# AX88772C Product Introduction

Revision 1.13
May 13th, 2024



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# Revision History

| Revision | Date | Description |
|---|---|---|
| 0.10 | 2013/03/27 | Preliminary release |
| 1.00 | 2013/05/08 | 1. Modified some descriptions in Section 1, 3, 8. |
| 1.10 | 2013/05/15 | 1. Modified some descriptions in Section 3, 4. |
| 1.11 | 2023/08/15 | 1. Updated Figure 6 in Section 3.<br>2. Remove Figure 13. |
| 1.12 | 2024/01/17 | Updated Selection Guide in Figure 6. |
| 1.13 | 2024/05/13 | Updated Selection Guide in Figure 6. |



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# 1. Introduction

The AX88772C USB 2.0 to 10/100M Fast Ethernet controller with Microsoft AOAC(Always On Always Connected) support is a high performance and highly integrated ASIC which enables a low cost, small form factor, and simple plug-and-play Fast Ethernet network connection capability for desktops, notebook PCs, Ultrabooks, cradles/port replicators/docking stations, game consoles, digital-home appliances, and any embedded system using a standard USB port.

The AX88772C can be used in any embedded system with a USB host microcontroller requiring a twisted pair physical network connection. Featuring a USB interface (compliant with USB specification V2.0 and V1.1) to communicate with a USB Host Controller, the AX88772C also integrates on-chip Ethernet MAC and PHY (IEEE802.3 and IEEE802.3u compatible) and embedded memory. Additionally, the AX88772C needs only a single 25MHz crystal to drive both the USB and Ethernet PHYs.

The AX88772C offers a wide array of features including IPv4/IPv6 checksum offload engine, Protocol Offload(ARP & NS), HP Auto-MDIX, and IEEE 802.3x and back-pressure flow control. The AX88772C also offers multiple power management Wake-on-LAN features, including Magic Packet, Microsoft Wakeup Frame, Link Status Change, 32 Microsoft Wakeup Patterns and Wakeup Packet Indication that allows the AOAC platform to enter a low-power “Connected Standby” state and wake on a desired network pattern.

The AX88772C provides an optional Multi-Function-Bus portion A and B (MFA and MFB) for external PHY or external MAC for different application purposes. The MFA/MFB can be a reduce-media-independent interface (RMII) for implementing HomePlug, HomePNA, etc. functions. The MFA/MFB can also be a Reverse Reduced-MII (Reverse-RMII) for glueless MAC-to-MAC connections to any MCU with Ethernet MAC RMII interface. In addition, the MFA/MFB can be configured as general purpose I/O.



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## 2. Block Diagram

The following is AX88772C block diagram,

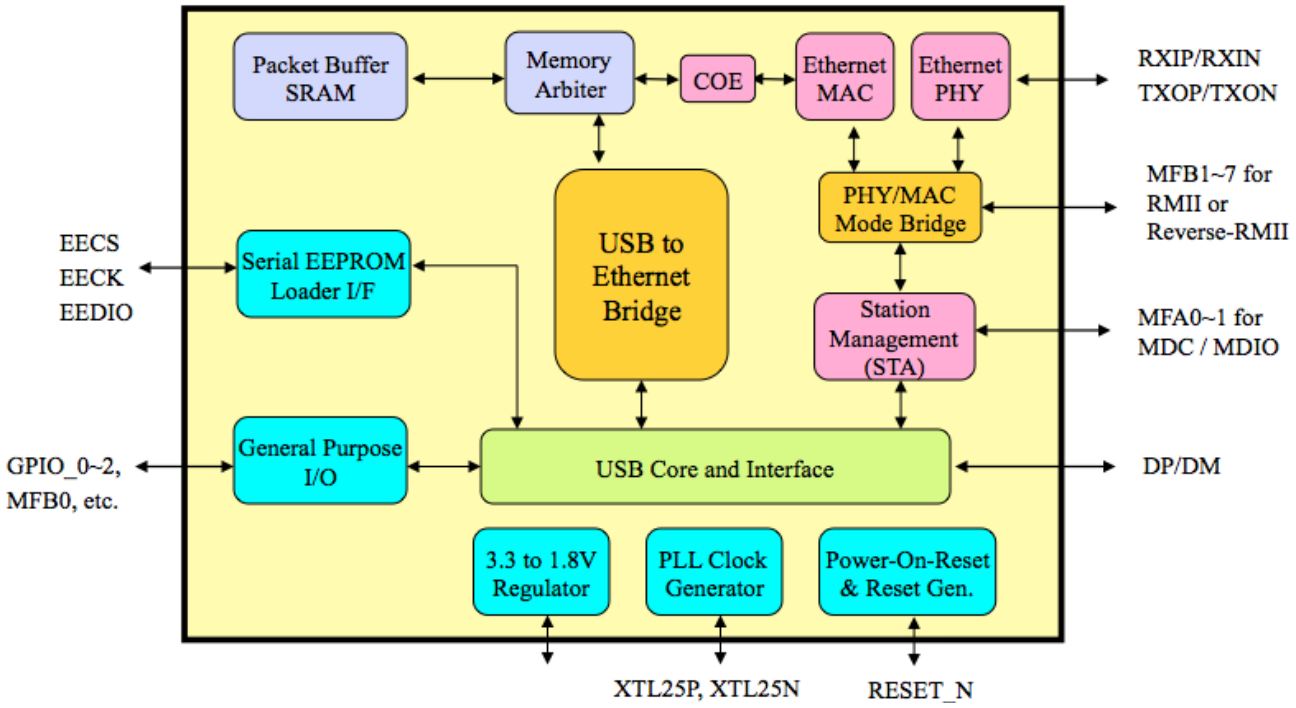


Figure 1. Block Diagram



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## 2-1. Typical System Block Diagrams

