# W7200-EVB User's Guide

**Version 1.1**



For more information, visit our website at http://www.wiznet.co.kr

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# 1 Introduction

W7200-EVB is the evaluation board for testing iMCU W7200 and prototyping development. W7200-EVB is composed of a W7200 based on ARM Cortex M3 CPU core, a W7200 which acts as Hardwired TCP/IP embedded Ethernet controller, and a FT232R which acts as USB-to-UART interface IC. W7200 has been proven in various fields to work as a fully hardwired TCP/IP implemented chip that processes various protocols such as TCP, UDP, IPv4, ICMP, ARP, IGMP, PPPoE, and etc.

The USB-to-UART interface IC in W7200-EVB can be used for UART communication. And the extension pin header (total of 40 pins) allows the user for easy connection and testing.

W7200-EVB can provide simple example codes based on ANSI C to implement various internet application programs based on W5200. W5200 can be used as a small embedded deice in Power down mode to save power consumption.

**Main features;**

- W7200 (Cortex-M3 + W5200 core)
- RJ-45 which is integrated transformer.
- USB-to-UART interface IC.
- 40pin expanded header.
- 2 user LEDs, 2 Serial TX/RX LEDs, 1 Power Indicate LED
- Mode S/W, Reset S/W
- Power source: USB BUS power (500mA) or External VIN (5V)

# 2 Specification

**Table 1 List of Items Contained in the EVB**

| Item | Description | Remark |
|---|---|---|
| MCU | W7200 (STM32F103CB + W5200) | |
| USB-to-Serial Converter | On board USB-to-UART interface IC, USB bus power | FT232RQ |
| Ethernet | On board RJ-45 which is integrated transformer | - |
| LED | User LED 2Ea Serial Status LED 2Ea | - |
| Button | Reset Switch 1Ea Program Enable Switch 1Ea | - |
| Expansion Port | MCU port expansion | 2.54mm Pitch |
| PCB | 28mm * 52mm Size | - |

# 3 W7200-EVB Block Diagram

The block diagram is shown below.

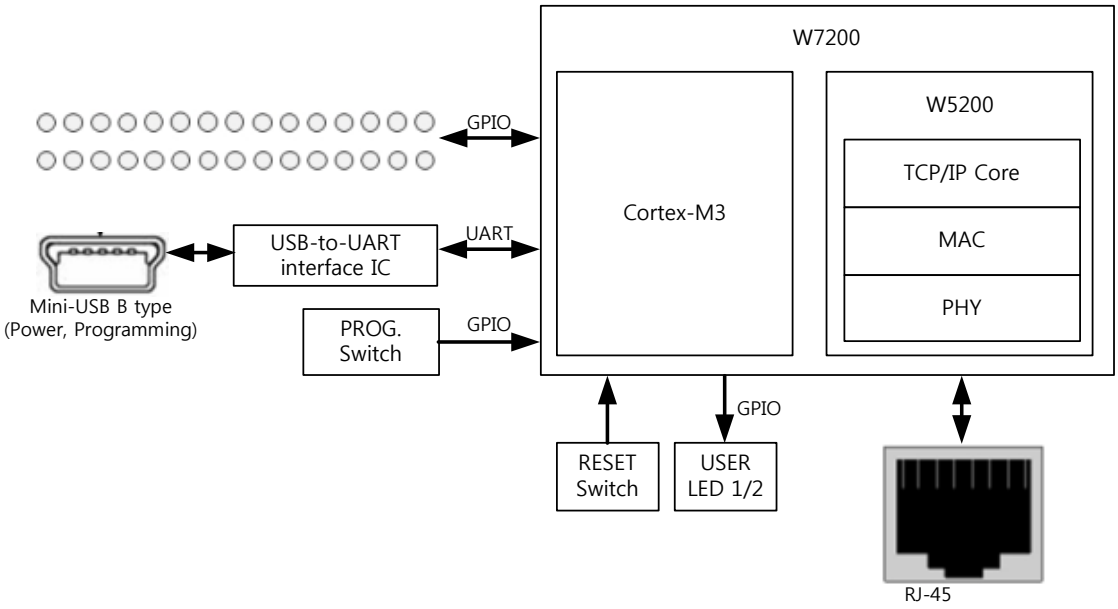



**Figure 1 W7200-EVB Block Diagram**

# 4 Hardware Layout

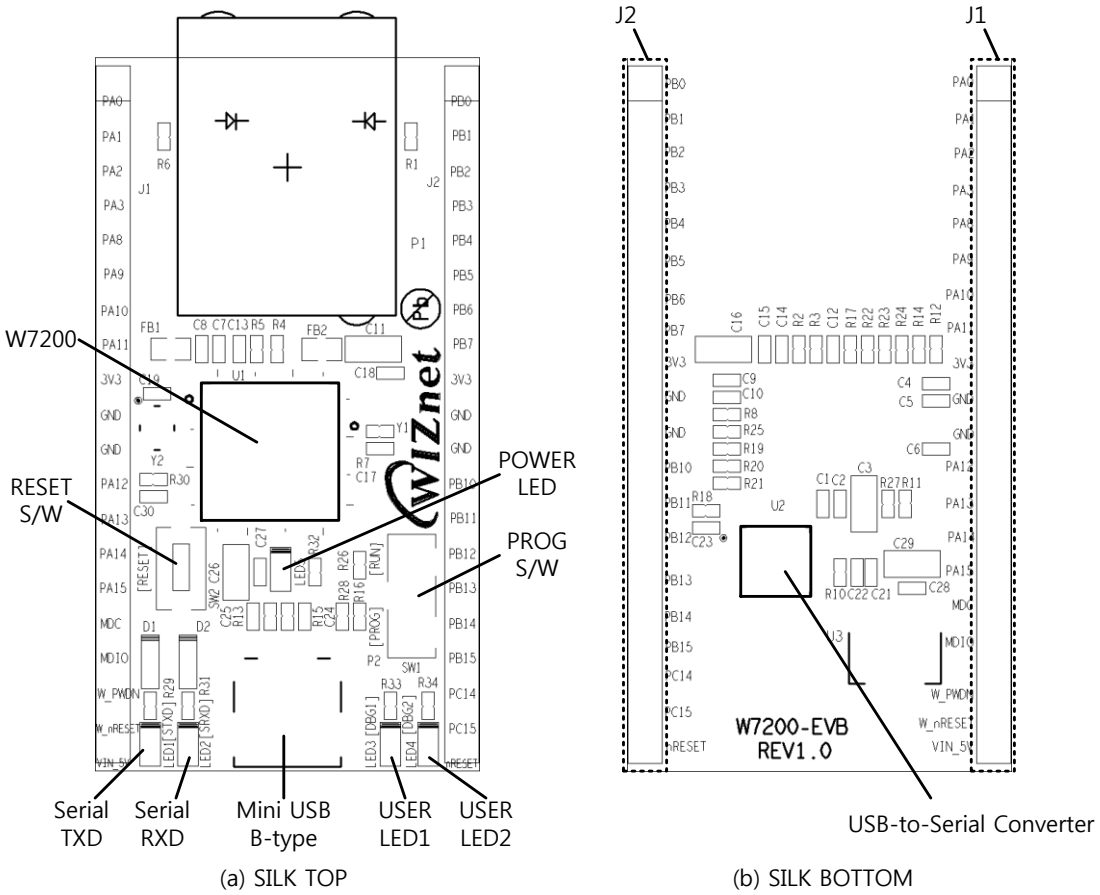



**Figure 2 W7200-EVB Layout**

**Table 2 Hardware Description**

| Symbols | Description | Symbols | Description |
|---|---|---|---|
| W5200 | Hardwired TCP/IP Core | STM32F103C8 | Cortex-M3 MCU |
| RESET S/W | Reset Switch | User LED1 / User LED2 | User LED 2Ea |
| PROG S/W | Enable Programming Switch<br>- PROG: Program Enable<br>- RUN: User APP. Enable | FT232RQ | USB-to-UART Interface IC |
| Ethernet Port | RJ-45<br>( integrated transformer ) | POWER LED | POWER Indicate LED |
| Serial TXD / Serial RXD | Serial status LED 2Ea | J1 / J2 | 20 Pin 2.54mm Pitch Expanded Headers |
| Mini USB B-type | USB Connector | | |

# 5 Expansion Port Interface

The expansion port has 2.54mm Pitch Pin-Header Hole.

