

Am29F040B

Data Sheet Supplement for PROM Programmer Manufacturers

This supplement is for use with the Am29F040B data sheet, publication number 21445, and describes the sector protection and sector unprotection functions intended for programming equipment.

The Am29F040B is manufactured on AMD's 0.35 μm process technology. This document refers to the Am29F040B as "98406 die". The sector protection/unprotection procedure for this device is the same as for the 98403 die described in the previous revision of this supplement. To facilitate the transition to the current device, all the information from the previous revision is retained. Note that the 98403 and 98401 die are no longer manufactured.

As shown in Table 1, "Sector Protection/Unprotection Auto Select Codes", the three die revisions have the same Manufacturer Code and Device Code, but are further differentiated by a third silicon signature code, the Device Unprotect Code.

SECTOR PROTECTION/ UNPROTECTION FOR Am29F040B

The Am29F040B features hardware sector protection and unprotection. These features disable (protect) or enable (unprotect) both program and erase operations in any one or combination of the eight sectors. In most instances the device is shipped fully erased with all sectors unprotected. The only exception is that AMD may program and protect sector(s) in the factory prior to shipping the device via AMD's ExpressFlash™ Service as described in AMD's Flash Memory Products Data Book.

Sector Protection

To invoke the Sector Protection Mode, the programming equipment must force V_{ID} (12.0 V \pm 0.5 V on pins

A9 and OE#, with $CE\# = V_{IL}$ and $V_{CC} = 5\text{ V} \pm 5\%$. The sector addresses (A18–A16) should be set to identify the sector to be protected. Programming of the protection circuitry begins on the falling edge of WE# and is terminated with the rising edge of WE#. Sector addresses must be held constant during the WE# pulse. Refer to Figures 1 and 2 for Sector Protection Algorithm and its associated AC waveforms, respectively.

To verify implementation of the protection circuitry, with the High Voltage A9 Autoselect Mode, the programming equipment must force V_{ID} on address pin A9 with $CE\#$ and $OE\# = V_{IL}$ and $WE\# = V_{IH}$. Scanning the sector addresses (A18–A16) while (A6, A1, A0) = (V_{IL} , V_{IH} , V_{IL} , respectively) will produce a logical "1" code at device output DQ0 for a protected sector. In this mode, the lower order addresses, except for A0, A1, and A6 are don't care. Address locations with A1= V_{IL} are reserved for Autoselect Manufacturer and Device codes.

Sector Unprotection

Sectors previously protected may subsequently be unprotected, to accommodate code changes, by using the Sector Unprotect Mode. Prior to initiating a code change in any previously protected sector **all sectors** must be placed into the Sector Protect Mode using the Sector Protection Algorithm.

Because two slightly differing designs exist for the three die revisions, it is necessary to maintain two unique signature codes for device identification. **There are two sector unprotect routines.** It is now necessary to match the correct sector unprotect routine to its corresponding die revision (98406, 98403, or 98401). Refer to Table 1 for the correct signature code/sector unprotect routine combination.

Table 1. Sector Protection/Unprotection Autoselect Codes

Type	A18	A17	A16	A6	A1	A0	DQ7–DQ0 (hex)
Manufacturers Code	X	X	X	V_{IL}	V_{IL}	V_{IL}	01h
Device Code	X	X	X	V_{IL}	V_{IL}	V_{IH}	A4h
98406, 98403 Device Unprotect Code	X	X	X	V_{IL}	V_{IH}	V_{IH}	01h
98401 Device Unprotect Code	X	X	X	V_{IL}	V_{IH}	V_{IH}	00h
Sector Protect/Unprotect Verify	Sector Addresses (See Note)			V_{IL}	V_{IH}	V_{IL}	00h
							01h

Note: Refer to datasheet for sector address table.

98406 and 98403 Die

The Sector Unprotect Mode for the 98406 or 98403 die revision is entered, after protecting all sectors, by setting $A5 = V_{IH}$, $A9 = V_{IL}$ and raising both $WE\#$ and $OE\#$ to a specified high voltage. $WE\#$ is raised to V_{SP} ($V_{SP} = 10.0 \pm 0.5$ V) and $OE\# = V_{ID}$ (preferred) or V_{SP} (acceptable). The unprotection circuitry is then invoked by keeping $CE\# = V_{IL}$ for a period of t_{WPP2} (two 5 ms pulses—see diagram).