- **Hosted by USB to operate with internal Ethernet PHY only**

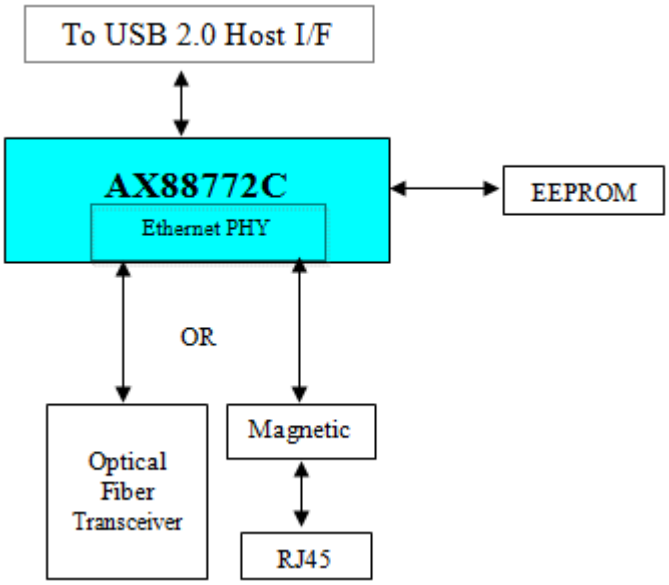


Figure 2. USB 2.0 to LAN Adaptor (MAC mode)

- **Hosted by USB to operate with either internal Ethernet PHY or RMII (in MAC mode)**

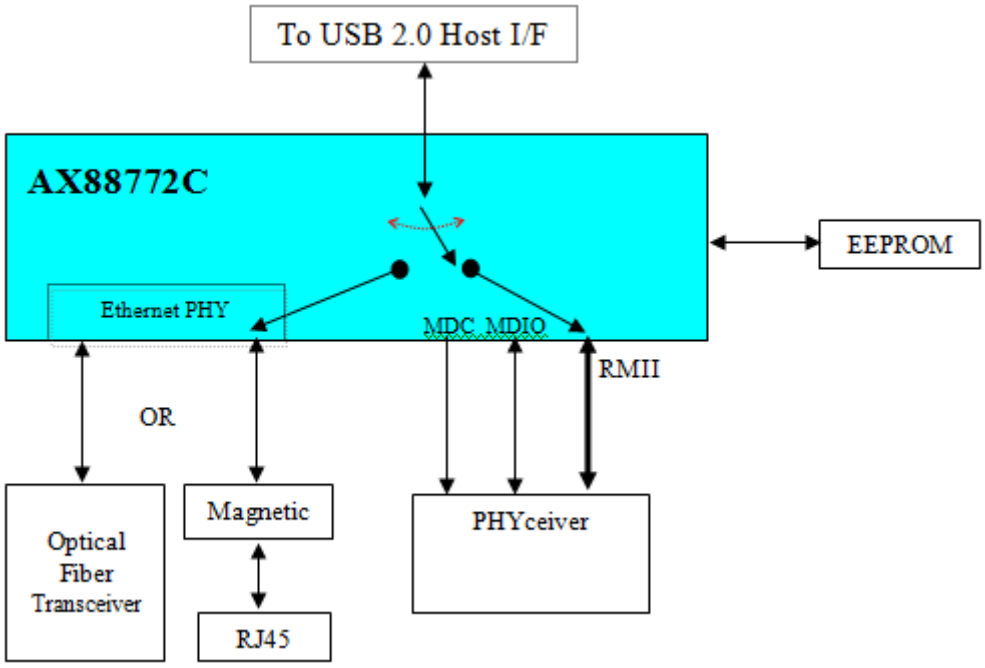


Figure 3. USB 2.0 to Fast Ethernet and external PHYceiver Combo (MAC mode)



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- **Hosted by USB to operate with either internal Ethernet PHY (in MAC mode) or Reverse-RMII (in PHY mode)**

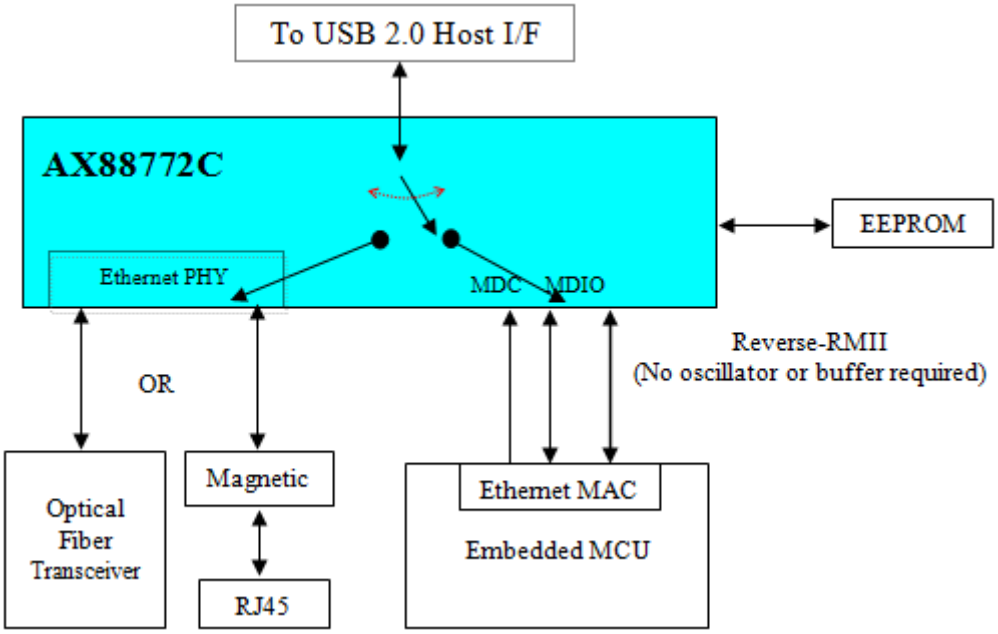


Figure 4. Bridging Embedded MCU to USB 2.0 Host Interface (PHY mode)

