

AX88x72A Product Introduction

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Revision History

Revision	Date	Description
1.0	2007/12/24	Initial release
1.10	2011/11/30	<ol style="list-style-type: none">1. Updated some descriptions in Section 6, 7 and 8.2. Changed the document revision number to 3-digit format.
1.11	2013/12/19	<ol style="list-style-type: none">1. Updated the Selection Guide table in Section 2.2. Corrected J1/J2 jumpers setting descriptions in Section 5-2.3. Modified some descriptions in Section 7.

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1. Introduction

The AX88x72A (i.e. AX88772A/AX88172A) Low-pin-count USB 2.0 to 10/100M Fast Ethernet controller is a high performance and highly integrated ASIC which enables low cost, small form factor, and simple plug-and-play Fast Ethernet network connection capability for desktop, notebook PC, Ultra-Mobile PC, docking station, game console, digital-home appliances, and any embedded systems using popular USB port.

The AX88x72A has an USB interface to communicate with USB Host Controller and is compliant with USB specification V1.1 and V2.0. The AX88x72A implements 10/100Mbps Ethernet LAN function based on IEEE802.3, and IEEE802.3u standards with embedded 24KB SRAM for packet buffering. The AX88x72A integrate an on-chip 10/100Mbps Ethernet PHY to simplify system design.

The AX88172A provides an optional External Media Interface (EMI) for external PHY or external MAC for different application purpose. The EMI can be media-independent interface (MII) for implementing 100BASE-FX Ethernet or HomePNA functions. The EMI can also be Reverse-MII or Reverse Reduced-MII (Reverse-RMII) for glueless MAC-to-MAC connections to any MCU with Ethernet MAC MII or RMII interface. In addition, the EMI can be configured to Dual-PHY mode allowing AX88172A acting as an Ethernet PHY or USB 2.0 PHY for external MAC device that needs Ethernet and USB interfaces in system application. The optional serial interface such as I2C, SPI, and UART are provided as control channel from the USB Host Controller to communicate with external MCU chip.

This document provides an overview of AX88772A/AX88172A family product.

