

ABSTRACT

There are a few things to consider when choosing a flash part for application purposes. This application report covers some of the basic requirements that a specific flash memory must support to be compatible with the AM263x device during both boot operation and application execution.

Table of Contents

1 Introduction	2
1.1 Acronyms Used in This Document	3
2 ROM Boot Requirements	3
3 Application Requirements	3
4 Additional Usage Factors	3
5 Flash Support in MCU PLUS SDK	4
6 Compatible Flash Devices	. 4
7 References	. 4
8 Revision History	4

List of Figures

Figure 1-1. QSPI Flash Memory Map	2
Figure 1-2. General Boot Flow.	2

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1



1 Introduction

The QSPI Flash memory can be utilized two different ways in the user system:

- Memory is used as boot media; the application image is stored in the Flash memory and used as bootloader source.
- Memory is used as a storage media during application.

When picking a Flash memory IC, the device must comply with all boot requirements of the system-on-chip (SoC). If the memory is used as boot media, some guidelines must be followed to work efficiently as a storage device during application.

Figure 1-1 depicts the Flash memory organization once the secondary bootloader (SBL) image and valid application image are present.

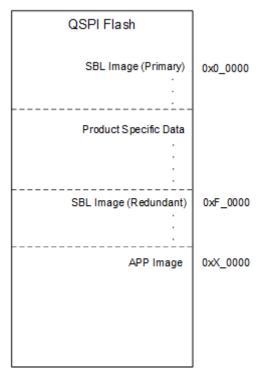
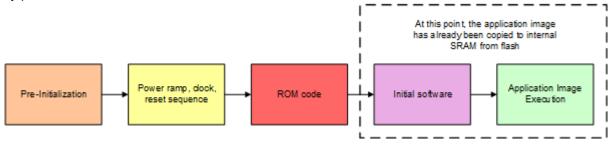


Figure 1-1. QSPI Flash Memory Map

Note You can utilize the flash region starting at "0x0_0000 + SBL Size Image" to 0xE_FFFF for product specific data.

Figure 1-2 shows the Boot Flow process where the flash usage is put into perspective, assuming a valid image is already present in flash.





1.1 Acronyms Used in This Document

SBL - Secondary Boot loader

- MCU Microcontroller Unit
- QSPI Quad Serial Peripheral Interface

ROM - Read-only memory

- SoC System on a Chip
- SDK Software Development Package

UART – Universal Asynchronous Receiver-Transmitter

2 ROM Boot Requirements

As seen in Figure 1-2, the boot flow process is a sequence adopted by AM263x that starts upon power-on. ROM code is already set to work in a certain way and expects specific instructions from the flash and expect specific timing and framing configurations for establishing communication. For the AM263x device, ROM code expects the following support:

- Flash device must operate in the 3.3 V vicinity (typical range 2.3 V to 3.6 V)
- Flash must be able to support Quad Output Fast Read (opcode 0x6B)
- Flash must be able to support Fast Read in Single Mode (opcode 0x0B)
- Device must allow 8 "dummy" clock cycles for setting up the initial address during the previously mentioned read operations
- · Flash must support 3-byte (24-bit) addressing mode by default
- Flash memory size 4MB is recommended as a minimum

All of this information is available in the data sheet of the flash device being evaluated. A flash device must support all of the points mentioned above to meet AM263x compatibility requirements.

3 Application Requirements

Application-specific requirements tend to be more lenient then the ROM code execution requirements as improper configuration and lack of support won't result in system boot failure. The following requirements must be met for general flash applications:

- Flash device must operate in the 3.3 V vicinity (typical range 2.3 V to 3.6 V).
- If the Flash memory is larger than 16MB (128Mb), then a flash device package with support for a RESET signal is required to prevent a device warm reset from affecting ROM code execution.

Note

Even though there is not a hard limit imposed on the Flash memory that can be used, AM263x only supports up to 4-byte addressing communication mode. As a result, any address requiring over 32 bits to reach is virtually inaccessible.

Note

in Serial Flash Interface mode (SFI), AM263x's external flash support is limited to 8MB. For more information on SFI operation, see the *Quad Serial Peripheral Interface (QSPI)* section of the *AM263x* Sitara™ Microcontroller Technical Reference Manual.

4 Additional Usage Factors

The following are also a few things to consider when deciding on what flash part to use for the application:

- What is the flash required for? Some applications require more flash storage than others depending if the memory is used for booting or storage
- Is the entirety of the memory be used? A smaller and lower-cost flash device can be used if a large storage space is not needed
- Is the application heavily flash dependent? Typically, 8MB to 16MB is enough for an application, but this varies depending on how heavily external storage is be used



 Does the flash part support a RESET signal? If at any point of the application 4-byte addressing mode must be used, then a RESET signal is required as to prevent booting problems upon reset.

5 Flash Support in MCU PLUS SDK

The MCU PLUS SDK comes with default flash software support for specific Flash memories in the library. If the evaluated flash meets requirements but does not have compatible software drivers in the SDK. For instructions on how to add support for the Flash memory, see the link below:

https://software-dl.ti.com/mcu-plus-sdk/esd/AM263X/latest/exports/docs/api_guide_am263x/CUSTOM_FLASH_SUPPORT_GUIDE.html

6 Compatible Flash Devices

Below is a short list of devices that meet the requirements for correct operation with Sitara MCU's AM263x as per the information contained in the device-specific data sheets. This list is be used for reference only:

- S25FL128S/S25FL256S family of devices
 - Manufacturer: Infineon
- W25Q series
 - Manufacturer: Winbond
- GD25 series
 - Manufacturer: GigaDevice
- MX25xxx35 series
 - Manufacturer: Macronix
- IS25LE/IS25LP Series
 - Manufacturer: ISSI

The following devices from the above families have been validated using AM263x:

- S25FL128S
- W25Q16DV ¹

Note

For information on physical connections between SoC and external flash, see the QSPI Environment section in the AM263x Sitara[™] Microcontroller Technical Reference Manual.

7 References

- Sitara MCU Device Portfolio
- AM263x Product Page
- MCU-PLUS-SDK-AM263X Tool Page
- MCU+ Academy for AM263x Getting Started Page
- Texas Instruments: AM263x Sitara™ Microcontroller Technical Reference Manual

8 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

С	hanges from Revision * (August 2022) to Revision A (March 2023)	Page
•	Updated the numbering format for tables, figures and cross-references throughout the document	2
•	Updated Section 6	4

¹ W25Q16DV is no longer recommended for new designs by WINBOND. However, the complete family of W25Q series devices meet the requirements for correct operation with AM263x.

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