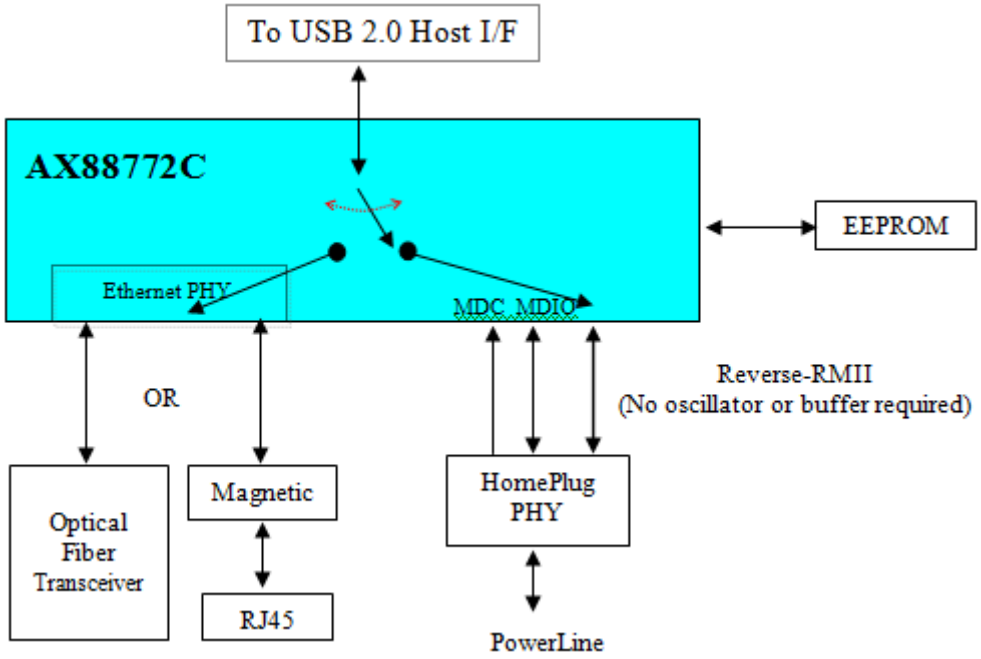


Figure 5. USB 2.0 to HomePlug Adaptor (PHY mode)



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# 3. Selection Guide

The following is the selection guide of ASIX Electronics USB to Ethernet ICs for different requirement applications. Please visit ASIX Electronics USB Ethernet ICs web pages and contact ASIX's Sales (sales@asix.com.tw) for details.

| Part No. | USB Speed | Ethernet MAC/ PHY (bps) | CDC-NCM Driverless | iPXE | PTP | MAC Interface | Temperature Range ($^0$C) | Package |
|---|---|---|---|---|---|---|---|---|
| AX88279 | USB 3.2 | 2.5G/1G/100M | V | V | V | - | 0 ~ +70 | QFN-60 |
| AX88179B | USB 3.2 | 1G/100M/10M | V | V | V | - | 0 ~ +70<br>-40 ~ +85 | QFN-40 |
| AX88179A | USB 3.2 | 1G/100M/10M | V | V | - | - | 0 ~ +70 | QFN-40 |
| AX88772E | USB 2.0 | 100M/10M | V | V | V | - | 0 ~ +70 | QFN-32 |
| AX88772D | USB 2.0 | 100M/10M | V | V | - | - | 0 ~ +70 | QFN-32 |
| AX88772C | USB 2.0 | 100M/10M | - | - | - | RMII/ Rev-RMII | 0 ~ +70/<br>-40 ~ +85 | LQFP-64 |
| AX88772B | USB 2.0 | 100M/10M | - | - | - | RMII/ Rev-RMII | 0 ~ +70/<br>-40 ~ +85 | LQFP-64 |
| AX88772A | USB 2.0 | 100M/10M | - | - | - | - | 0 ~ +70 | LQFP-64 |

Figure 6. Selection Guide



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# 4. Ordering Information

The following are the ordering information of AX88772C silicon and AX88772C demo boards. Please contact ASIX's Sales (sales@asix.com.tw) for more details.

| Part Number | Description |
|---|---|
| **AX88772CLF** | 64 PIN, LQFP Package, Commercial grade 0°C to +70 °C (Green, Lead-Free) |
| **AX88772CLI** | 64 PIN, LQFP Package, Industrial grade -40°C to +85 °C (Green, Lead-Free) |

| AX88772C Demo Boards | Description |
|---|---|
| AX88772C USB to 100Base-TX Ethernet Demo Board | This is a USB dongle for AX88772C USB to 100Base-TX Ethernet application |
| AX88772C USB to 100Base-TX Ethernet (with RMII) Demo Board | This is a general-purpose demo board for AX88772C USB to 100Base-TX Ethernet (with optional RMII/Rev-RMII interface) application |
| AX88772C USB to 100Base-FX 1x9 SC Ethernet Demo Board | This is a general-purpose demo board for AX88772C USB to 100Base-FX 1x9 SC Fiber Ethernet (with optional RMII/Rev-RMII interface) application |
| AX88772C USB to 100Base-FX POF Ethernet Demo Board | This is a general-purpose demo board for AX88772C USB to 100Base-FX POF (Plastic Optical Fiber) Fiber Ethernet (with optional RMII/Rev-RMII interface) application |

Figure 7. Ordering Information



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# 5. Target Applications

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

## PC/Internet

USB Dongle

Docking Station

Port Replicator for Mobile Computer

USB KVME Switch

Internet Security USB Key

Card Reader

UWB/802.11n/WiMAX USB Dongle

Media Gateway

UMPC

Pocketable Computer

## Consumer Electronics

Portable Media Player

ePiano

TiVo Box

Game Console

IP STB

DVD-Recorder/DVR

IPTV

Figure 8. Target Applications



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# 6. Mass Production Solutions

To support the mass production for those products using AX88772C chip. ASIX provides the Windows SROM Programming Tool and Windows Production Test Tool solutions for AX88772C customers. This chapter provides a brief introduction for both solutions. Please refer to "**AX88772C 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 AX88772C on a typical Windows PC. This AX88772C Windows SROM Programming Tool supports to customize the MAC address, Serial Number, Vendor ID and Product ID, etc. for AX88772C based application systems in mass production.