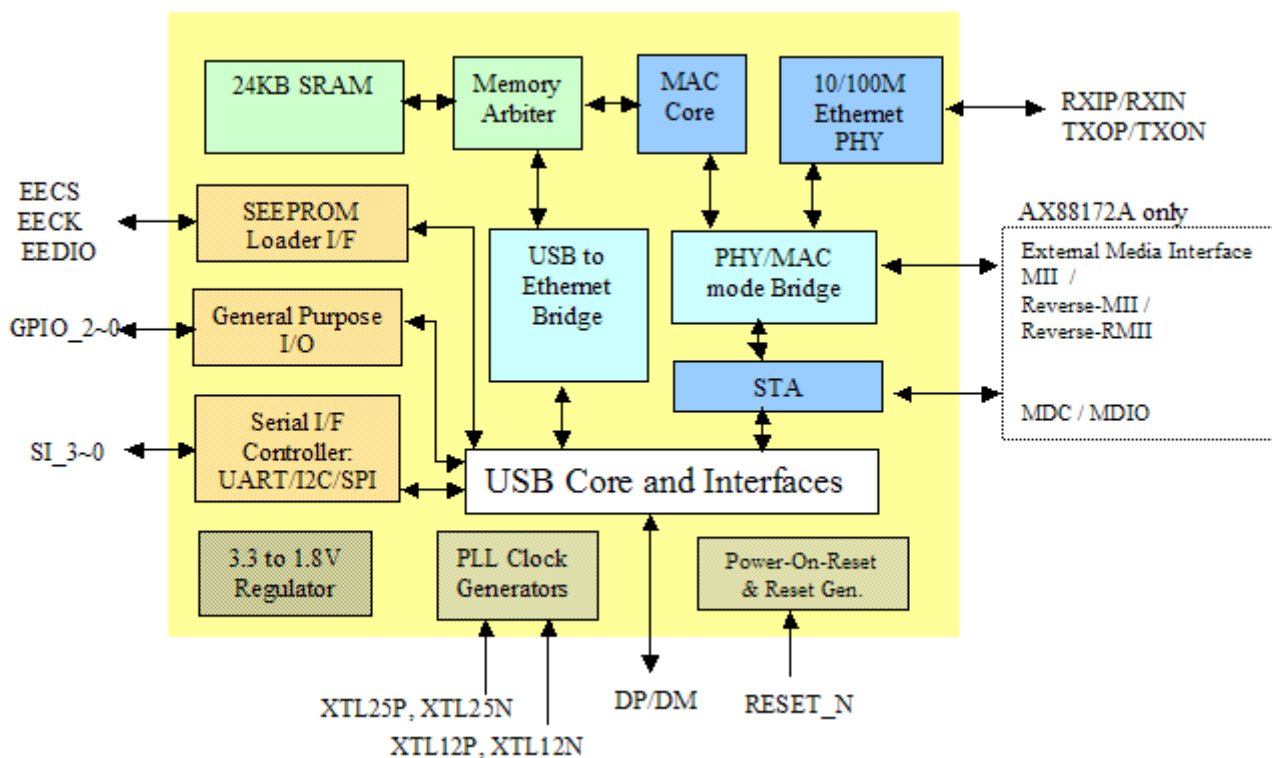


Figure 1. Block Diagram

2. Selection Guide

The following is the selection guide of ASIX Electronics USB to Ethernet family for different requirement applications. Please visit ASIX Electronics' High-Speed USB-to-LAN product web page (<http://www.asix.com.tw/products.php?PLine=71>) and contact ASIX's Sales (sales@asix.com.tw) for details.

Part No.	USB Speed	USB Hub	Ethernet MAC/PHY (Mbps)	Microsoft AOAC	MAC Interface	Crossover Detection and Auto-correction
AX88179	Super (3.0)	-	10/100/1000	-	-	v
AX88178A	High (2.0)	-	10/100/1000	-	-	v
AX88178	High (2.0)	-	10/100/1000 (MAC only)	-	MII/GMII/RGMII	-
AX88772C	High (2.0)	-	10/100	v	RMII/Rev-RMII(Optional)	v
AX88772B	High (2.0)	-	10/100	-	RMII/Rev-RMII(Optional)	v
AX88772A	High (2.0)	-	10/100	-	-	v
AX88172A	High (2.0)	-	10/100	-	(Rev-)MII/Rev-RMII	v
AX88772	High (2.0)	-	10/100	-	MII	-
AX88760	High (2.0)	3-Port	10/100	-	-	v

Part No.	IP/TCP/UDP Checksum	Wake-on-LAN	Serial Interface	Temperature Range (°C)	Package
AX88179	v	v	-	0 ~ +70	QFN-68
AX88178A	v	v	-	0 ~ +70	QFN-68
AX88178	-	v	-	0 ~ +70	LQFP-128
AX88772C	v	v	-	0 ~ +70	LQFP-64
AX88772B	v	v	-	0 ~ +70/ -45 ~ +85	LQFP-64
AX88772A	-	v	I ² C, SPI UART	0 ~ +70	LQFP-64
AX88172A	-	v	I ² C, SPI UART	0 ~ +70	TQFP-80
AX88772	-	v	-	0 ~ +70	LQFP-128
AX88760	-	v	-	0 ~ +70	LQFP-100

Figure 2. Selection Guide

3. Ordering Information

The following is the ordering information of AX88x72A family chips and AX88x72A demo boards. Please contact ASIX's Sales (sales@asix.com.tw) for details.

Part Number	Description
AX88772ALF	AX88772A: Product Name (64 pin). L: LQFP Package. F: Lead Free.
AX88172ATF	AX88172A: Product Name (80 pin). T: TQFP Package. F: Lead Free.

AX88x72A Demo Boards	Description
AX88772A demo board	This is a general-purpose demo board for AX88772A
AX88172A demo board	This is a general-purpose demo board for AX88172A with the MII/Rev-MII/Rev-RMII interface

4. Target Applications

The following are some PC/Internet and consumer electronics target applications for your reference.



Figure 3. Target Applications

5. AX88772A/AX88172A Demo Boards

ASIX Electronics provides two kinds of AX88772A/AX88172A demo boards for users to evaluate the basic functions of AX88772A or AX88172A. If you need to purchase the AX88x72A demo boards, please contact ASIX's Sales (sales@asix.com.tw) for details.

5-1. AX88772A Demo Board

The following is the picture of AX88772A demo board for your reference.

