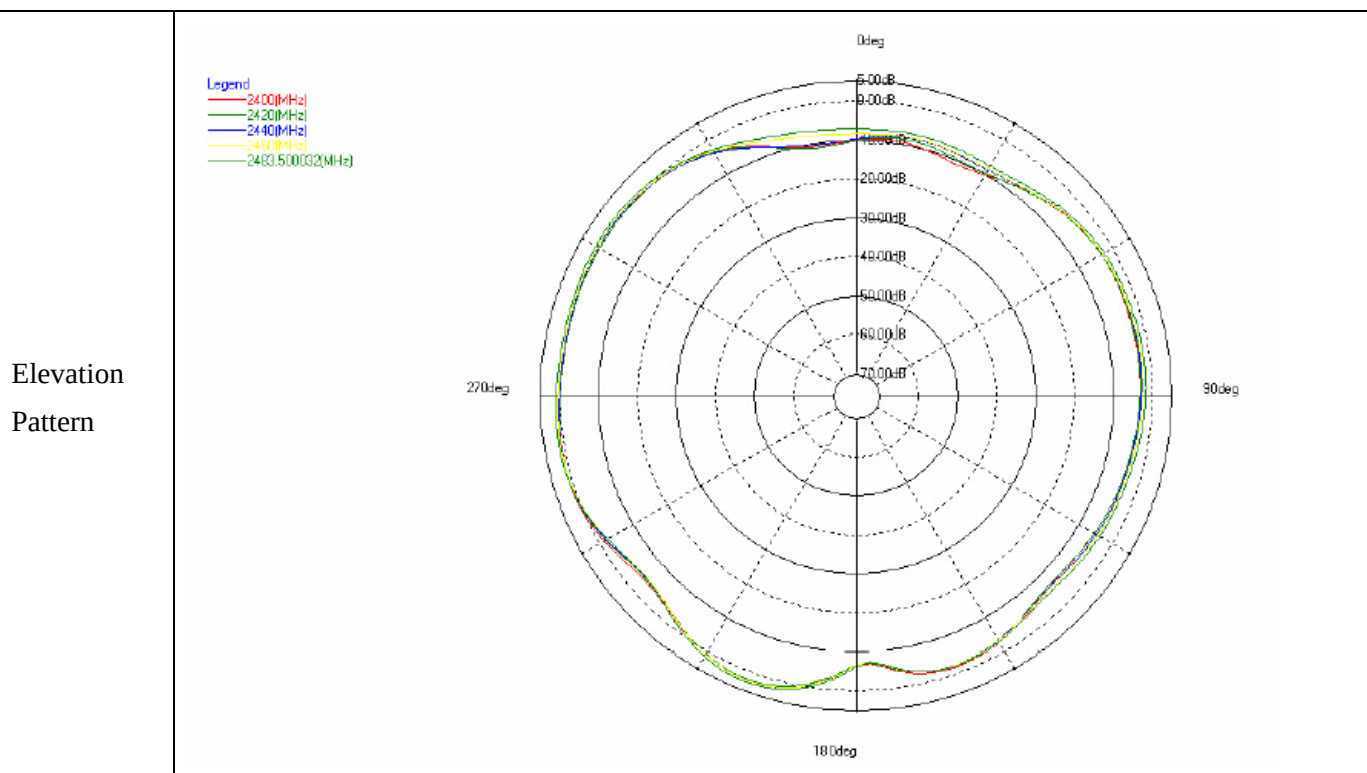
● Electrical Specification

Frequency Range	2.4 ~ 2.4835 GHz	5.15 ~ 5.875 GHz
Band Width	83.5 MHz	725 MHz
V.S.W.R (Min)	1.9 : 1	1.9 : 1
Gain (Max)	3.3 dBi	4 dBi
Input Impedance	50 Ω	
Polarization	Linear	