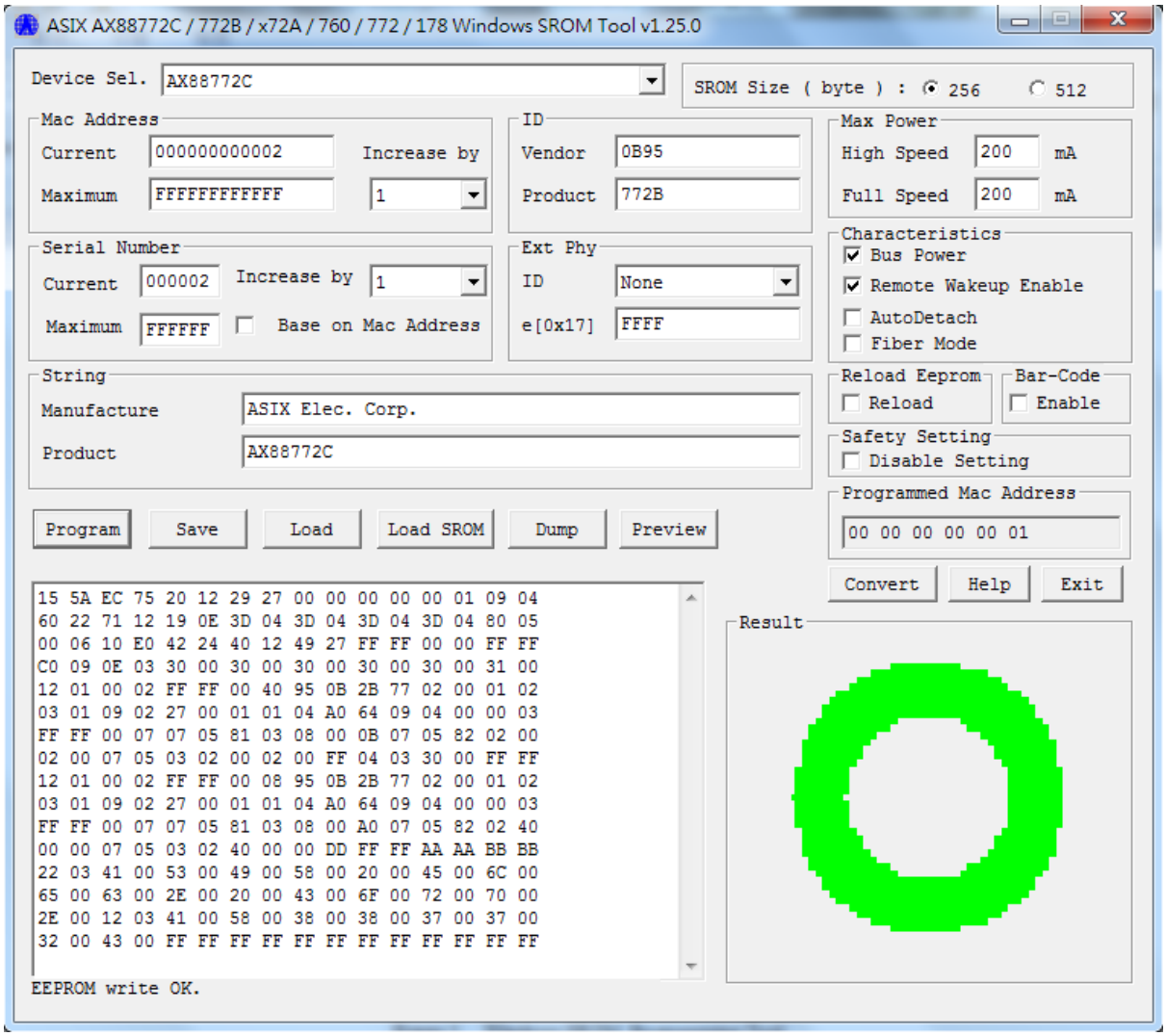


Figure 9. Windows SROM Programming Tool



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## 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 AX88772C based application systems during production. This tool is used for testing the USB to Ethernet Network Adapter product that uses ASIX AX88772C chip.

This tool supports to send/receive packets in different Ethernet speed modes, and program EEPROM. This tool can be run on a Windows PC, which installs the special AX88772C Windows 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.