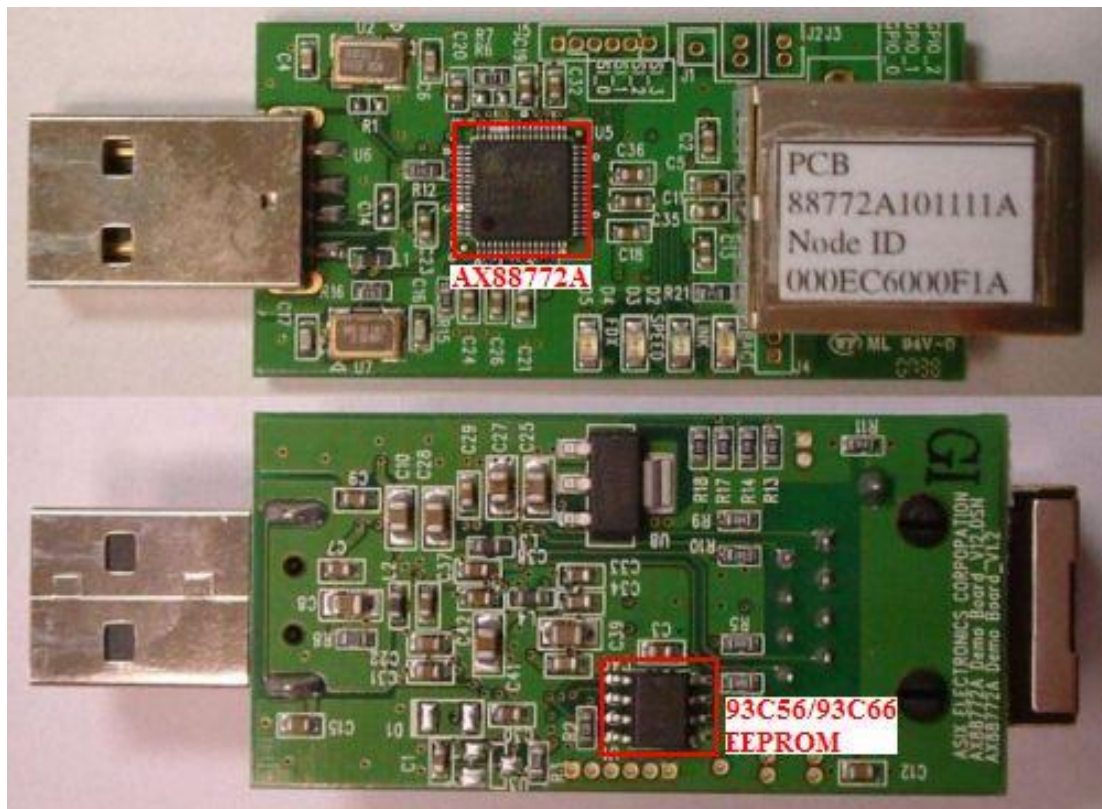


Figure 4. AX88772A Demo Board

5-2. AX88172A Demo Board

The following is the picture of AX88172A demo board for your reference.

