Nuvoton
8051 ISP Programmer

User Manual

Revision 0.94b, 2009/6/1

Contents

Revision History

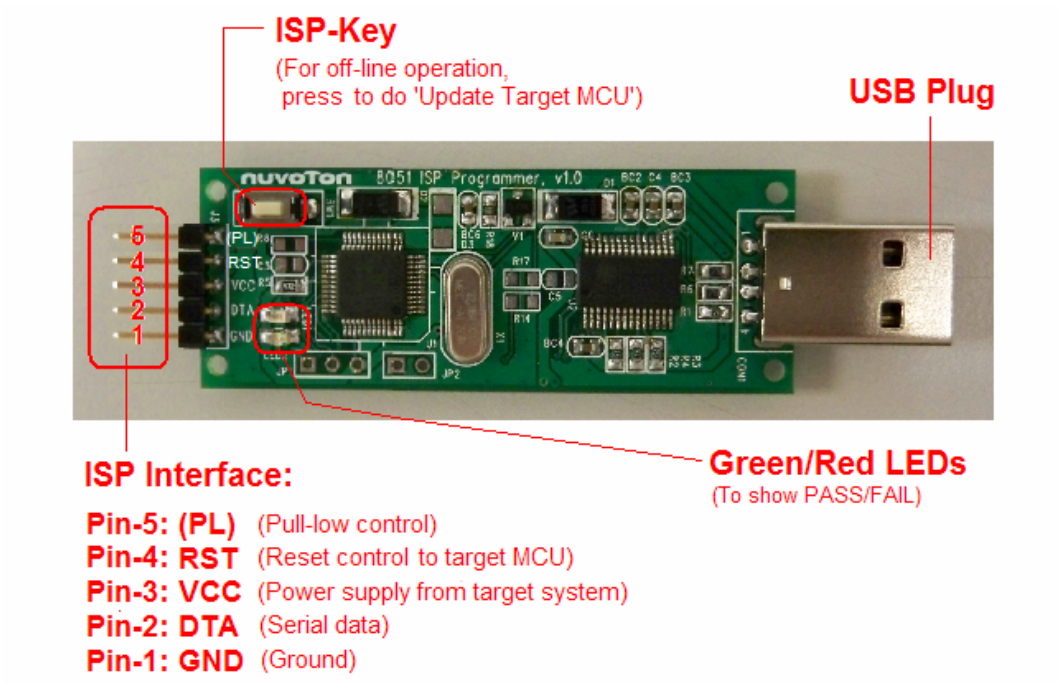
Revision	Description	Date
v0.92	(1) The first released version for beta-site test. (2) Only W78E051D/ W78E052D/W78E054D are supported.	2009/5/15
v0.93	(1) Add “Reset Control” to the ISP interface. (2) Add support of W78E(L)365A/W78E065A.	2009/5/18
v0.94	(1) Refine and correct this user manual. (2) Fix the Programmer’s firmware bug: The reset control becomes invalid if an error happens in “Update Target”.	2009/5/22
v0.94b	(1) Modify the *auto-FW-upgrade* function for the Programmer. (2) Add section 2.2.1, Introduction to the GUI of the Application Program, to this user manual.	2009/6/1

1 Introduction

ISP is the acronym of **I**n-**S**ystem **P**rogramming, which makes it possible that the user can update the application code under the software control without removing the mounted MCU chip from the actual end product. The USB-stick-like tool "Nuvoton 8051 ISP Programmer", as shown in the following picture, is used to perform the ISP function when the MCU's LDROM is pre-programmed with the *Nuvoton standard ISP code*. In addition, since this tool can save the programming data downloaded from the host, it is able to perform off-line operation. This feature is especially useful in the field without the host.

