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I2C-SPI Control Center (1)

Preface

In the field of digital electronic circuit, Buses are often used in the communication between devices, and the most frequently used are I2C (Inter Integrated Circuit) and SPI (Serial Peripheral Interface).

I2C-SPI Control Center, developed by Zeroplus Technology, can be set to simulate the communication status between I2C or SPI devices (Master Device or Slave Device); and its Batch Mode can improve the analysis for circuit under test and meet the requirements of test in the production line.

Now we will explain the functions of I2C-SPI Control Center one by one.

I2C (Inter integrated Circuit) Mode

In 1980s, in order to make the motherboard, embedded system or cellphone connect with peripheral devices, Philips has developed the I2C, which, as its simple construction and easy operation, now become the standard interface between different devices. I2C can make two-way data transmission (Serial Data and Serial Clock) by using two signal lines. We will introduce its functions by measuring EEPROM 24LS02.

Connect the SDA and SCL of I2C-SPI Control Center to the SDA and SCL of object under test, then open the I2C-SPI Control Center. Below is the software interface.

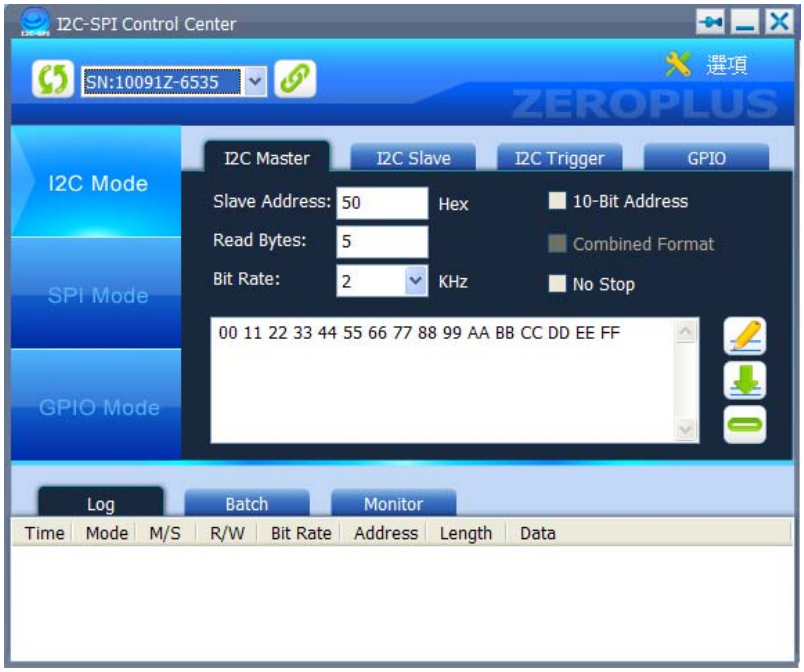

Image 1: Software Interface of I2C-SPI Control Center

After the driver installation is completed, users can select the I2C-SPI Control Center from the pulldown menu of Select Device, then click the “Connect” button to do settings.

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First, operate the I2C Master in I2C Mode. Set the Slave Address=0X50, Bit Rate=2KHz, and the data of Master End to be 0X00, 0X11, 0X22, 0X33, 0X44, 0X55, 0X66, 0X77, 0X88, 0X99, 0XAA, 0XBB, 0XCC, 0XDD, 0XEE and 0XFF, and then click the “Write” button on the right to send the signal. Relevant information will be displayed in the Log Windows, see the Image 2.