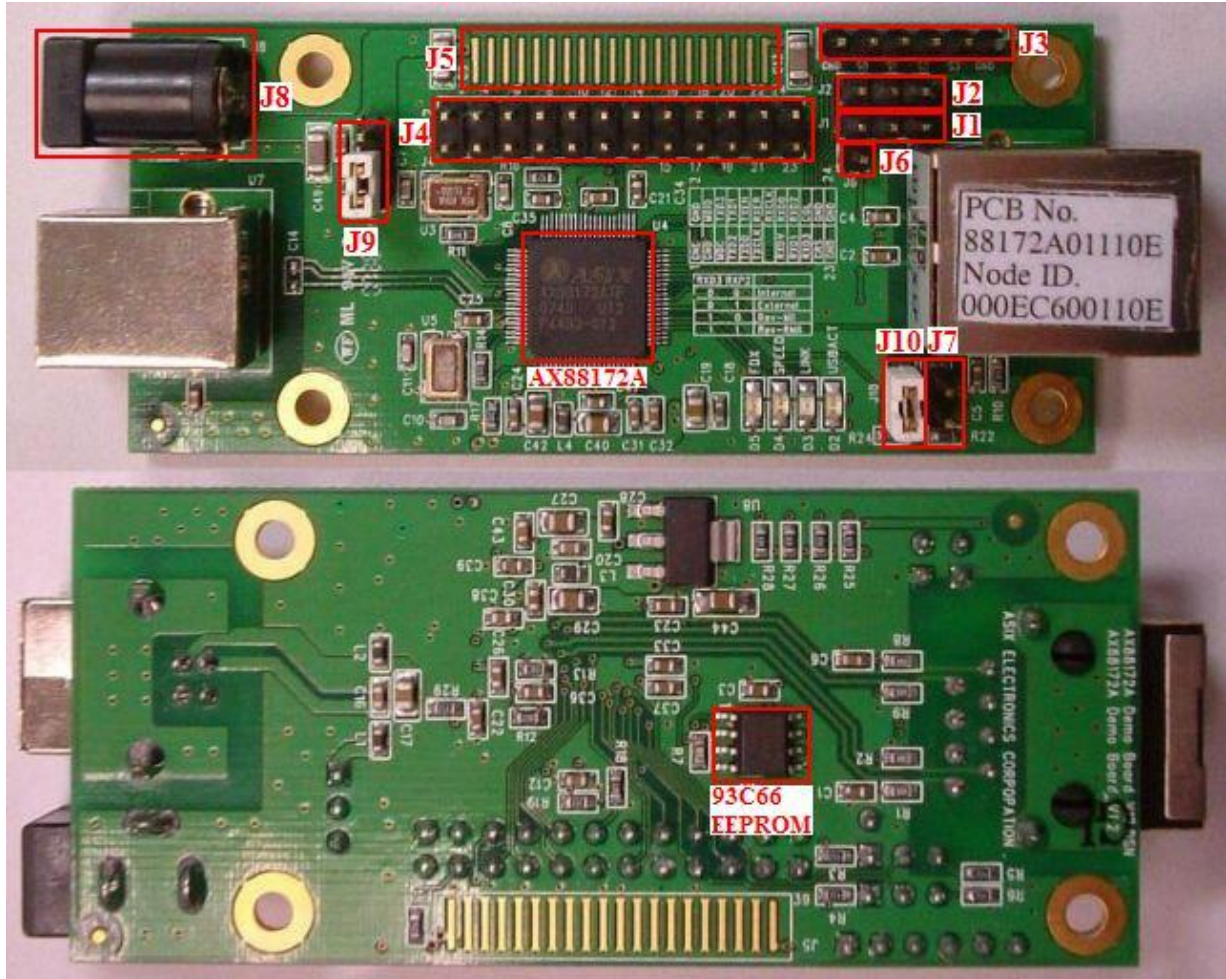


Figure 5. AX88172A Demo Board

The following are the jumper configuration table of the AX88172A demo board.






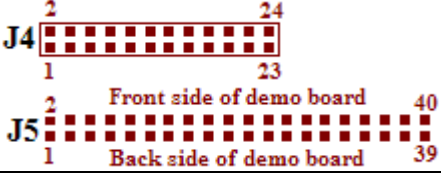



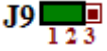


Jumper	Setting	Description
J1/J2		Enable the AX88172A MAC Mode with internal PHY
		Enable the AX88172A MAC Mode with external MII interface
		Enable the AX88172A PHY Mode with external Reverse-MII interface
		Enable the AX88172A PHY Mode with external Reverse-RMII interface
J3	 Pole #1 & #6: GND Pole #2: SI_0 Pole #3: SI_1 Pole #4: SI_2 Pole #5: SI_3	The multi-function pins (SI_0~SI_3) of AX88172A serial interface should be configured properly at the Flag field (offset 01h) of AX88172A EEPROM. I2C interface: SI_0 (I2C_SCLK), SI_1 (I2C_SDA) UART interface: SI_2 (UART_TX), SI_3 (UART_RX) SPI interface: SI_0 (SPI_SCLK), SI_1 (SPI_SS), SI_2 (SPI_MOSI), SI_3 (SPI_MISO)
J4/J5		The J4 and J5 are two kinds of the MII interface headers. Please refer to AX88172A Demo Board Reference Schematic for details.
J6		The PME output pin.
J7		Disable the default Wake-On-LAN ready mode.
		Enable the default Wake-On-LAN ready mode for some special applications.
J8/J9		Set AX88172A demo board to Bus-power mode The J8 connector doesn't need to be connected.
		Set AX88172A demo board to Self-power mode The J8 connector should be connected to a 5V power adapter.
J10		External wake-up event trigger pin Trigger the external wake-up event by unplugging/re-plugging the jumper.

Figure 6. AX88172A Demo Board Jumper Setting Table

6. Mass Production Solutions

To support the mass production for those products using AX88x72A chips. ASIX provides the Windows SROM Programming Tool and Windows Production Test Tool solutions for AX88x72A customers. This chapter provides a brief introduction for both solutions. Please refer to “AX88x72A EEPROM User Guide” for details.