**** To let users easily use the ISP Programmer, the 8051 products will have the Nuvoton standard ISP code pre-programmed in the MCU's LDROM before shipping. Please contact Nuvoton for detailed product information.*

Picture of the "Nuvoton 8051 ISP Programmer"



Description of the ISP Interface:

PL: pull-low control.
This pin is pulled low by the ISP Programmer for the target MCU which needs P4.3 to be pulled low when reset or powered on (in order to boot from LDROM). Thus, the user needn't be requested to pull low P4.3 in the target system when using the ISP function. And, P4.3 is released for user's normal function. (Refer to Section 3: Hardware Connection.)

RST: reset control to target MCU.
The pin will send reset signal to the target MCU in ISP operation.

VCC: power supply from target system.
The power source for the ISP Programmer in off-line operation.

DTA: serial data.
The bi-directional serial data communicated between the target MCU and the ISP Programmer.

GND: ground.

2 Driver and Application Program

2.1 Install the Driver

This ISP Programmer is embedded with a USB-to-Serial bridge chip, PL-2303, which functions as a USB virtual COM port. Before starting to use the ISP Programmer, we need to install the PL-2303 driver. The driver is located in the folder [(1) Driver].

Note: Don't plug the ISP Programmer to the host before the driver is installed.

2.2 Install the Application Program

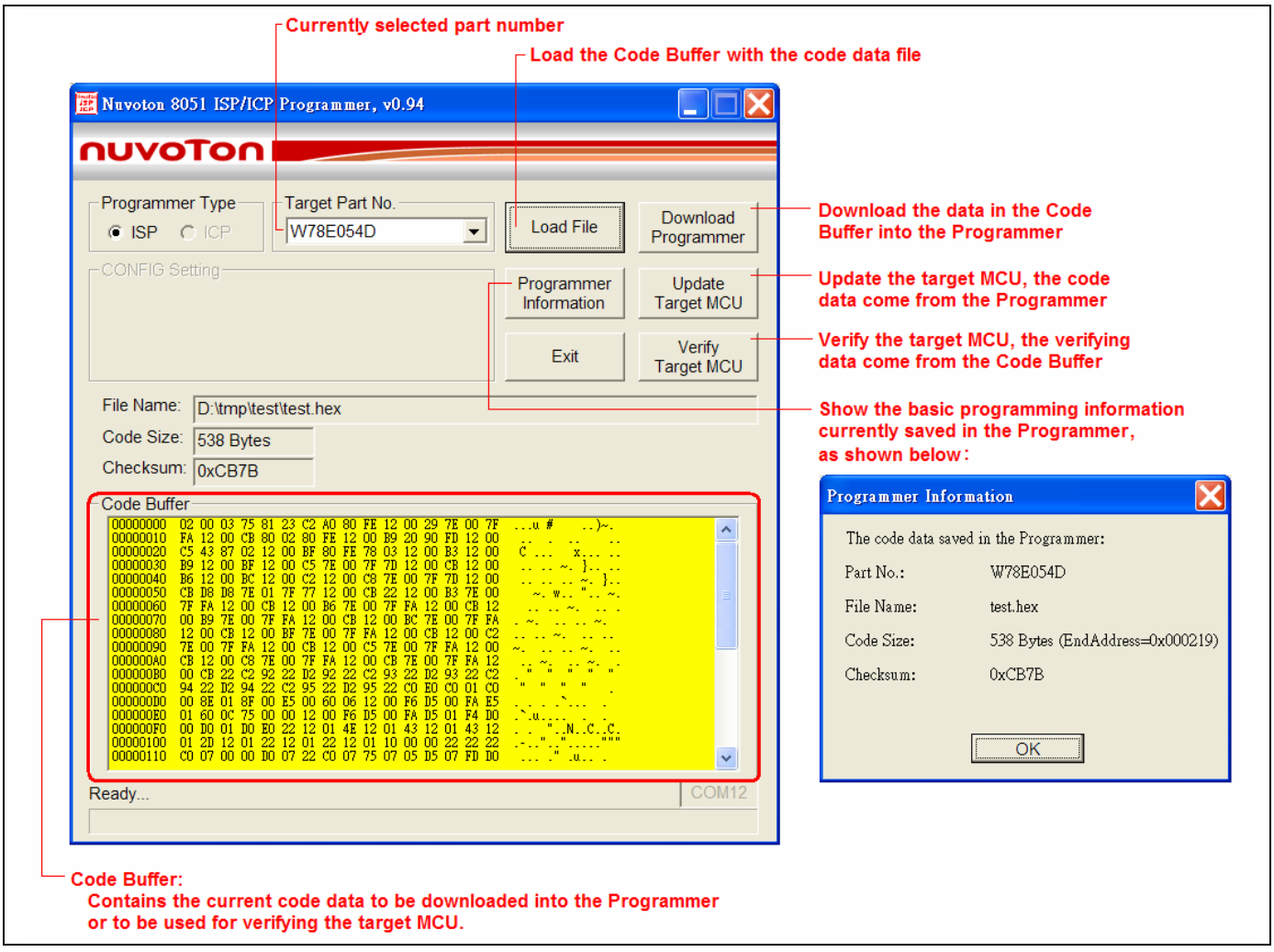
The application program setup file is located in the folder [(2) PC-site AP]. Using the default installation setting, you will find the item *"Nuvoton Tools \ Nuvoton 8051 ISP-ICP Programmer, v?.??"* appearing in the Windows START-menu after the application program is successfully installed.

