Migrating from Single-byte to Three-byte Device IDs

Application Note

July 2003

The following document refers to Spansion memory products that are now offered by both Advanced Micro Devices and Fujitsu. Although the document is marked with the name of the company that originally developed the specification, these products will be offered to customers of both AMD and Fujitsu.

Continuity of Specifications

There is no change to this document as a result of offering the device as a Spansion product. Any changes that have been made are the result of normal documentation improvements and are noted in the document revision summary, where supported. Future routine revisions will occur when appropriate, and changes will be noted in a revision summary.

Continuity of Ordering Part Numbers

AMD and Fujitsu continue to support existing part numbers beginning with "Am" and "MBM". To order these products, please use only the Ordering Part Numbers listed in this document.

For More Information

Please contact your local AMD or Fujitsu sales office for additional information about Spansion memory solutions.

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Introduction

This document describes the device driver changes necessary in order to migrate from single-byte device IDs to three-byte device IDs. Device IDs in AMD Flash devices are accessible either via a software command sequence or through a high-voltage hardware method. Because AMD has utilized all possible single-byte device codes, new devices will utilize a new three-byte device ID changes affect customers using the Am29BDS643D, Am29PDS322D, Am29DL640D, and Am29PL320D devices. Specifically, device driver changes are required in order to uniquely identify devices utilizing three-byte device IDs. Future product migrations, including those for MirrorBit devices, will also utilize the three-byte device ID.

Device Codes on Older Devices

High-Voltage Hardware Method

The "High-Voltage Method" provides a hardware method of reading device codes on AMD Flash devices. To implement the High-Voltage Method in previous AMD devices, control pins must be held at a specified state and voltage V_{ID} is applied at Address Pin A9. Using the High-Voltage Method, address pins A6, A1, and A0 can be used to switch in between reading the Manufacturer ID, Device ID, Sector Protection Verification, and the SecSi Sector Indicator Bit. With A1 held low, A0 held high, A6 held low, and V_{ID} on A9, the device code is read on the least significant eight bits of the databus. Table 1 illustrates the hardware settings for Device ID using the High-Voltage Method. The illustration is based on the Am29LV641DH/L, an example using a 16-bit data bus.

Table 1. Manufacturer and Device ID

Description	CE#	OE#	WE#	A21: A10	A9	A8: A7	A6	A5: A2	A1	A0	DQ15: DQ0
Device ID: Am29LV641D	L	L	H	X	V_{ID}	X	L	X	L	H	22D7h

Note: V_{ID} = 8.5 to 12.5 V

Software Command Sequence

The manufacturer and device codes for AMD devices may also be read via the autoselect command sequence. The autoselect command sequence is initiated by first writing two unlock cycles. This is followed by a third write cycle that contains the bank address [1] and the autoselect command. The bank then enters the autoselect mode. The following, typical[2] bus-cycle sequence accesses the autoselect mode; where BA is the bank address and X is don't care.

Bus-cycle	Address	Data
1	X555	AA
2	X2AA	55
3	(BA) X555	90

The system may read at any address within the same bank any number of times without initiating another autoselect command sequence. Previously, AMD device codes consisted of a unique single-byte combination read at address 01h[3] within the autoselect mode. For example, the command definition for reading the device ID from the Am29LV010B (3.0 V, 1 Mbit, uniform

1. For AMD devices offering Simultaneous Read/Write functionality, the bank address bits identify the bank from which the device code will be read and utilizes the top few bits of the address bus. For devices with only one bank, it is unnecessary to include the bank address in the command sequence.

2. While most previous AMD devices follow this sequence, a few exception devices differ slightly. Please consult datasheet for device-specific information.

3. Address 02h is used in devices utilizing the A-1 line during addressing. For example, byte-wide databus mode on x8/x16 devices utilizes the A-1 line. Likewise, word-wide databus mode on x16/x32 devices also utilizes the A-1 line.

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sector device), including the autoselect command sequence, is as follows:

Bus-cycle	Address	Data
1	555	AA
2	2AA	55
3	555	90
4	X01	6E

In this example, 6Eh is the device code for the device. Note that the bank address is not needed for this device, because it does not offer multiple banks (Simultaneous Read/Write).

Migrating to Three-byte Device Codes

High-Voltage Hardware Method

For devices utilizing a three-byte device code, the device code may still be read via the high-voltage method, but requires three separate reads in order to uniquely identify the device. In addition, the reads now require logic applied to the A3 and A0 pins, in addition to the other device pins. Holding A3:A1 low, A0 high, A6 low, and A9 at V_{ID} reads the first byte of the device ID. The second byte is read by holding A3:A1 high, A0 low, A6 low, and A9 at V_{ID}. The third byte of the device code is read by holding A3:A0 high, A6 low, and A9 at V_{ID}. Table 2 describes the high-voltage method for reading the device ID for the Am29PL320D device.

Table 2. High-Voltage Method

Description	CE#	OE#	WE#	A19: A10	A9	A8: A7	A6	A5: A4	A3	A2	A1	A0	DQ7: DQ0
Device ID Read 1	L	L	H	X	V_{ID}	X	L	X	L	L	L	H	7Eh
Device ID Read 2	L	L	H	X	V_{ID}	X	L	X	H	H	H	L	03h
Device ID Read 3	L	L	H	X	V_{ID}	X	L	X	H	H	H	H	00h (bottom boot); 01h (top boot)

Note: V_{ID} = 8.5 to 12.5 V

Software Command Sequence

For devices utilizing a three-byte device ID, the device code may still be read via the autoselect command sequence, but will require three-sequential read cycles in order to uniquely distinguish the device. The three read cycles are read at addresses 01h, 0Eh, and 0Fh, respectively. For a device utilizing the A-1 line[4], the three read cycles are read at addresses 02h, 1Ch, and 1Eh. The device code 7Eh read during the first read cycle (where the single-byte device code was read in previous devices) now indicates that two additional read cycles are required to completely identify the device.