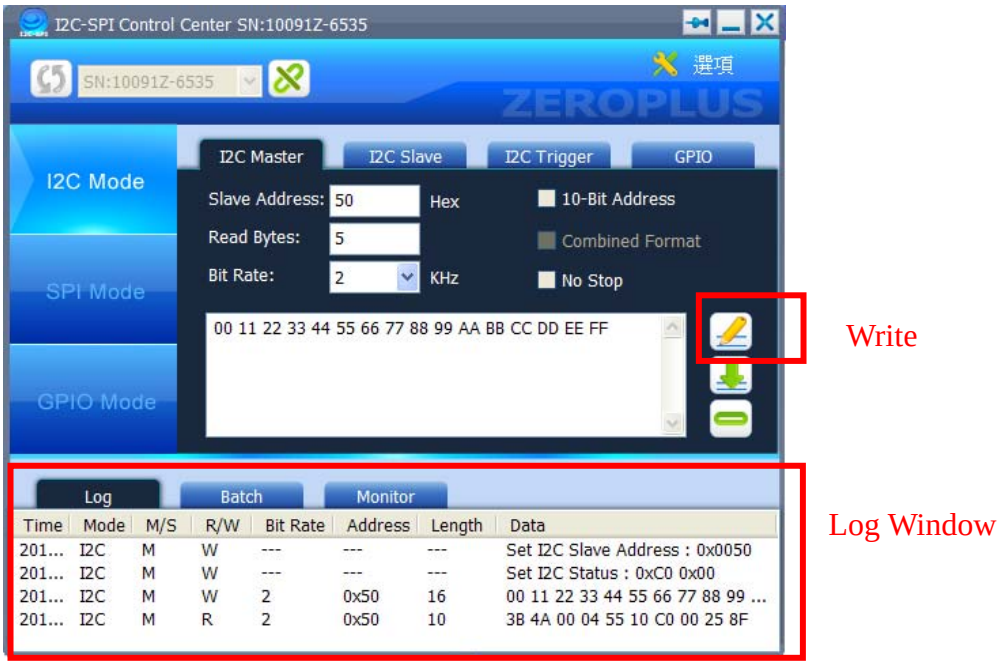

Image 2: I2C SPI Control Center Log Window

Users can see the data writing status very clearly on the LA software.

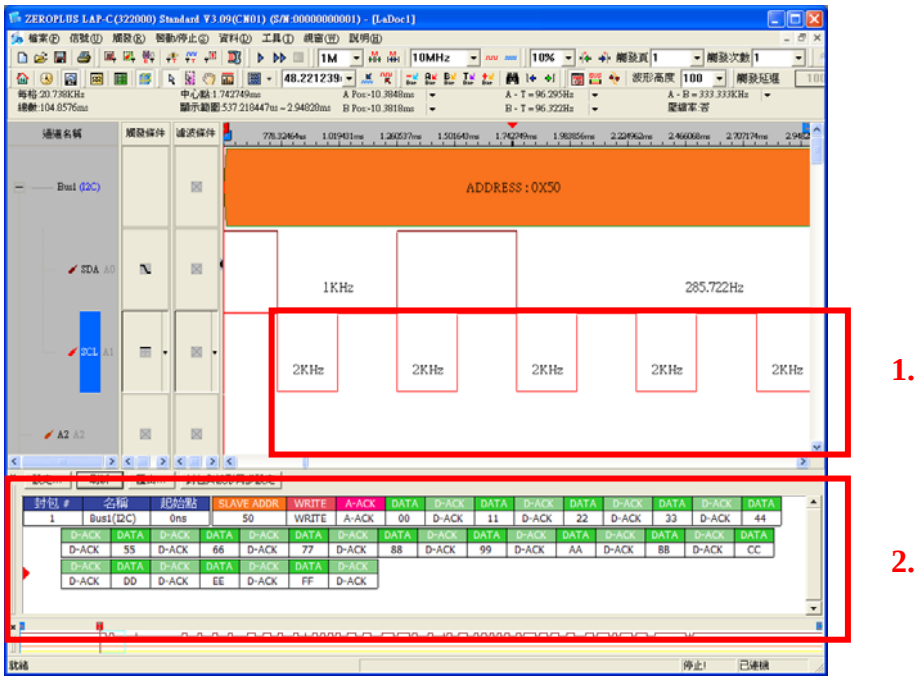

Image 3: Writing status displayed on the LA software.

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The selected area 1 in the image 3 is the I2C Clock, users can see clearly that the Bit Rate in the I2C is 2KHz; the selected area 2 is the written data.

The operating mode of read function is similar with that of the write function. Set the Read Bytes firstly, the default is 5 Bytes, we change the value to 20 Bytes and click the “Read” button to read.

