

Common Flash Interface Version 1.4 Vendor Specific Extensions



Application Note

Introduction

This application note provides an overview of the changes implemented between versions 1.3 and 1.4 of the Spansion™ Flash memory Common Flash Interface (CFI) implementation.

CFI is a JEDEC standard database that may be read from a Flash memory. It allows Flash driver software to query the installed device to determine the proper configuration, e.g. memory size, speed, special features, and other characteristics.

The JEDEC CFI standard provides for vendor specific extensions to the basic device information. These extensions provide information about optional device features. As successive device generations add new features new fields are added to the vendor specific extensions area.

Benefit

There are two main benefits of using CFI

- Ease of upgrading memory density or features
- Second source availability

CFI-compliant Flash allows the system designer to add and upgrade memory without the inconvenience of modifying Flash driver software to adapt to each new device in a product family. This holds true for new devices of higher density or different sector architecture than available at the time of initial system and driver development.

CFI Data Structure

From the CFI mode the user can access the following information (**Note, the subsequent CFI data tables are provided as examples only. For product-specific CFI data, refer to the Spansion Datasheet**):

1. CFI Identification String - A standard string of characters that any CFI compliant device will display so that Flash driver software can confirm that a CFI device is in use. See *Table 1*.
2. System Interface String - Information on device voltage and timing parameter. See *Table 2*.
3. Device Geometry Definition - Information on command protocol, device size, and sector sizes. See *Table 3*.
4. Primary Vendor-Specific Extended Query - Information on vendor or device specific features that are supported. See *Table 4*.

Table 1. CFI Query Identification String

Addresses (x16)	Data	Description
10h 11h 12h	0051h 0052h 0059h	Query Unique ASCII String "QRY"
13h 14h	0002h 0000h	Primary OEM Command Set
15h 16h	0040h 0000h	Address for Primary Extended Table
17h 18h	0000h 0000h	Alternate OEM Command Set (00h = none exists)
19h 1Ah	0000h 0000h	Address for Alternate OEM Extended Table (00h = none exists)

Table 2. System Interface String

Addresses (x16)	Data	Description
1Bh	0027h	V _{CC} Min. (Write/Erase) D7-D4: volt, D3-D0: mV
1Ch	0036h	V _{CC} Max. (Write/Erase) D7-D4: volt, D3-D0: mV

Table 2. System Interface String (Continued)

Addresses (x16)	Data	Description
1Dh	0000h	V _{pp} Min. voltage (00h = no V _{pp} pin present)
1Eh	0000h	V _{pp} Max. voltage (00h = no V _{pp} pin present)
1Fh	0007h	Typical timeout per single byte/word 2 ^N μs
20h	0007h	Typical timeout for Min. size buffer write 2 ^N μs (00h = not supported)
21h	0000h	Typical timeout per individual block erase 2 ^N ms
22h	0000h	Typical timeout for full chip erase 2 ^N ms (00h = not supported)
23h	0001h	Max. timeout for byte/word write 2 ^N times typical
24h	0005h	Max. timeout for buffer write 2 ^N times typical
25h	0004h	Max. timeout per individual block erase 2 ^N times typical
26h	0000h	Max. timeout for full chip erase 2 ^N times typical (00h = not supported)

Table 3. CFI Device Geometry Definition

Addresses (x16)	Data	Description
27h	0018h	Device size = 2 ^N byte
28h 29h	0002h 0000h	Flash device interface description (refer to CFI publication 100)
2Ah 2Bh	0005h 0000h	Max. number of byte in multi-byte write = 2 ^N (00h = not supported)
2Ch	0001h	Number of erase block regions within device (01h = uniform device, 02h = boot device)
2Dh 2Eh 2Fh 30h	00FFh 0000h 0000h 0001h	Erase block region 1 information (refer to the CFI specification or CFI publication 100)
31h 32h 33h 34h	0000h 0000h 0000h 0000h	Erase block region 2 information (refer to CFI publication 100)
35h 36h 37h 38h	0000h 0000h 0000h 0000h	Erase block region 3 information (refer to CFI publication 100)
39h 3Ah 3Bh 3Ch	0000h 0000h 0000h 0000h	Erase block region 4 information (refer to CFI publication 100)