● Mechanical Specification

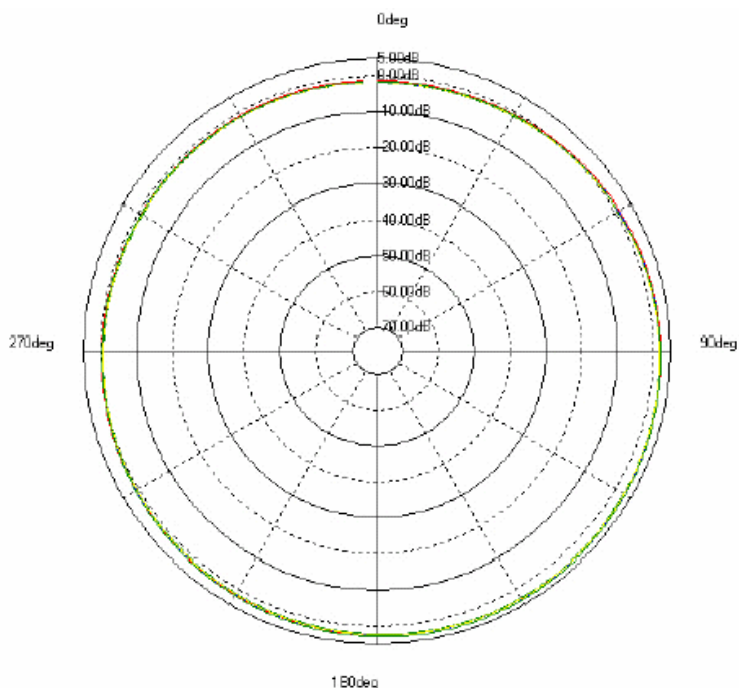
Antenna Size	67 x 12 x 5 mm
Weight	5 g
Radiator Material	Copper
Operation Temperature	-30 ~ 90 $^{\circ}\text{C}$
Operation Humidity	10 ~ 90 %

● Radiation Pattern (Omni-directional)