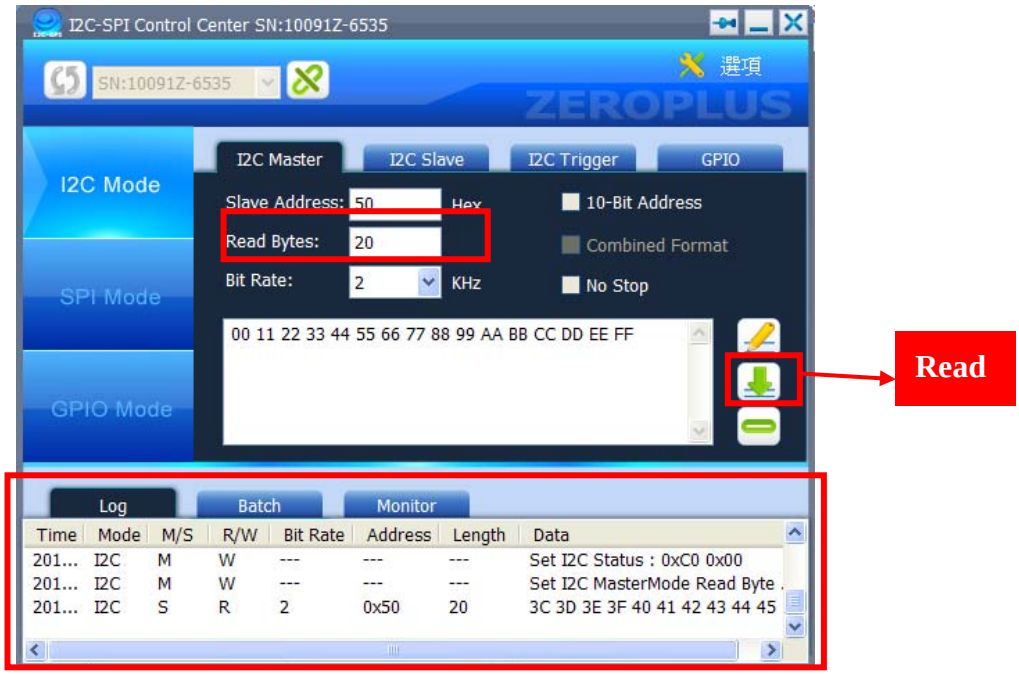

Image 4

The read data of I2C-SPI Control Center can be displayed on the LA software.

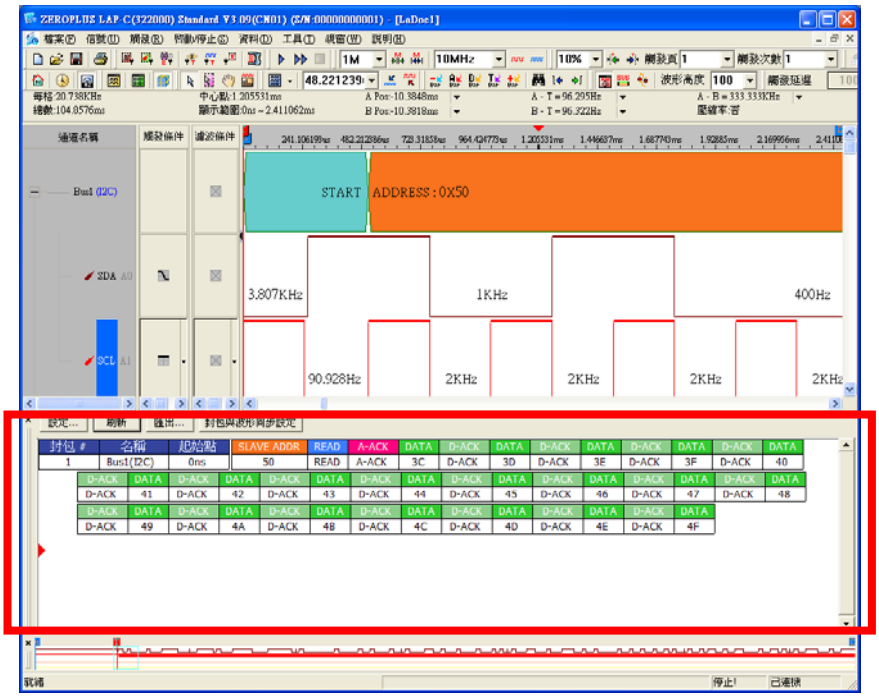

Image 5: Record the I2C data by LA.