Note.

1. Some of the expanded pin headers are shared by on board peripherals.

2. Refer to W7200's datasheet for more detailed information about alternative functions of pin header

**Table 3 Expanded pin header**

| J1 | Alternative Functions | Shared by | J2 | Alternative Functions | Shared by |
|---|---|---|---|---|---|
| PA0 | WKUP/<br>USART2_CTS/<br>ADC12_IN0/<br>TIM_CH1_ETR | - | PB0 | ADC12_IN8/<br>TIM3_CH3 | LED3 |
| PA1 | USART2_RTS/<br>ADC12_IN1/<br>TIM_CH2 | - | PB1 | ADC12_IN9/<br>TIM3_CH4 | LED4 |
| PA2 | USART2_TX/<br>ADC12_IN2/<br>TIM_CH3 | - | PB2 | BOOT1 | - |
| PA3 | USART2_RX/<br>ADC12_IN3/<br>TIM_CH4 | - | PB3 | JTDO | - |
| PA8 | USART1_CK/<br>TIM1_CH1/MCO | - | PB4 | JNTRST | - |
| PA9 | UART1_TX/<br>TIM1_CH2 | - | PB5 | I2C1_SMBAI | - |
| PA10 | UART1_RX/<br>TIM1_CH3 | - | PB6 | I2C1_SCL/<br>TIM4_CH1 | - |
| PA11 | UART1_CTS/<br>CANRX/<br>USBDM/<br>TIM1_CH4 | - | PB7 | I2C1_SDA/<br>TIM4_CH2 | - |
| 3V3 | - | - | 3V3 | - | - |
| GND | - | - | GND | - | - |
| GND | - | - | GND | - | - |

| | | | | | |
|---|---|---|---|---|---|
| PA12 | UART1_RTS/<br>CANTX/<br>USBDP/<br>TIM1_ETR | - | PB10 | I2C2_SCL/<br>USART3_TX | - |
| PA13 | JTMS/SWDIO | - | PB11 | I2C2_SDA/<br>USART3_RX | - |
| PA14 | JTCK/SWCLK | - | PB12 | SPI2_NSS/<br>I2C2_SMBAI/<br>USART3_CK/<br>TIM1_BKIN | - |
| PA15 | JTDI | - | PB13 | SPI2_SCK/<br>USART3_CTS/<br>TIM1_CH1N | - |
| MDC | - | - | PB14 | SPI2_MISO/<br>USART3_RTS/<br>TIM1_CH2N | - |
| MDIO | - | - | PB15 | SPI2_MOSI/<br>TIM1_CH3N | - |
| W_PWDN | - | - | PC14 | OSC32_IN | - |
| W_nRESET | - | - | PC15 | OSC32_OUT | - |
| VIN_5V | External VIN (5V) | - | nRESET | - | - |

# 6 Development environment

## 6.1 IDE

The IAR Embedded Workbench for ARM IDE is currently supported. (Other IDE tools for ARM IDE will be supported as like Keil.) The W5200E01-M3 software package is released the version of IAR Embedded Workbench for ARM 5.41. Refer to IAR's own documentation on how to use it.

The W5200E01-M3 software package contains various examples for using W5200

## 6.2 Install Flash loader Demonstrator

Flash Loader demonstrator is used to program for W5200E01-M3.

Note:

Refer to UM0462 User manual at www.st.com for more detailed information about STM32F103xx Flash Loader demonstrator

- Download: UM0462 Flash loader demonstrator

http://www.st.com/internet/mcu/product/216817.jsp

Click "Design Support" -> SW DEMOS (Bottom end of page)

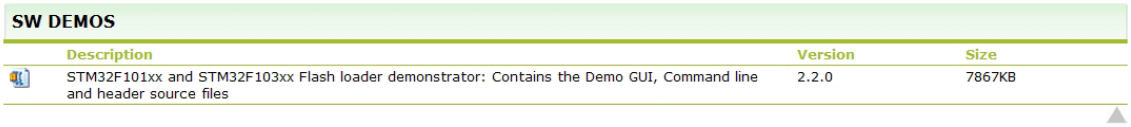



**Figure 3 Download Flash loader Demonstrator**

## 6.3 USB-to-UART interface IC Driver

When the mini-USB is connect to USB-equipped Windows computer, the Device Manager will properly installed USB-to-Serial driver. If USB-to-Serial adaptor not works as expected, you can download the USB-to-Serial driver at www.ftdichip.com.

Note:

Refer to Installation Guides at www.fuducguo.com more detailed information about USB-to-Serial converter.

- Download Installation Guides:

1. www.fidichip.com
2. Click "Support->Documents-> Installation Guides"
3. Download up to your operation system.

- Download Driver

1. www.fidichip.com
2. Click "Drivers->VCP Drivers"
3. Download up to your operation system.

| | | Processor Architecture | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Operating System | Release Date | x86 (32-bit) | x64 (64-bit) | PPC | ARM | MIPSII | MIPSIV | SH4 |
| Windows* | 2011-04-12 | 2.08.14 | 2.08.14 | - | - | - | - | - |
| | 2011-08-26 | 2.08.17 (Beta) | 2.08.17 (Beta) | - | - | - | - | - |
| Linux | 2009-05-14 | 1.5.0 | 1.5.0 | - | - | - | - | - |
| Mac OS X | 2011-02-28 | 2.2.16 | 2.2.16 | 2.2.16 | - | - | - | - |
| Windows CE 4.2-5.2** | 2010-02-11 | 1.1.0.6 | - | - | 1.1.0.6 | 1.1.0.6 | 1.1.0.6 | 1.1.0.6 |
| Windows CE 6.0 | 2010-02-11 | 1.1.0.6 | - | - | 1.1.0.6 | 1.1.0.6 | 1.1.0.6 | 1.1.0.6 |

**Figure 4 Currently Supported VCP Drivers (16DEC2011)**

# 7 W7200 SPI

Below diagram show internal SPI connection between STM32F103CB and W5200.

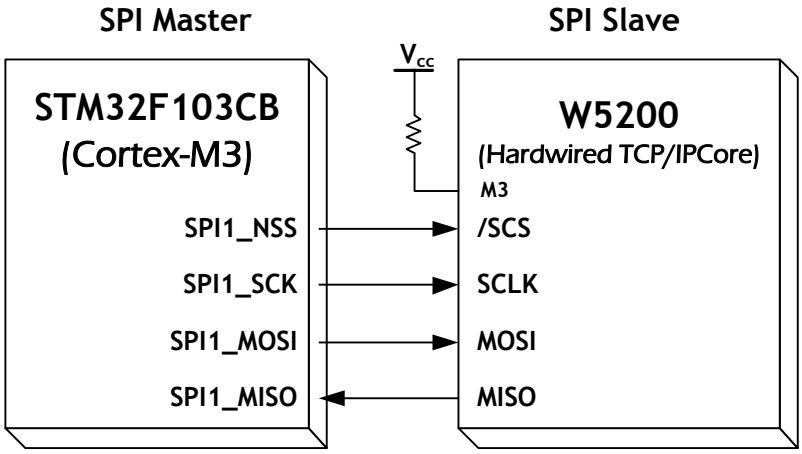



**Figure 5 W7200 SPI Interface**

A pseudo code for read/write with SPI is shown below. Check the W5200 documentation for SPI burst mode, and how to use it.