To determine if unprotection is complete, each sector must be verified, as unprotected, individually. The Sector Unprotect Verify Mode is entered by setting $OE\# = V_{IH}$, $WE\# = V_{IH}$ and raising $A9$ to V_{ID} or V_{SP} . The sector status can then be read from DQ0 by setting sector address bits A18–A16 to the desired sector with $A1 = V_{IH}$, $A0 = V_{IL}$ and $CE\# = V_{IL}$. When $DQ0 = 0$, the sector unprotect routine is complete for a given sector. If any other sector status reads $DQ0 = 1$ (protected) the process for unprotecting a sector must be repeated. When $DQ0 = 0$ is read for all sectors, sector unprotection is complete.

Refer to Figures 3 and 4 for 98406 and 98403 Sector Unprotect Algorithm and associated AC Waveforms, respectively.

98401 Die

To activate the Sector Unprotect Mode, after any/or all sectors have been protected, the address pins A16 and A12 must be set to V_{IH} and the programming equipment must force V_{ID} on control pins $OE\#$, $CE\#$ and address pin A9. The unprotection mechanism begins on the falling edge of the $WE\#$ pulse and is terminated with the rising edge of $WE\#$.

It is possible to determine if a sector is unprotected by setting $A1$ and $A6 = V_{IH}$ and $A0 = V_{IL}$ and then perform a read operation at address location XXX2h, where the highest order addresses (A18–A16) define a particular sector address. Reading 00h indicates an unprotected sector.

Refer to Figures 5 and 6 for the 98401 Sector Unprotect Algorithm and associated AC Waveforms, respectively.

DC CHARACTERISTICS

Parameter Symbol	Parameter Description	Test Conditions	Min	Max	Units
V_{ID}	Voltage for Autoselect and Sector Protection	$V_{CC} = 5.0\text{ V}$	11.5	12.5	V
V_{IH}	Input High Voltage		2.0	$V_{CC} + 0.5\text{ V}$	V
V_{IL}	Input Low Voltage		-0.5	0.8	V
V_{SP}	Voltage for Sector Unprotect		9.5	10.5	V

AC CHARACTERISTICS

98406 and 98403 Sector Protect/Unprotect Operations

Parameter Symbols				
Standard	Description		All Speed Options	Unit
t_{CE}	Chip Enable to Output Delay	Min	150	ns
t_{VCS}	V_{CC} Set Up Time	Min	50	μs
t_{VLHT}	Voltage Transition Time (Note 1)	Min	500	ns
t_{WPP1}	Sector Protect Pulse Width (Note 2)	Min	100	μs
t_{CSP}	OE# Set Up Time to CE# Active	Min	4	μs
t_{WPP2}	Sector Unprotect Pulse Width (Notes 3, 4)	Min	5	ms

Notes:

1. Not 100% tested.
2. These timings are for Sector Protect operation.
3. These timings are for Sector Unprotect operation.
4. CE# requires two pulses at 5 ms (min) each pulse.