Note:

(1) ***v?.??*** *means the current version and may be upgraded in the future.*

(2) ***ISP-ICP*** *means this application program is used for both ISP Programmer and ICP (In-Circuit Programming) Programmer, which will be developed in the near future.*

2.2.1 Introduction to the GUI of the Application Program



3 Operation Modes

There are three operation modes for the ISP Programmer.

3.1 On-line Operation Mode

The following figures show the connection of the ISP Programmer between the target MCU and the host. In this condition, the ISP Programmer cooperates with the PC-site application program. The user should select the wanted "**Part No.**", and then click "**Load File**" to load the Code Buffer with the code data to be programmed into the target MCU. Four main software buttons are available in this condition:

(1) "**Download Programmer**", which downloads the ISP Programmer with the data in the Code Buffer. This button will keep disabled until "Load File" is performed.

(2) "**Update Target MCU**", which triggers an ISP operation to update the target MCU. The ISP operation includes *program* and *verify*. This button will keep disabled until "Download Programmer" is performed.

(3) "**Verify Target MCU**", which compares the data programmed in the target MCU with the data in the Code Buffer. This button will keep disabled until "Load File" is performed.

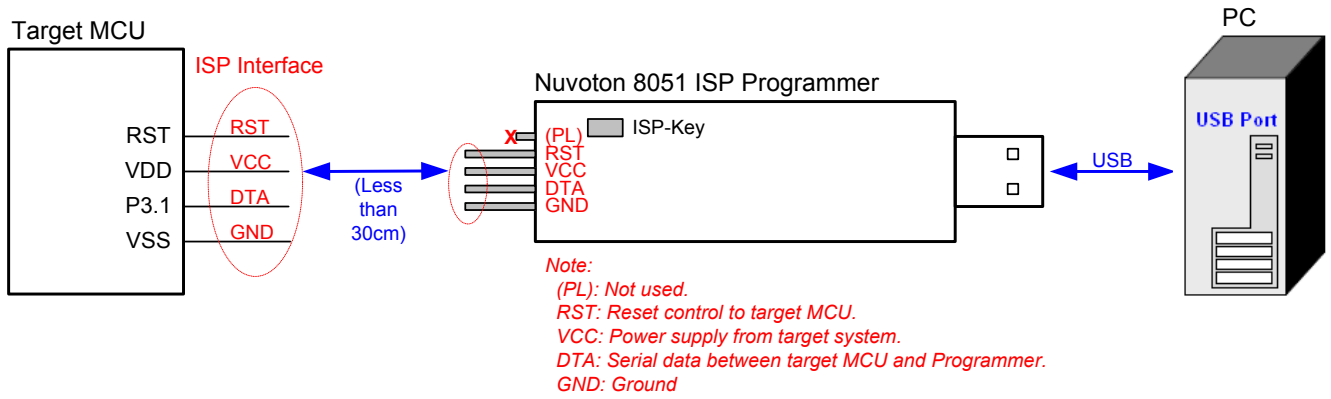
(4) "**Programmer Information**", which shows the basic programming information currently saved in the ISP Programmer, including Part No., file name, code size and code checksum.