6-1. Windows SROM Programming Tool

ASIX Electronics provides a Windows SROM Programming tool for users to easily program the Serial EEPROM of AX88x72A on a typical Windows PC. This AX88x72A Windows SROM Programming Tool supports to customize the MAC address, Serial Number, Vendor ID and Product ID, etc. for AX88x72A based application systems in mass production.

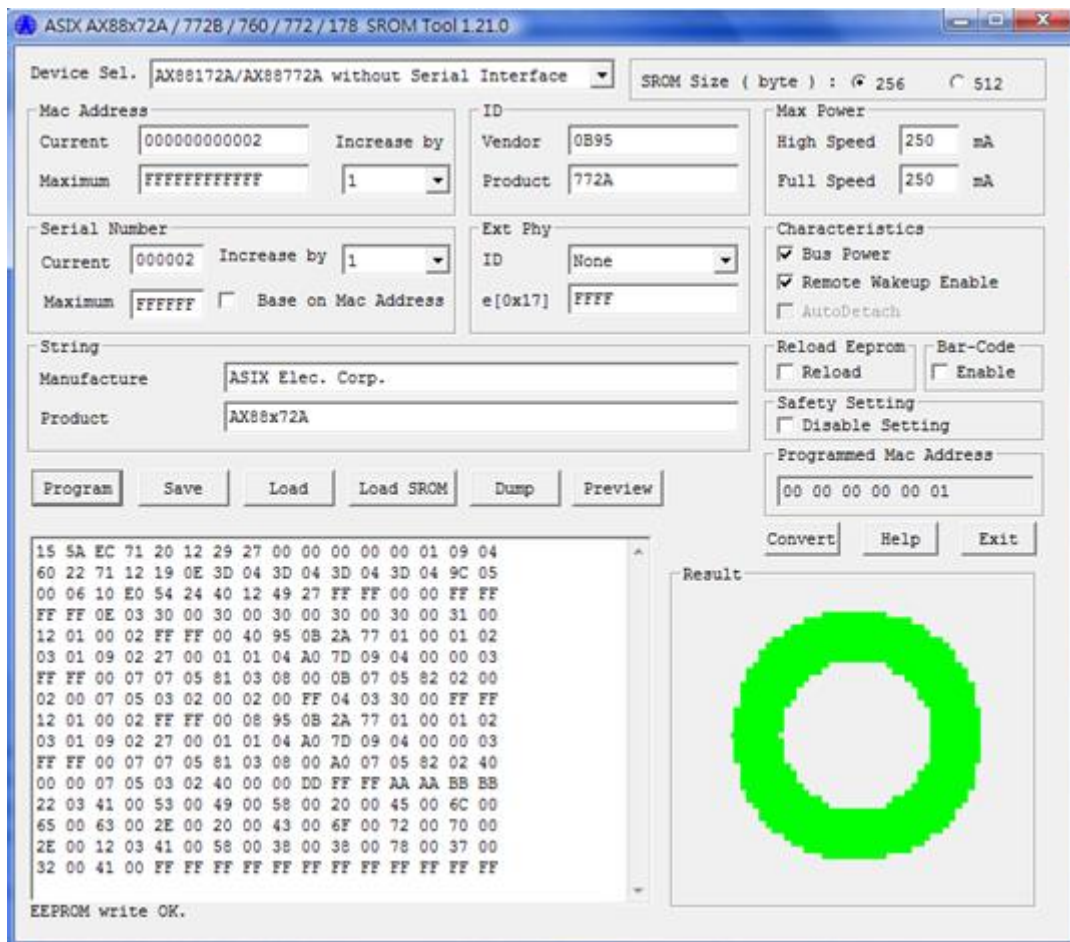


Figure 7. Windows SROM Programming Tool

6-2. Windows Production Test Tool

ASIX Electronics provides a Windows Production Test tool for users to run some basic network function tests and program the EEPROM of their AX88x72A based application systems during production. This tool is used for testing the USB to Ethernet Network Adapter product that uses ASIX AX88x72A chip.

This tool supports to send/receive packets in different Ethernet speed modes, and program EEPROM. This tool must be run on a Windows PC, which installs the AX88x72A special test driver. This tool also needs a separate server PC to run the test server tool. The test server tool on server PC can receive packets from the “device under test” product, and then reply back.