**Code 1 Pseudo code for Read with SPI interface**

```
#define data_read_command 0x00
uint16 addr; //address : 16bits
int16 data_len; //data_length :15bits
uint8 data_buf[]; // array for data
SpiSendData(); //send data from MCU to W5200
SpiRecvData(); //Receive data from W5200 to MCU
/* Pseudo Code for Read data of 8bit per packet */
{
ISR_DISABLE(); // Interrupt Service Routine disable
CSoff(); // CS=0, SPI start
//SpiSendData
SpiSendData(((addr+idx) & 0xFF00) >> 8); //Address byte 1
SpiSendData((addr+idx) & 0x00FF); //Address byte 2
// data write command + data length upper 7bits
SpiSendData((data_read_command | ((data_len & 0x7F00) >> 8)));
// data length bottom 8bits
SpiSendData((data_len & 0x00FF));
```

```
SpiSendData(0); //dummy data
data_buf[idx] = SpiRecvData(idx); //READ data
CSon(); // CS=1, SPI end
ISR_ENABLE();// Interrupt Service Routine disable
}
```

**Code 2 Pseudo code for write with SPI interface**

```
#define data_write_command 0x80
uint16 addr; //address : 16bits
int16 data_len; //data_length :15bits
uint8 data_buf[]; // array for data
SpiSendData(); //send data from MCU to W5200
SpiRecvData(); //Receive data from W5200 to MCU
/* Pseudo Code for Read data of 8bit per packet */
{
SpiSendData(); //send data from MCU to W5200
ISR_DISABLE(); // Interrupt Service Routine disable
CSoff(); // CS=0, SPI start
SpiSendData(((addr+idx) & 0xFF00) >> 8); //Address byte 1
SpiSendData((addr+idx) & 0x00FF); //Address byte 2
// data write command + data length upper 7bits
SpiSendData((data_write_command | ((data_len & 0x7F00) >> 8)));
// data length bottom 8bits
SpiSendData((data_len & 0x00FF));
SpiSendData(data_buf[idx]);
CSon(); // CS=1, SPI end
IINCHIP_ISR_ENABLE(); // Interrupt Service Routine disable
}
```

# 8 Reference Firmware

- The TCP (Transmission Control Protocol) RFC 793 of IETF
- TCP Server / Client Loopback

The TCP protocol of W5200 supports both server mode and client mode, user can select one and use for its application. The difference between server mode and client mode are shown below.

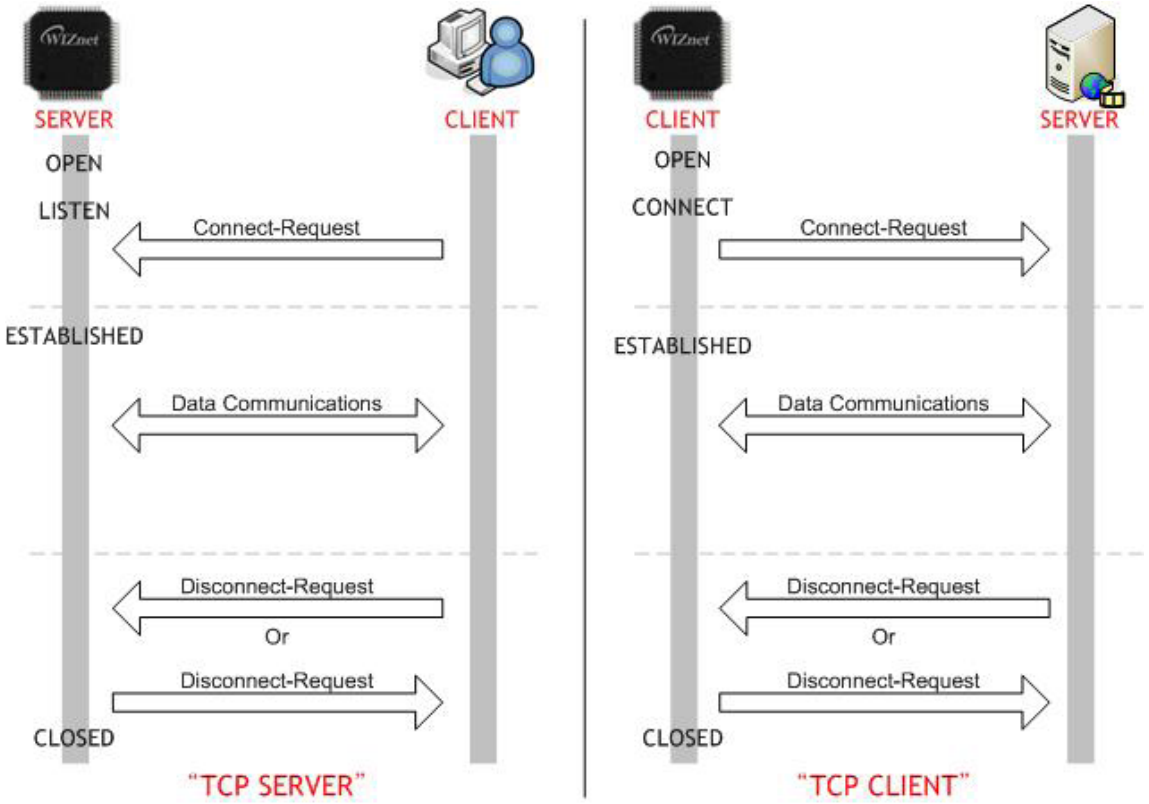



**Figure 6 TCP Server / Client**

## 8.1 W7200 Socket API

Please refer to "Socket API for ioPlatform" document.

## 8.2 Firmware Structure

**Table 4 Project Hierarchy**

| Directory | Files | Decryption |
|---|---|---|
| USER | main.c | W7200-EVB main function |
| | W5200.c, W5200.h | I/O functions for W5200 |

| | | |
|---|---|---|
| | socket.c, socket.h | Socket APIs for W5200 |
| | loopback.c, loopback.h | TCP, UDP Loopback Apps implementation |
| | SPI1.c | STM32F103x SPI Interface initialization |
| | util.c, util.h | Utilities |
| | dhcp.c, dhcp.h | DHCP App implementation |
| | md5.c, md5.h | md5 hash algorithm implementation for PPPoE |
| | stm32f10x_it.c | Main Interrupt Service Routines |
| | system_stm32f10x.c | Cortex-M3 Device Peripheral Access Layer System |
| CMSIS | core_cm3.c | Cortex™ Microcontroller Software Interface Standard |
| EWARMv5.4 | startup_stm32f10x_md.s | STM32F10x Medium Density Devices vector table |
| EWARMv5.4/ StdPeriph_Driver | misc.c | miscellaneous firmware functions |
| | stm32f10x_bkp.c | BKP firmware functions |
| | stm32f10x_flash.c | FLASH firmware functions |
| | stm32f10x_gpio.c | GPIO firmware functions |
| | stm32f10x_rcc.c | RCC firmware functions |
| | stm32f10x_spi.c | SPI firmware functions |
| | stm32f10x_tim.c | TIM firmware functions |
| | stm32f10xusart.c | USART firmware functions |

## 8.3 Firmware Functions

**Table 5 Functions in main.c**

| Function | Description |
|---|---|
| RCC_Configuration | Configure the system clocks |
| NVIC_Configuration | Nested Vectored Interrupt Controller configuration |
| GPIO_Configuration | Configure the General Purpose I/O Pin |
| Reset_W5200 | W5200 Reset Function |
| UART1_Init | UART Interface Initialization |
| WIZ_SPI_Init | W5200 SPI Interface Initialization |
| Timer_Configuration | Timer Configuration |
| LED3_onoff/LED4_onoff | USER LED n Control Function |
| Set_network | Configure Network In formations for W5200 |
| WIZ_Config | Configure Network In formations |

**Table 6 Key Variables for network Confguration**

| Variable | Description | Example Code (Location: main.c) |
|---|---|---|
| MAC[6] | MAC address | MAC[6] = {0x00, 0x08, 0xDC, 0x01, 0x02, 0x03}; |
| IP[4] | Local IP address | IP[4] = {192, 168, 11, 4}; |
| GateWay[4] | Gateway address | GateWay[4] = {192, 168, 11, 1}; |
| SubNet[4] | Sub | SubNet[4] = {255, 255, 255, 0}; |

- Note : MAC address should be defined even if DHCP mode.