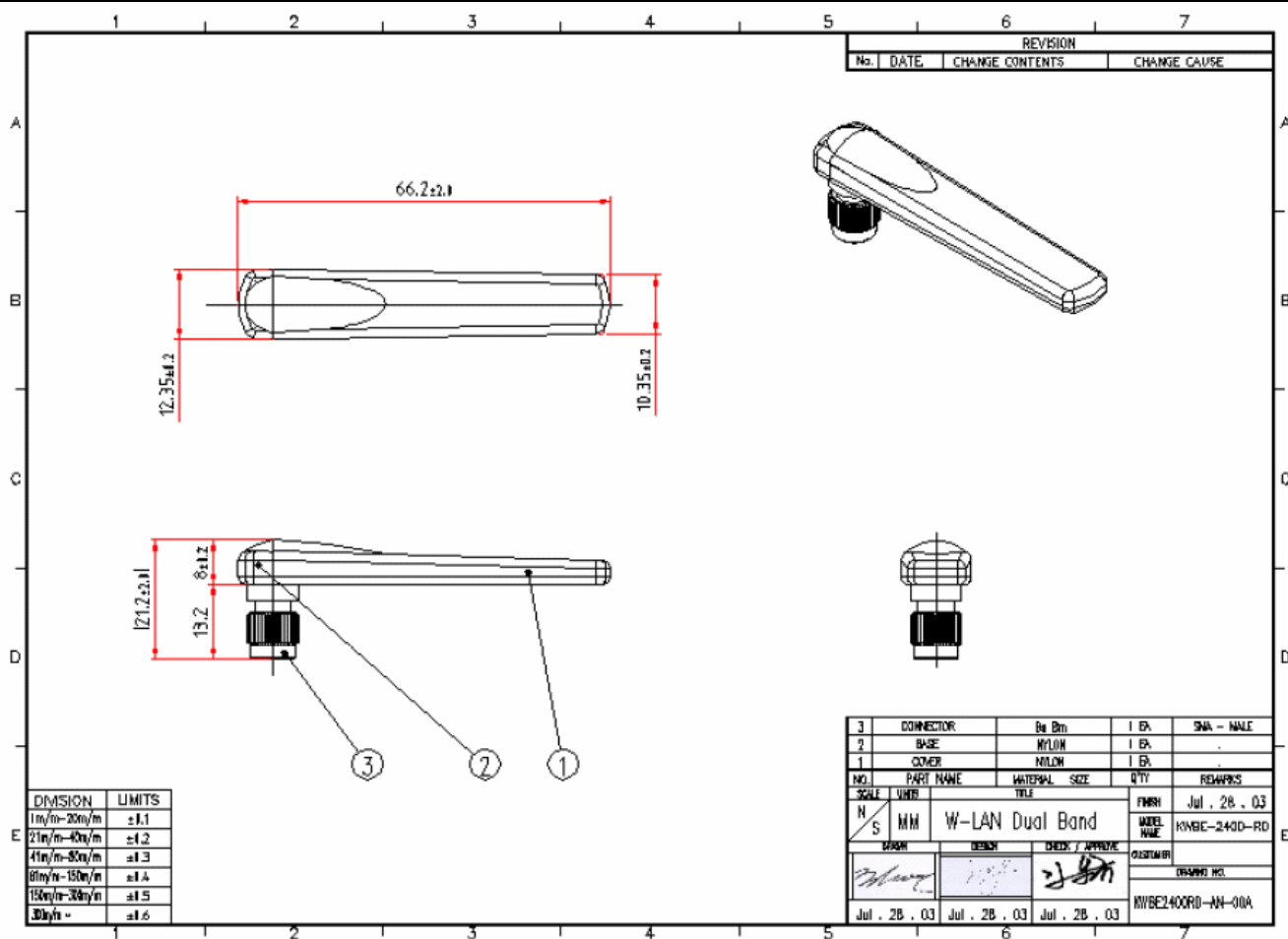


Azimuth Pattern

Legend
 2400.00MHz E Total dBi(dB)
 2420.00MHz E Total dBi(dB)
 2440.00MHz E Total dBi(dB)
 2460.00MHz E Total dBi(dB)
 2483.50MHz E Total dBi(dB)



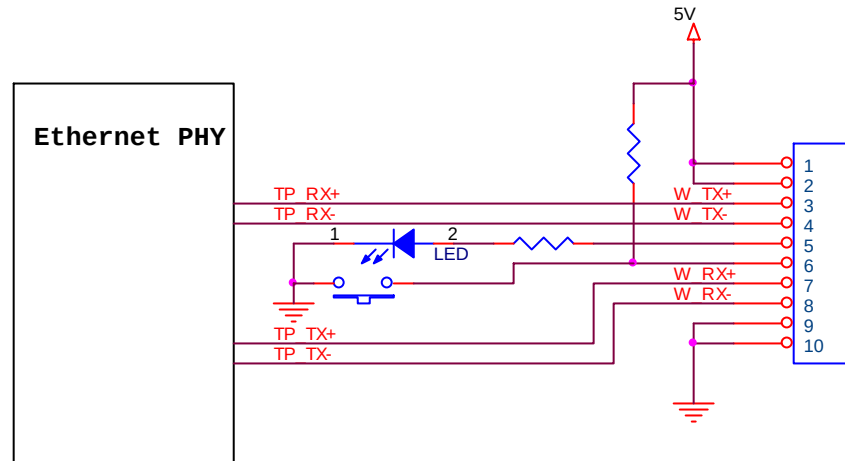
● Drawing



2. Design Guide for W3100A, NM7010A User

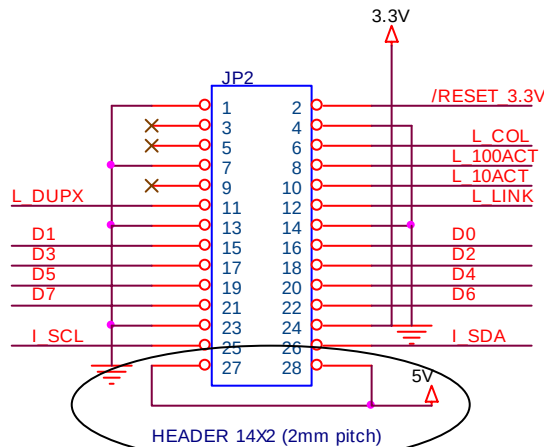
(1) For W3100A user & IIM7100A user, remove transformer and RJ-45 jack from your system and add ten-pin connector interface for NM6000.