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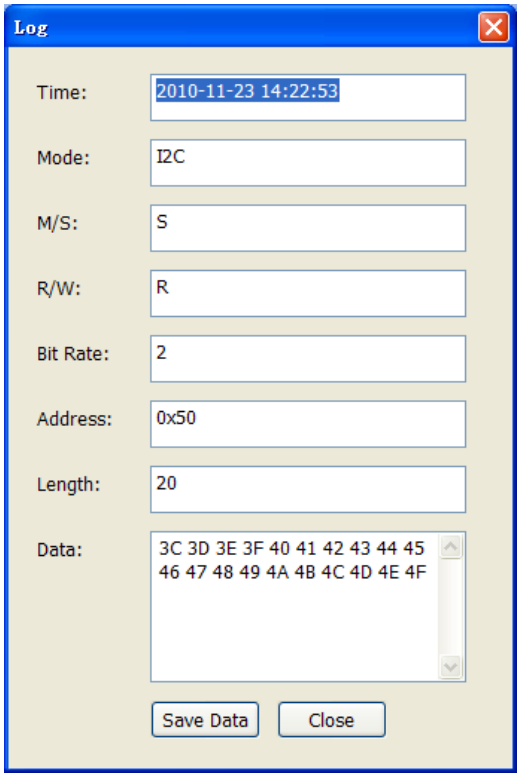
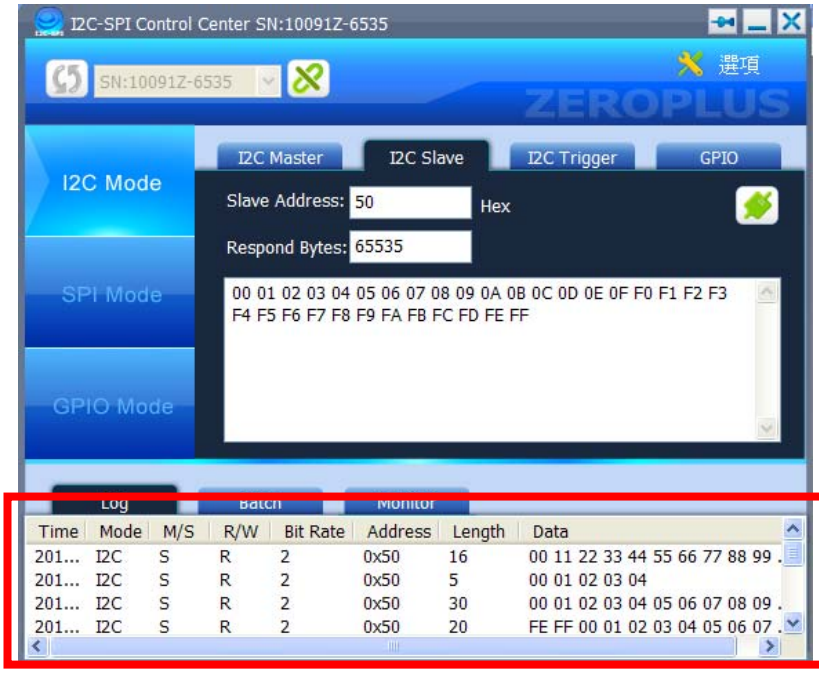
Tip: Click the Right key in the I2C-SPI Control Center Log Window and select the View option, the below dialog box will display:



Name	Description
Time	Display the time when the data is captured.
Mode	Represent the current mode, I2C, SPI or GPIO.
M/S	Show the data is sent by Master Device or Slave Device.
R/W	Show the data is Read or Write.
Bit Rate	Show the transmission rate of Bus.
Address	Show the Bus address.
Length	Show the Bus Data Bytes.
Data	Show the detailed data values.

Image 6: Log Dialog Box

I2C-SPI Control Center also can simulate the Slave device, users can set the data responded by the Slave when the Master reads the command.



Responded data.

Image 7: I2C Slave Setting Interface.

