HT8 MCU ISP Application

**D/N: AN0418E**

Introduction

Some Holtek Flash MCUs provide the user with a means of convenient and easy upgrades and modifications to their programs on the same device. The Holtek USB Flash MCUs, the HT66FB5x0 and HT68FB5x0 devices, have provided a means of programing the microcontroller in-system using a two-line USB interface. This provides the users with the possibility of manufacturing their circuit boards complete with a programmed microcontroller or one that is only programmed with the Bootloader Code. This allows the users to easily keep their manufactured products supplied with the latest program releases without removal and re-insertion of the devices at a later stage. This application note will show that how to use the microcontroller support In-system Programing - ISP.

Functional Description

Both the HT66FB5x0 and HT68FB5x0 series of devices support a Bootloader function, which can be used to update the Flash program memory using the ISP function. The Bootloader Code will be executed if the library or a subprogram is called to enable the Bootloader Code after a reset or power-on reset when the MCU is executing user code. At this time, new programs can be loaded from a PC via a USB interface to update the Flash memory program and then be executed after the MCU is re-powered on with corresponding configurations.

Principle

The user can select the ISP provided by the Holtek HT-IDE3000 or create their own IAP program. When the Holtek IDE ISP is selected, users can select the Bootloader function in the HT-IDE3000 project setup. After an .MTP file is generated after successful compilation, the Bootloader Code can be programmed into the device with the current user program using the latest version of the HOPE3000 writer software. The Bootloader Code will occupy 0.5K words of Flash memory. Taking the HT66FB550 as an example, the device has a Flash program memory capacity of 8K×16 so there will be a capacity of 7.5K×16 available for user development after deducting the Bootloader Code space. The accompanying diagram illustrates the Flash program structure.
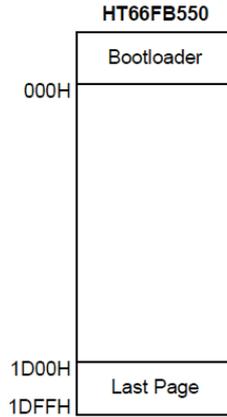
To allow the program to branch to the Bootloader code, users can add a function library provided by Holtek into their project. To meet the requirements for Bootloader branching, a subprogram provided by the Enable_Bootloader.lib will be called to enable the Bootloader Mode. Use an external reset or an intentional Watchdog Timer overflow to reset the MCU, then if the Bootloader Mode is successfully enabled, the MCU will execute the Bootloader Code after the reset. The microcontroller is connected to the PC via a USB interface. Users can select the I3000 provided by the Holtek or use their own application programs to communicate with the Bootloader Code and transfer new programs to the device to update the user program after a successful USB Enumeration.
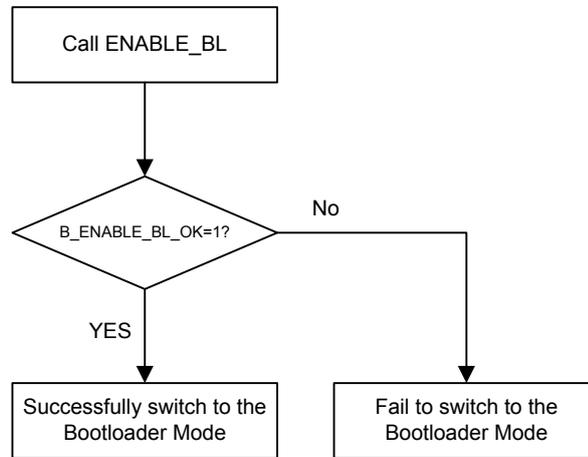
Hardware Description
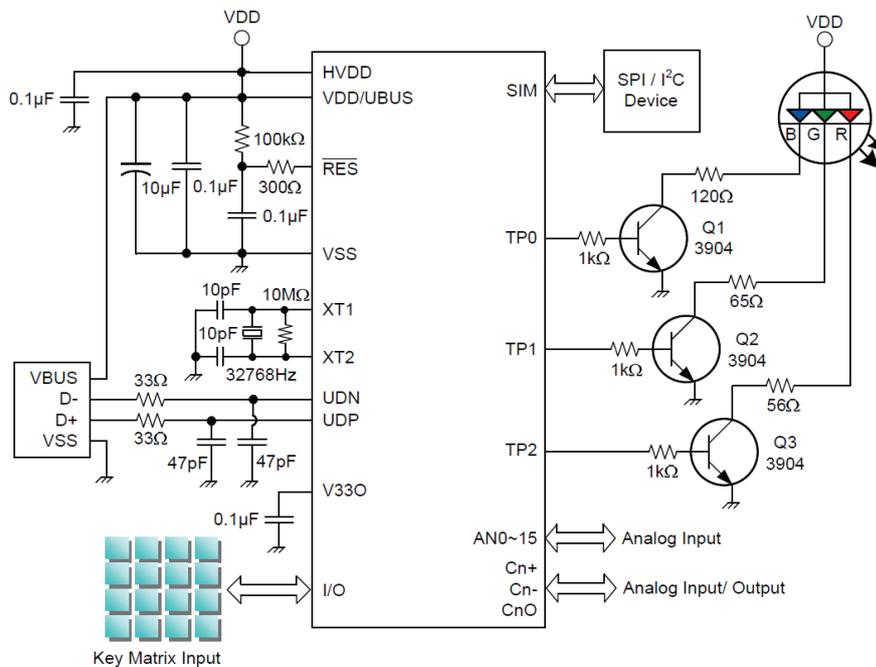
Note : The Program Memory can be programmed serially in-system using the USB interface, namely the UDN and UDP pins. The power is supplied by the UBUS pin.