Cross-connect output signal TP_TX, TP_RX of Ethernet PHY to PHY signal of NM6000 like following figure.



(2) For NM7010A (old named IIM7010A) user, replace NM7010A with NM7001 which is pin-compatible with NM7010A and has a connector for NM6000.

A big difference is need to connect VCC 5V to 27, 28 pin which were not connected of JP2 for supplying 5V power (5V,600mA) to NM6000.



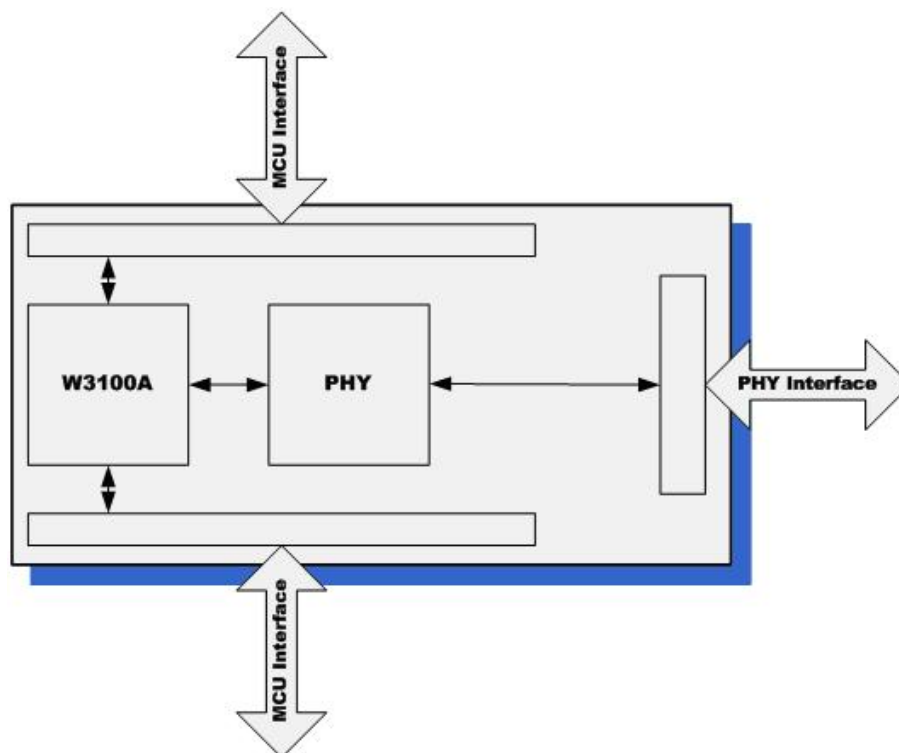
3. Related Product

3.1. NM7001

3.1.1. Feature

For easy development, NM7001 provides an interface to be connected to NM6000 directly with ten-wired cable and is pin-compatible with NM7010A for replacement of NM7010A (old named IIM7010A).

3.1.2. Block Diagram



3.1.2. Pin Description

* Notation :

I : Input

O : Output

I/O : Bi-directional Input and output

P : Power

● Power & Ground

Symbol	Type	Pin No.	Description
VCC	P	JP1 : 1 , JP2 : 24	Power : 3.3 V power supply
VCC	P	JP2 : 27 , JP2 : 28	Power : 5 V power supply for NM6000
GND	P	JP1 : 8, JP1 : 13, JP1 : 24, JP2 : 1 JP2 : 7, JP2 : 13 JP2 : 14, JP2 : 23	Ground