The user can disconnect the ISP Programmer from the target MCU anytime to let the target MCU run the new application code.

3.1.1 For W78E051D, W78E052D and W78E054D

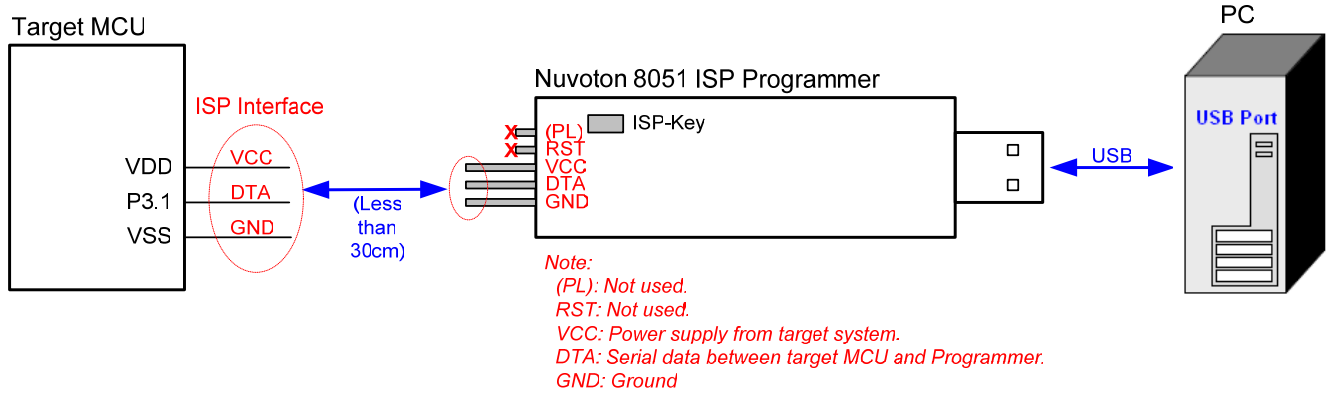
For these parts, there is no need to have the I/O pin (P2.6/P2.7 or P4.3) be pulled low in order to use the ISP function. Thus the PL-pin in the ISP interface is not used. The following two figures show the hardware connection for "*With Reset Control*" and "*Without Reset Control*" configuration. The former is adopted when the target MCU's RST-pin ***can*** be controlled by the ISP Programmer; the latter is adopted when the target MCU's RST-pin ***cannot*** be controlled by the ISP Programmer.

With Reset Control (if the RST-pin can be controlled by the ISP Programmer)



Note:
(PL): Not used.
RST: Reset control to target MCU.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

Without Reset Control (if the RST-pin cannot be controlled by the ISP Programmer)