4. See footnote 2 on page 1.

For example, the command definition for reading the device code from the Am29DL640D (64 Mbit, 8 M x 8-bit/4 M x 16-bit device) in word-mode is as follows (where BA is the Bank Address and X is don't care):

Bus-cycle	Address	Data
1	555	AA
2	2AA	55
3	(BA) 555	90
4	(BA) X01	7E
5	(BA) X0E	02
6	(BA) X0F	01

Likewise, the command definition for reading the Am29DL640D in byte-mode is as follows:

Bus-cycle	Address	Data
1	AAA	AA
2	555	55
3	(BA) AAA	90
4	(BA) X02	7E
5	(BA) X1C	02
6	(BA) X1E	01

Required Modifications

For devices utilizing a three-byte device ID, using only the first read cycle of the device ID-in either the high-voltage hardware method or in the software command sequence-will not completely identify the device. Consequently, customers utilizing the Am29BDS643D, Am29PDS322D, Am29DL640D, and Am29PL320D devices must update any software drivers utilizing the software command sequence in order to reflect the updated device codes. In addition, customers planning to migrate to MirrorBit or future AMD devices should also update any drivers as needed. Programmers utilizing the High-Voltage Method should also update any drivers as needed.

Device ID Reference Table

Table 3 summarizes device ID combinations for AMD Flash devices. Please refer to the datasheets posted on www.amd.com for complete, up-to-date descriptions of device codes for all AMD devices:

Table 3. AMD Flash Device IDs

Flash Device	Device ID
Am29BDS643D	7E 02 00
Am29PDS322D	7E 06 01 (T); 7E 06 00 (B)
Am29DL640D	7E 02 01
Am29PL320D	7E 03 01 (T); 7E 03 00 (B)
Am29LV640G	7E 0E 01(T); 7E 0E 00 (B); 7E 0C 00 (H, L)
Am29LV641G	7E 0F 01 (T); 7E 0F 00 (B)
Am29LV065M - MirrorBit™	7E 13 00 (U)
Am29LV640M - MirrorBit™	7E 10 01 (T); 7E 10 00 (B); 7E 0C 01 (H, L); 7E 13 01 (U)
Am29LV641M - MirrorBit™	7E 11 01 (T); 7E 11 00 (B); 7E 13 01 (H, L)
Am29LV128M - MirrorBit™	7E 12 00 (H, L)
Am29LV256M - MirrorBit™	7E 12 01 (H, L)
Am29BDS323D	D1
Am29DS163D	95 (T); 96 (B)
Am29DS323D	B7 (T); B8 (B)
Am29DL400B	0C (T); 0F (B)
Am29DL800B	4A (T); CB (B)
Am29DL161D	36 (T); 39 (B)
Am29DL162D	2D (T); 2E (B)
Am29DL163D	28 (T); 2B (B)
Am29DL164D	33 (T); 35 (B)
Am29DL322D	55 (T); 56 (B)
Am29DL323D	50 (T); 53 (B)
Am29DL324D	5C (T); 5F (B)
Am29SL800C	EA (T); 6B (B)
Am29SL160C	E4 (T); E7 (B)
Am29LV200B	3B (T); BF (B)
Am29LV400B	B9 (T); BA (B)
Am29LV800B	DA (T); 5B (B)
Am29LV160B/ Am29LV160D	C4 (T); 49 (B)
Am29LV320D	F6 (T); F9 (B)
Am29LV001B	ED (T); 6D (B)
Am29LV002B	40 (T); C2 (B)
Am29LV004B	B5 (T); B6 (B)
Am29LV008B	3E (T); 37 (B)
Am29LV116D	C7 (T); 4C (B)
Am29LV010B	6E
Am29LV040B	4F
Am29LV081B	38
Am29LV017D	C8
Am29LV033C	A3
Am29LV065D/ Am29LV652D/ Am29LV065GU	93
Am29LV640D/ Am29LV641D/ Am29LV641GH/ Am29LV641GL/ Am29LV640GU	D7
Am29F002B/ Am29F002NB	B0 (T); 34 (B)
Am29F004B	77 (T); 7B (B)
Am29F200B	51 (T); 57 (B)
Am29F400B	23 (T); AB (B)
Am29F800B	D6 (T); 58 (B)
Am29F160D	D2 (T) D8 (B)

Flash Device	Device ID
Am29F010B	20
Am29F040B	A4
Am29F080B	D5
Am29F016D	AD
Am29F017D	3D
Am29F032B	41
Am29BL802C	81

Flash Device	Device ID
Am29BL162C	03
Am29PL160C	45

B = Bottom Boot Device, T = Top Boot Device, U = Uniform Sector Device (no WP#), H = Uniform Sector Device (highest address sector protected), L = Uniform Sector Device (lowest address sector protected)

REVISION SUMMARY

Revision A (September 25, 2001)

Initial release.

Revision A+1 (November 8, 2001)

Global

Deleted references to manufacturer ID.