● MCU Interfaces

Symbol	Type	Pin No.	Description
A14~A8	I	JP1 : 7, JP1 : 10 JP1 : 9, JP1 : 12 JP1 : 11, JP1 : 14 JP1 : 15	Address / Device Address : In Bus access mode is used as Address[14-8] pin. In I ² C interface mode is used as device address[6-0] pin
A7~A0	I	JP1 : 16 ~ JP1 : 23	Address : In Bus access mode is used as Address[7-0] pin In I ² C interface mode, these pins are not used, so leave them NC or ground them.
D7~D0	I/O	JP2 : 21, JP2 : 22 JP2 : 19, JP2 : 20 JP2 : 17, JP2 : 18 JP2 : 15, JP2 : 16	Data : 8 bit-wide data bus
/CS	I	JP1 : 5	Module Select : Active low. /CS of W3100A
/RD	I	JP1 : 4	Read Enable : Active low. /RD of W3100A
/WR	I	JP1 : 3	Write Enable : Active low /WR of W3100A
/INT	O	JP1 : 2	Interrupt : Active low. After reception or transmission it indicates that the W3100A requires MCU attention. By writing values to the Interrupt Status Register of W3100A the interrupt will be cleared. All interrupts can be masked by writing values to the IMR of W3100A(Interrupt Mask Register). For more details refer to the W3100A Datasheet
I_SCL	I	JP2 : 25	SCL : Used as clock by I ² C interface mode. Internally pull-down
I_SDA	I/O	JP2 : 26	SDA : Used as data by I ² C interface mode. Internally pull-down

● Network status & LEDs

You can observe the network status using MAG-JACK LEDs. LED interface can be extended to the LED of the main board.

Symbol	Type	Pin No.	Description
L_COL	O	JP2 : 6	Collision LED : Active low when collisions occur.
L_100ACT	O	JP2 : 8	Link 100/ACT LED : Active low when linked by 100 Base TX, and blinking when transmitting or receiving data.
L_10ACT	O	JP2 : 10	Link 10/ACT LED : Active low when linked by 10 Base T, and blinking when transmitting or receiving data.
L_DUPX	O	JP2 : 11	Full Duplex LED : Active low when in full duplex operation. Active high when in half duplex operation.
L_LINK	O	JP2 : 12	Link LED : Active low when linked

● Miscellaneous Signals

Symbol	Type	Pin No.	Description										
RESET	I	JP1 : 6	Reset : Active high Initializes or Reinitializes the W3100A. Asserting this pin will force a reset process to occur, which will result in all internal registers reinitializing to their default and all strapping options are reinitialized. For complete reset function, this pin must be asserted low for at least 10us. Refer to W3100A datasheet for further detail regarding reset.										
/RESET	I	JP2 : 2	Reset : Active low. Reset RTL8201BL chip. For complete reset function this pin must be asserted low for at least 10ms.										
MODE1~0	I	JP1 : 26 , JP1 : 25	Mode Select : These pins select MCU interface and operating mode. Since each pin is pull-down internally, clocked mode (the default mode) is selected when these pins are not connected. <table border="1"><tr><th>M1 M0</th><th>Mode</th></tr><tr><td>0 0</td><td>Clocked</td></tr><tr><td>0 1</td><td>External clocked</td></tr><tr><td>1 0</td><td>Non-clocked</td></tr><tr><td>1 1</td><td>I²C interface</td></tr></table> Refer to W3100A datasheet for further detail regarding mode select	M1 M0	Mode	0 0	Clocked	0 1	External clocked	1 0	Non-clocked	1 1	I ² C interface
M1 M0	Mode												
0 0	Clocked												
0 1	External clocked												
1 0	Non-clocked												
1 1	I ² C interface												
EXT_CLK	I	JP1 : 28	External clock : supplementary clock used for external clocked mode. In external clocked mode, W3100A uses this clock to interface with MCU. Refer to W3100A datasheet for further detail regarding external clock.										
NC	-	JP1 : 27, JP2 : 3, JP2 : 5, JP2 : 9	Not Connect										