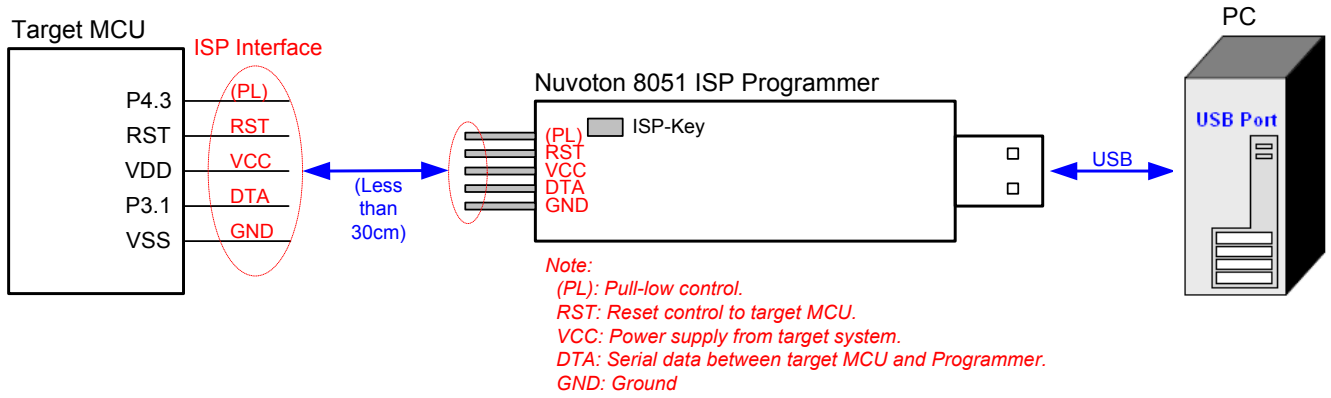


Note:
(PL): Not used.
RST: Not used.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

3.1.2 For W78E(L)365A and W78E065A

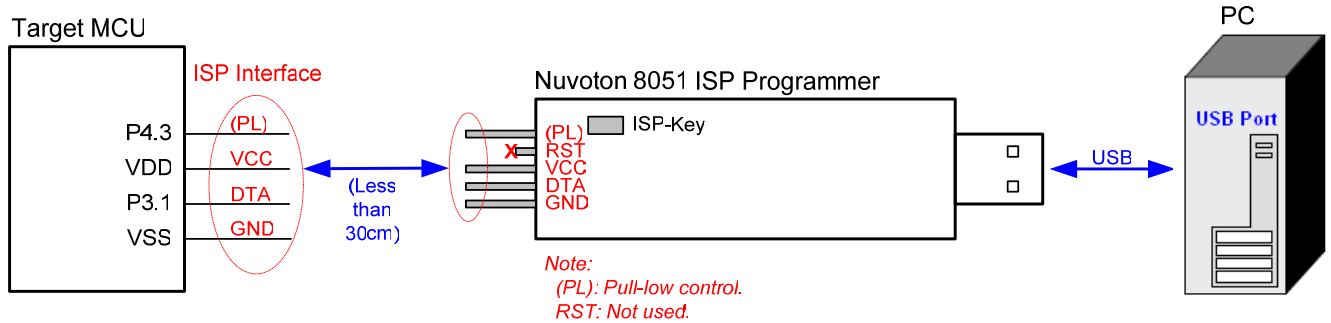
For these parts, there needs to have the I/O pin (P2.6/P2.7 or P4.3, usually we use P4.3) be pulled low in order to use the ISP function. The PL-pin in the ISP interface can automatically pull low P4.3 when the ISP Programmer is connected to the target MCU. So, the user needn't pull low P4.3 in the target system. The following two figures show the hardware connection for "*With Reset Control*" and "*Without Reset Control*" configuration. The former is adopted when the target MCU's RST-pin ***can*** be controlled by the ISP Programmer; the latter is adopted when the target MCU's RST-pin ***cannot*** be controlled by the ISP Programmer.