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SPI (Serial Peripheral Interface)

SPI(Serial Peripheral Interface), designed by Motorola, is a standard interface for series data transmission in full duplex mode. It transmits from Master device to Slave device; the Master device can choose one or more Slave devices to connect through Slave select (chip select). According to the different application environment, the SPI can work in four-wire (SCLK, MOSI, MISO, SS), the SPI has full duplex capability; for three-wire (SCLK, DATA, SS), the SPI has half duplex capability; and for two-wire (SCLK, DATA), the SPI has only one Master device and one Slave device.

The I2C-SPI Control Center Software can work after users switch to SPI Mode. Users can set the sampling mode for the SPI in the software. There are 4 modes: 0, 1, 2 and 3, which consist of Clock Phase and Clock Polarity. The Image 8 shows the Data sampling position of SPI Clock in different SPI mode.

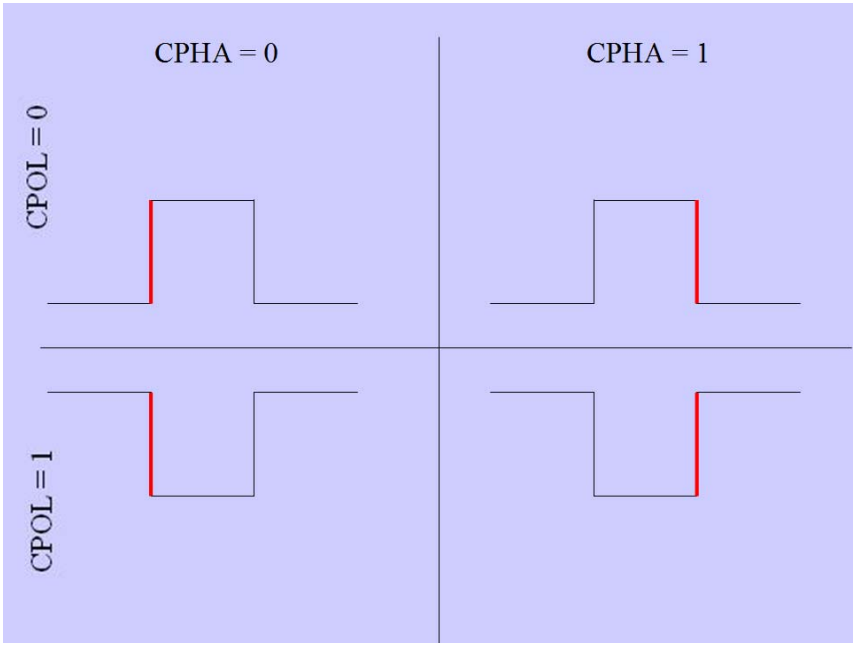

Image 8: The sampling point description in SPI mode (the waveform is Clock pulse, the red edge is the sampling position.)

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Users also can set other parameters in the SPI Master interface, such as Bit Order, Bit Rate, SS Polarity and so on.