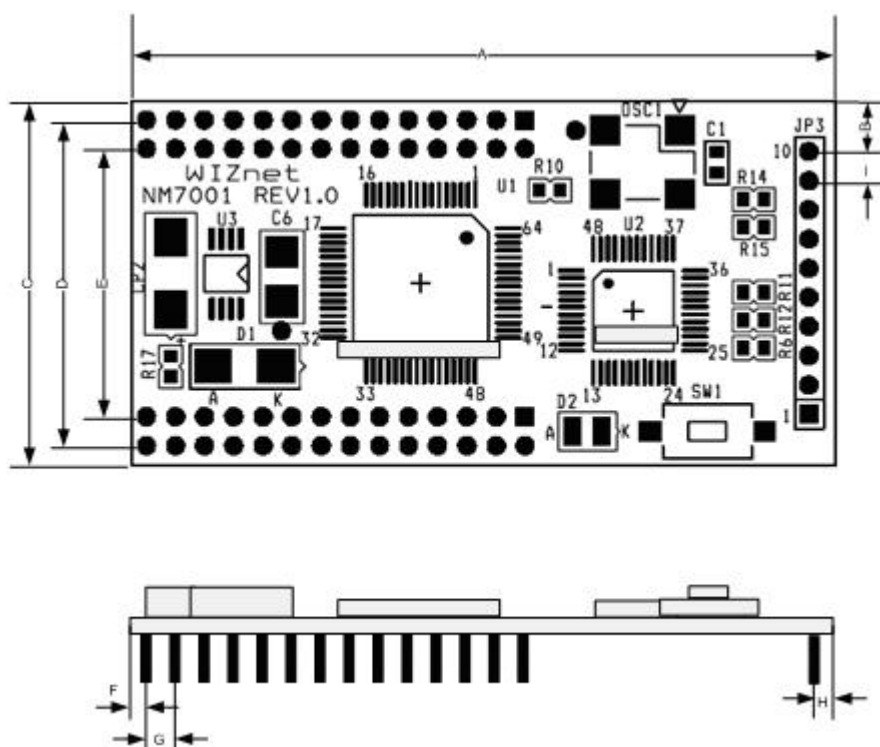
3.1.3. Timing Diagram

NM7010A (old named IIM7010A) provides following interfaces of W3100A

- Direct/Indirect mode bus access
- I²C Interface
- Clocked mode, Non-Clocked mode, External clocked mode

Refer to W3100A datasheet for timing of NM7010A.

3.1.4. Dimension



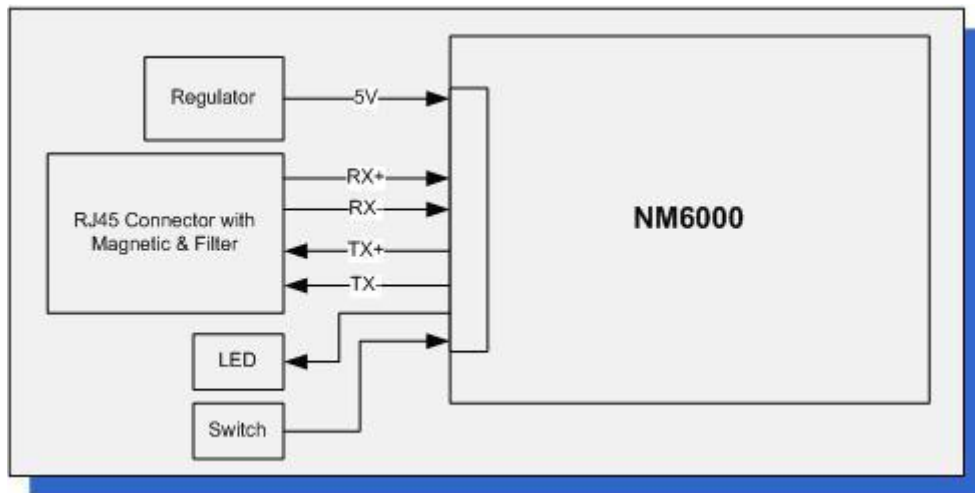
Symbols	Dimensions (mm)
A	48.0
B	3.6
C	25.0
D	22.4
E	18.4
F	1.0
G	2.0
H	1.7
I	2.0

3.2. NM6000-IF

3.2.1. Feature

For quick test, NM6000-IF (interface board plugged NM6000) provides RJ45 interface and can be connected directly to RJ45 interface of existing Ethernet application by crossed UTP cable.

