

# **Nuvoton**

# **8051 ISP by COM Port**

## **User Manual**

*Revision 5.02, 2010/11/15*

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## Revision History

Revision	Description	Date
v1.00	The first released version.	2009/07/15
v2.00	(1) Fix some minor bugs in AP. (2) Modify the handshaking mechanism in linking to target system. (3) The data in Code Buffer are refreshed when the "Update 8051" or "Verify 8051" button is clicked.	2009/09/03
v2.01	(1) Update the display of part numbers W78E051D, W78E052D and W78E054D to become W78E(I)051D, W78E(I)052D and W78E(I)054D, respectively. (2) Fix a minor bug in <i>Nuvoton standard ISP code</i> . (The version is changed to v0201.)	2009/09/22
v3.00	(1) Add new parts: N78E366A, N78E055A, N78E059A and N78E517A. (2) Use the integrated PC-site application program of ISP-ICP Programmer.	2010/02/10
v4.00	Update the PC-site AP version to v4.00.	2010/04/01
v4.01	(1) Fix a minor bug in <i>Nuvoton standard ISP code</i> for W925EP01, N78E366A, N78E055A, N78E059A and N78E517A. (The version is updated to v3.12.) (2) Add a new part: W925EP01. (3) Update the PC-site AP version to v4.01.	2010/06/15
v5.00	(1) Improve data security of the <i>Nuvoton standard ISP code</i> for N78E366A, N78E055A, N78E059A and N78E517A. (The version is updated to v3.13.) (2) Update the PC-site AP to v5.00. (The GUI display for "CONFIG Setting" becomes more user-friendly.)	2010/08/13
v5.02	(1) Fix the HEX-to-BIN conversion error when the hex input file has a binary code size more than 64K. (The application program is updated to v5.02.) (2) Modify all the ISP codes to prevent from hanging in LDROM during powered on in an RS-485 application. (The version is updated to v3.20.)	2010/11/15

## 1 Introduction

**ISP** is the acronym of **In-System Programming**, which makes it possible that the user can update the program memory under the software control without removing the mounted MCU chip from the actual end product. For the 8051 MCU products, we provide an ISP solution through the PC's COM port. As long as the *Nuvoton standard ISP code* is pre-programmed in the MCU's LDROM, the user can easily update the MCU's APROM through the PC's COM port.

*Note:*

*The ISP function can work only when the ISP code has resided in MCU's LDROM. To let users easily use the ISP function, some of the 8051 MCU products have the "Nuvoton Standard ISP Code" pre-programmed in LDROM and CONFIG bits properly configured before shipping. Please contact Nuvoton for detailed product information. (The "Nuvoton Standard ISP Code" is also included in the folder [(3) Nuvoton Standard ISP Code]. The user may program it by himself using a universal programmer.)*

## 2 Hardware

To make the 8051 MCU boot from LDROM after reset to run the ISP code, some specific I/O pins need to be tied to ground and the CONFIG needs to be properly configured. The following table shows the specific I/O pins and the proper CONFIG setting used for booting from LDROM after reset. In addition, to directly connect to PC's COM port, there needs an RS232 transceiver (e.g. MAX232) in the target system. The following sub-sections will show the hardware connection.