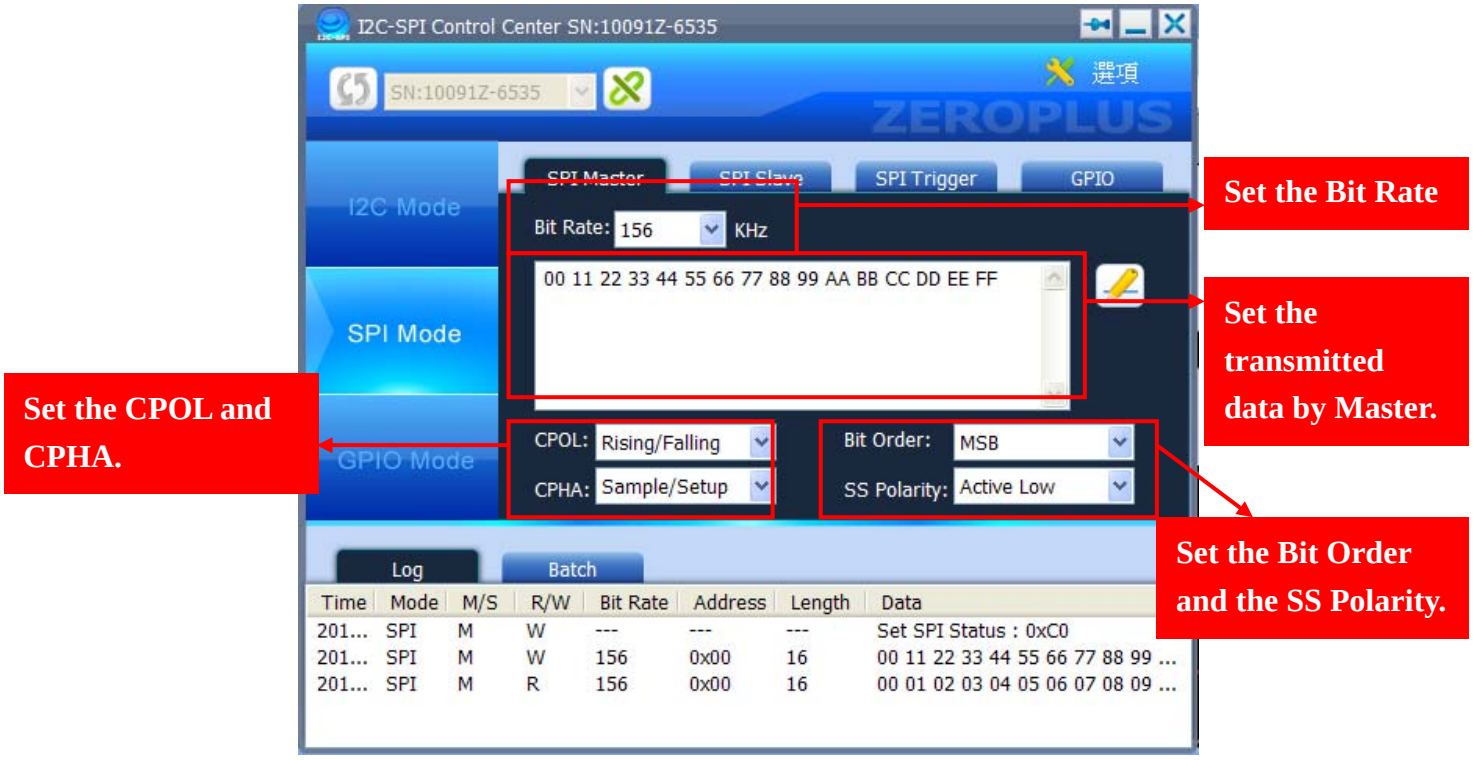

Image 9: SPI Master Setting Interface.

Like the I2C Mode, the SPI Mode also supports the SPI Slave device simulation. Users can set the response content of the Slave device to test the response of Master.