3.2.2. Block Diagram



3.3. EVB8051-NM6000

3.3.1. Feature

EVB8051-NM6000 provides development environment for Wireless LAN Internet connectivity. It includes EVB8051, NM7001 and NM6000.

3.3.2. Contents List

EVB8051-NM6000 package includes followings.

Component	Qty	Description
EVB8051	1	8051 & W3100A Evaluation Board
NM7001	1	TCP/IP Ethernet Module for NM6000 (WLAN Module)
NM6000	1	Wireless LAN Module (including NM6000-ANT1)
UTP Cable	1	Crossed UTP Cable
Serial Cable	1	Serial Cable
AD-DC Adaptor	1	Power Supply (Input : AC110~220V, 60Hz / Output : DC5V)
User Manual	1	User Manual
CD	1	Software, Data Sheets & Documents

4. Ordering Information

Product No.	Product Description	Availability
EVB8051-NM6000	W3100A & WLAN Evaluation Board (includes EVB8051, NM7001, NM6000)	Available
NM7001	TCP/IP Ethernet Module for NM6000	Available
NM6000-IF	Interface Board for NM6000	Available
NM6000	Wireless LAN Module (including NM6000-ANT1)	Available
NM6000-ANT1	Wireless Antenna for NM6000 (default)	Available
NM6000-ANT2	Wireless Antenna for NM6000	Available
NM6000-ANT3	Wireless Antenna for NM6000	Available

5. FAQ

Q. What is NM6000?

A. NM6000 is the 802.11b WLAN Module for mainly WIZnet customers who are using one of WIZnet solutions and are asking for WLAN connectivity with minimum change in their application system.

Q. Why does NM6000 include Ubicom IP2022?

A. Ubicom IP2022 is used only for bridging WLAN MAC and Ethernet MAC not for Internet connectivity. This module was developed by WIZnet VAR partner only for satisfying WIZnet customer's WLAN connectivity needs. WIZnet has a plan to release WLAN ASSP in 1Q 2005.

Q. How can I do quick test it with existing system that adopted WIZnet solution?

A. With NM6000-IF, connect your existing system's RJ-45 and RJ-45 of NM6000-IF by crossed UTP cable.

Q. How can I adopt it to our application that is using WIZnet solution?

A. (1) For NM7010A (old named IIM7010A) user, replace NM7010A with NM7001 which is pin-compatible with NM7010A and has a connector for NM6000.

(2) For W3100A user, remove transformer and RJ-45 jack from your system and add ten-pin connector interface for NM6000.

Q. Should I change existing software?

A. You don't have to change anything.

Q. Is an antenna included in NM6000 already? or should I order separately?

A. You don't have to order it separately. NM6000 already includes an antenna (NM6000-ANT1). But, you can order different typed antenna for your taste when you order it.

Q. How can I order it? When is it available?

A. Please find the nearest distributor or representative in your location on our homepage (www.wiznet.co.kr) and ask him. Refer to following ordering information.

Product No.	Product Description	Availability
EVB8051-NM6000	W3100A & WLAN Evaluation Board (includes EVB8051, NM7001, NM6000)	Available
NM7001	TCP/IP Ethernet Module for NM6000	Available
NM6000-IF	Interface Board for NM6000	Available
NM6000	Wireless LAN Module (including NM6000-ANT1)	Available
NM6000-ANT1	Wireless Antenna for NM6000 (default)	Available
NM6000-ANT2	Wireless Antenna for NM6000	Available
NM6000-ANT3	Wireless Antenna for NM6000	Available