

1T 8051

8-bit Microcontroller

NuMicro[®] 8051 Series SPROM User Manual

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1 OVERVIEW

NuMicro 8051 series with an additional include special 128 bytes security protection memory (SPROM) to enhance the security and protection of customer application. To facilitate programming and verification, the Flash allows to be programmed and read electronically by parallel Writer or In-Circuit-Programming (ICP). Once the code is confirmed, user can lock the code for security.

SPROM start address from FF80H, if the last byte (FFFFH) is the lock bit of SPROM, if this byte value is not FFH, whole SPROM can't be read out, include IAP / ICP or MOVC instruction, also can't setting break point when in OCD mode.

2 SPROM FUNCTION DESCRIPTION

2.1 Security Protection Memory (SPROM)

The security protection memory (SPROM) is used to store instructions for security application. The SPROM includes 128 bytes at location address FF80H ~ FFFFH and doesn't support "whole chip erase command". [Figure 2.1-1 SPROM Memory Mapping And SPROM Security Mode](#) shows that the last byte of SPROM (address: FFFFH) is used to identify the SPROM code is non-secured or secured mode.

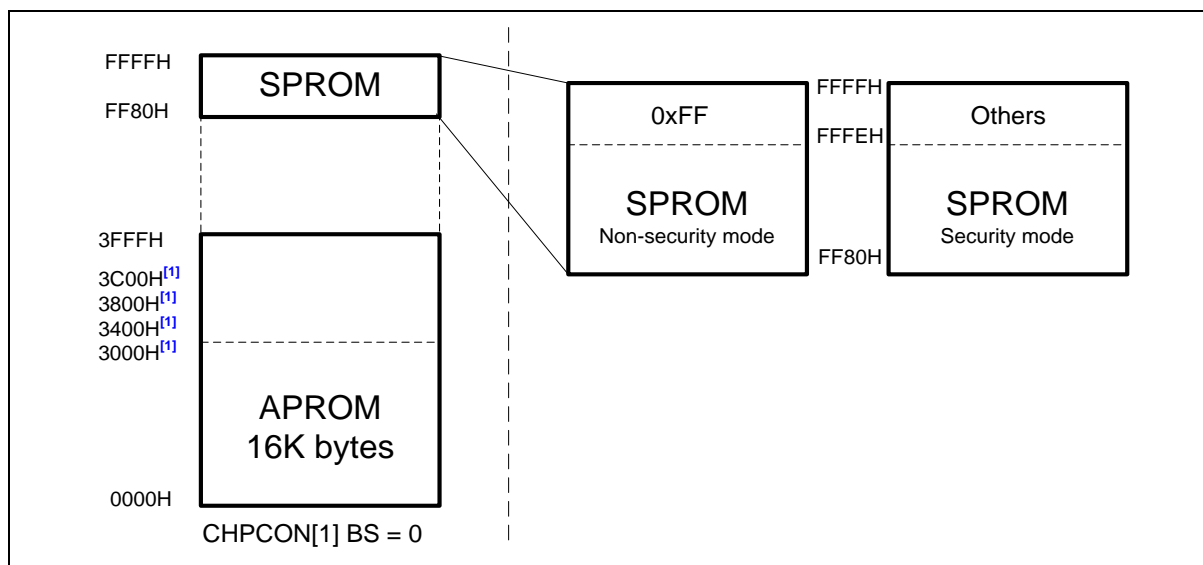


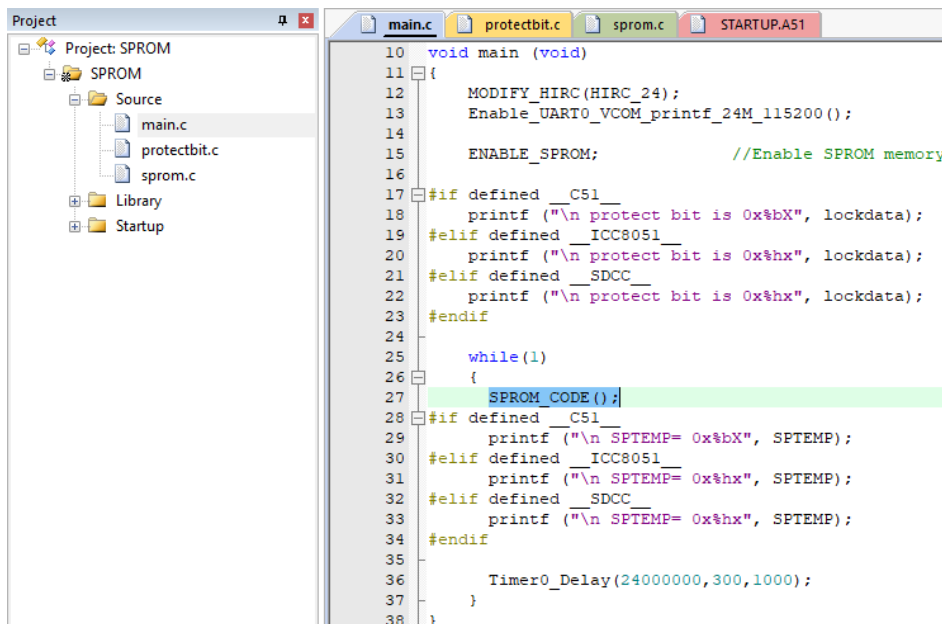
Figure 2.1-1 SPROM Memory Mapping And SPROM Security Mode

(1) SPROM non-secured mode (the last byte is 0xFF). The access behavior of SPROM is the same with APROM and LDROM. All area can be read by CPU or ISP command, and can be erased and programmed by ISP command.