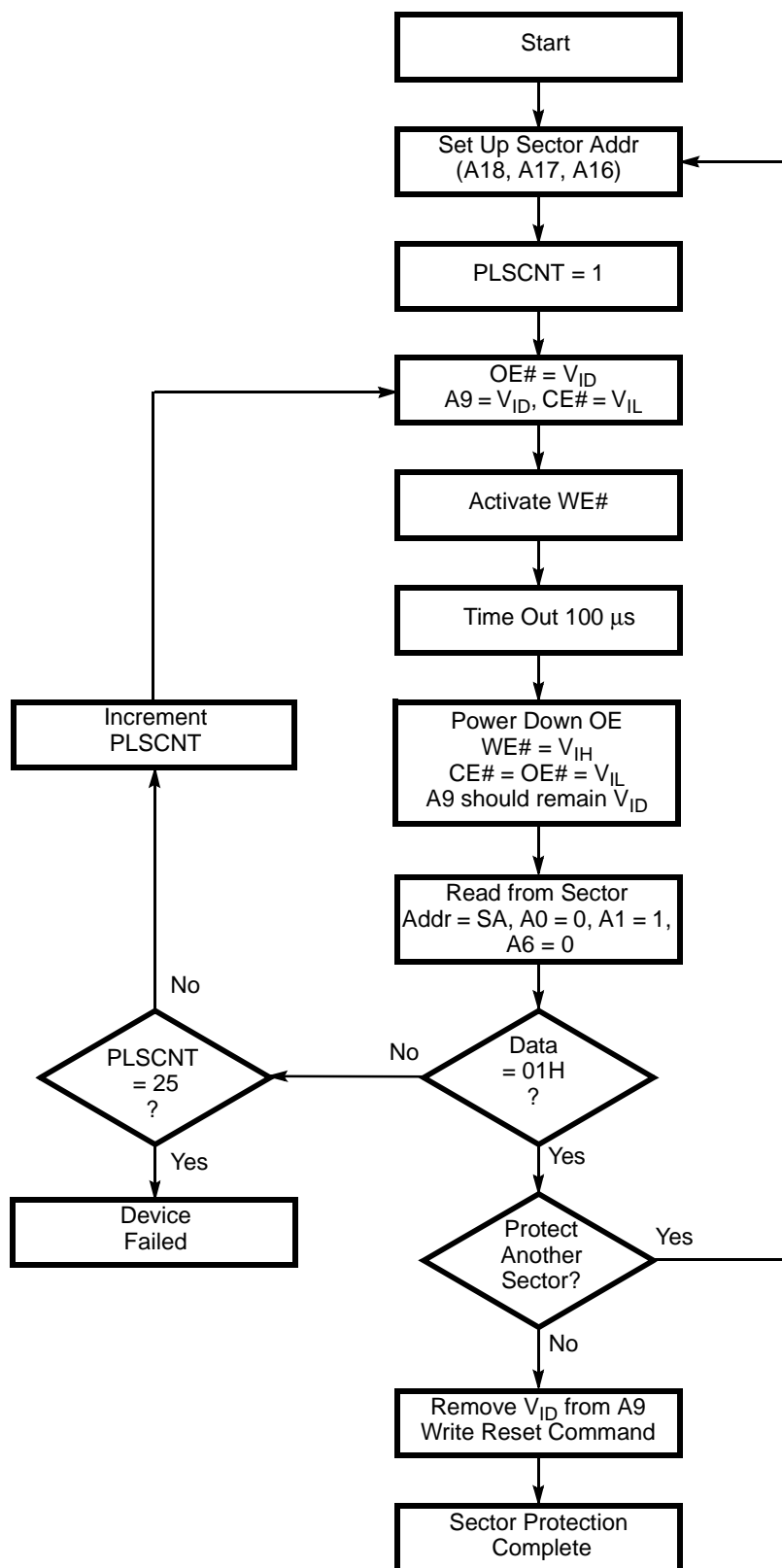
98401 Sector Protect/Unprotect Operations

Parameter Symbols				
Standard	Description		All Speed Options	Unit
t_{ACC}	Address To Output Delay (Note 1)	Max	150	ns
t_{OE}	Output Enable to Output Delay (Note 1)	Min	55	ns
t_{VCS}	V_{CC} Set Up Time	Min	50	μs
t_{VLHT}	Voltage Transition Time (Note 2)	Min	500	ns
t_{WPP1}	Sector Protect Pulse Width (Note 3)	Min	100	μs
t_{WPP2}	Sector Unprotect Pulse Width (Note 4)	Min	10	ms
t_{OESP}	OE# Set Up Time to WE# Active (Note 2)	Min	4	μs
t_{CSP}	CE# Set Up Time to WE# Active (Note 2)	Min	4	μs

Notes:

1. If higher performance specifications for t_{ACC} and t_{OE} are required, refer to the Read Operations table in the AC Specifications section of the Am29F040B data sheet.
2. Not 100% tested.
3. These timings are for Sector Protect operation.
4. These timings are for Sector Unprotect operation.