With Reset Control (if the RST-pin can be controlled by the ISP Programmer)



Note:
(PL): Pull-low control.
RST: Reset control to target MCU.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

Without Reset Control (if the RST-pin cannot be controlled by the ISP Programmer)



Note:
(PL): Pull-low control.
RST: Not used.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

3.1.3 About the "Reset Control"

Normally, the target MCU's RST-pin with RC reset circuitry can be controlled by the ISP Programmer. At this time, the user may adopt the "*With Reset Control*" configuration for ISP operation. However, the RST-pin cannot be controlled by the ISP Programmer when the RST-pin is connected to a reset IC (such as MAX810, ADM810, AIC810 and FP6810, etc.), the user should adopt the "*Without Reset Control*" configuration for ISP operation.

For the "*With Reset Control*" configuration, the ISP Programmer will always keep the target MCU in reset state until the ISP operation is triggered, e.g. "Update Target" button is clicked or ISP-Key is pressed. At this time, the ISP Programmer will release the target MCU to let it reboot from LDROM to run the ISP code. After ISP operation is completed, the ISP Programmer keeps the target MCU in reset state again. The target MCU may be released and run the new application code by disconnecting the ISP Programmer.

For the "*Without Reset Control*" configuration, to successfully let the target MCU boot from its LDROM to run the ISP code, the user should follow the steps below.

Step1: Connect the ISP Programmer to the target MCU.

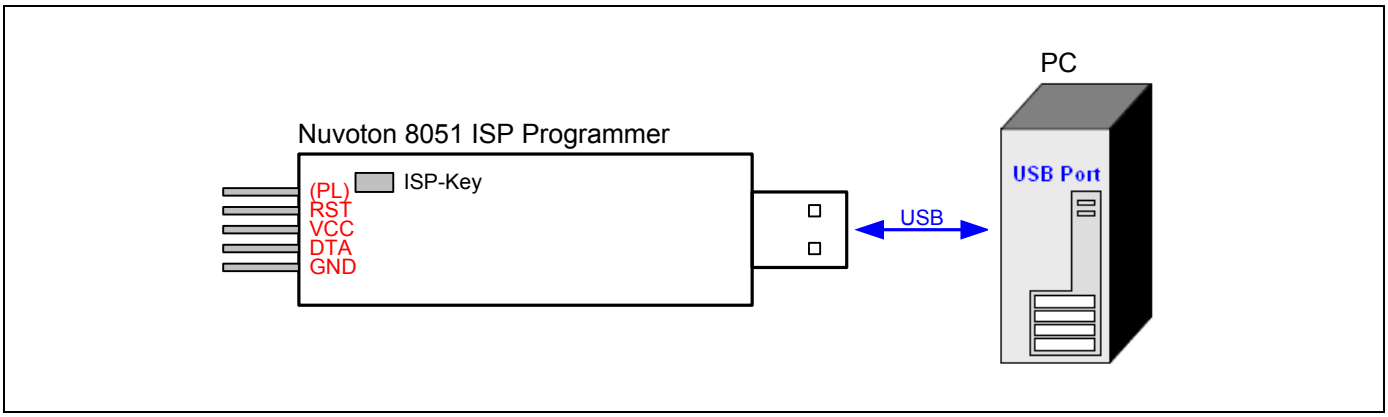
Step2: Connect the ISP Programmer to the host. (This step is only for on-line operation and may be exchanged with Step1.)

Step3: Reset the target MCU manually, or turn off and then turn on again the target system.

Now, the target MCU will boot from its LDROM and run the ISP code.

3.2 Download Programmer Mode

The following figure shows the ISP Programmer to which only the host is connected. In this condition, the ISP Programmer cooperates with the PC-site application program. The user should select the wanted "**Part No.**", and then click "**Load File**" to load the Code Buffer with the code data to be programmed into the target MCU. Three main software buttons are available in this condition: "**Download Programmer**", "**Verify Target MCU**" and "**Programmer Information**". Refer to the previous description of these buttons. This mode is for the following off-line operation.



