

# AP08006

## C868

Interfacing SPI/I2C Serial  
EEPROM with C868  
Microcontroller

Microcontrollers



Never stop thinking.

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## C868

<b>Revision History:</b>	2005-04	<b>V 1.1</b>
Previous Version:	2002-04	V1.0
Page	Subjects (major changes since last revision)	
6	Figure 1 is corrected.	

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## 1 Introduction

The C868 microcontroller offers the key feature of interfacing with an external EEPROM, (re)programming the EEPROM and loading program from EEPROM to on-chip SRAM/XRAM.

This application note describes the type of EEPROM supported, the hardware configuration of the EEPROM with the C868 and the EEPROM functions implemented by the C868 bootstrap loader. Software (three intel hex files) for this application note provides SPI EEPROM (re)programming function. I2C EEPROM software routines will be provided later. Table 1 gives the details of the SPI software.

**Table 1 SPI Software for the application note**

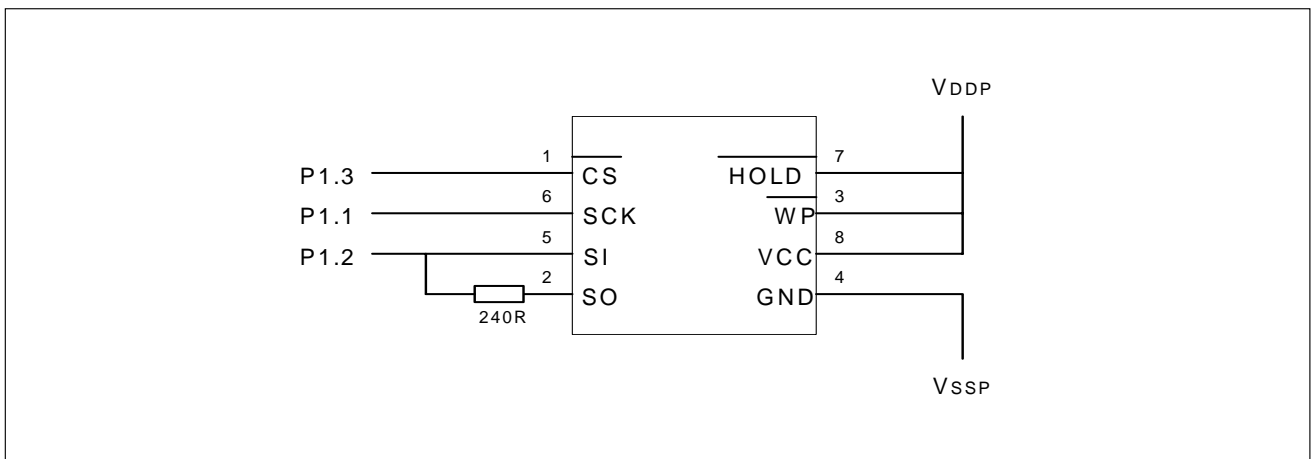
<b>File Name</b>	<b>Function</b>
RPROTECT.HEX	Remove EEPROM write protection.
EPROA5_G.HEX	Program EEPROM with the SRAM content and program the first byte of EEPROM as 0A5H.
EPRO00_G.HEX	Program EEPROM with the SRAM content and program the first byte of EEPROM as 00H.

## 2 Type of EEPROM

The type of external EEPROM supported is SPI or I2C serial EEPROM. Serial EEPROM devices offer significant advantages over parallel devices in applications where lower data transfer rates are acceptable. They also require less board space and allow microcontroller I/O pins to be conserved. This is valuable to our low pin count C868 microcontroller. Furthermore, SPI or I2C specification is easy to be implemented in software. Additionally, please note that only EEPROM in 32-byte page mode is supported. There is no limitation on the size of the EEPROM. However, as the SRAM size is 8K, It is suggested to use EEPROM ( $\geq 8K$  bytes) so that all SRAM content can be loaded to EEPROM.