Table 4. Primary Vendor-Specific Extended Query

Addresses (x16)	Data	Description
40h 41h 42h	0050h 0052h 0049h	Query-unique ASCII string "PRI"
43h	0031h	Major version number, ASCII
44h	0033h	Minor version number, ASCII
45h	0004h	Address Sensitive Unlock (Bits 1-0) 0 = Required, 1 = Not Required Silicon Technology (bits 5-2) 0001 = 0.17 μm
46h	0002h	Erase Suspend 0 = Not Supported, 1 = To Read Only, 2 = To Read & Write
47h	0001h	Sector Protect 00 = Not Supported, x = Number of sectors per group
48h	0000h	Sector Temporary Unprotect 00 = Not Supported, 01 = Supported
49h	0005h	Sector Protect / Unprotect scheme 04 = 29LV800 mode
4Ah	0063h	Simultaneous Operation Number of sectors in all banks except boot block
4Bh	0001h	Burst Mode Type 00 = Not Supported, 01 = Supported
4Ch	0000h	Page Mode Type 00 = Not Supported, 01 = 4 Word Page, 02 = 8 Word Page
4Dh	0085h	ACC (Acceleration) Supply Minimum 00h = Not Supported, D7-D4: Volt, D3-D0: 100mV
4Eh	00C5h	ACC (Acceleration) Supply Maximum 00h = Not Supported, D7-D4: Volt, D3-D0: 100mV
4Fh	00xxh	Top/Bottom Boot Sector Flag 02h = Bottom Boot Device, 03h = Top Boot Device
50h	0000h	Program Suspend. 00h = not supported
57h	0004h	Bank Organization: x = Number of Banks
58h	0023h	Bank A Region Information. x = Number of sectors in bank
59h	0020h	Bank B Region Information. x = Number of sectors in bank
5Ah	0020h	Bank C Region Information. x = Number of sectors in bank
5Bh	0023h	Bank D Region Information. x = Number of sectors in bank

Changes

The major difference between Spansion™ memory specific CFI extensions version 1.3 and version 1.4 are the addition of these features in the Primary Vendor-Specific Extended Query section:

- Unlock Bypass
- SecSi Sector size
- Hardware Reset Low Time-out during an embedded algorithm

- Hardware Reset Low Time-out not during an embedded algorithm
- Erase Suspend Time-out Maximum
- Program Suspend Time-out Maximum
- Increased Bank region information from four bank to thirty-two bank

These changes will be implemented in new Spansion™ Flash devices. The added features are highlighted in *Table 5*. New Features are highlighted in **bold face** type.

Table 5. Updated Primary Vendor-Specific Extended Query

Address (byte mode)	Data	Description
40h 41h 42h	50h 52h 49h	query-unique ASCII string "PRI"
43h	31h	Major version number ASCII
44h	34h	Minor version ASCII
45h		Address Sensitive Unlock (DQ1,DQ0) 0000 (Hex) = required, 0001 (Hex) = NOT Required Process Technology (DQ5-DQ2) 0001 (Hex) = 170-nm Floating Gate technology 0010 (Hex) = 230-nm MirrorBit™ technology 0011 (Hex) = 130-nm Floating Gate technology 0100 = 110-nm MirrorBit™ technology 0101 = 90-nm Floating Gate technology 0110 = 90-nm MirrorBit™ technology
46h		Erase Suspend 00 = Not Supported, 01 = To read only, 02 = To read and write
47h		Sector Protect 00 = Not Supported, X = Number of sectors per group
48h		Sector Temporary Unprotect 00 = Not Supported, 01 = Supported
49h		Sector Protect/Unprotect scheme 01 = 29F040 mode 02 = 29F016 mode 03 = 29F400 mode 04 = 29LV800 mode -> RESET# or A9 =Vid 05 = Software command sector locking 06 = New Sector Protect 07 = RESET# or A9 =Vid + New Sector Protect 08 = Advanced Sector Protect
4Ah		Simultaneous Operation 00 = Not Supported, X = Total number of sectors in all banks except BOOT BANK
4Bh		Burst Mode Type 00 = Not Supported, 01=Supported
4Ch		Page Mode Type 00 = Not Supported, 01 = 4 word Page, 02 = 8 word Page, 03 = 16 word Page
4Dh		ACC (Acceleration) Supply Minimum Bit 7-4 = Hex Value in Volts Bit 3-0 = BCD Value in 100 Millivolts