**Table 7 Functions in Loopback.c**

| Function | Description | Example Code (Location: loopback.c) |
|---|---|---|
| loopback_tcps | TCP Loopback server mode | - ch : socket number [0-7]<br>- port : source port<br>loopback_tcps(uint8 ch, uint16 port) |
| loopback_tcpc | TCP Loopback client mode | - ch : socket number [0-7]<br>-ChConfig.destip : Destination IP<br>-ChConfig.port : Destination Port<br>loopback_tcpc(uint8 ch, CHConfig_TypeDef* ChConfig) |
| loopback_udp | UDP (User Datagram Protocol) Loopback server mode | - ch : socket number [0-7]<br>- port : source port<br>loopback_udp(uint8 ch, uint16 port) |

## 8.4 Firmware Build and Upload

### 8.4.1 Build – IAR Embedded Workbench IDE

To build and link you project choose "Make" form the "Project" menu, or press F7.

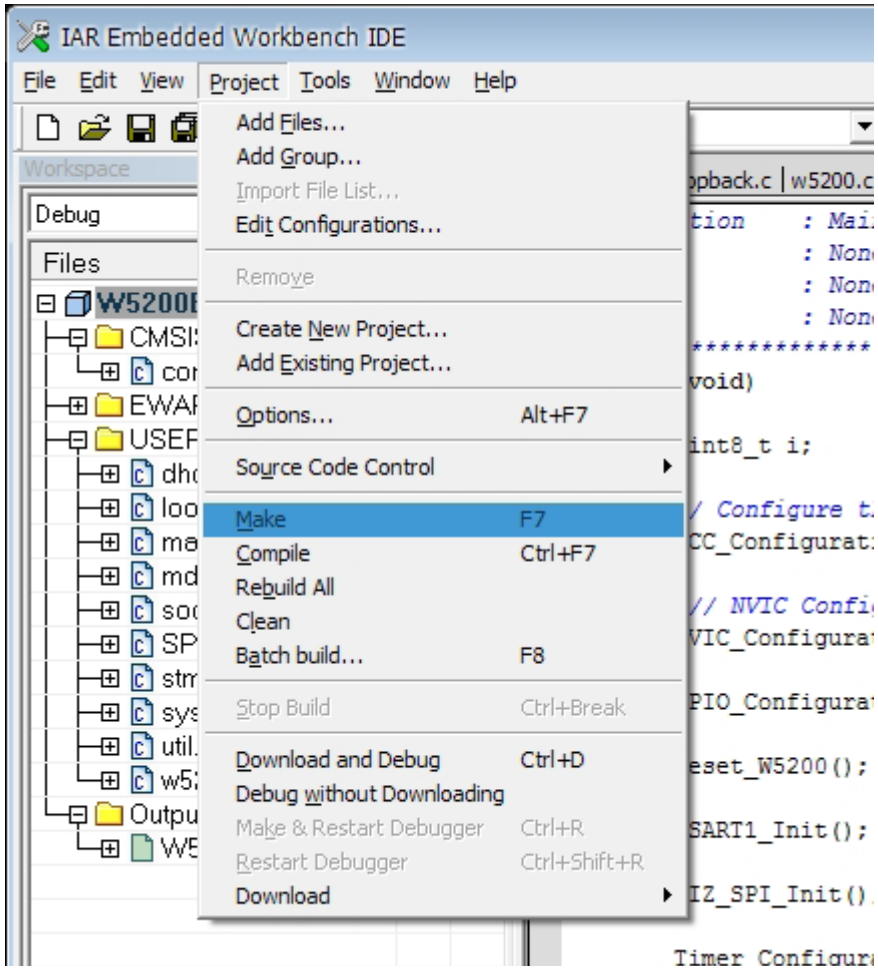
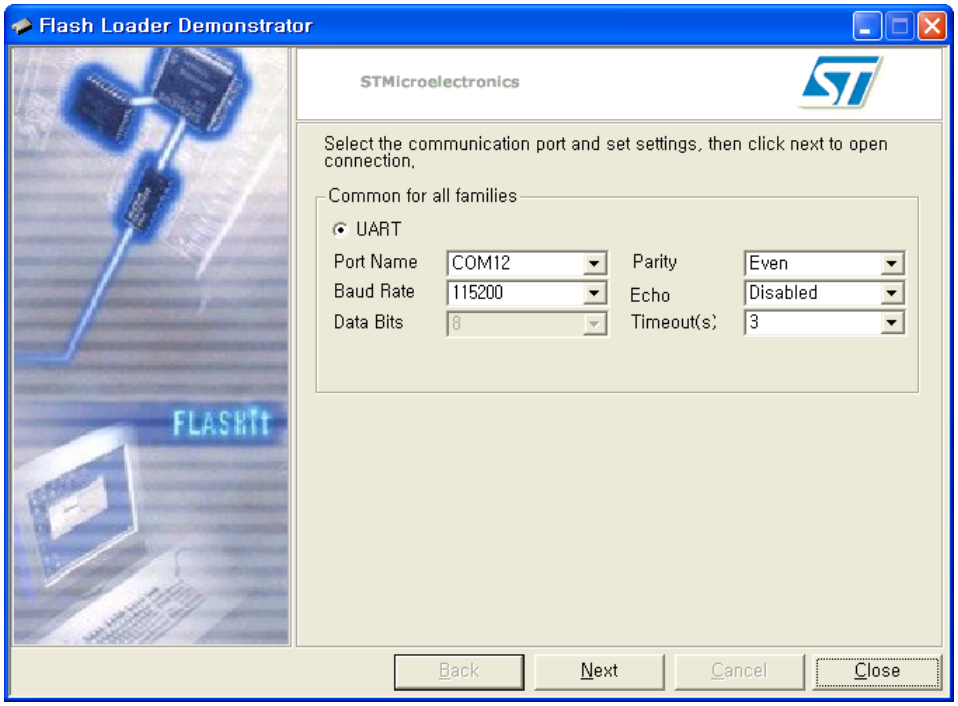