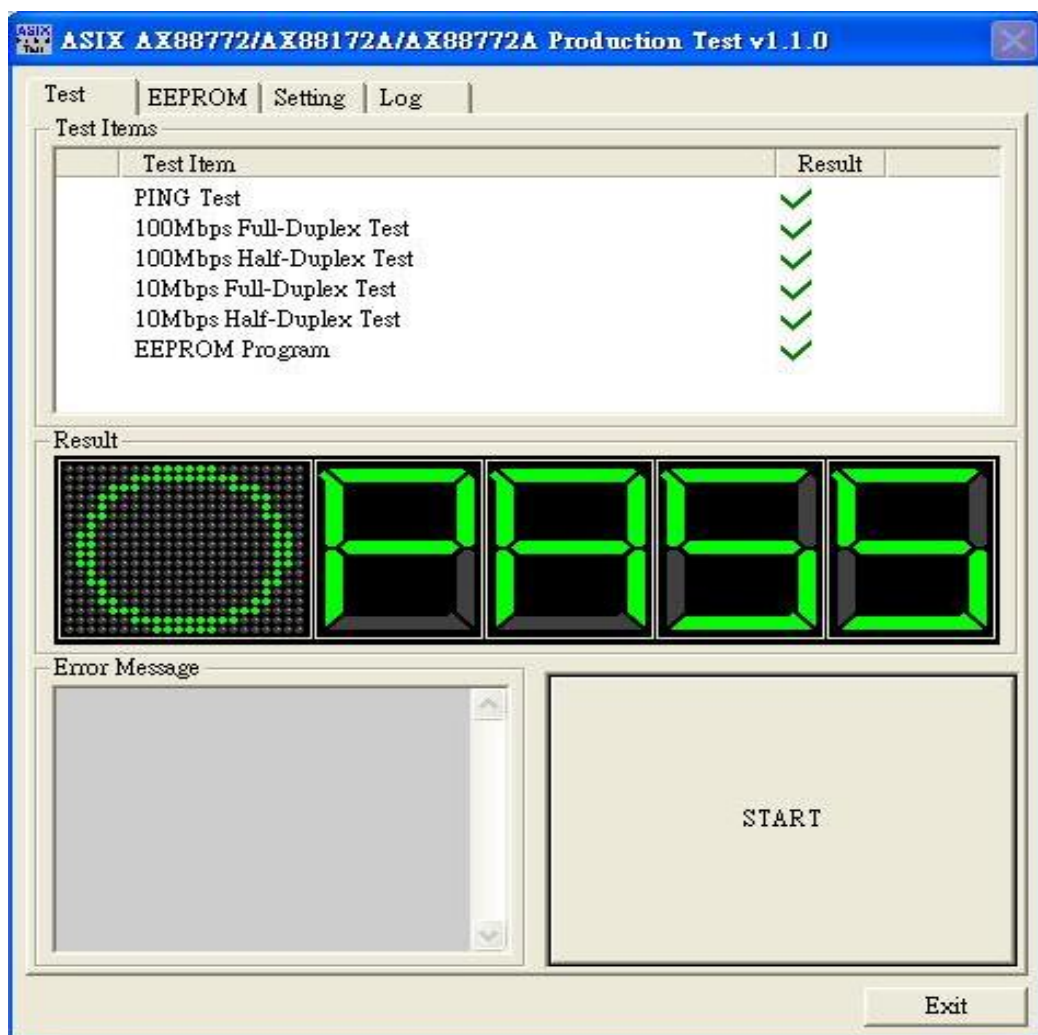


Figure 8. Windows Production Test Tool

7. Related Technical Archives

The following are the AX88772A/AX88172A product web pages for your reference. You can download some basic AX88x72A related technical archives from these web sites.