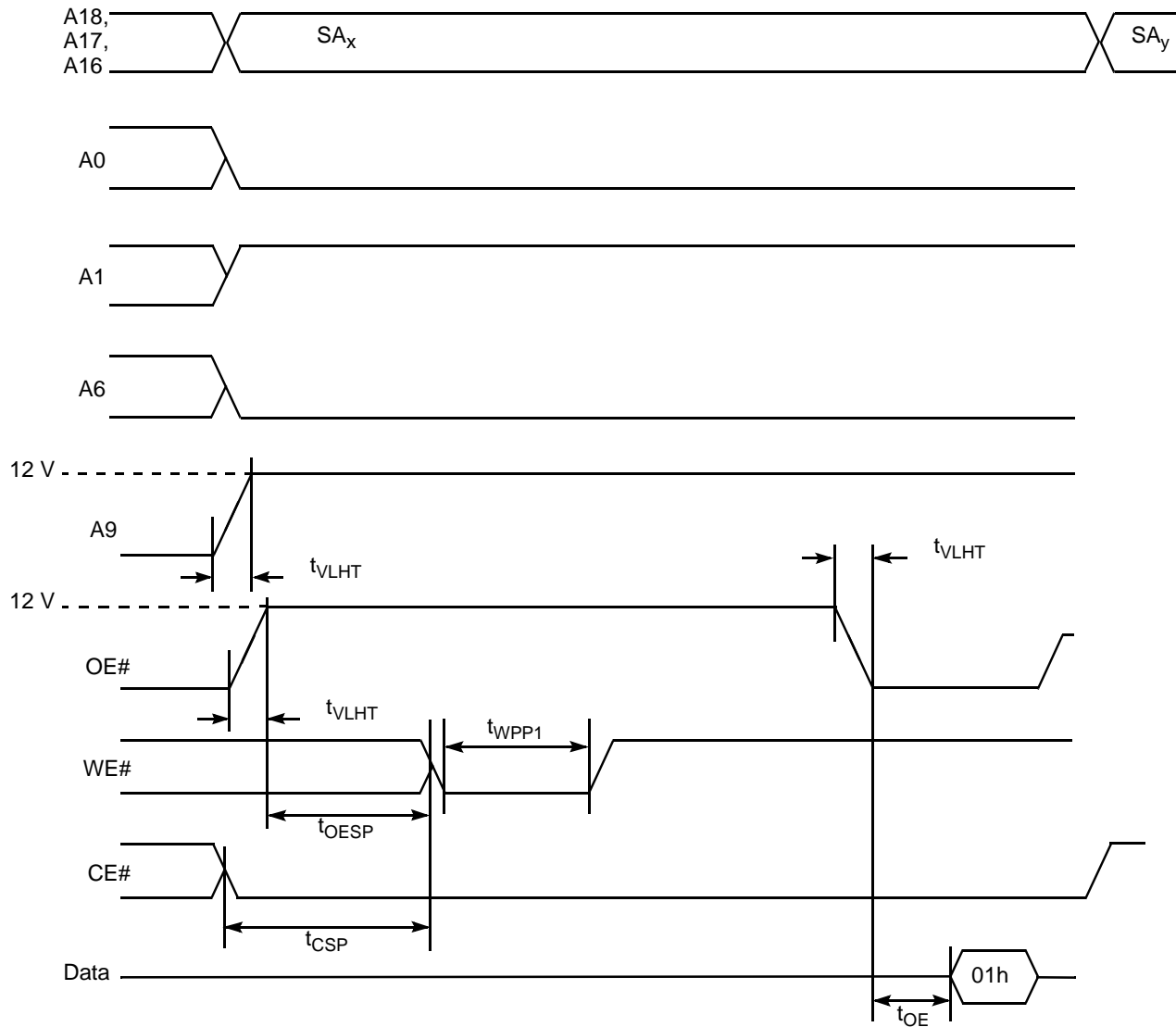
SWITCHING WAVEFORMS



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Figure 1. Sector Protection Algorithm