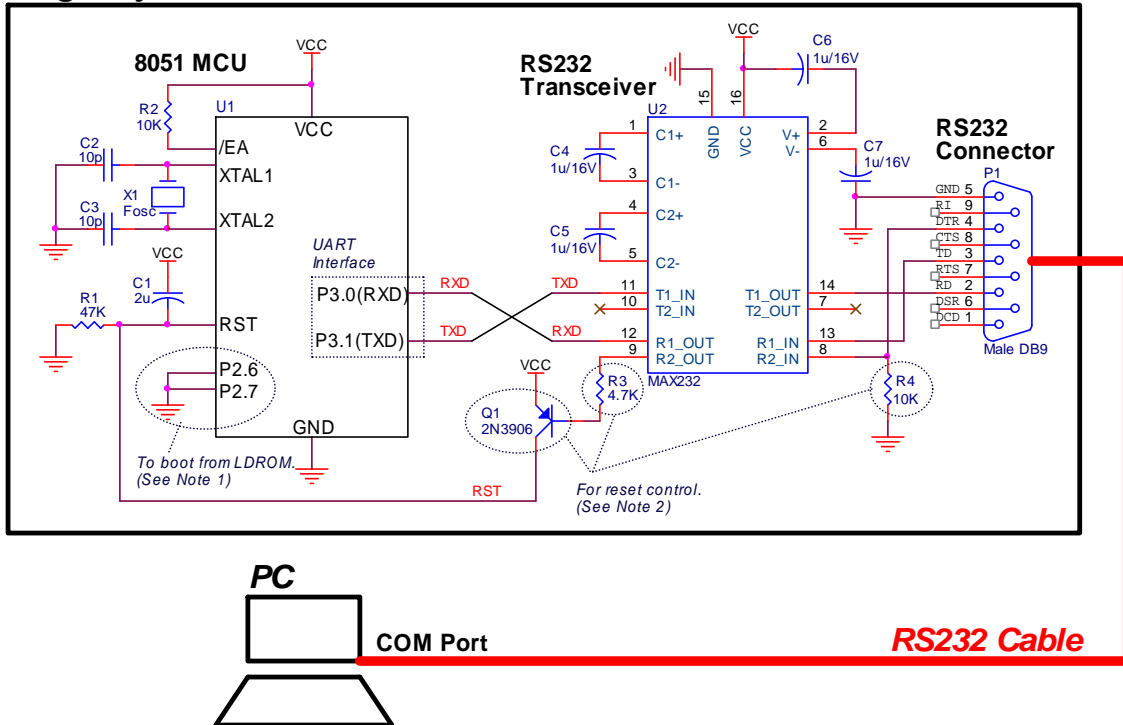
### I/O Pins and CONFIG Bit for Booting from LDROM after Reset

Part No.	I/O Pins Tied to Ground for Booting from LDROM	CONFIG Setting for Booting from LDROM
W78E(I)051D W78E(I)052D W78E(I)054D	(Not Need)	"CBS" Selected as LDROM (Boot from LDROM)
W78E(I)058D W78E(I)516D W78E(L)365A W78E065A W78E858A	P2.6 & P2.7 (for 40-pin package)  P4.3 (for 44-pin package)	(Not Need)  (Not Need)
W78E(I)RD2A W77E(L)516A W77E(L)532A W79E(L)632A W79E(L)633A W79E(L)648A W79E(L)649A W79E(L)658A W79E(L)659A	P2.6 & P2.7 (for 40-pin package)  P4.3 (for 44/68/100-pin package)	"Reboot P2.6/P2.7" Enabled  "Reboot P4.3" Enabled
W79E217A W79E225A W79E226A W79E227A	P3.6 & P3.7 (for 44-pin package)  P4.3 (for 48/100-pin package)	"Reboot P3.6/P3.7" Enabled "Reboot P4.3" Enabled
W79E201A	P4.0	"Reboot P4.0" Enabled
W925EP01	P4.7	"Reboot P4.7" Enabled
N78E366A N78E055A N78E059A N78E517A	(Not Need)	"CBS" Selected as LDROM (Boot from LDROM)

## 2.1 With an RS232 Transceiver in the Target System

In this design, each target system has an RS232 transceiver (e.g. MAX232) inside, and so only one RS232 cable is needed during the ISP operation, as shown below.

**Target System (with RS232 Transceiver)**



Note 1:

The I/O pins used for booting from LDRAM may be P2.6&P2.7, P4.3, P3.6&P3.7, P4.0 or none.  
(See the above table.)

Note 2:

For "With Reset Control" configuration, Q1, R3 and R4 are needed.

For "Without Reset Control" configuration, Q1, R3 and R4 are not needed.

To save an RS232 transceiver (e.g. MAX232) built in each target system, the user may use the *RS232 Cable Adaptor* with an RS232 transceiver inside, as shown below.



### **2.3 Requirement on the MCU's Operating Frequency**

There is no restriction on the MCU's operating frequency for ISP operation. All frequencies between 3MHz and 40MHz are acceptable. The 8051 MCU will automatically build a proper baudrate according to its operating frequency. It is recommended that the user uses the following specific frequencies: 11.0592MHz, 18.432MHz, 22.1184MHz or 36.864MHz. All these frequencies can generate the exact baudrate of 115200bps, which will shorten the data transmission time during ISP operation.