AX88772A -- Single chip Low-pin-count USB 2.0 to 10/100M Fast Ethernet controller
<http://www.asix.com.tw/products.php?op=pItemdetail&PItemID=97;71;101&PLine=71>

AX88172A -- Single chip USB 2.0 to MII, single chip MII to Ethernet and USB Bridging controller in Dual-PHY mode
<http://www.asix.com.tw/products.php?op=pItemdetail&PItemID=96;71;101&PLine=71>

AX88x72A Technical Archives	Type	Availability
AX88x72A Product Introduction	Document	Downloadable*
AX88x72A Product Brief	Document	Downloadable
AX88x72A Datasheet	Document	Downloadable
AX88x72A USB-to-LAN Application Design Note	Document	Downloadable
AX88772A Demo Board Reference Schematic	Schematic	Downloadable
AX88172A Demo Board (USB to Rev-MII) Reference Schematic	Schematic	Downloadable
AX88172A ExpressCard to Rev-MII Reference Schematic	Schematic	Downloadable
AX88772A Demo Board PCB file	PCB	Downloadable
AX88172A Demo Board PCB file	PCB	Downloadable
AX88772A Demo Board Gerber files	Gerber	Downloadable
AX88172A Demo Board Gerber files	Gerber	Downloadable
AX88772A Demo Board BOM file	BOM	Downloadable
AX88172A Demo Board BOM file	BOM	Downloadable
AX88772A Reliability Report	Report	Downloadable
AX88172A Reliability Report	Report	Downloadable
AX88772A RoHS Report	Report	Downloadable
AX88172A RoHS Report	Report	Downloadable
AX88772A IBIS Model	IBIS	Downloadable
AX88172A IBIS Model	IBIS	Downloadable
AX88772A Win8.x 64-bit Driver	Driver	Downloadable
AX88772A Win8.x 32-bit Driver	Driver	Downloadable
AX88772A Win7 64-bit Driver	Driver	Downloadable
AX88772A Win7 32-bit Driver	Driver	Downloadable
AX88772A WinXP/Vista 64-bit Driver	Driver	Downloadable
AX88772A WinXP/Vista 32-bit Driver	Driver	Downloadable
AX88772A Mac OSX 10.9 to 10.5 Driver	Driver	Downloadable
AX88772A Linux Kernel 3.x/2.6.x Driver	Driver	Downloadable
AX88772A WinCE 6.0 Driver	Driver	Downloadable
AX88772A WinCE 5.0 Driver	Driver	Downloadable
AX88172A Win7 64-bit Driver	Driver	Downloadable

AX88172A Win7 32-bit Driver	Driver	Downloadable
AX88172A WinXP/Vista 64-bit Driver	Driver	Downloadable
AX88172A WinXP/Vista 32-bit Driver	Driver	Downloadable
AX88172A Linux Kernel 3.x/2.6.x Driver	Driver	Downloadable

*"Downloadable" means this archive can be downloaded from AX88x72A product web pages.

Figure 9. Downloadable Technical Archives

The following table is the AX88x72A available upon request technical archives for your reference. These archives are not published on the AX88x72A product web sites and are available upon request. Please contact ASIX's Sales (sales@asix.com.tw) for detailed information.

AX88x72A Technical Archives	Type	Availability
AX88x72A EEPROM/Manufacture User Guide	Document	Available upon request
AX88172A MAC-to-MAC Application Note	Document	Available upon request
AX88x72A PHY-to-PHY Connection Reference Circuit	Document	Available upon request
AX88x72A Windows SROM Programming Tool	Utility	Available upon request
AX88x72A Linux SROM Programming Tool	Utility	Available upon request
AX88x72A WinCE SROM Programming Tool	Utility	Available upon request
AX88x72A Windows Production Test Tool	Utility	Available upon request
AX88x72A Performance Test Report	Report	Available upon request

Figure 10. Available Upon Request Technical Archives

8. Frequently Asked Questions

Users can learn some basic information about AX88x72A family from here. If you couldn't find the answers to your questions, please feel free to contact ASIX's Support (support@asix.com.tw) for helps.

1. Where can I obtain the latest AX88772A/AX88172A drivers?

Please visit the following AX88772A/AX88172A Driver Download web pages to download the latest AX88772A/AX88172A drivers.

AX88772A Driver Download web page

(<http://www.asix.com.tw/download.php?sub=driverdetail&PItemID=97>)

AX88172A Driver Download web page

(<http://www.asix.com.tw/download.php?sub=driverdetail&PItemID=96>)

Notes: The AX88172A Windows/Linux driver was released for users to evaluate some basic network functions of the AX88172A demo board. You should contact ASIX Sales (sales@asix.com.tw) for further driver support on your AX88172A target applications.

2. Why don't ASIX's AX88x72A drivers work with my AX88x72A device?

All ASIX's AX88x72A drivers are qualified with ASIX AX88x72A demo boards with ASIX's default Vendor ID (0B95h) and Product ID (772Ah for AX88772A or 172Ah for AX88172A). Some of AX88x72A manufacturers have their own Vendor ID and Product ID. In this case, ASIX's AX88x72A drivers will not work with your AX88x72A device. Please contact the technical support of your device manufacturer to obtain their driver.