**Figure 7 Compile on IAR Embedded Workbench IDE**

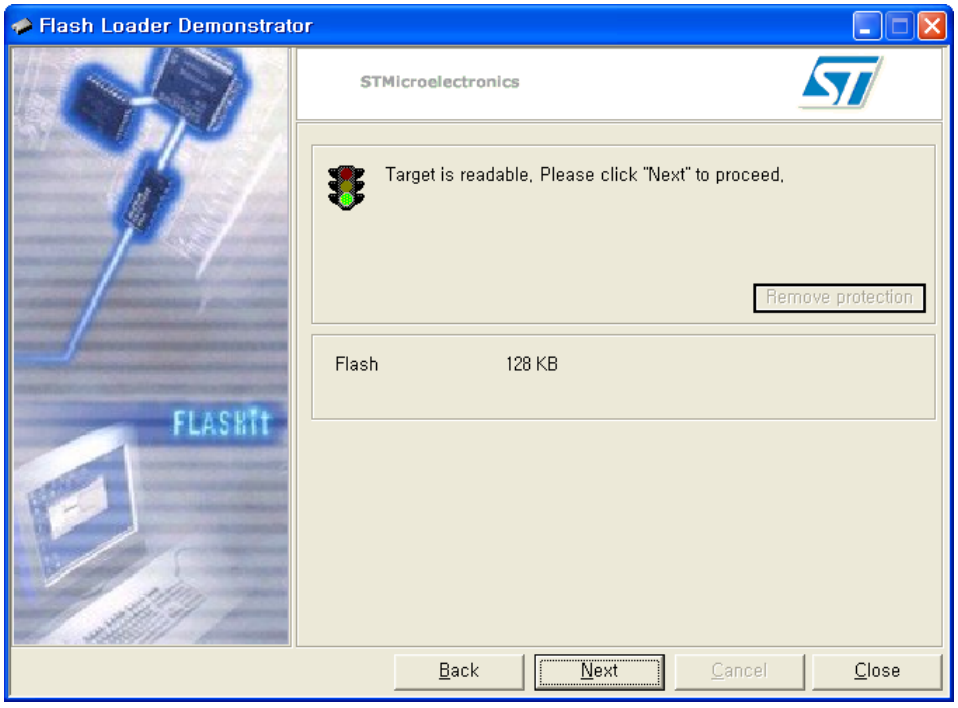
## 8.4.2 Upload – Flash Loader Demonstrator