(2) SPROM secured mode (the last byte is not 0xFF). In order to conceal SPROM code in secured mode, CPU only can perform instruction fetch and get data from SPROM when CPU is run at SPROM area. Otherwise, CPU will get all 00H for data access. In order to protect SPROM, the CPU instruction fetch will also get zero value when ICE (OCD) port is connected in secured code. At this mode, SPROM doesn't support ISP program, read or erase.

2.2 How To Coding Sprom Code In Keil Project

Main loop call SPROM code, for example call SPROM function "SPROM_CODE();" "

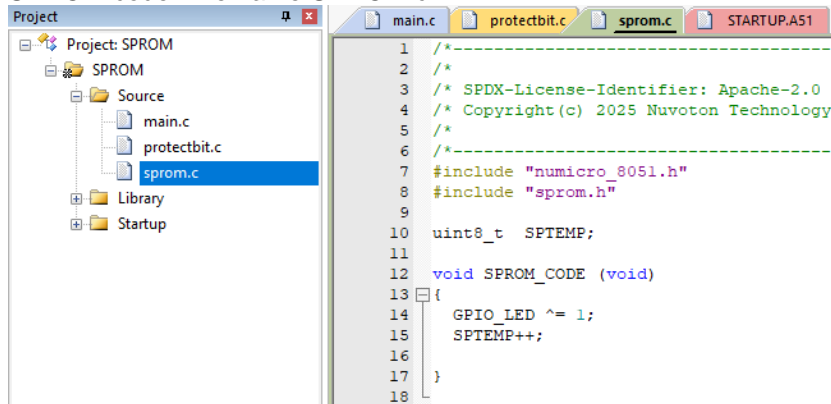


```

10 void main (void)
11 {
12     MODIFY_HIRC(HIRC_24);
13     Enable_UART0_VCOM_printf_24M_115200();
14
15     ENABLE_SPROM;           //Enable SPROM memory
16
17     #if defined __C51__
18         printf ("\n protect bit is 0x%X", lockdata);
19     #elif defined __ICC8051__
20         printf ("\n protect bit is 0x%x", lockdata);
21     #elif defined __SDCC__
22         printf ("\n protect bit is 0x%x", lockdata);
23     #endif
24
25     while(1)
26     {
27         SPROM_CODE();
28     }
29     #if defined __C51__
30         printf ("\n SPTIME= 0x%X", SPTIME);
31     #elif defined __ICC8051__
32         printf ("\n SPTIME= 0x%x", SPTIME);
33     #elif defined __SDCC__
34         printf ("\n SPTIME= 0x%x", SPTIME);
35     #endif
36
37     Timer0_Delay(24000000,300,1000);
38 }

```

SPROM code: File name SPROM.c.



