

DM9051 with AT32 MCU

Introduction

The DM9051NP chip is an independent Ethernet controller with SPI interface.

This application note introduces how to realize Ethernet communication on AT32F4xx chip through DM9051 chip and provides source code based on AT32F4xx_StdPeriph_Lib and uIP stack.

Applicable products:

Part number	AT32F403xx
	AT32F413xx
	AT32F415xx
	AT32F403Axx

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1 Overview

The DM9051NP chip with SPI interface is a specific solution developed to facilitate Ethernet communication of MCUs. The DM9051NP chip is an independent Ethernet controller with SPI (Serial Peripheral Interface), and it complies with IEEE 802.3 and supports transmission in DMA mode for fast data transfer. DM9051NP chip communicates with the master controller/MCU through one interrupt pin and SPI interface, with the data transmission size of 10/100M.

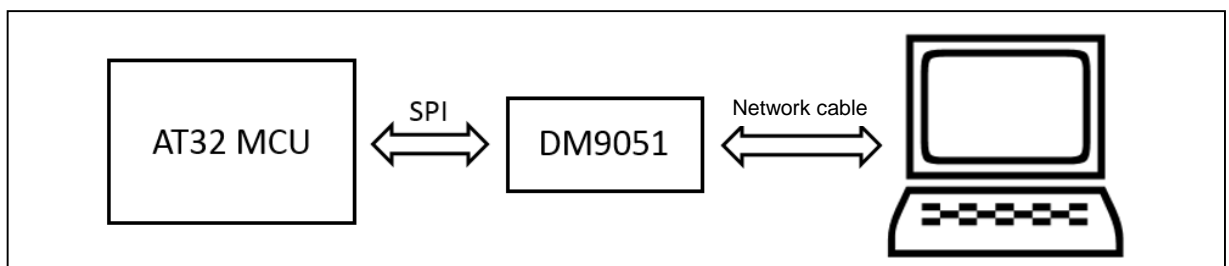
- Package:32 supports the QFN package
- IEEE 802.3az Energy Efficient Ethernet (EEE)
- Built-in integrated 3.3V to 1.8V regulator
- Wake On LAN (WOL)
- Parallel/crossover automatic switching (HP Auto-MDIX)
- Support optical port interface
- With 16 KB SRAM
- EMI (Class B) and HBM ESD Rating 8KV
- Industrial temperature range: $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
- Power: (100/10 M) => 429/561 mW
- Continuous operating temperature $<60\text{ }^{\circ}\text{C}$

1.1 AT32-based Ethernet communication

This application note introduces how to realize Ethernet communication on AT32F4xx chip through DM9051 chip and provides source code based on AT32F4xx_StdPeriph_Lib and uIP stack. The Ethernet communication application parses TCP/IP network based on the uIP stack, and DM9051 chip exchanges data with AT32F4xx MCUs through SPI interface. Combining the AT-START Board and Ethernet Arduino Board (DM9051) provided by Artery, you can easily build a set of Ethernet communication device.

The system structure chart is as follows:

Figure 1. AT32 Ethernet device system structure



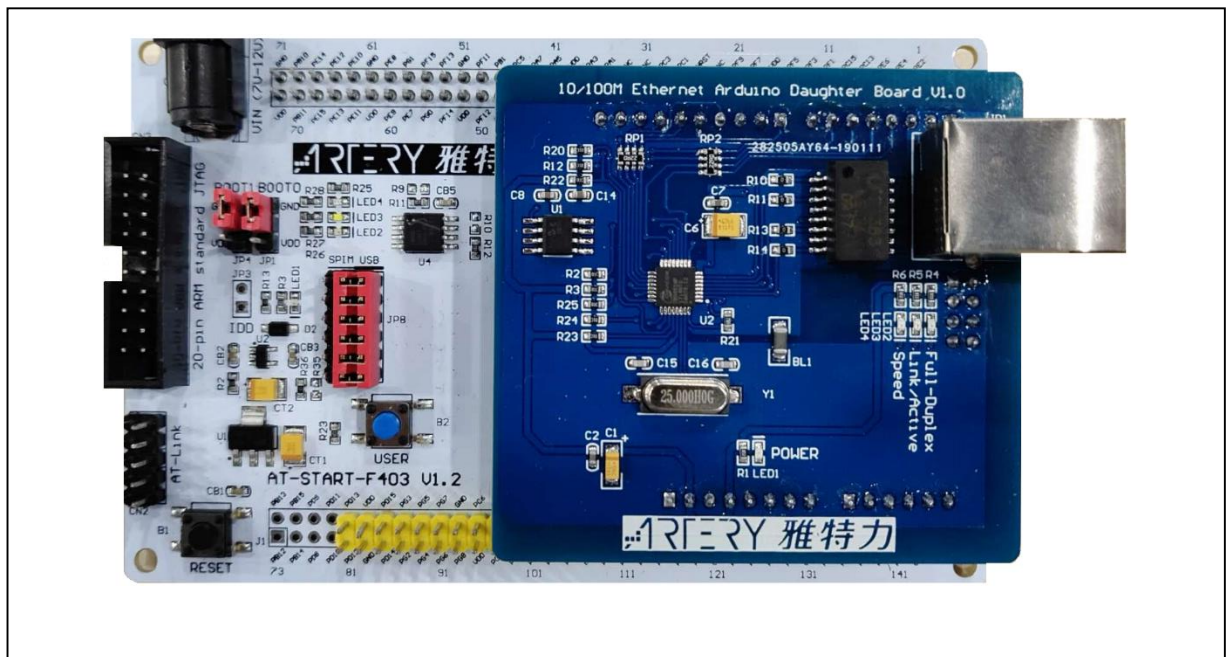
2 How to use DM9051

2.1 Hardware requirements

In order to facilitate rapid and effective development of Ethernet communication on AT32F4xx series MCUs, we provide the Ethernet Arduino Board based on AT-START Board, which includes complete circuits of DM9051 and its peripheral devices ((crystal oscillator, LED, network port, etc.). The Ethernet Arduino Board can be used together with AT-START-F403 V1.2 or AT-START-F413 V1.0 demo board. The required hardware is as follows:

- 1) AT-START-F403 V1.2 / AT-START-F413 V1.0 demo board
- 2) Ethernet Arduino Board (DM9051)
- 3) USB-TTL serial port tool
- 4) Network cable
- 5) PC

Figure 2. Combined use of AT-START-F403 and Ethernet Arduino Board



Note:

1. This demo is the hardware condition based on AT32F413. For application on other AT32 MCUs, please modify configurations accordingly.
2. Use the power supply or USB cable for power supply (do not use Link separately).

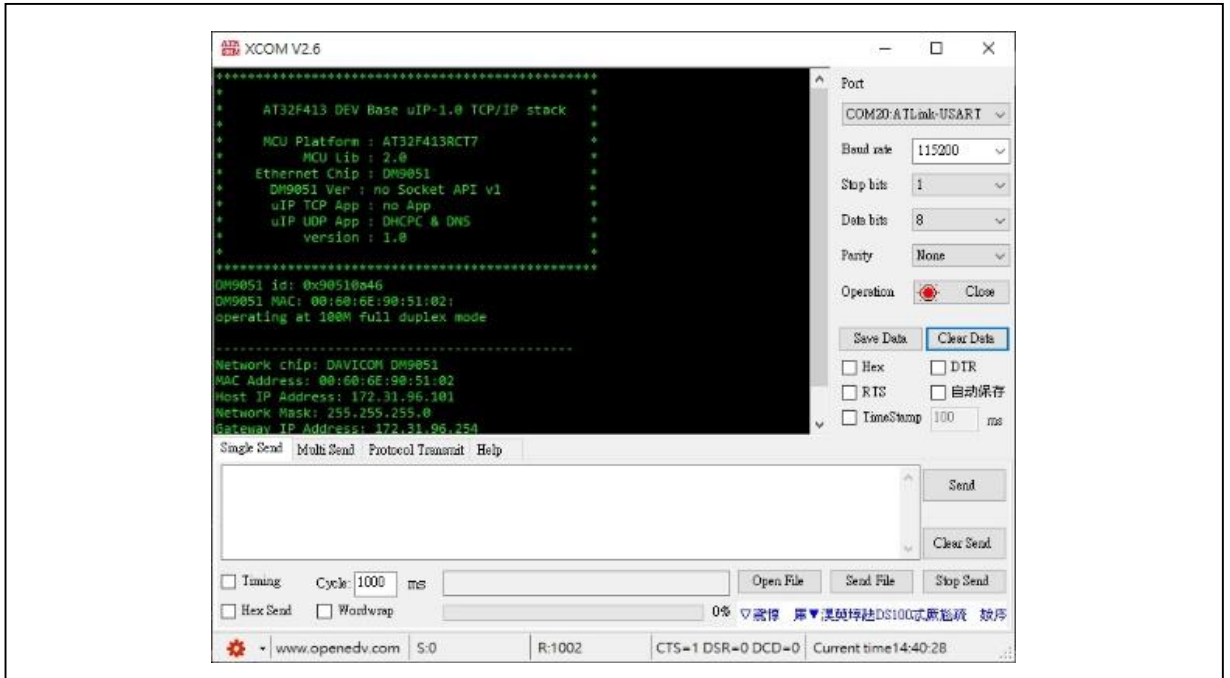
2.2 Test Ethernet communication

Use the aforementioned two boards as a network terminal device for Ethernet communication test. The test procedures are as follows:

- 1) Connect AT-START Board to Ethernet Arduino Board;
- 2) Connect PC to Ethernet Arduino Board via network cable;
- 3) Compile and download the DM9051-based demo code provided by Artery;
- 4) Connect the serial assistant to view the printed information;

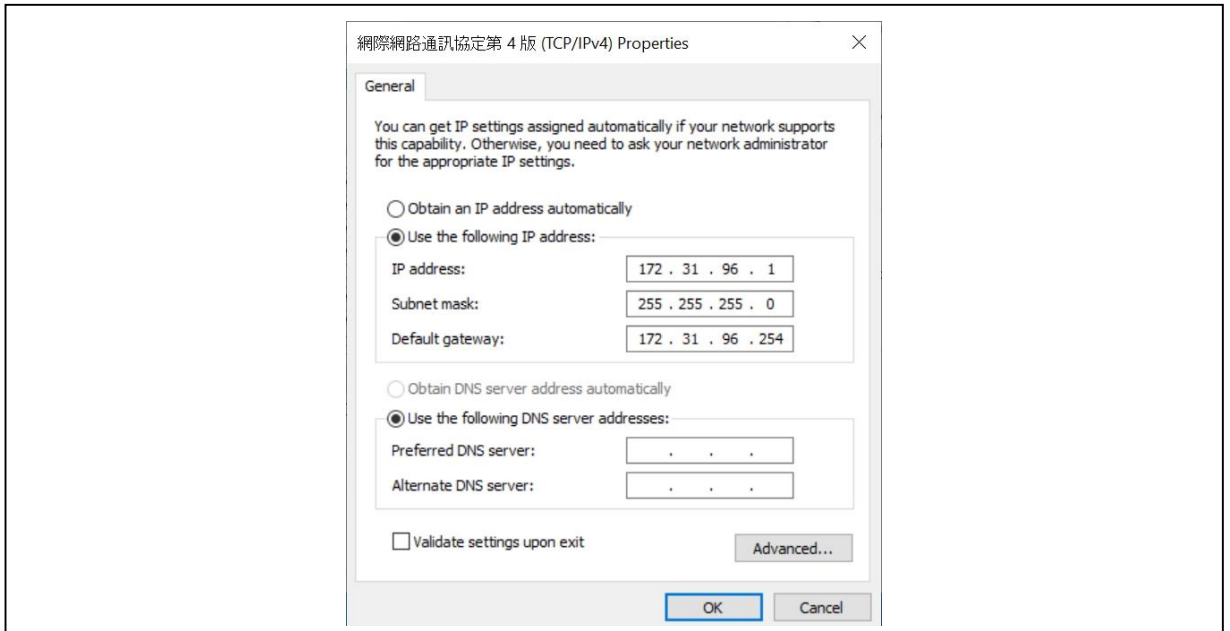
- 5) Wait for the completion of initialization and distribution of IP address, as shown in Figure 3;