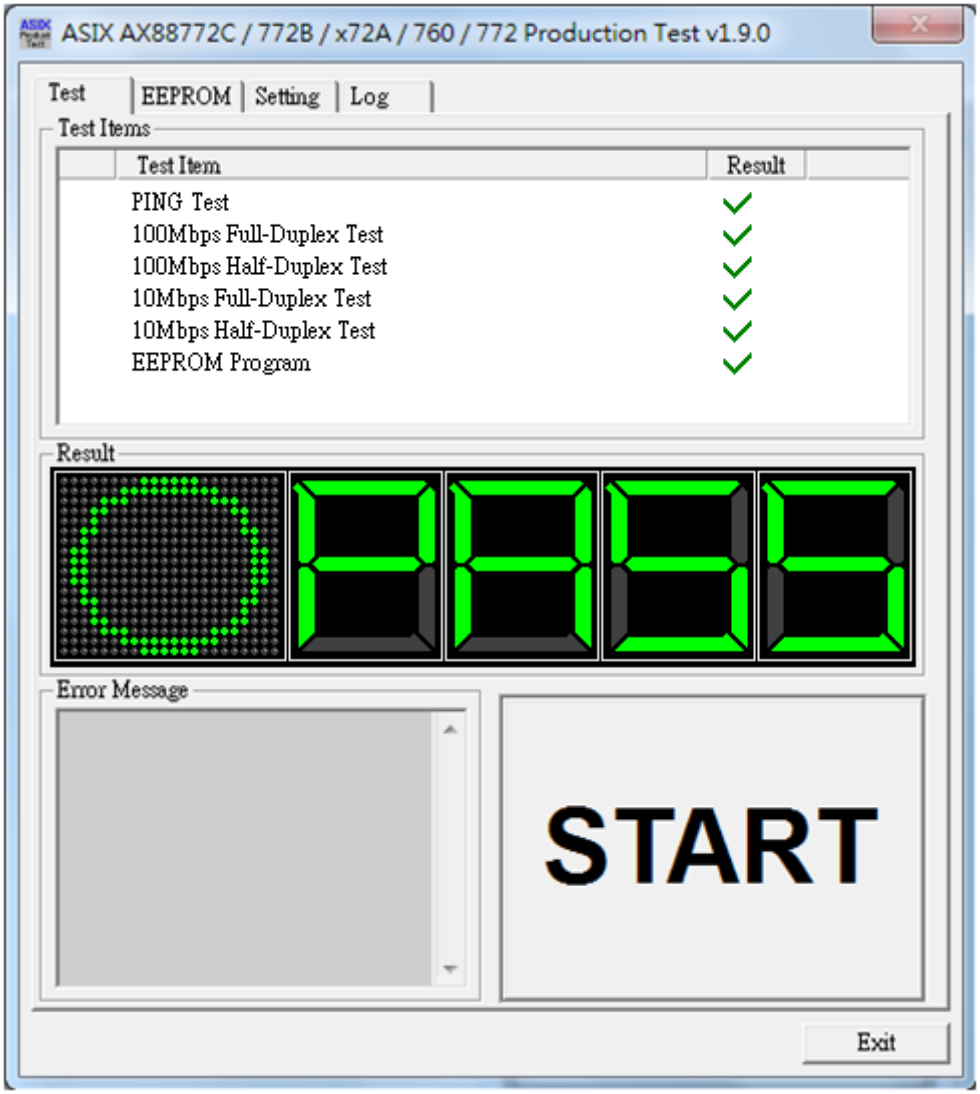


Figure 10. Windows Production Test Tool



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# 7. AX88772C Demo Boards

ASIX Electronics provides several AX88772C demo boards for users to evaluate the basic functions of AX88772C on different target applications. If you need to purchase the AX88772C demo boards, please contact ASIX's Sales (sales@asix.com.tw) for more details.

## 7-1. AX88772C USB to 100Base-TX Ethernet Demo Board

The following is the picture of AX88772C USB to 100Base-TX Ethernet demo board for your reference.

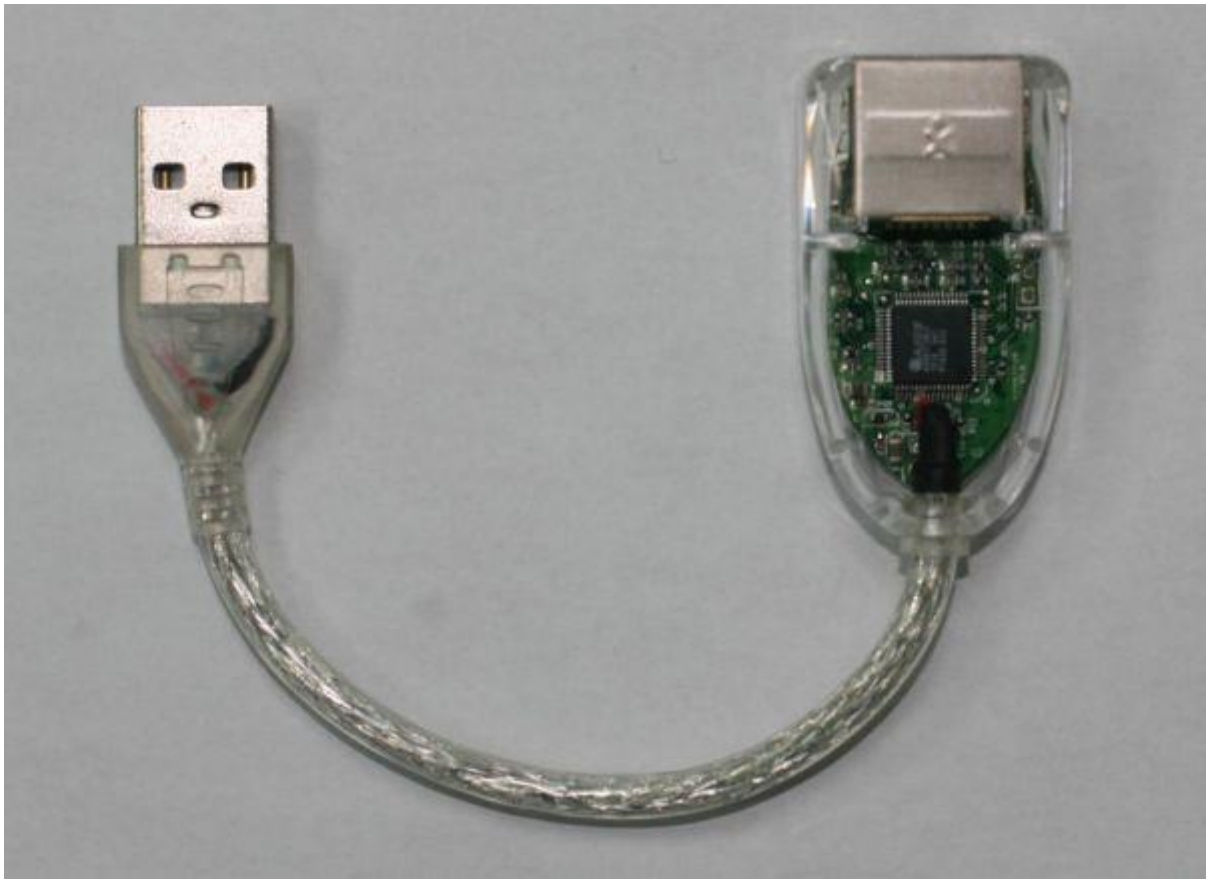

Figure 11. AX88772C USB to 100Base-TX Ethernet Demo Board



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## 7-2. AX88772C USB to 100Base-TX Ethernet (with RMII) Demo Board

The following is the picture of AX88772C USB to 100Base-TX Ethernet (with RMII) demo board for your reference.