SWITCHING WAVEFORMS

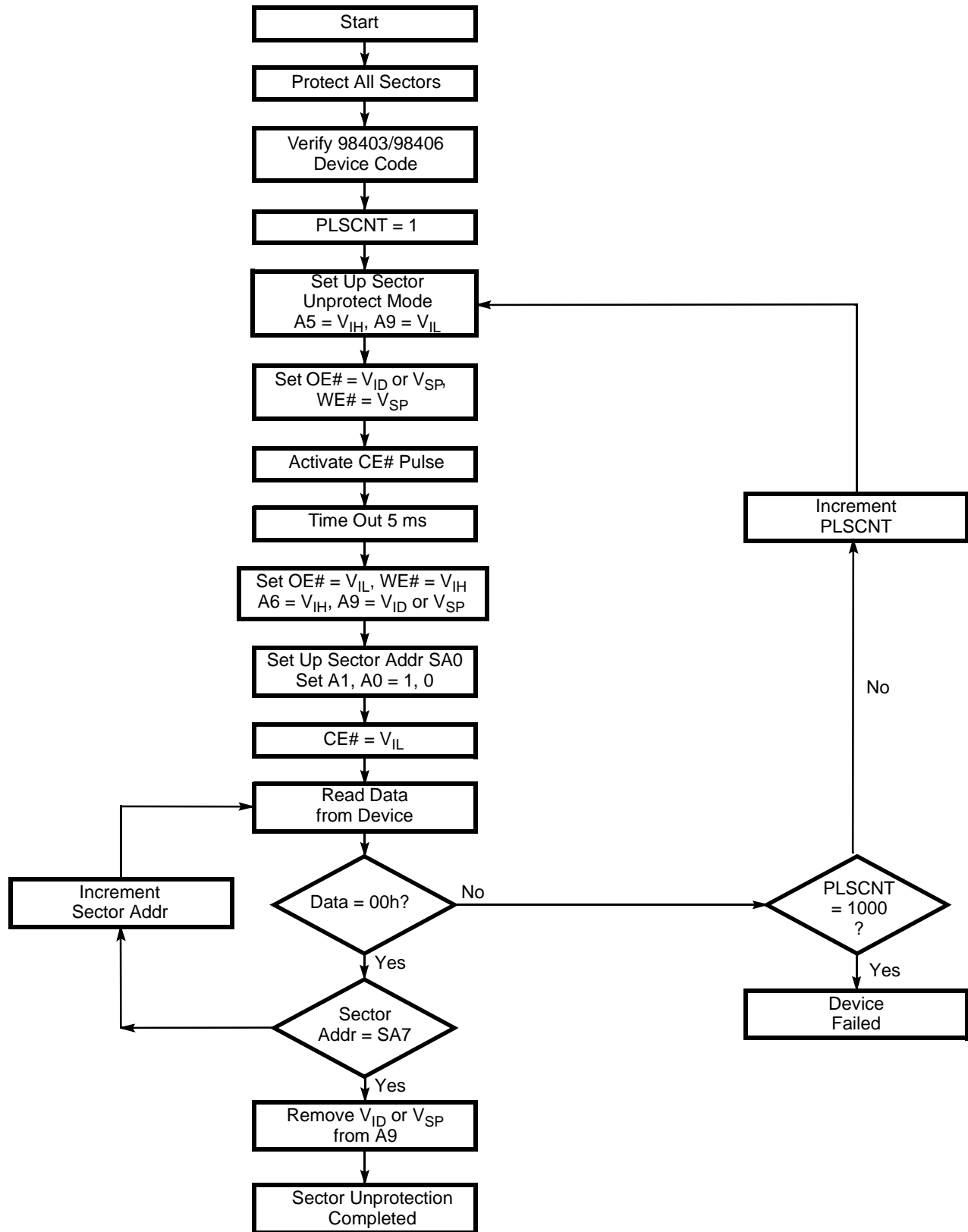


SA_x = Sector Address for initial sector
SA_y = Sector Address for next sector

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Figure 2. AC Waveforms for Sector Protection