Software Description

Software Flowchart

Program Description

Taking the HT66FB550 as an example, the following summarises the individual steps that should be executed in order to implement a branch from the user code to the Bootloader Code:

1. Check the "with Boot Loader" option when setting up a project, then select "Start at User mode" as shown in Fig.1, or users can click on the "Bootloader Option" in the "Project Setting" dialog box as shown in Fig.2 then check the "with Boot Loader" option and select "Start at User mode".
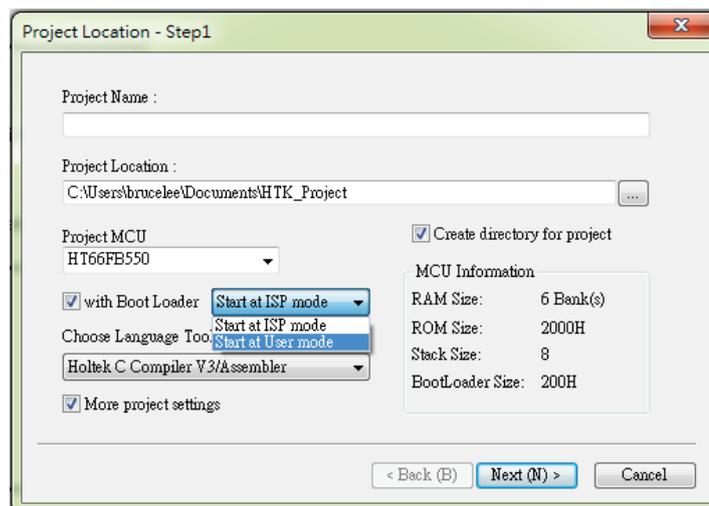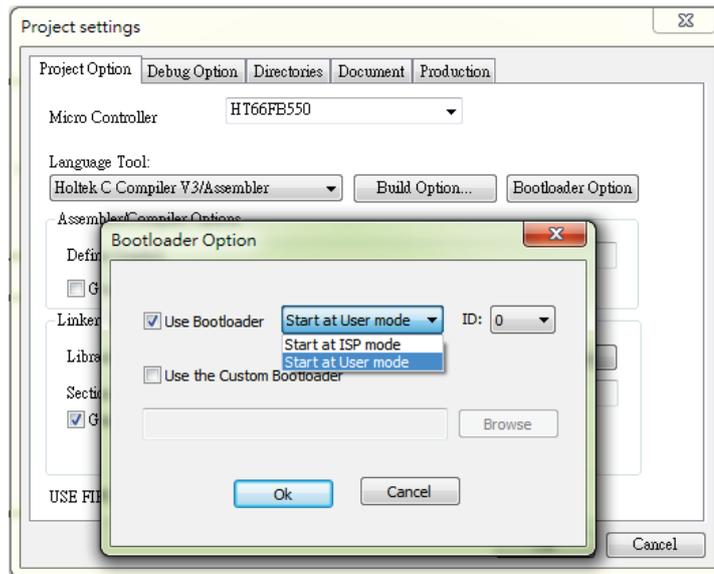