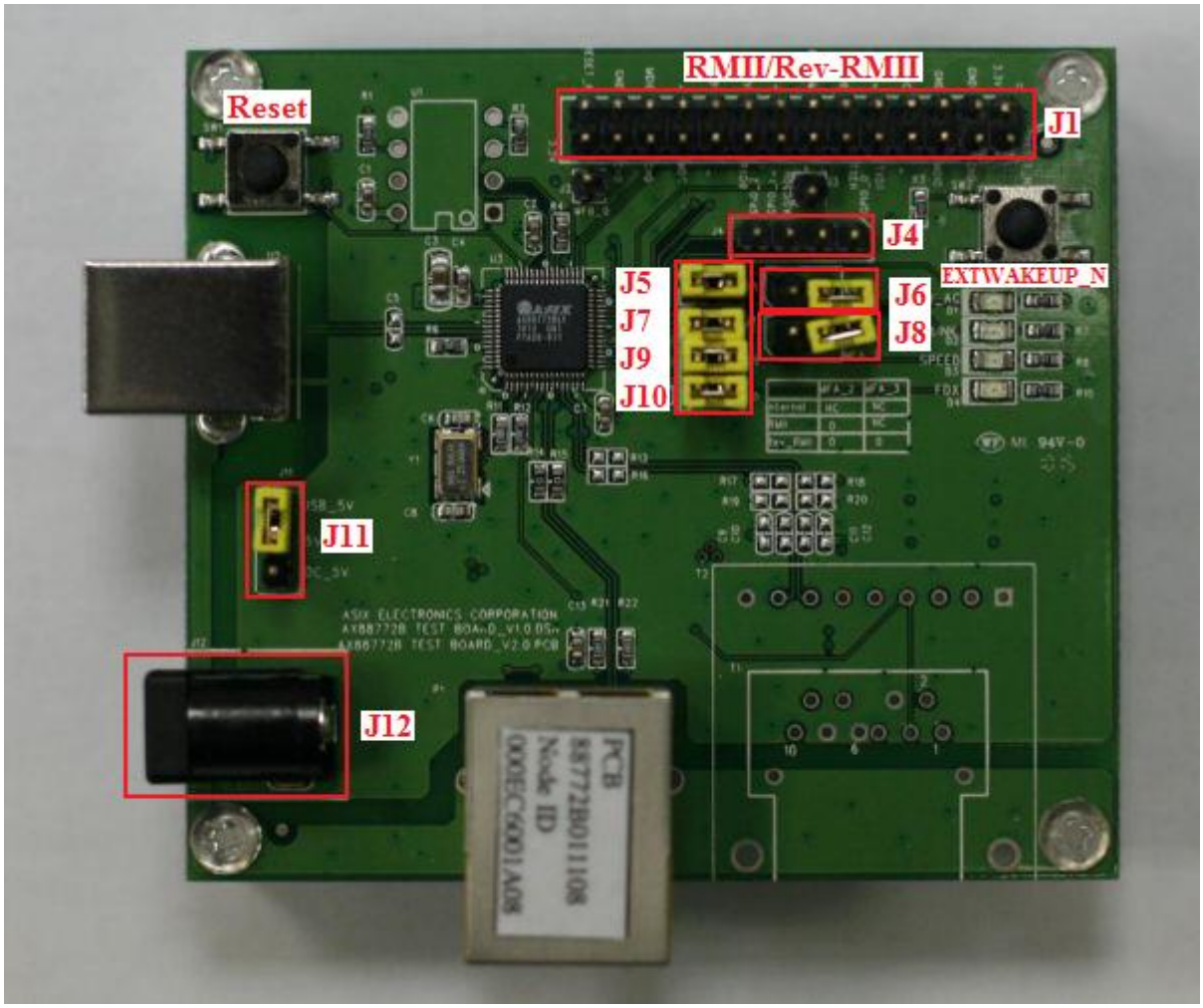


Figure 12. AX88772C USB to 100Base-TX Ethernet (with RMII) Demo Board



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## 7-3. AX88772C USB to 100Base-FX 1x9 SC Ethernet Demo Board

The following is the picture of AX88772C USB to 100Base-FX 1x9 SC Ethernet demo board for your reference.