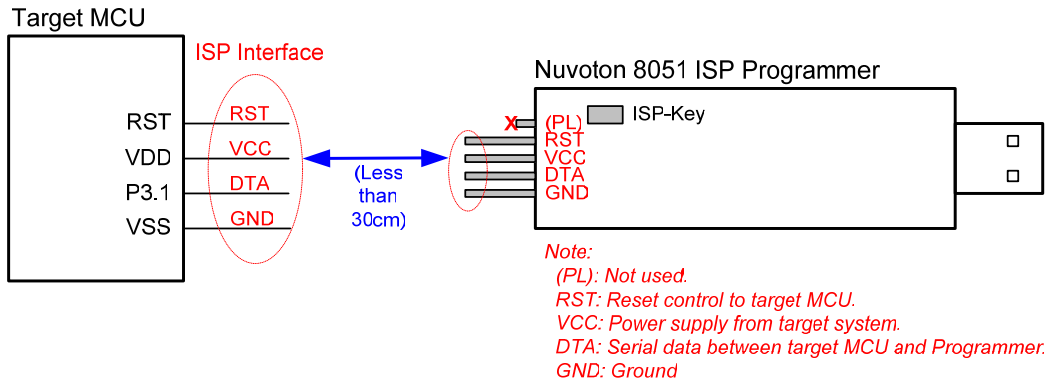
3.3 Off-line Operation Mode

The following figures show the connection of the ISP Programmer to which only the target MCU is connected. In this condition, the ISP Programmer should have been previously downloaded, and then can perform the off-line operation. The **ISP-Key** is used to trigger an ISP operation to update the target MCU. The programming data are out of the ISP Programmer. After updating is finished, the user may disconnect the ISP Programmer from the target MCU anytime to let the target MCU run the new application code. This operation mode is especially useful in the field without the host.

3.3.1 For W78E051D, W78E052D and W78E054D

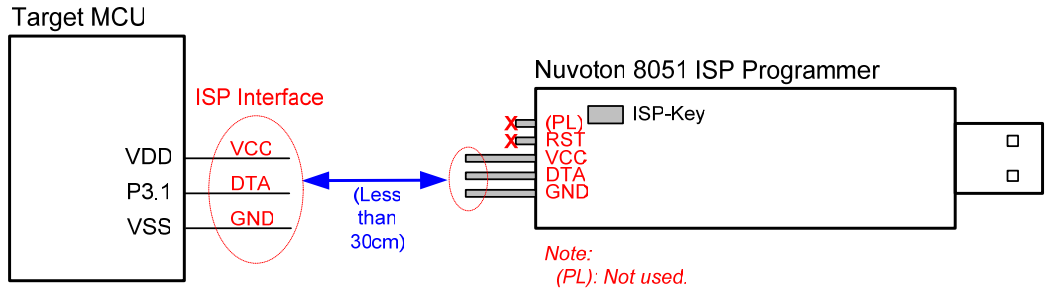
For these parts, there is no need to have the I/O pin (P2.6/P2.7 or P4.3) be pulled low in order to use the ISP function. Thus the PL-pin in the ISP interface is not used. The following two figures show the hardware connection of "*With Reset Control*" and "*Without Reset Control*". The former is adopted when the target MCU's RST-pin ***can*** be controlled by the ISP Programmer; the latter is adopted when the target MCU's RST-pin ***cannot*** be controlled by the ISP Programmer.

With Reset Control (if the RST-pin can be controlled by the ISP Programmer)



Note:
(PL): Not used.
RST: Reset control to target MCU.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

Without Reset Control (if the RST-pin cannot be controlled by the ISP Programmer)