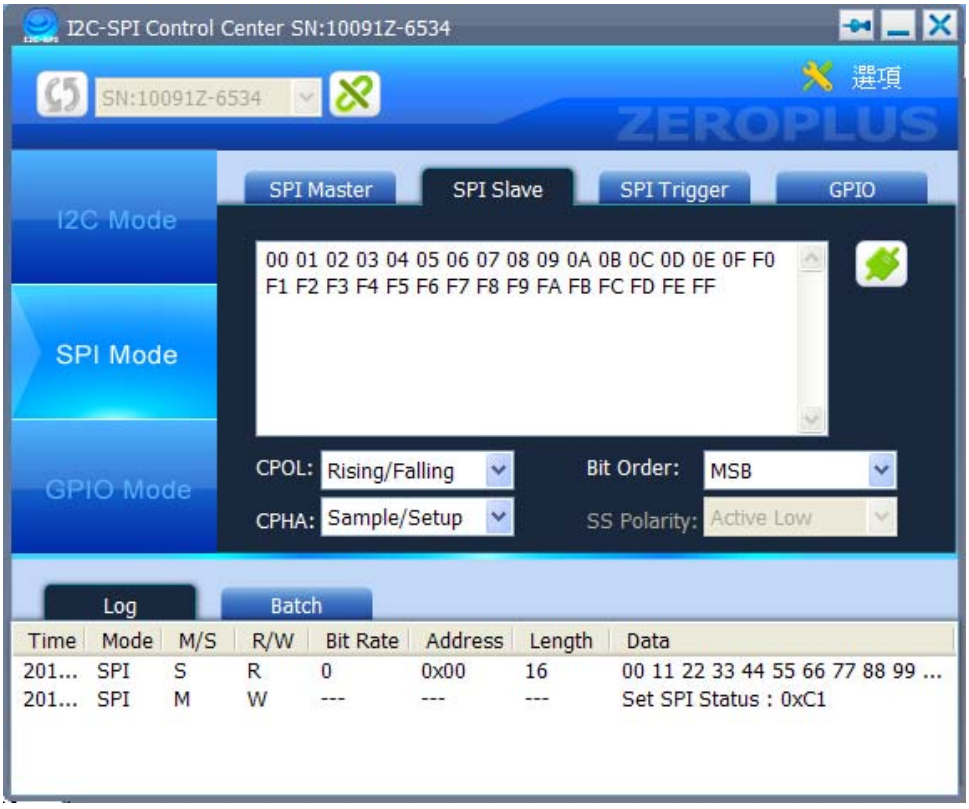

Image 10: SPI Slave Setting Interface.

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After the environment is set, press the Write to send the data of SPI according to the settings. The data transmission status of Master/Slave device can be seen clearly on the LA software.

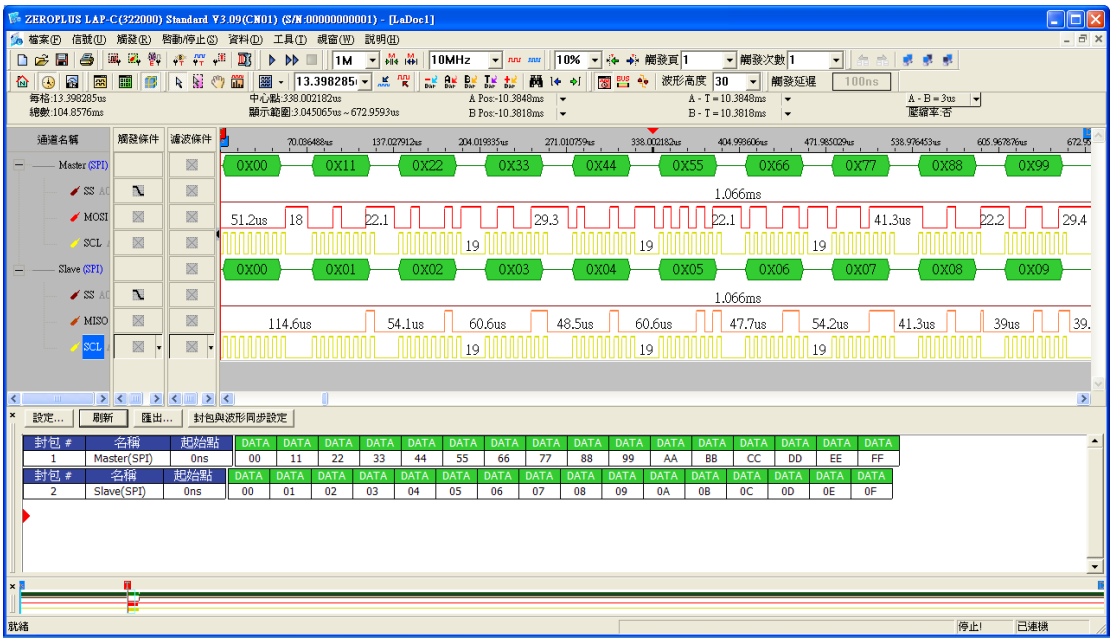

Image 11: SPI data displayed on the LA software.

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GPIO(Generator Purpose Input / Output)

GPIO(Generator Purpose Input / Output) is often used in MCU(Micro Control Unit). Users can define each pin of GPIO as input status or output status.

The I2C-SPI Control Center also supports this mode, and can provide 8 Bits GPIO to operate. Users can define each pin as input status or output status.