### 3 Software

#### 3.1 Install the Application Program

The application program setup file is contained in the folder [(2) Application Program]. Using the default installation setting, you will find the item "Nuvoton Tools \ ISP-ICP Utility, v?.??" appearing in the Windows START-menu after the application program is successfully installed.

Note:

*ISP-ICP means this application program is used for both the **ISP Programmer** and the **ICP Programmer**. In addition, also for the **ISP by COM Port**.*

#### 3.2 Introduction to the Application Program

The screenshot shows the Nuvoton ISP-ICP Utility, v5.02 window. The interface includes a 'Programmer Type' section with radio buttons for 'ISP', 'ICP', and 'Gang', where 'ISP by COM Port' is selected. A 'Part No.' dropdown shows '8051 Family' and 'N78E055A'. Buttons for 'Load File', 'Update Chip', 'Download Programmer', 'Verify APROM', 'Programmer Information', 'Read CONFIG', and 'Exit' are present. The 'Items to be Updated' section has checkboxes for 'APROM', 'DataFlash', 'LDROM', and 'CONFIG', with 'CONFIG' currently selected. Below this is a 'CONFIG Setting' button. The 'APROM Buffer' and 'DataFlash Buffer' tabs are visible, showing a hex dump of memory addresses and values. At the bottom, there's a 'File Name' field with a path, 'Code Size' (16384 Bytes), 'Checksum' (0x4FB5), and a 'Prog. Type' dropdown. A status bar at the very bottom shows 'Ready...' and 'COM13'.