Fig.1

Fig.2

2. The HT-IDE3000 will automatically jump to the Bootloader Library. Write programs to call the "ENABLE_EN" subprogram provided by the function library when a Bootloader Code Branch is required. An .MTP file will be generated after program compilation.

3. Program using the HOPE3000 V3.08 or later version.

4. The HT66FB550 works with peripheral circuits including a USB interface for proper operation.

5. When a program update of the HT66FB550 is required, such as a Bootloader Code branch command ordered by PC software, the HT66FB550 will be re-powered on or reset, caused by Watchdog Timer overflow or USB re-plugging. Then after a successfull branch, the device will switch from User Code to the Bootloader Code.

6. Run the I3000 software on the PC. Then the HT66FB550 is connected to the PC and is powered using the USB interface. When the "USB Connect" and "Download Mode" of the I3000 are checked, as shown in Fig.3, this means a successful USB interface setup of the HT66FB550. At this time, the .MTP file for the new program can be programmed into the device via the I3000 without using a writer.

Fig.3

7. Procedures for updating a program .MTP file using the I3000:

   1) Open the new .MTP file in the I3000.

   2) Click the "Erase" button on the right side of the I3000 software interface, choose the "Select All" option then click on "OK" to implement erasing.

   3) Click the "Program" button for programming.

   4) Click the "Verify" button to check if the code has been successfully programmed into the device.

8. Setup the MCU start mode on the I3000. Click the "MCU Start" button on the right side and there will appear a window as shown in Fig.4. Choose the "MCU starts at the user firmware" option and click on "OK" to finish the setup. The MCU will start operating from the new user program according to the above configuration after re-plugging the USB device.

Fig.4

Program Example

```
asm("extern ENABLE_BL:near")          ; // extern funtion
asm("extern B_ENABLE_BL_OK : bit")     ;
void UserToBootloader()
{
    asm("CALL ENABLE_BL")              ;
    asm("SNZ B_ENABLE_BL_OK")          ;
    asm("JMP asmend")                  ; // fail to enable bootloader, end of program
                                       ; // enable bootloader success,
    FlagBit.BootloaderSuccess=1        ;
    asm("asmend:")                     ;
}
```

Conclusion

This application note has shown how the MCUs which include a Bootloader function can support In-system Programing to update firmware programs using the above procedures. By selecting the Bootloader setup in the HT-IDE3000 and adding the Enable_Bootloader.lib file, the MCU will switch to the Bootloader Code when the corresponding function in the library is called. After that, the user can use the I3000 software to update the firmware or choose to start running program in the ISP Mode or the User Mode.

Version and Modify Information

Date	Author	Issue
2015.11.27	李孟哲	First Version
2016.07.23	李孟哲	V1.10. Delete the contents of Add the "Enable_Bootloader.lib" in the Project Setting dialog box.

References

1. HT66FB550 Datasheet.
2. HA0321E, "Using the HT66FB5x0/HT68FB5x0 USB Interface to Switch from User Code to Bootloader Code".
3. HA0322E, "Using the Library to jump from the User Code to the Bootloader Code in the HT66FB5x0 and HT68FB5x0".

For further information, refer to the Holtek official website www.holtek.com.

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