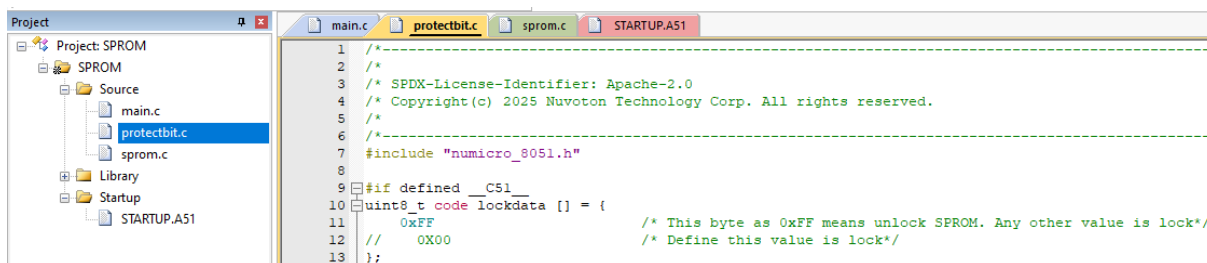
```

1  /*
2  /*
3  /* SPDX-License-Identifier: Apache-2.0
4  /* Copyright(c) 2025 Nuvoton Technology
5  /*
6  /*
7  #include "numicro_8051.h"
8  #include "sprom.h"
9
10 uint8_t SPTIME;
11
12 void SPROM_CODE (void)
13 {
14     GPIO_LED ^= 1;
15     SPTIME++;
16 }
17
18

```

SPROM Security bit control code: File name ProtectBit.c.

IF code define as 0xFF for unlock, define as 0x00 for lock SPROM.

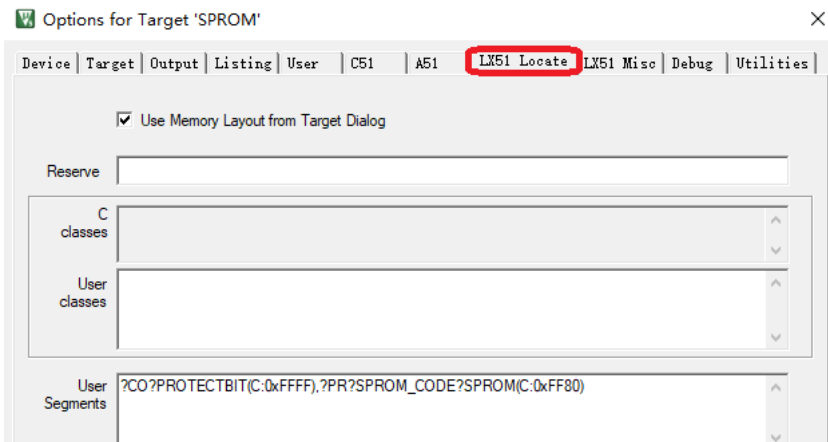


```

1  /*
2  /*
3  /* SPDX-License-Identifier: Apache-2.0
4  /* Copyright(c) 2025 Nuvoton Technology Corp. All rights reserved.
5  /*
6  /*
7  #include "numicro_8051.h"
8
9  #if defined __C51__
10 uint8_t code lockdata [] = {
11     0xFF          /* This byte as 0xFF means unlock SPROM. Any other value is lock*/
12     //  0x00          /* Define this value is lock*/
13 };

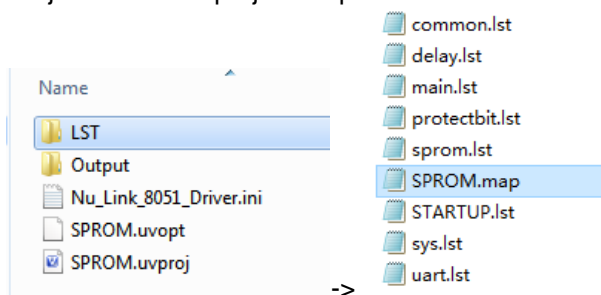
```

Setting the SPROM address and Protect bit address in options / LX51(BL51) Locate.
SPROM code locate in 0xFF80, protect bit locate in 0xFFFF.