3. What kind of EEPROM should I implement on my AX88x72A applications?

AX88x72A supports 16-bit mode 93C56/93C66 EEPROM. You can select a proper EEPROM model according as the serial interface function of AX88x72A was enabled or disabled or some other special requirements such as a long manufacture string or product string, etc. If the serial interface function is enabled or you need use a long manufacture string, product string, etc., the necessary EEPROM size might be larger than 128 * 16 bits. In this case, you MUST select the 93C66 EEPROM (256 * 16 bits); otherwise, you can select the 93C56 EEPROM (128 * 16 bits). Please refer to “**AX88x72A EEPROM User Guide**” for more details.

4. Do we need to register our own VID/PID for our AX88x72A based application systems or can we use the VID/PID of ASIX Electronics?

The answers to above questions really depend on user's product applications and target market, which can be different on individual cases. Below gives customers some general guidelines about whether one can use ASIX's VID/PID or one should better register its own one with USB-IF.

(1) Cases for OK to use ASIX Electronics' VID (0B95h) and PID (772Ah for AX88772A or 172Ah for AX88172A)

You may be able to use ASIX Electronics' VID and PID when your AX88x72A based application system can simply work with AX88x72A standard drivers provided by ASIX without any modification and you don't have any concern from business and product marketing perspective to use the same VID and PID on your products as ASIX's other customers who are also using ASIX's VID and PID. ASIX Electronics would like to request customers to inform ASIX sales staffs by sending us email at sales@asix.com.tw beforehand if you would like to use ASIX Electronics VID and PID for your products.

In other words, if your AX88x72A based application system requires you to modify AX88x72A driver on your own or by ASIX support team, you might have to register your own VID and PID. This can avoid your end customers from going to ASIX web site to download the AX88x72A standard driver which may not be suitable to work with the specific AX88x72A based application system.

(2) Cases requiring you to use your own VID and PID

- a) Your AX88x72A based application systems can't work directly with AX88x72A standard drivers which ASIX Electronics release on its web site and your target application system (such as USB dongle or docking station) may allow your end customers to update the standalone AX88x72A driver by themselves after sales. In that case, you **MUST** assign your own unique VID and PID for your AX88x72A based devices.
- b) For brand name products, you probably don't want your AX88x72A based devices to become compatible with other company's AX88x72A based devices. In this case, you should consider assigning your own unique VID and PID for your AX88x72A based devices.

Please visit the USB-IF web site (<http://www.usb.org/developers/vendor/>) to register your own VID from USB Implementers Forum, Inc. and define the PID based on your company rules by yourselves. If you have any problem, please contact ASIX's support (support@asix.com.tw) for further support.

5. How to register a Vendor ID from USB-IF?

If you are a new USB product developer looking to get a Vendor ID for your company, you can register a Vendor ID from USB Implementers Forum, Inc. Please visit the USB-IF web site (<http://www.usb.org/developers/vendor/>) for details.

6. Do I have to assign a unique MAC address to every AX88x72A based devices?

Yes, every Ethernet device must have a unique MAC address. Users should always assign a unique MAC address in the AX88x72A EEPROM for every AX88x72A based devices.

You should visit the IEEE-SA web site (http://standards.ieee.org/regauth/registry_OUI.html) to register a block of MAC addresses for your company.

7. How to register a MAC/Ethernet address from IEEE-SA?

You must first have an OUI or an IAB, to which you then append 24 or 12 bits respectively, in a way that makes the resulting 48-bit number unique, i.e., your 24 or 12 bits must be unique within your organization, which will require coordination among all the users of your organization's OUI or IAB. Please visit the IEEE-SA web site (http://standards.ieee.org/regauth/registry_OUI.html) for details.

8. Do I have to assign a unique serial number to every AX88x72A based device?

No, it depends on the real requirement of your AX88x72A target application. If your end customer may need to install more than one AX88x72A-based device on your target application, you should assign a different serial number in the EEPROM for every AX88x72A device.

If your target application always uses one AX88x72A device, you can consider assigning the same serial number in the EEPROM for every AX88x72A device for easy maintenance in mass production, especially if you plan to use a Windows PC to test AX88x72A based devices repeatedly during the mass production test.



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