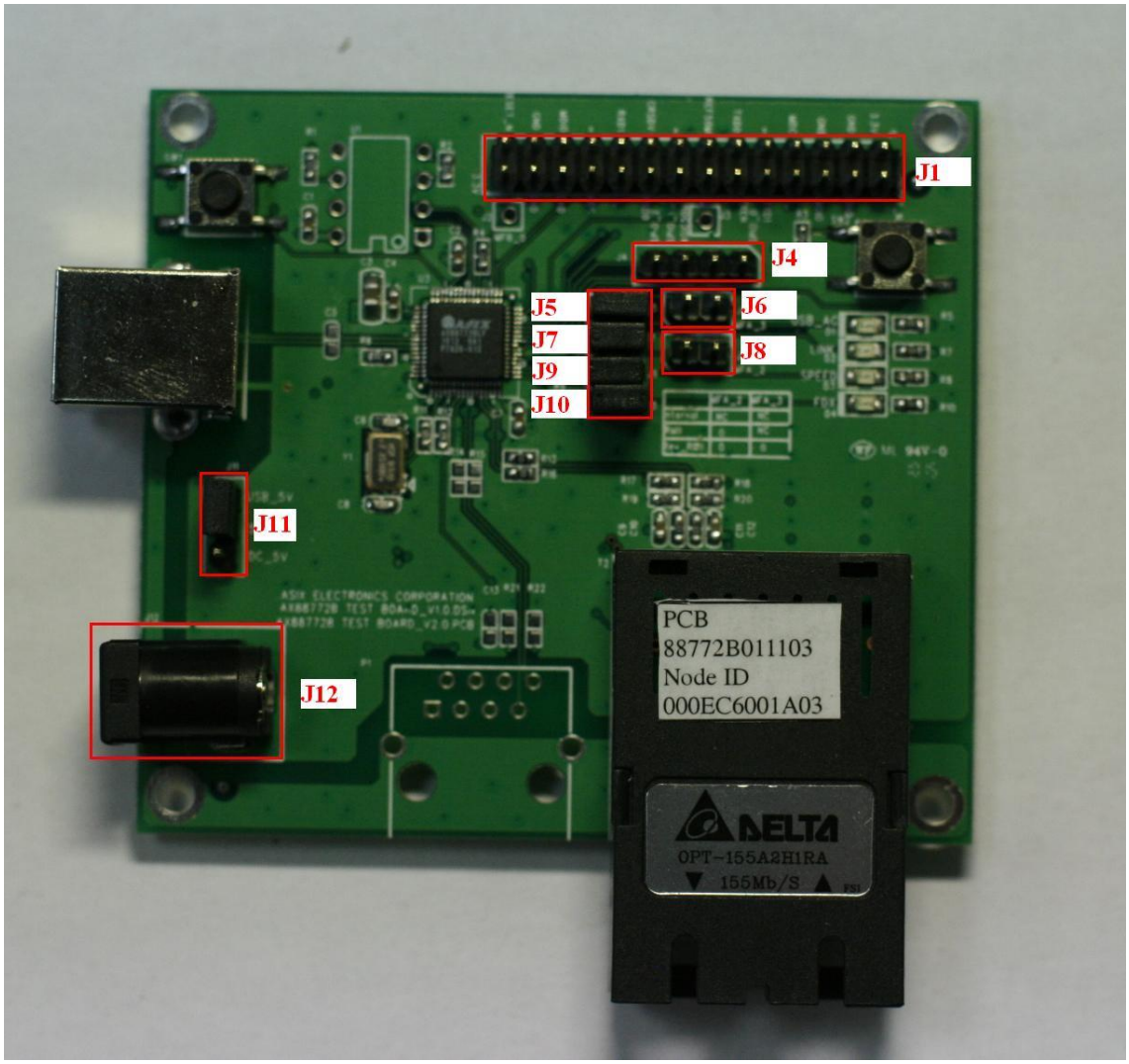


Figure 13. AX88772C USB to 100Base-FX 1x9 SC Ethernet Demo Board



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## 7-4. AX88772C USB to 100Base-FX POF Ethernet Demo Board

The following is the picture of AX88772C USB to 100Base-FX POF Ethernet demo board for your reference.

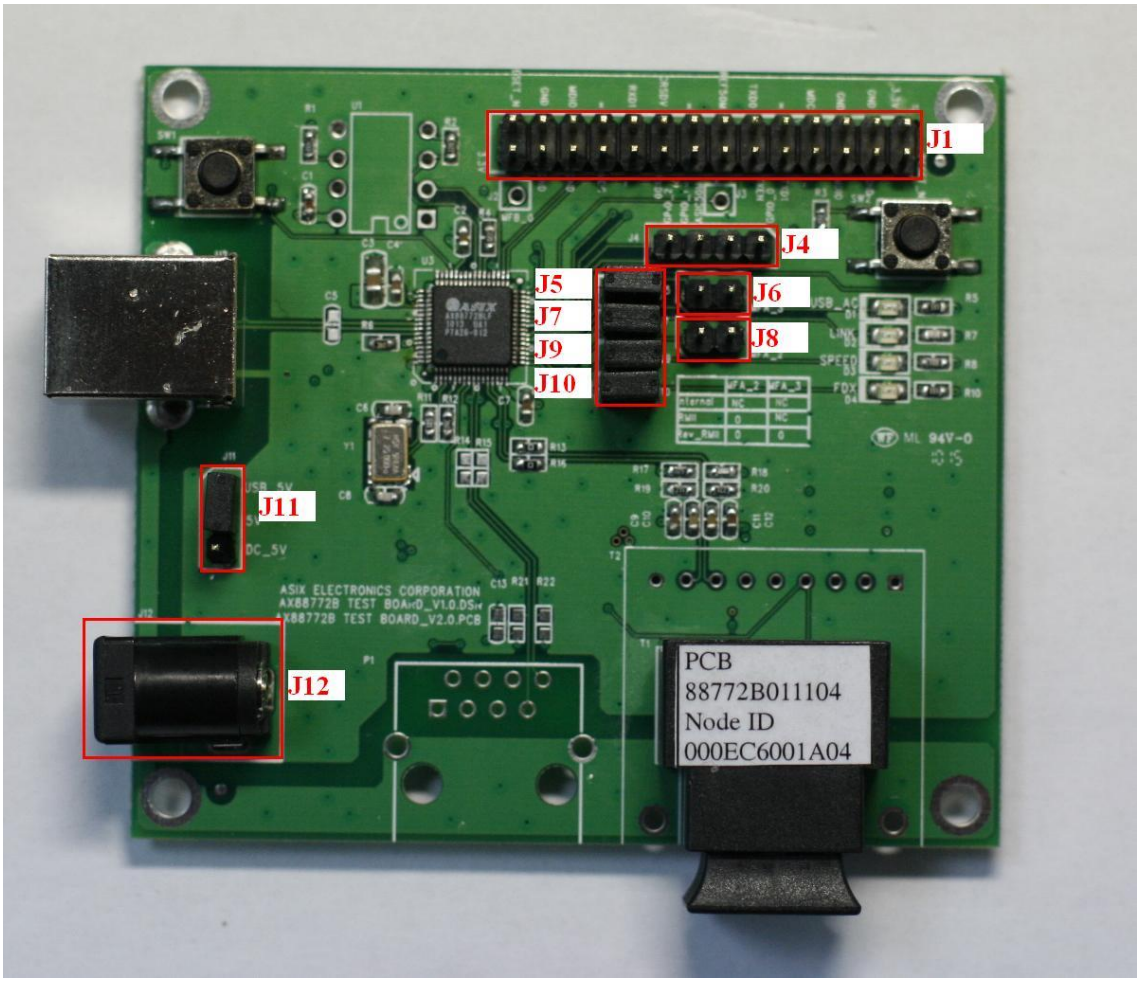


Figure 14. AX88772C USB to 100Base-FX POF Ethernet Demo Board



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The following is the jumper configuration table of the AX88772C USB to 100Base-TX/FX Ethernet (with RMII) demo boards.