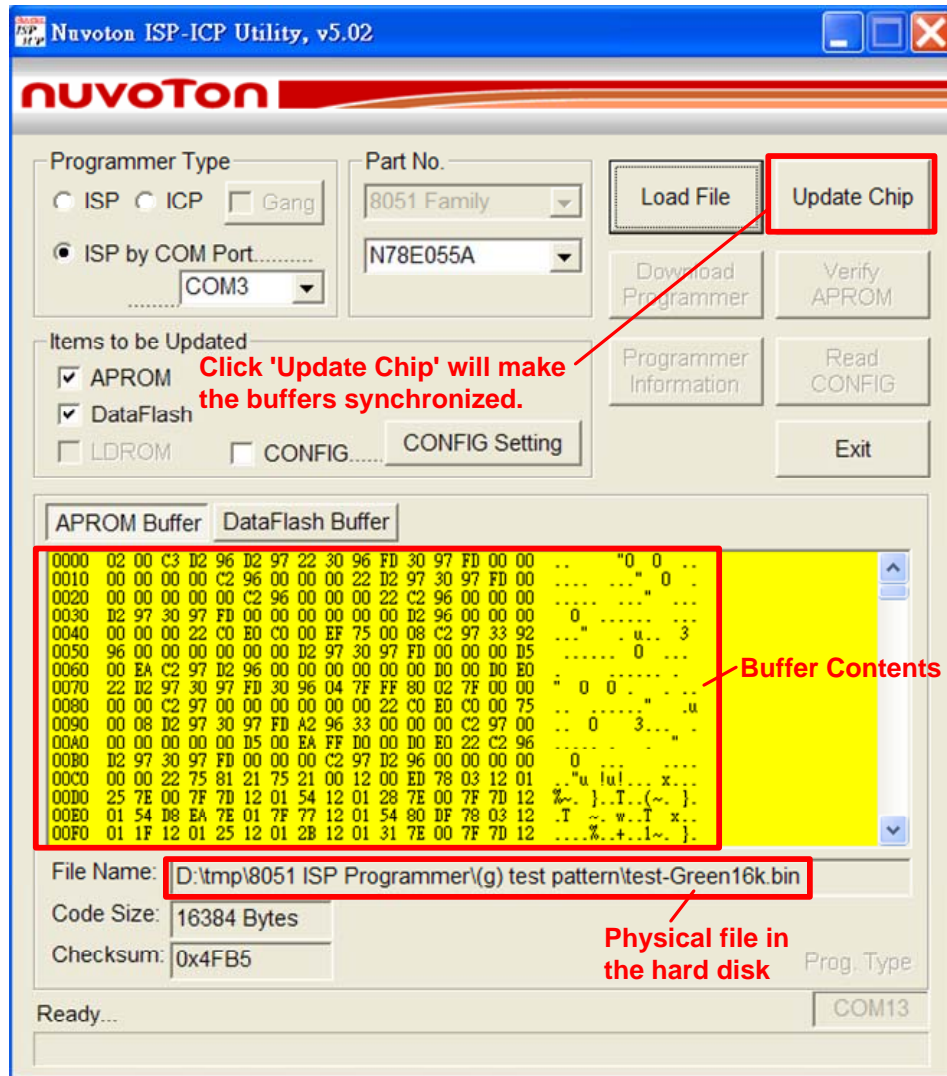
**Labels and Callouts:**

- Select 'ISP by COM Port'
- Select wanted Part No.
- Load file for APROM buffer and DataFlash buffer (See Note)
- Update the MCU chip
- Select the COM port to which the MCU chip is connected
- Select updated items when 'Update chip' is clicked
- Set CONFIG bits
- Click to show APROM buffer
- Click to show DataFlash buffer
- Information of the loaded file
- Processing status
- The COM port to which the MCU chip has ever been connected

**Note:**  
 To load code file, click 'APROM Buffer', then click 'Load File'  
 To load data file, click 'DataFlash Buffer', then click 'Load File'

### 3.3 Auto Synchronization of APROM/DataFlash Buffer

The buffer contents will be automatically synchronized with the physical file in the hard disk when the function button 'Update Chip' is clicked, as shown below. So, the user needn't manually reload the files for APROM buffer and DataFlash buffer when the physical files are updated externally.



## 4 Operation Steps

### 4.1 With Reset Control

For the “*With Reset Control*” configuration, the user should follow the steps to do ISP.

Step 1: Connect the target system to PC’s COM port through an RS232 cable.

Step 2: Run the PC-site AP, select wanted part no., select correct COM port to which the target system is connected, and load the code/data file into APROM/DataFlash Buffer.

Step 3: Click the “Update Chip” button when the target system is in power-on state.

Step 4: Now, the 8051 MCU will automatically reboot from LDROM, and will be successfully detected and updated.

*Note: If possible, “With Reset Control” is strongly recommended for ISP operation.*

### 4.2 Without Reset Control

For the “*Without Reset Control*” configuration, the user should follow the steps to do ISP.

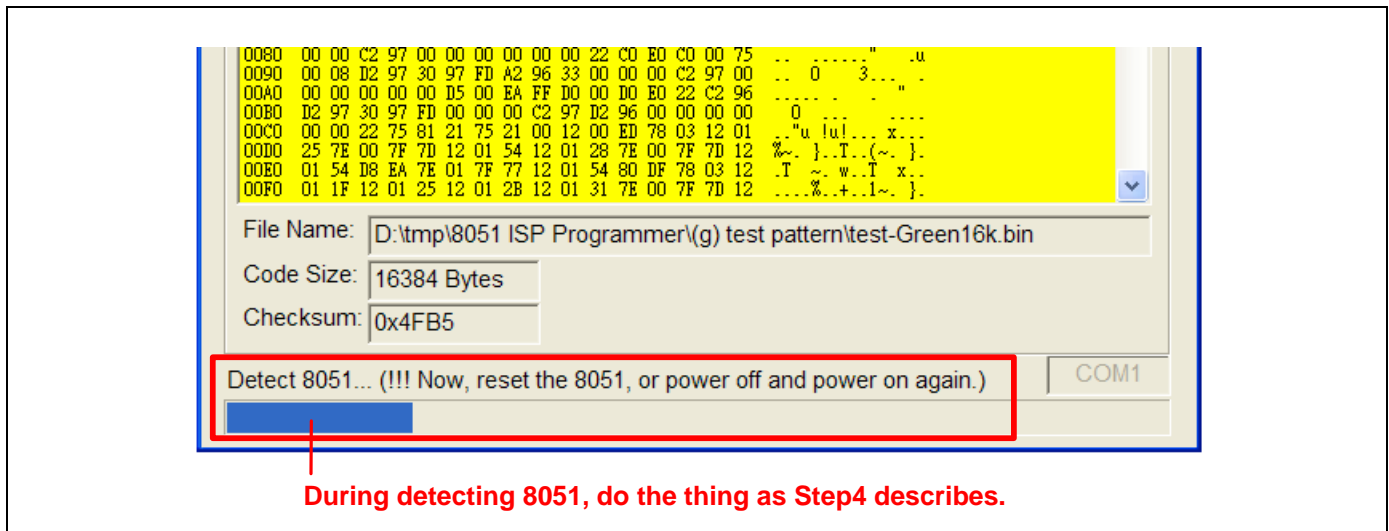
Step 1: Connect the target system to PC’s COM port through an RS232 cable.