To find the option “Code” marco name: check projet.map file

Project folder\Lst\project.map file



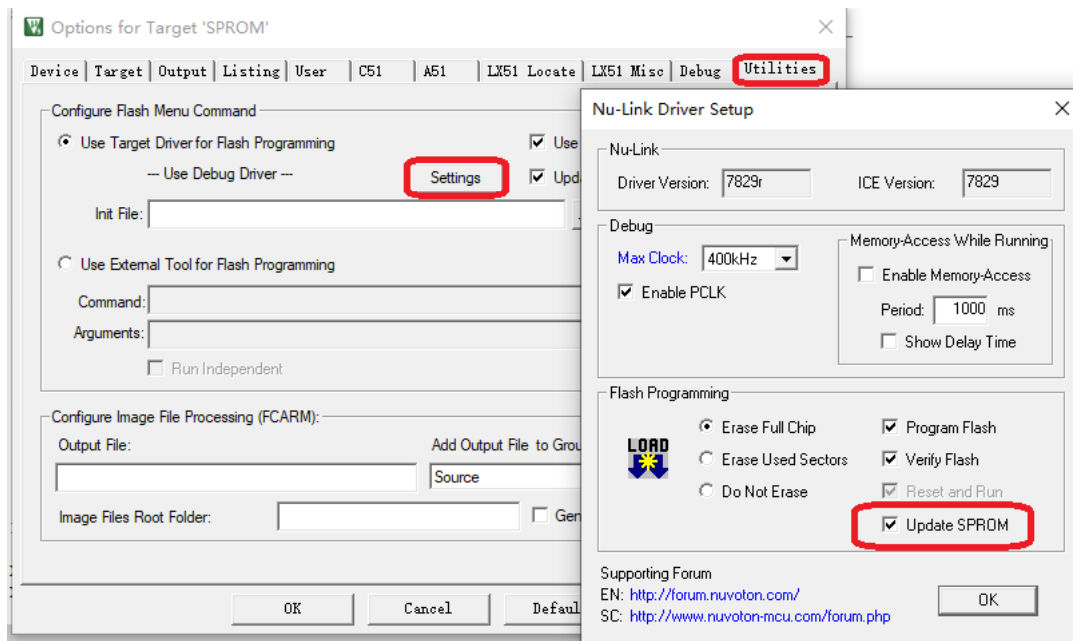
After define the SPROM and SPROM security bit memory mapping
SPROM locate in FF80 and Protectbit locate in FFFF.

0009D9H	0009FFH	000027H	BYTE	UNIT	CONST	?CO?MAIN
000A00H	00FF7FH	00F580H	---	---	**GAP**	
00FF80H	00FF8BH	00000CH	BYTE	UNIT	CODE	?PR?SPROM_CODE?SPROM
00FF8CH	00FFFEH	000073H	---	---	**GAP**	
00FFFFH	00FFFFH	000001H	BYTE	UNIT	CONST	?CO?PROTECTBIT

Before difine the location (without setting address in options)

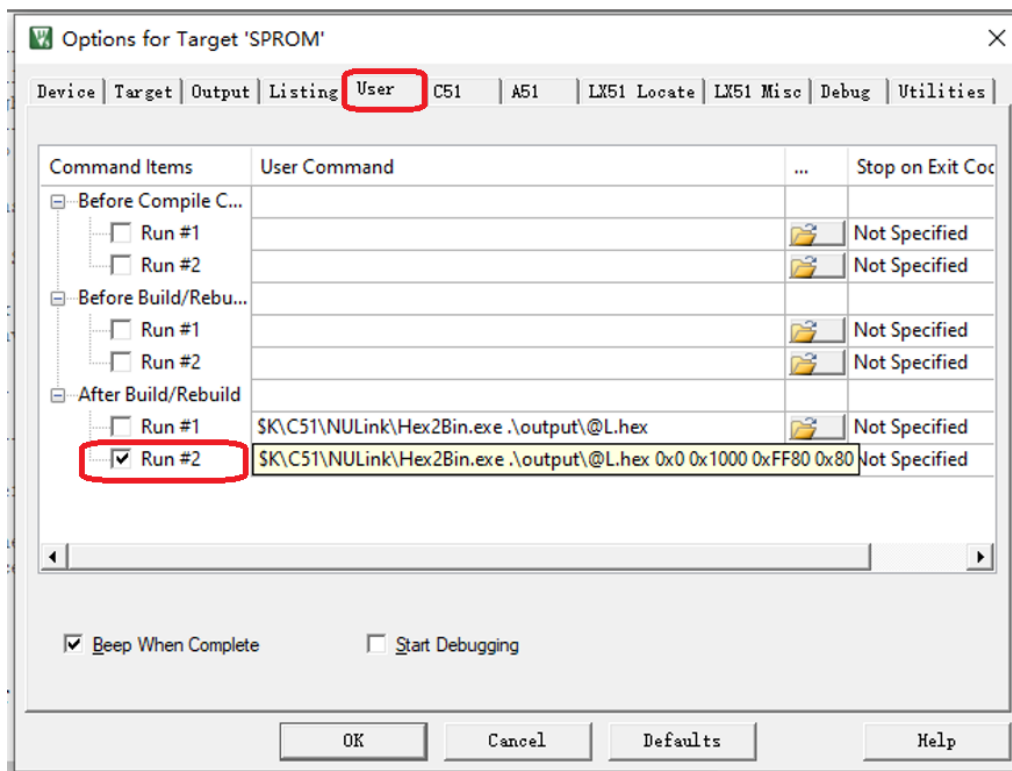
000000H	000002H	000003H	---	OFFS..	CODE	?CO??C_STARTUP?0
000003H	000003H	000001H	BYTE	UNIT	CONST	?CO?PROTECTBIT
000004H	00000FH	00000CH	BYTE	UNIT	CODE	?PR?SPROM_CODE?SPROM
000010H	000374H	000365H	BYTE	UNIT	CODE	?PR?PRINTF?PRINTF