**Upload (1) Select the Communication port and set setting**

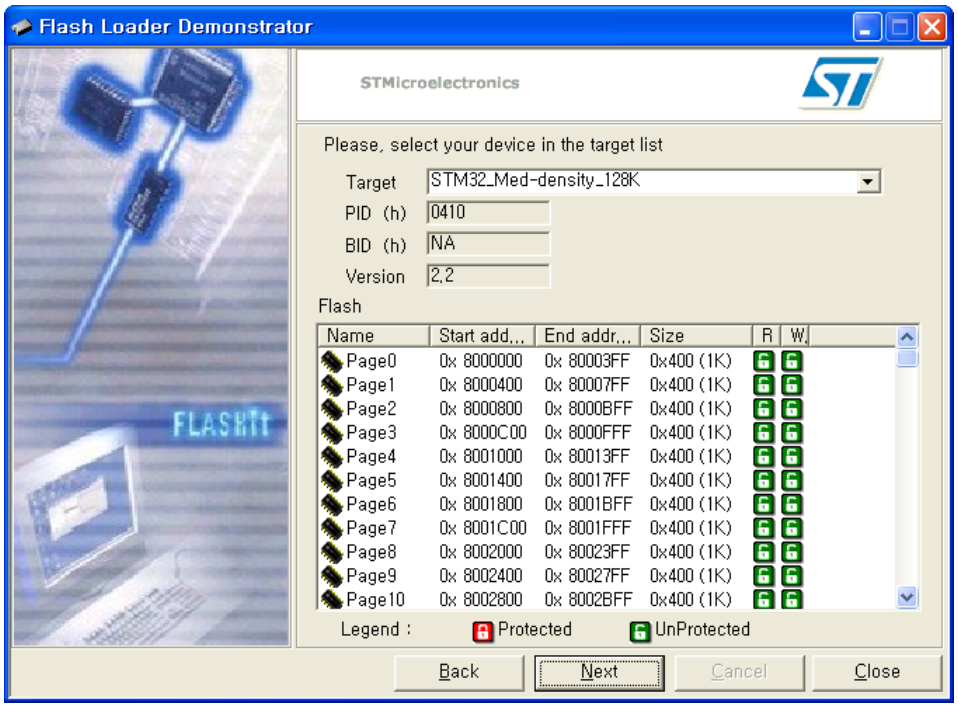



*Note - PROG S/W should be selected 'PROG' to connect to W7200-EVB with PC.*

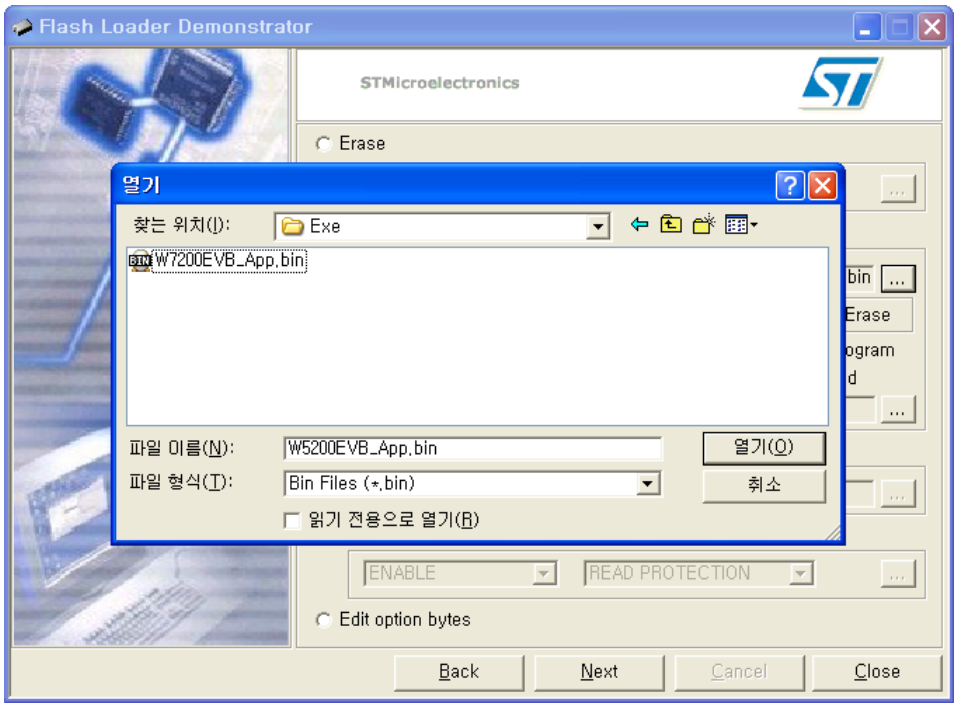
**Upload (2) Check target readable**



### Upload (3) Select device in the target

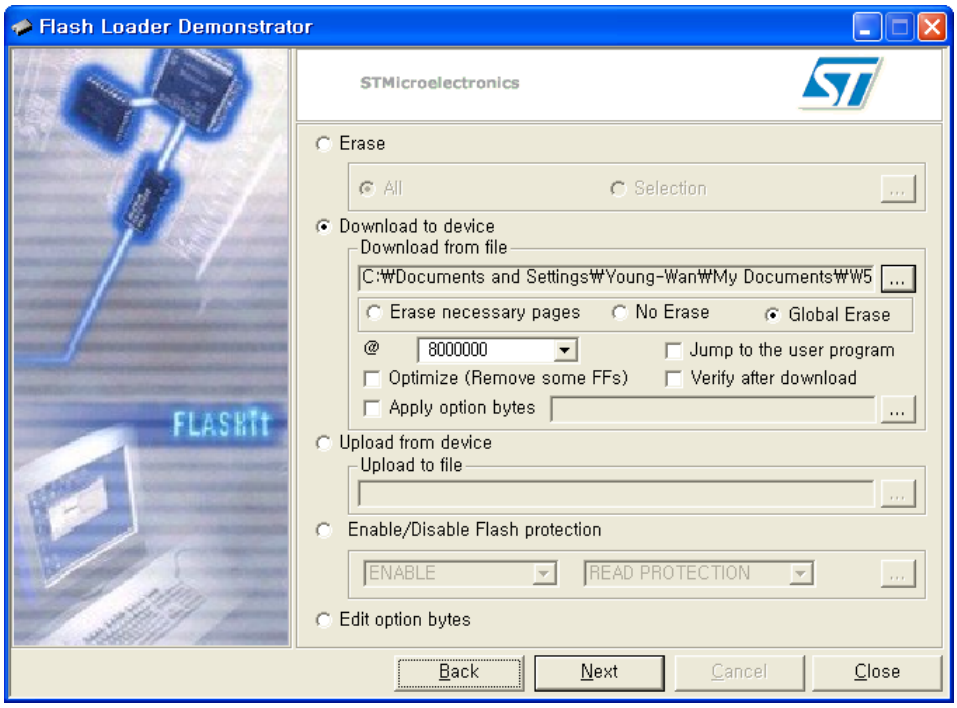



### Upload (4) Choose Binary image file in work project

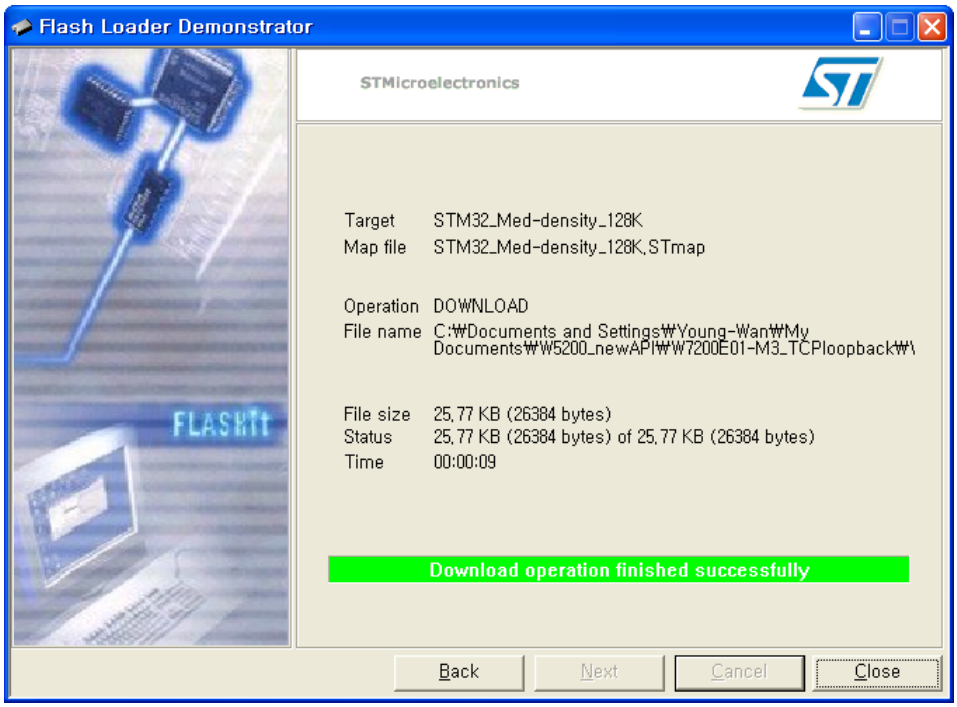



*Note - Binary image file's location: …\Work\App\Debug\Exe in project directory*

### Upload (5) Select "@0x08000000" in memory address list




### Upload (6) Select "Next" to upload the binart image file




*Note - After finishing 'Download', PROG S/W should be selected 'RUN' to run User APP.*

# 9 Application Demonstration

## 9.1 Flow of Demonstration

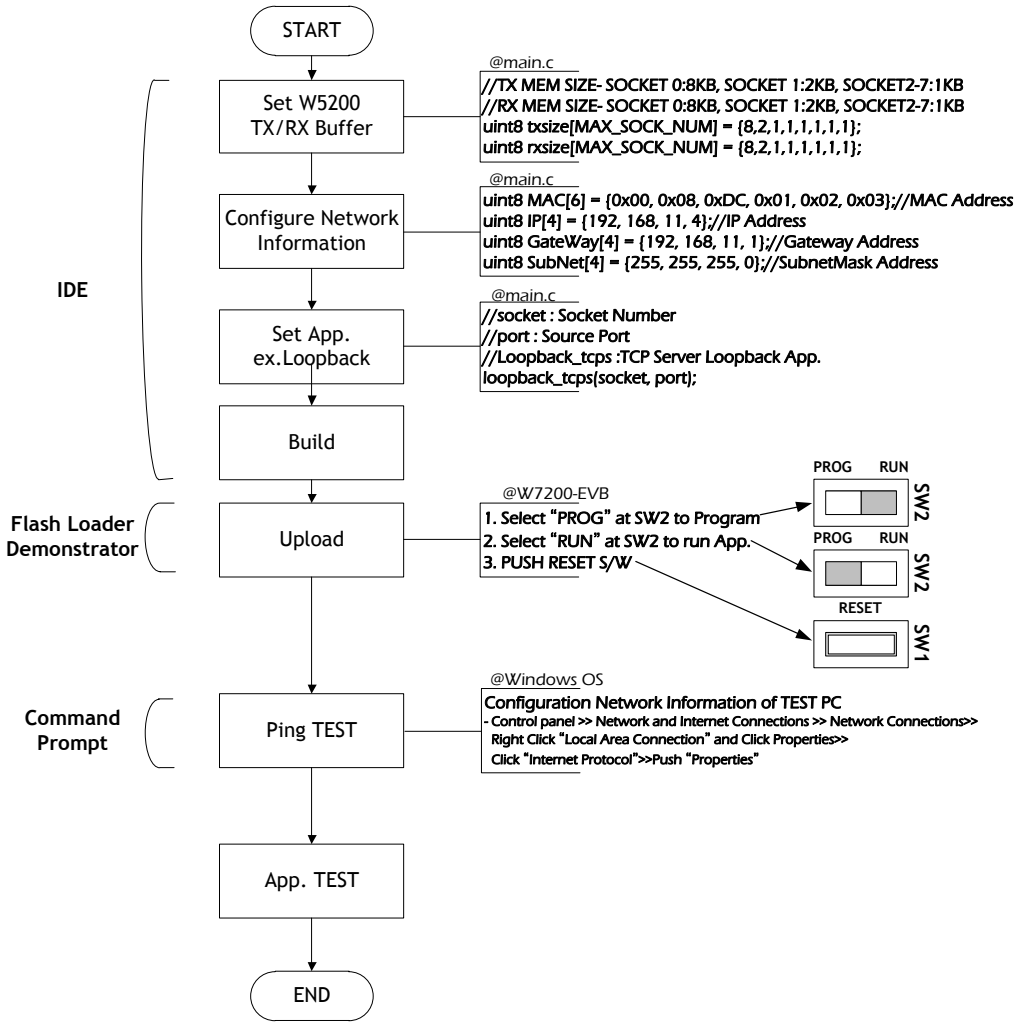



**Figure 8 Flow Chart of Demonstration**

## 9.2 Ping TEST

A ping test determines whether your test PC can communicate with the W7200-EVB over the network.

### 9.2.1 Network configuration for TEST PC

1. Access the "Start" menu and click "Control Panel."
2. Click "Network Connections"
3. Right-click the name of your network in the list of available networks. Select "Properties."
4. Navigate to the "General" tab. Scroll down through the list of connection types and locate the "Internet Protocol (TCP/IP)" entry.

5. Right-click the entry and select "Properties."
6. Configurate IP address, subnet mask and Default gateway as follow figure.