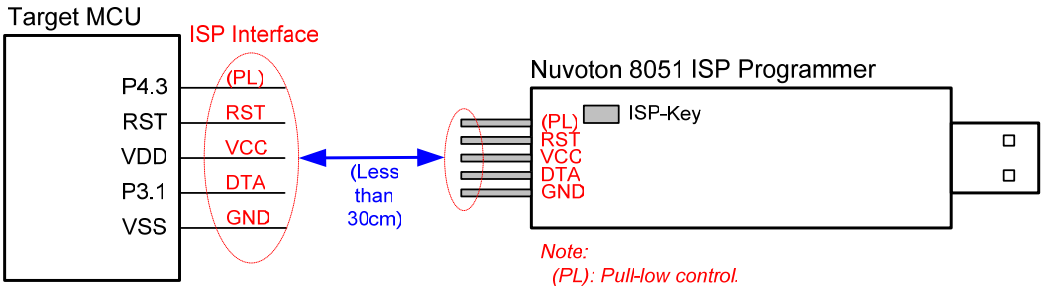


Note:
(PL): Not used.
RST: Not used.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

3.3.2 For W78E(L)365A and W78E065A

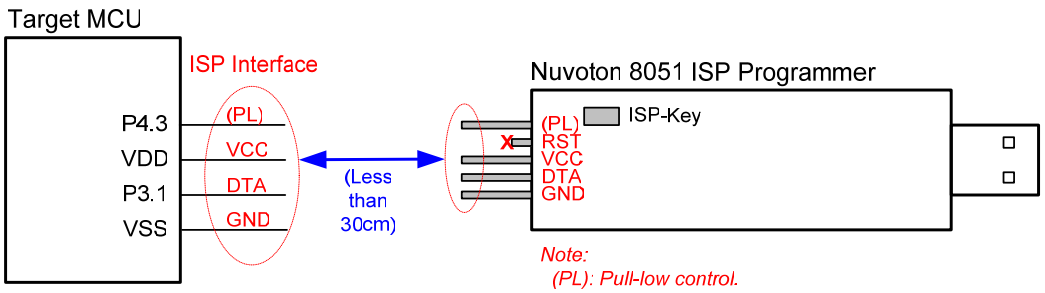
For these parts, there needs to have the I/O pin (P2.6/P2.7 or P4.3, usually we use P4.3) be pulled low in order to use the ISP function. The PL-pin in the ISP interface can automatically pull low P4.3 when the ISP Programmer is connected to the target MCU. So, the user needn't pull low P4.3 in the target system. The following two figures show the hardware connection of "*With Reset Control*" and "*Without Reset Control*". The former is adopted when the target MCU's RST-pin ***can*** be controlled by the ISP Programmer; the latter is adopted when the target MCU's RST-pin ***cannot*** be controlled by the ISP Programmer.

With Reset Control (if the RST-pin can be controlled by the ISP Programmer)



Note:
(PL): Pull-low control.
RST: Reset control to target MCU.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

Without Reset Control (if the RST-pin cannot be controlled by the ISP Programmer)



Note:
(PL): Pull-low control.
RST: Not used.
VCC: Power supply from target system.
DTA: Serial data between target MCU and Programmer.
GND: Ground

4 Note for ISP

For the ISP operation, the target MCU's **P3.1** pin is used as the **DTA** serial data pin. The best case is that P3.1 dedicates itself to the ISP operation. However, P3.1 can have its normal function when ISP is not requested as long as the user conforms to the following rules:

(1) The state on P3.1 must be logic-1 when the target MCU is just powered on or reset.

(2) During the ISP operation, P3.1 cannot be pulled low by the other components connected to it.

It is because when the MCU boots from its LDROM and runs the *Nuvoton standard ISP code*, the MCU will sample the state of P3.1 to determine the next action. If logic-0 is sampled, it means the ISP Programmer is connected to the target MCU, so the MCU will continue to run the ISP code for further ISP operation; if logic-1 is sampled, the MCU will immediately, within several instructions, re-boot from APROM to run user's application code.

During the operating of ISP, P3.1 functions as bi-directional I/O for serial data transfer. It may output logic-1 or logic-0 to the ISP Programmer, and receive logic-1 or logic-0 from the ISP Programmer. Thus the user should check if there is any side effect on the other components connected to P3.1 during ISP operation.