Step 2: Run the PC-site AP, select wanted part no., select correct COM port to which the target system is connected, and load the code/data file into APROM/DataFlash Buffer.

Step 3: Click “Update Chip” button.

Step 4: Manually have the 8051 MCU reboot from LDROM during “Detect 8051...”, as shown in the following figure, by the following two methods:

- (1) send a reset pulse to the 8051 MCU’s RST-pin when the target system is in power-on state, or
- (2) power off the target system and then power on again.



Step 5: Now, the 8051 MCU will be successfully detected and updated.

*Note:*

- (1) Step 4 shows the “*Without Reset Control*” is somewhat inconvenient for the user to have the 8051 MCU reboot from LDROM. This is why we strongly recommend the user to adopt the “*With Reset Control*” configuration.
- (2) If any failed condition happens, repeat steps 3 and 4.

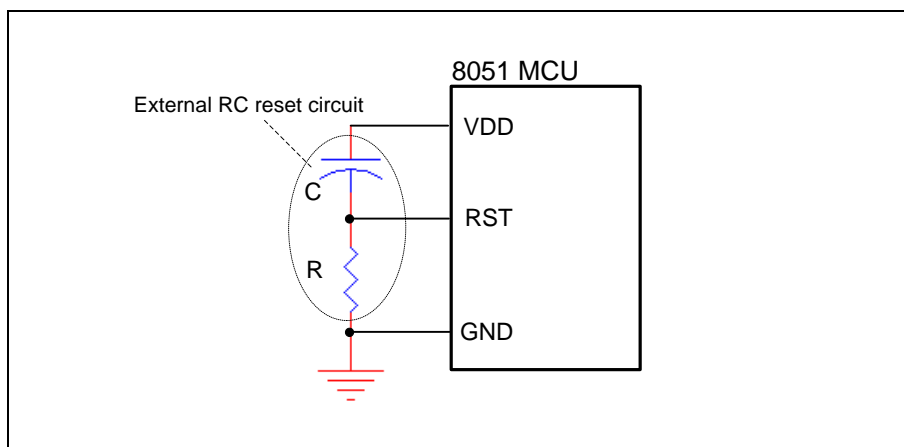
## 5 Reset Control

Normally, the 8051 MCU's RST-pin with external RC reset circuit (see Figure 4a) can be controlled by the PNP transistor Q1 (see the Figures in Sections 2.1 and 2.2). At this time, the user may adopt the "*With Reset Control*" configuration for ISP operation. However, the RST-pin cannot be controlled when it is connected to a reset IC (such as MAX810, ADM810, AIC810 and FP6810, etc., see Figure 4b). Now the user should adopt the "*Without Reset Control*" configuration for ISP operation.

### External RC Reset Circuit

The general external RC reset circuit is shown in Figure 4a. The resistance of R should be larger than  $47K\Omega$  to have the RST-pin be successfully controlled by the PNP transistor. Normally,  $\{47K\Omega, 2.2\mu F\}$  and  $\{100K\Omega, 1\mu F\}$  are recommended for  $\{R, C\}$ .

Figure 4a. External RC Reset Circuit



### Reset Circuit with a Reset-IC

In this condition, the RST-pin cannot be controlled by the PNP transistor Q1.

Figure 4b. Reset Circuit with a Reset-IC