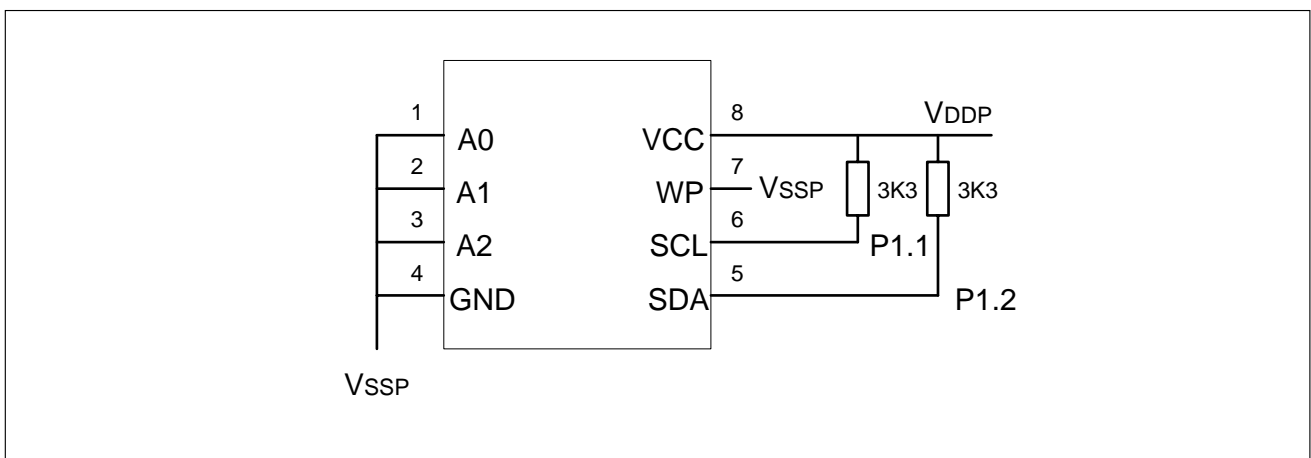
### 3 Hardware Configuration

The SPI EEPROM is connected to the C868 microcontroller in three-wire configuration as shown in Fig.1. In this configuration, the SPI EEPROM serial data in (SI) and serial data out (SO) are both connected to the same C868 I/O pin, thereby saving a pin. This is possible because the C868 I/O pins can be dynamically reprogrammed as input or output.



**Figure 1 Three-wire connection to SPI EEPROM**

The connection of I2C EEPROM to the C868 is shown in Fig. 2. The address inputs (A0, A1, A2) can be hardwired either to Vssp (low) or Vccp (high). In this configuration, they are all hardwired to Vssp to have an address zero. WP (Write Protect Input Pin) is also tied to Vssp (low) to allow normal write operations. Serial Clock (SCL) is connected to P1.1 and Serial Data (SDA) is connected to P1.2. SCL and SDA are both externally pulled up through resistors (3.3K). This is to simulate an open-drain port behavior which is required by I2C protocol.



**Figure 2 Two-wire connection to I2C EEPROM**

## 4 Function Description

Through the C868 bootstrap loader, host PC software and software for this application note, the user can easily implement (re)programming the EEPROM and loading program from the EEPROM to SRAM/XRAM.

### 4.1 (Re)program EEPROM

After boot-up from bootrom, the MCU would try to read the first byte (Password) of EEPROM. If Password is 0A5H (a dummy code), the MCU would directly load program from the EEPROM to SRAM/XRAM and then execute from SRAM/XRAM after loading is completed. Otherwise, it would start serial communication with the host PC. The host controls the communication by sending special header information, which selects one of the working modes.

For the first time, the EEPROM is empty, so the MCU would start serial communication with the host PC. Write Protection of EEPROM must be removed to enable further EEPROM programming.

Step 1: Select Mode 0: download **RPROTECT.HEX** to XRAM.

Step 2: Select Mode 1: execute **RPROTECT.HEX** in XRAM.

Now the EEPROM is writable and can be programmed.

Step 3: Apply a reset and invoke serial communication with the host again.

Step 4: Select Mode 0: download either **EPROA5\_G.HEX** or **EPRO00\_G.HEX** to XRAM.

Step 5: Select Mode 1: execute code in XRAM.

In this way, EEPROM is programmed with the SRAM content. Pls take note that only SRAM content 0000H to 1FF7H can be programmed to EEPROM. The last 8 bytes of SRAM cannot be programmed. If you want to program the first byte of the EEPROM as the password 0A5H, use the **EPROA5\_G.HEX**; otherwise, use **EPRO00\_G.HEX**.



## 4.2 Load program from EEPROM to SRAM/XRAM

Once EEPROM is programmed with the password 0A5H, after boot-up from bootrom, the MCU would directly load program from the EEPROM to SRAM/XRAM and then execute from SRAM/XRAM after loading is completed. Otherwise, loading program from EEPROM to SRAM/XRAM can be invoked by host command mode 3.

## 5 Glossary

XRAM                      On-chip ram mapped at address 0FF00H to 0FFFFH

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