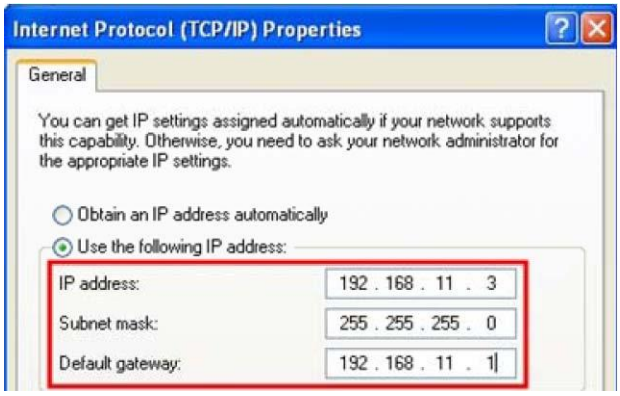



**Figure 9 Internet Protocol Properties**

### 9.2.2 Ping Test at Command Prompt

1. Access the "Start" in the menu, click "Run".
2. Enter "cmd" in the "Open:" field,
3. Type "ping 192.168.11.4" (W7200-EVB IP address) in Command Prompt window

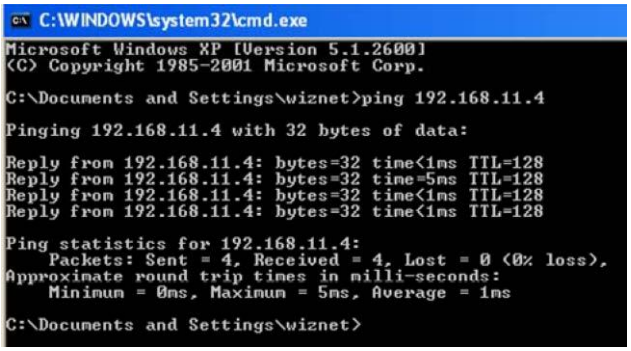
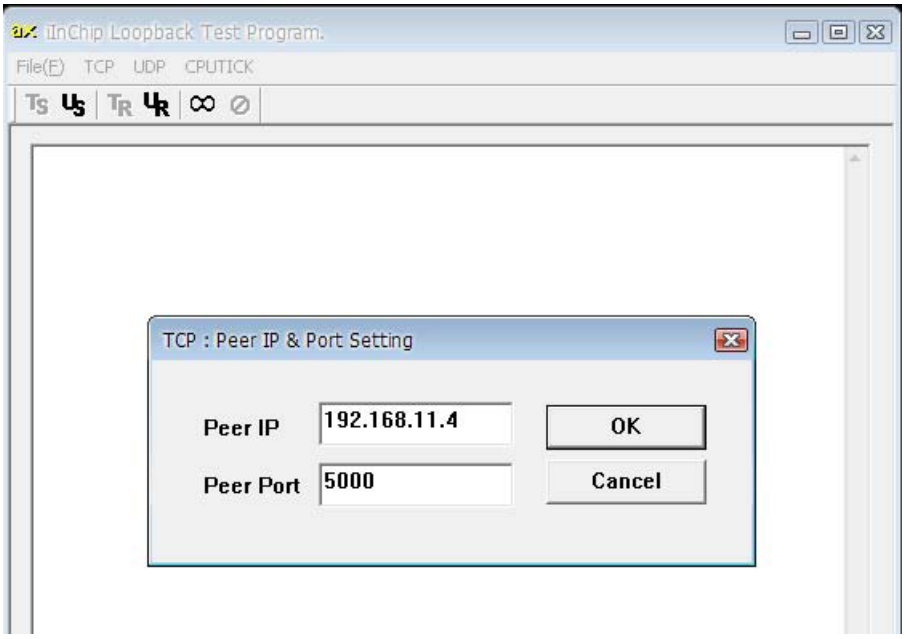



**Figure 10 Ping Test at Command Prompt**

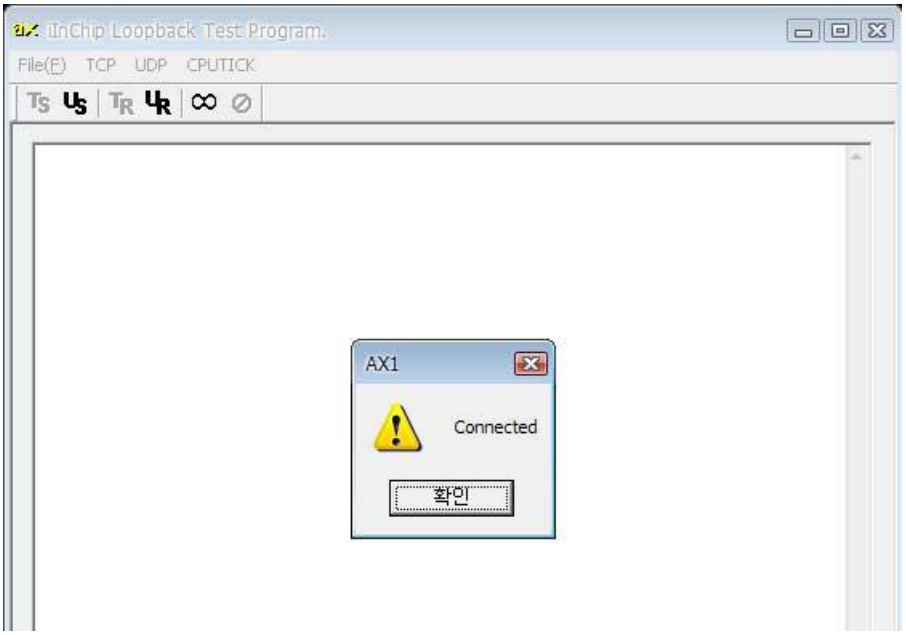
### 9.2.3 App. Test – Loopback TEST

- AX1 : Loopback test program
- Download URL : http://www.wiznet.co.kr/UpLoad_Files/ReferenceFiles/AX1.zip
  - ■ AX1.zip : AXInstallV3.1.exe, AX1 Manual V3.1.pdf