Before download or enter debug mode enable “Update SPROM” is necessary.

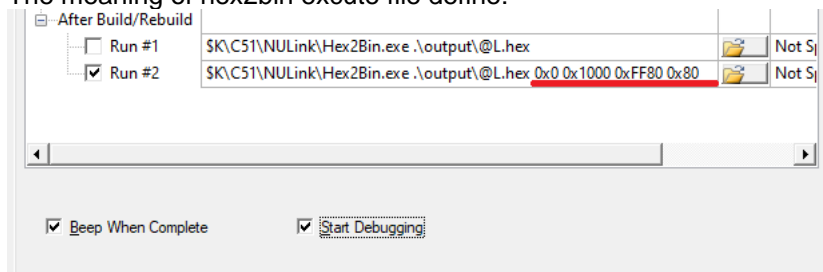


2.3 How To Create The Bin File of APROM and SPROM

Choose run “Options -> User -> Run User Programs After Build/Rebuild as following”



The meaning of hex2bin excute file define:



APROM start address	APROM bin file size define	SPROM start address	SPROM bin file size define
0x0	0x1000	0xFF80	0x80

To fine APROM size check with .map file.

For example in this project the APROM size must be larger than 0x0A00.

0009D9H	0009FFH	000027H	BYTE	UNIT	CONST	?CO?MAIN
000A00H	00FF7FH	00F580H	---	---	**GAP**	
00FF80H	00FF8BH	00000CH	BYTE	UNIT	CODE	?PR?SPROM_CODE?SPROM
00FF8CH	00FFFEH	000073H	---	---	**GAP**	
00FFFFH	00FFFFH	000001H	BYTE	UNIT	CONST	?CO?PROTECTBIT

Note: this hex2bin.exe is only released by nuvoton. Please download nuvoton CM1003 BSP package.

Github: https://github.com/OpenNuvoton/MS51_BSP

https://github.com/OpenNuvoton/ML51_BSP_KEIL

https://github.com/OpenNuvoton/CM1003_BSP

Find in "Output" folder to find the bin file

For APROM code: SPROM.bin

For SPROM code: SPROM1.bin

common.obj	543 KB
delay.obj	548 KB
main.obj	541 KB
protectbit.obj	539 KB
SPROM	3,794 KB
SPROM.bin	4 KB
SPROM.build_log.htm	2 KB
SPROM.hex	8 KB
SPROM.lnp	1 KB
sprom.obj	539 KB
SPROM.SBR	3,716 KB
SPROM1.bin	1 KB
STARTUP.obj	1 KB
sys.obj	550 KB
uart.obj	545 KB

3 REVISION HISTORY

Date	Revision	Description
2019.05.06	1.00	Initial release
2026.01.26	1.01	Renamed NuMicro 8051 Series and replaced the screenshot.

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