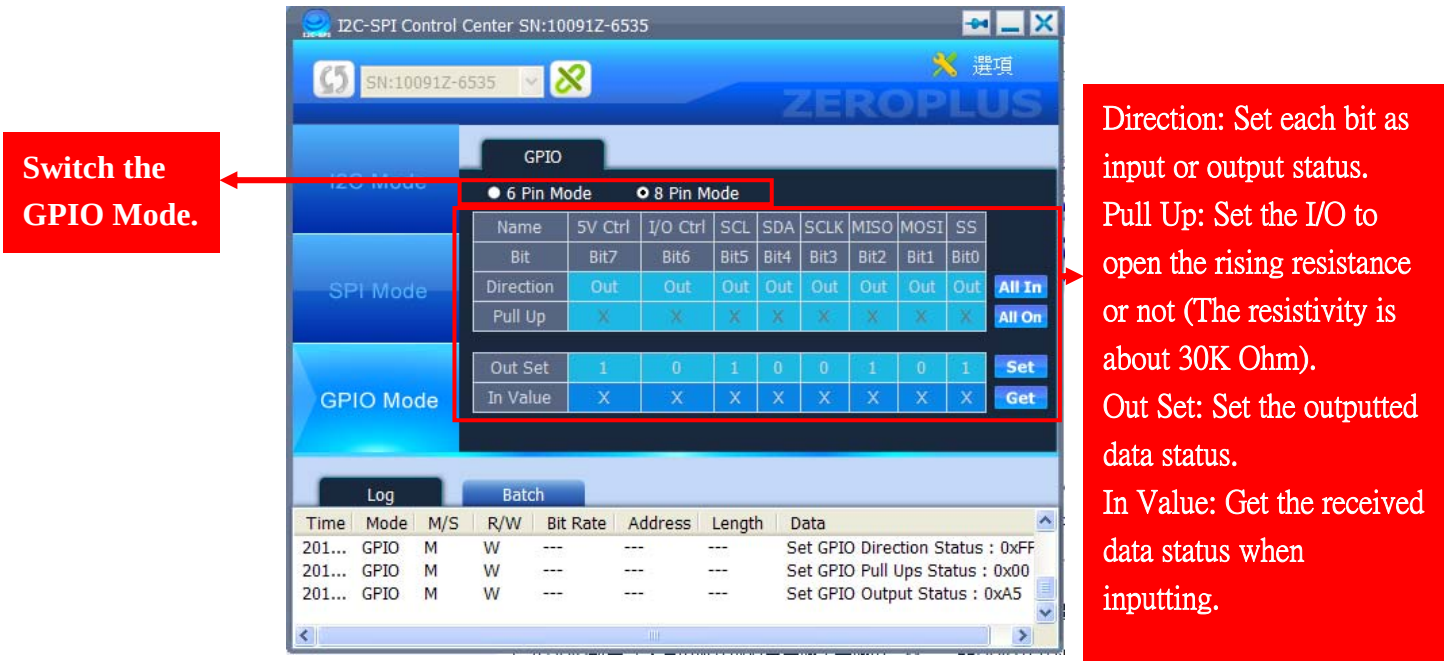

Image 12: I2C-SPI Control Center GPIO Mode

I2C-SPI Control Center is a new developed product of Zeroplus Technology. It can simulate the signal of I2C or SPI devices, and send/receive data through GPIO. Besides the above three modes, I2C-SPI Control Center has I2C/SPI Trigger function, and the supported Batch mode makes the device response simulation more flexibly. Next time we will introduce I2C / SPI Trigger and Batch mode in detail.

by ZEROPLUS Instrument Division FAE

Gary Hsu

About ZEROPLUS

ZEROPLUS Technology Co., Ltd was established in 1997. It focuses on the design of the peripheral products of computer games. In 2004, the business scope was extended to the electronic measurement instruments. Applying the advanced MCU programming technology, the company successfully developed the latest patented measurement instrument, PC-Based Logic Analyzer. The unique and innovative technology was accredited by a number of patents granted, and the regions or countries where the company applied for patents have covered the whole world and the number of the patent and the country continues to grow. Since the release in 2005, the Logic Analyzer has been widely adopted by tens of dozens of public-listed technological manufacturers in the IC industry and the tertiary educational institutions. The excellent sale has made the Logic Analyzer the most popular in the market.