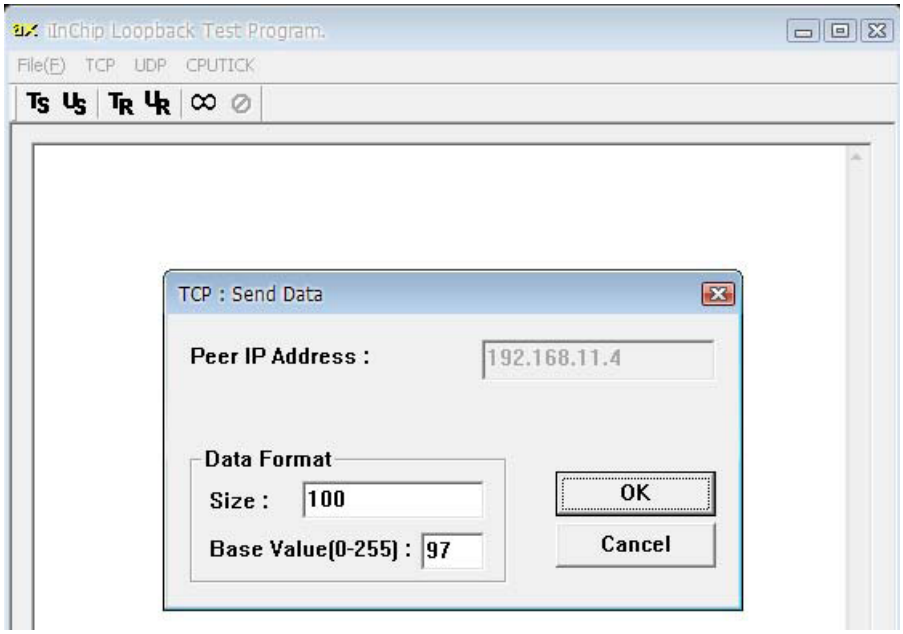
### Run (1) Input W7200-EVB IP and Port



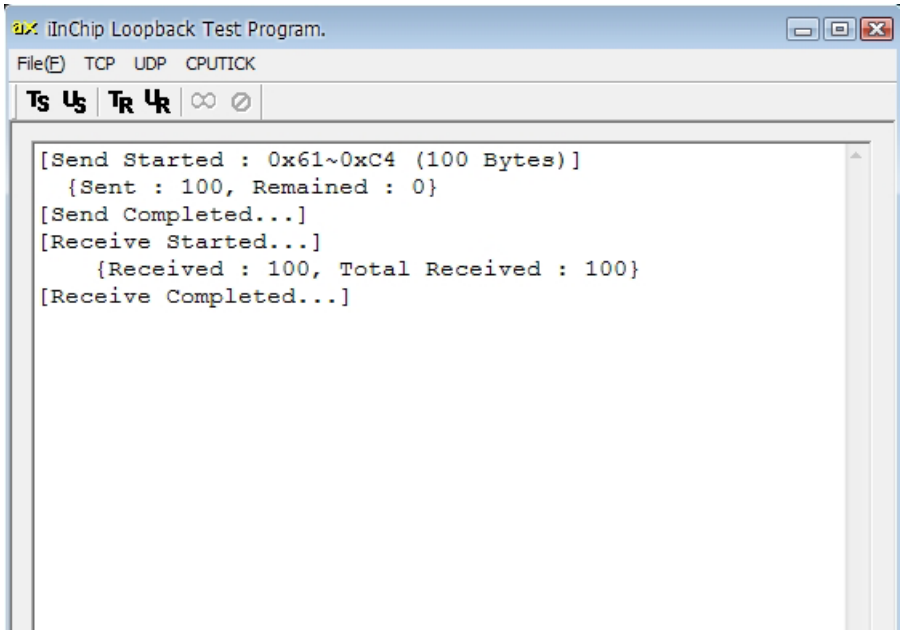

### Run (2) Check "Connected" message



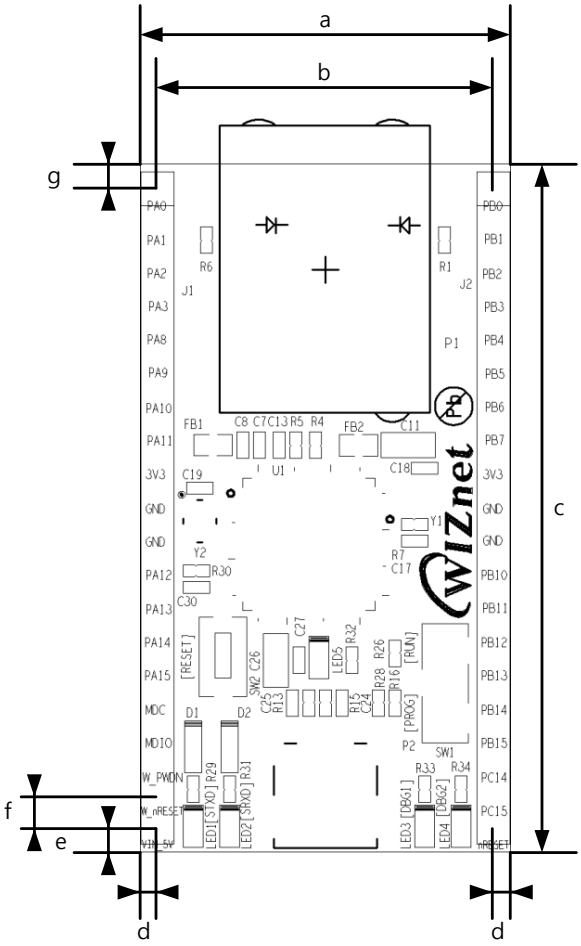
### Run (3) Set Data format; size and base value




### Run (4) Check the status message in dialog window



# 10 Physical Specification

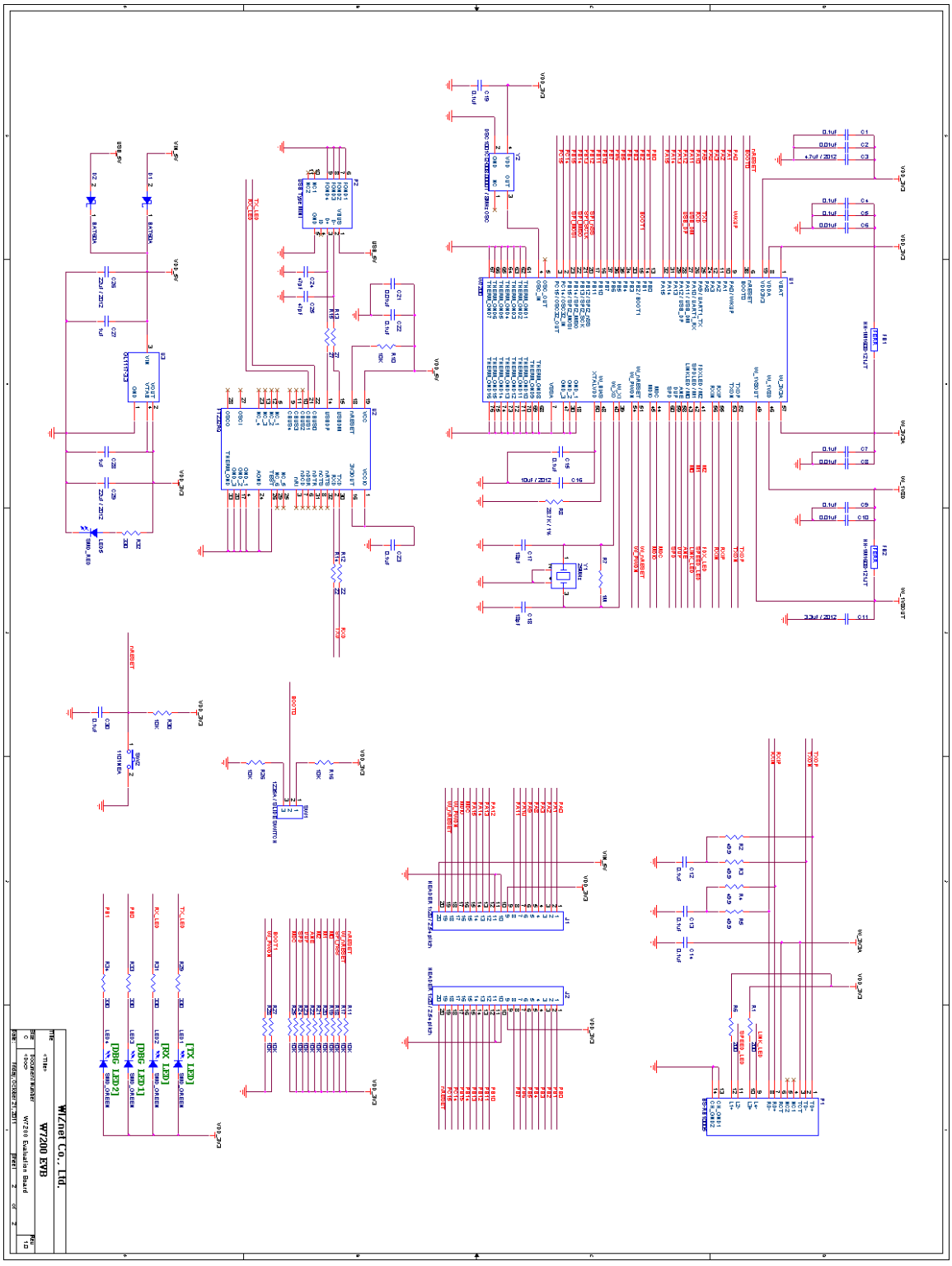



| Symbols | Dimensions (mm) |
|---|---|
| a | 28.00 |
| b | 25.40 |
| c | 52.00 |
| d | 1.30 |
| e | 1.87 |
| f | 2.54 |
| g | 1.87 |

**Figure 11 W7200-EVB Board Dimension**

# 11 Schematic

W7200-EVB schematic can be downloading at WIZnet Homepage, www.wiznet.co.kr



# Document History Information

| Version | Date | Descriptions |
|---|---|---|
| Ver.1.0 | Dec. 2011 | Release |
| Ver.1.1 | Dec. 2011 | Modify the figures |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

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