

29F010, 29F010A, 29F010B Technical Brief

Revision Status

10/98 *Process Change*

Date	Description	Impact	Comments
8/4/97	Die Shrink	No change in 29F010 part number or data sheet	
10/98	<i>Process Change</i> from 0.85u to 0.55u	29F010 replaced with 29F010A, no change to data sheet	11/98 final ship for old parts
11/99	<i>Process Change</i> from 0.55u to 0.32u	29F010A replaced with 29F010B, no change to data sheet	12/99 final ship for old parts The Embedded Erase operation erases 2 sectors at a time rather than all sectors in parallel (no change to data sheet erase time parameters

Behavior Difference When Applying the Autoselect Command To obtain Mfr. ID and Device ID for Am29F010 vs. 29F010A vs. Am29F010B

1. *The "old" data sheet for Am29F010, "Autoselect Command", 1996 Flash Data book, p1-11:*

"The device contains a command autoselect operation to supplement traditional PROM programming methodology. The operation is initiated by writing the autoselect command sequence into the command register. Following the command write, a read cycle from address XX00H retrieves the manufacture code of 01H. A read cycle from address XX01H returns the device code 20H (see Table 2). All manufacturer and device codes will exhibit odd parity with the (DQ7) defined as the parity bit.

.....

To terminate the operation, it is necessary to write the read/reset command sequence into the register."

The sentence highlighted in red was in the 29F010 data sheets as far back as September, 1992 (PID#16736, Rev.C) but the parts would tolerate a violation of the requirement. AMD's position was that a user should always follow the data sheet specification to avoid upward compatibility issues and therefore recommended the use of a reset to exit Autoselect mode..

2 *With the Am29F010 device version, customer(s) would implement the autoselect command with the following sequence:*

The customer issued the 4-bus cycle autoselect command to obtain Manufacturer ID (01H) and then re-issued another 4-bus cycle autoselect command to obtain Device ID (A4H). **An eight step process.**

For the Am29F010, this worked (although this was not intended to work like this).

The correct method to do this was to issue the 4-bus cycle autoselect command to obtain Mfr. ID, then simply reading out of the next address

to obtain Device ID. **A six step process** (including read/reset command). The customer did not have to re-issue the 4-bus cycle sequence to read the Device ID.

3 *Problem seen by the customer after converting to Am29F010A and Am29F010B without changing their software:*

Because the previous Autoselect command is not terminated correctly, the following command* will be corrupted. If the following command like in this case is the Autoselect command for reading the device ID this leads to:

Read incorrect Device ID.*

Note 1: Customers would not have encountered any problems if their sequence included a Reset command between the 4-bus cycle sequence to obtain Mfr. ID and the 4-bus cycle sequence to obtain the Device ID and a concluding Reset Command. A ten step process.

* Note 2: It depends on customer's software and his order of commands which command will follow the incorrectly terminated Autoselect command and therefor might be the corrupted one. So the problem might have different effects depending on which following command will not come to its correct function. Once again no problem will occur if the Autoselect command is terminated correctly with the read/reset command.

4 *Solutions for the customer (See Table 1 below.)*

Use Flow B (the six step process) or use Flow C (the ten step process).

5 *The new data book has a better write up to describe the use of the autoselect commands; "Autoselect Command Sequence", 1999 Flash Data Book (PID 11796F), p.6-279:*

"The autoselect command sequence is initiated by writing two unlock cycles, followed by the autoselect command. The device then enters the autoselect mode, and the system may read at any address any number or times, without initiating another command sequence."

Table 1: Command Sequence to Mfr. ID and Device ID

Flow A What worked before	Flow B What should have been used	Flow C An alternative that could have been used to prevent problems
1. First Bus Write Cycle Addr: 5555H Data: AAH	1. First Bus Write Cycle Addr: 5555H Data: AAH	1. First Bus Write Cycle Addr: 5555H Data: AAH
2. Second Bus Write Cycle Addr: 2AAAH Data: 55H	2. Second Bus Write Cycle Addr: 2AAAH Data: 55H	2. Second Bus Write Cycle Addr: 2AAAH Data: 55H
3. Third Bus Write Cycle Addr: 5555H Data: 90H	3. Third Bus Write Cycle Addr: 5555H Data: 90H	3. Third Bus Write Cycle Addr: 5555H Data: 90H
4. Fourth Bus Read Cycle Addr: 00H Data: 01H (Mfr. ID)	4. Fourth Bus Read Cycle Addr: 00H Data: 01H (Mfr. ID)	4. Fourth Bus Read Cycle Addr: 00H Data: 01H (Mfr. ID)
5. First Bus Write Cycle Addr: 5555H Data: AAH	5. Read Addr: 01H Data: A4H (Device ID)	5. Read/Reset Command* Addr: XXXH Data: F0H *Optional 4 step command sequence
6. Second Bus Write Cycle Addr: 2AAAH Data: 55H	6. Read/Reset Command* Addr: XXXH Data: F0H *Optional 4 step command sequence	6. First Bus Write Cycle Addr: 5555H Data: AAH
7. Third Bus Write Cycle Addr: 5555H Data: 90H		7. Second Bus Write Cycle Addr: 2AAAH Data: 55H
8. Fourth Bus Read Cycle Addr: 01H Data: A4H (Device ID)		8. Third Bus Write Cycle Addr: 5555H Data: 90H
		9. Fourth Bus Read Cycle Addr: 01H Data: A4H (Device ID)
		10. Read/Reset Command* Addr: XXXH Data: F0H *Optional 4 step command sequence

Multi-sector Erase Sequence

The 29F010 supports a feature in the Sector Erase command that allows multiple sectors to be erased without the need to go through the 6 cycle unlock for each sector to be erased. In this case the 6 cycle unlock is applied to the part, after the last cycle (SA/30) a 50 microsecond (uS) timer is started. During this 50uS period, additional SA/30 cycles can be applied to the part that define the other sector addresses (SA) to be erased. When the 50uS period ends all the sectors that have been written

to the device will be erased sequentially. The only commands that should be used during this 50uS period are the 6th sector erase cycle (SA/30) and Erase Suspend (XXX/B0), any other command will reset the device to the read mode.

It appears the 29F010 and the 29F010A will allow this requirement to be violated without consequence. During the 50uS period the 010 and 010A parts appear to permit any other commands to be executed. The application of any other commands will: clear the internal 50uS timer, allow the part to initiate the original sector erase command, and execute the new command. For example, if a customer wanted to erase 8 sectors by applying the 6 cycle sequence eight times (once for each sector address), the 29F010 and 29F010A allows a customer to provide a 6 cycle erase sequence for each sector while violating the 50 uS period. If this sequence is applied to a 29F010B then all erase sequences will be ignored except the one for the last sector.

Reset Codes

The correct reset code is F0. The 29F010, 29F010A and 29F010B will accept both F0 and FF as the reset code. Insure your code uses the correct F0 code.

Use status to determine the end of program and erase

Some customers will not monitor status to determine when the embedded program or embedded erase operation is executed. Rather they will use a software timer programmed with a theoretical number to indicate the end of an operation. This is extremely dangerous since FLASH program and erase times are probabilistic in nature. It is important to use the DQ status bits or the ready/busy line to determine the end of an embedded operation.