Figure 3. IP address printed on serial port



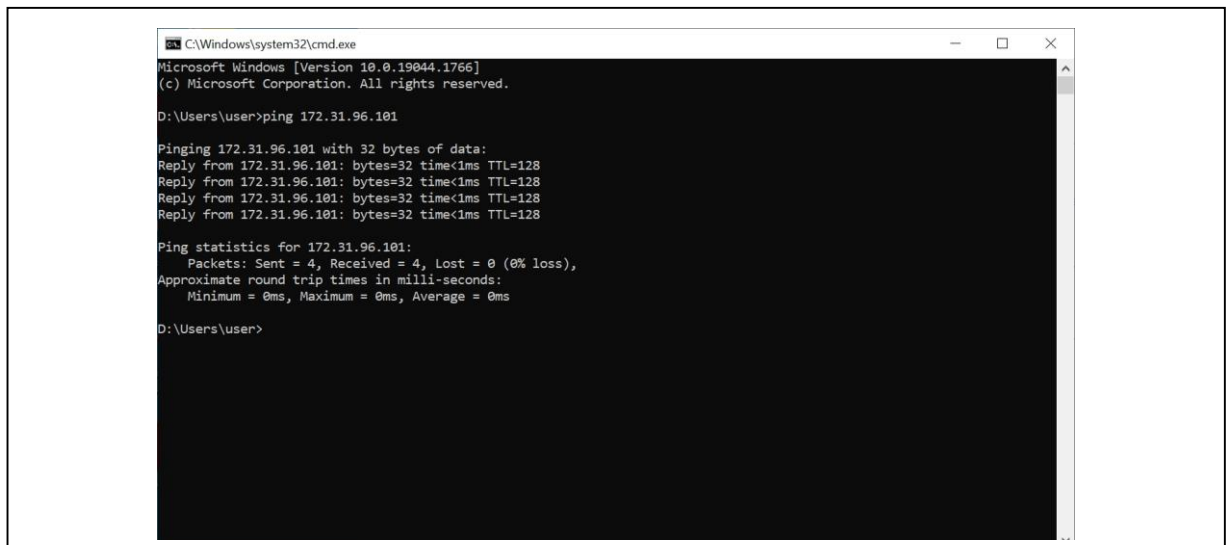
- 6) Configure PC network connection properties, which should be within the same segment as the above IP address, as shown in Figure 4;

Figure 4. PC network connection settings



- 7) Test if the network is connected, as shown in Figure 5;

Figure 5. Ping test



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 10.0.19044.1766]
(c) Microsoft Corporation. All rights reserved.

D:\Users\user>ping 172.31.96.101

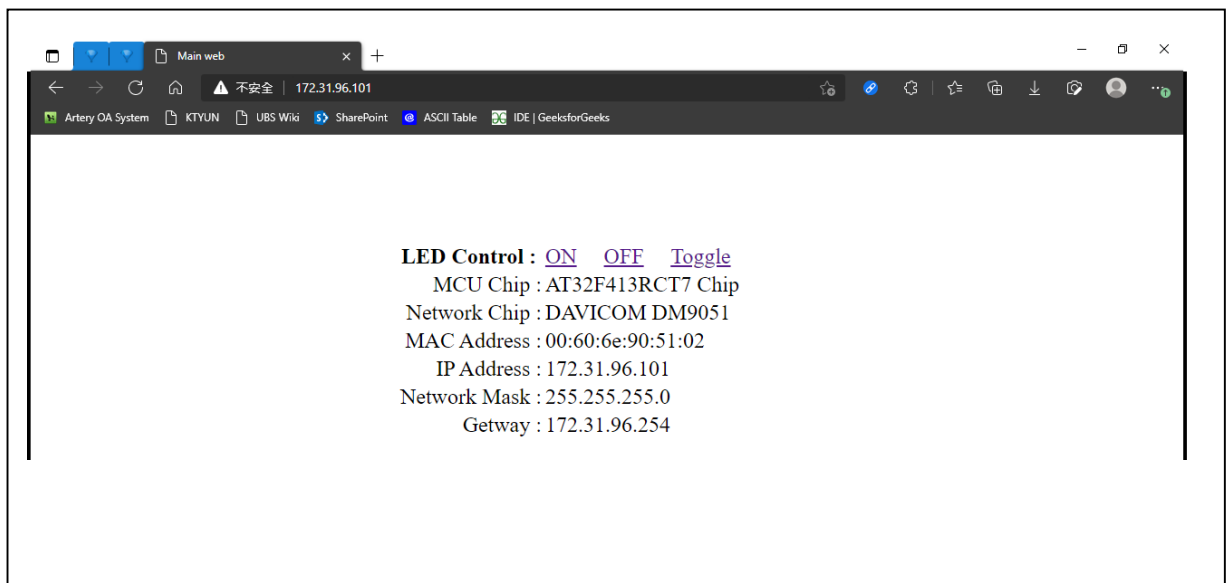
Pinging 172.31.96.101 with 32 bytes of data:
Reply from 172.31.96.101: bytes=32 time<1ms TTL=128
Reply from 172.31.96.101: bytes=32 time<1ms TTL=128
Reply from 172.31.96.101: bytes=32 time<1ms TTL=128
Reply from 172.31.96.101: bytes=32 time<1ms TTL=128

Ping statistics for 172.31.96.101:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

D:\Users\user>
```

8) Test web page control, as shown in Figure 6.

Figure 6. Web page test



Going through the above seven steps to complete Ethernet communication test. For relevant documents, schematic diagrams and demo code, please refer to attachments.

3 Revision history

Table 1. Document revision history

Date	Version	Revision Note
2022.03.08	2.0.0	Initial release

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