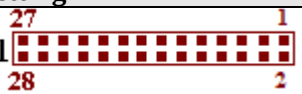
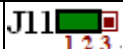
| Jumper | Setting | Description |
|---|---|---|
| J1 |  | The J1 is the RMII/Reverse-RMII interface headers. Please refer to AX88772C USB to 100Base-TX/FX Ethernet (with RMII) Demo Boards Reference Schematic for details. |
| J4 | <br>Pole #1: GPIO2<br>Pole #2: VCC 3.3V<br>Pole #3: GPIO1<br>Pole #4:GPIO0/PME | AX88772C GPIO Pins |
| J6/J8 | (Default) | Set AX88772C to Internal Ethernet PHY |
| | | Set AX88772C to RMII mode |
| | | Reserved |
| | | Set AX88772C to Reverse-RMII mode |
| J5/J7/J9/J10 | <br>J5 : PHY_N<br>J7 : RMII_N<br>J9 : MDIO<br>J10 : MDC | The multi-function pins (PHY_N, RMII_N, MDIO, MDC) for RMII/Reverse-RMII pins. |
| | (Default)<br>J5 : MFA3<br>J7 : MFA2<br>J9 : MFA1<br>J10 : MFA0 | The multi-function pins (MFA0 ~ MFA3) for LED display purpose.<br>Please refer to PIN configuration of MFA in section 2.2 of AX88772C datasheet for details. |
| J11/J12 |  (Default)<br>Pole #1: USB_5V<br>Pole #2: 5V<br>Pole #3: DC_5V | Set AX88772C USB to 100Base-TX/FX Ethernet (with RMII) demo boards to Bus-power mode.<br>The J12 connector doesn't need to be connected. |
| | | Set AX88772C USB to 100Base-TX/FX Ethernet (with RMII) demo boards to Self-power mode.<br>The J12 connector should be connected to a 5V power adapter. |

Figure 15. AX88772C USB to 100Base-TX/FX Ethernet with RMII Demo Boards Jumper Setting Table



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# 8. Related Technical Archives

The following is the AX88772C technical archives table.

| AX88772C Technical Archives | Type | Availability |
|---|---|---|
| AX88772C Product Introduction | Document | This document |
| AX88772C Product Brief | Document | Public Release |
| AX88772C USB to 100Base-TX Ethernet Demo Board Reference Schematic | Schematic | Public Release |
| AX88772C USB to 100Base-TX/FX Ethernet with RMII Demo Boards Reference Schematic | Schematic | Public Release |
| AX88772C Windows 8 64-bit Driver (Note1) | Driver | Public Release |
| AX88772C Windows 8 32-bit Driver (Note1) | Driver | Public Release |
| AX88772C Windows 7 64-bit Driver | Driver | Public Release |
| AX88772C Windows 7 32-bit Driver | Driver | Public Release |
| AX88772C Windows XP/Vista 64-bit Driver | Driver | Public Release |
| AX88772C Windows XP/Vista 32-bit Driver | Driver | Public Release |
| AX88772C Apple Mac OSX 10.5 to 10.8 Drivers | Driver | Public Release |
| AX88772C Android/Linux Driver | Driver | Public Release |
| AX88772C WinCE 7.0 Driver | Driver | Public Release |
| AX88772C WinCE 6.0 Driver | Driver | Public Release |
| AX88772C WinCE 5.0/Mobile 5/Mobile 6 Driver | Driver | Public Release |
| AX88772C Datasheet | Document | MyASIX Membership |
| AX88772C USB-to-LAN Application Design Guide | Document | MyASIX Membership |
| AX88772C USB to 100Base-TX Ethernet Demo Board PCB file | PCB | MyASIX Membership |
| AX88772C USB to 100Base-TX/FX Ethernet with RMII Demo Boards PCB file | PCB | MyASIX Membership |
| AX88772C USB to 100Base-TX Ethernet Demo Board Gerber files | Gerber | MyASIX Membership |
| AX88772C USB to 100Base-TX/FX Ethernet with RMII Demo Boards Gerber files | Gerber | MyASIX Membership |
| AX88772C USB to 100Base-TX Ethernet Demo Board BOM File | BOM | MyASIX Membership |
| AX88772C USB to 100Base-TX Ethernet with RMII Demo Board BOM file | BOM | MyASIX Membership |
| AX88772C USB to 100Base-FX 1x9 SC Ethernet Demo Board BOM file | BOM | MyASIX Membership |
| AX88772C USB to 100Base-FX POF Ethernet Demo Board BOM file | BOM | MyASIX Membership |
| AX88772C IBIS Model | IBIS | MyASIX Membership |
| AX88772C EEPROM/Manufacture User Guide | Document | Contact ASIX Sales |
| AX88772C Windows SROM Programming Tool | Utility | Contact ASIX Sales |
| AX88772C Windows Production Test Tool | Utility | Contact ASIX Sales |
| AX88772C Linux SROM Programming Tool | Utility | Contact ASIX Sales |
| AX88772C Windows IEEE 802.3 Compliant Test | Utility | Contact ASIX Sales |



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| Tool | | |
|---|---|---|
| AX88772C Performance Test Report | Report | Contact ASIX Sales |
| AX88772C RoHS Report | Report | Contact ASIX Sales |
| AX88772C Reliability Report | Report | Contact ASIX Sales |
| AX88772C USB-IF Compliant Test Report | Report | Contact ASIX Sales |
| AX88772C IEEE 802.3 Compliant Test Reports | Report | Contact ASIX Sales |

*Note 1: The Windows 8 32-bit/64-bit systems already support AX88772C/AX88772B/AX88772A/AX88760/ AX88772 inbox drivers.

Figure 16. Related Technical Archives



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