Table 5. Updated Primary Vendor-Specific Extended Query (Continued)

Address (byte mode)	Data	Description
4Eh		ACC (Acceleration) Supply Maximum Bit 7-4 = Hex Value in Volts Bit 3-0 = BCD Value in 100 Millivolts
4Fh		Top/Bottom Sector Flag 00 = No Boot 01 = 8x8kb, Sectors at TOP and Bottom 02 = Bottom Boot Device 03 = Top Boot Device 04 = Uniform Bottom Boot Device 05 = Uniform Top Boot Device
50h		Program Suspend 00 = Not Supported, 01=Supported
51h		Unlock Bypass 00 = Not Supported, 01 = Supported
52h		SecSi Sector (Customer OTP Area) Size 2ⁿ (Bytes)
53h		Embedded Hardware Reset Timeout Maximum < 2ⁿ (ns)
54h		Non-Embedded Hardware Reset Timeout Maximum < 2ⁿ (ns)
55h		Erase Suspend Timeout Maximum < 2ⁿ (us)
56h		Program Suspend Timeout Maximum < 2ⁿ (us)
57h		Bank Organization 00 = If data at 4Ah is Zero XX = Number of banks
58h		Bank1 Region Information = Number of sectors in Bank 1
59h		Bank2 Region Information = Number of sectors in Bank 2
5Ah		Bank3 Region Information = Number of sectors in Bank 3
5Bh		Bank4 Region Information = Number of sectors in Bank 4
5Ch		Bank5 Region Information = Number of sectors in Bank 5
5Dh		Bank6 Region Information = Number of sectors in Bank 6
5Eh		Bank7 Region Information = Number of sectors in Bank 7
5Fh		Bank8 Region Information = Number of sectors in Bank 8
60h		Bank9 Region Information = Number of sectors in Bank 9
61h		Bank10 Region Information = Number of sectors in Bank 10
62h		Bank11 Region Information = Number of sectors in Bank 11

Table 5. Updated Primary Vendor-Specific Extended Query (Continued)

Address (byte mode)	Data	Description
63h		Bank12 Region Information = Number of sectors in Bank 12
64h		Bank13 Region Information = Number of sectors in Bank 13
65h		Bank14 Region Information = Number of sectors in Bank 14
66h		Bank15 Region Information = Number of sectors in Bank 15
67h		Bank16 Region Information = Number of sectors in Bank 16
68h		Bank17 Region Information = Number of sectors in Bank 17
69h		Bank18 Region Information = Number of sectors in Bank 18
6Ah		Bank19 Region Information = Number of sectors in Bank 19
6Bh		Bank20 Region Information = Number of sectors in Bank 20
6Ch		Bank21 Region Information = Number of sectors in Bank 21
6Dh		Bank22 Region Information = Number of sectors in Bank 22
6Eh		Bank23 Region Information = Number of sectors in Bank 23
6Fh		Bank24 Region Information = Number of sectors in Bank 24
70h		Bank25 Region Information = Number of sectors in Bank 25
71h		Bank26 Region Information = Number of sectors in Bank 26
72h		Bank27 Region Information = Number of sectors in Bank 27
73h		Bank28 Region Information = Number of sectors in Bank 28
74h		Bank29 Region Information = Number of sectors in Bank 29
75h		Bank30 Region Information = Number of sectors in Bank 30
76h		Bank31 Region Information = Number of sectors in Bank 31
77h		Bank32 Region Information = Number of sectors in Bank 32

Conclusion

These changes enable updated Flash driver software to recognize and make use of new device features.

Revision Summary

Revision A (March 22, 2004)

Initial Release.

Trademarks and Notice

This document contains FASL confidential information. The contents of this document may not be copied nor duplicated in any form, in whole or in part, without prior written consent from FASL. The information in this document is subject to change without notice. Product and Company names are trademarks or registered trademarks of their respective owners

Copyright 2004 FASL LLC. All rights reserved.