SWITCHING WAVEFORMS

**Notes:**

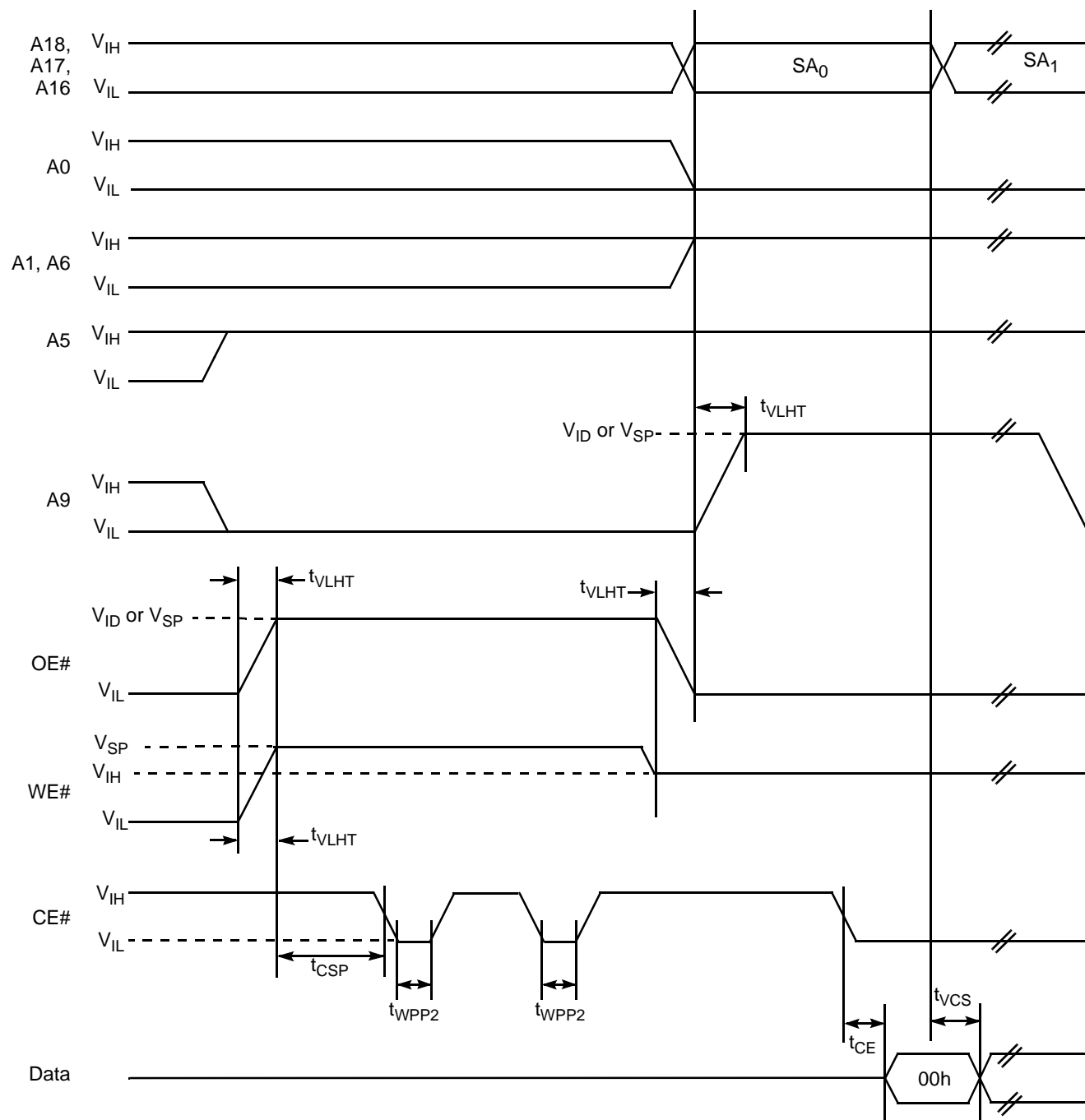
SG0 = Sector Address for initial sector

SG7 = Sector Address for last sector

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Figure 3. Sector Unprotection Algorithm for Device Based on 98406 and 98403 Die

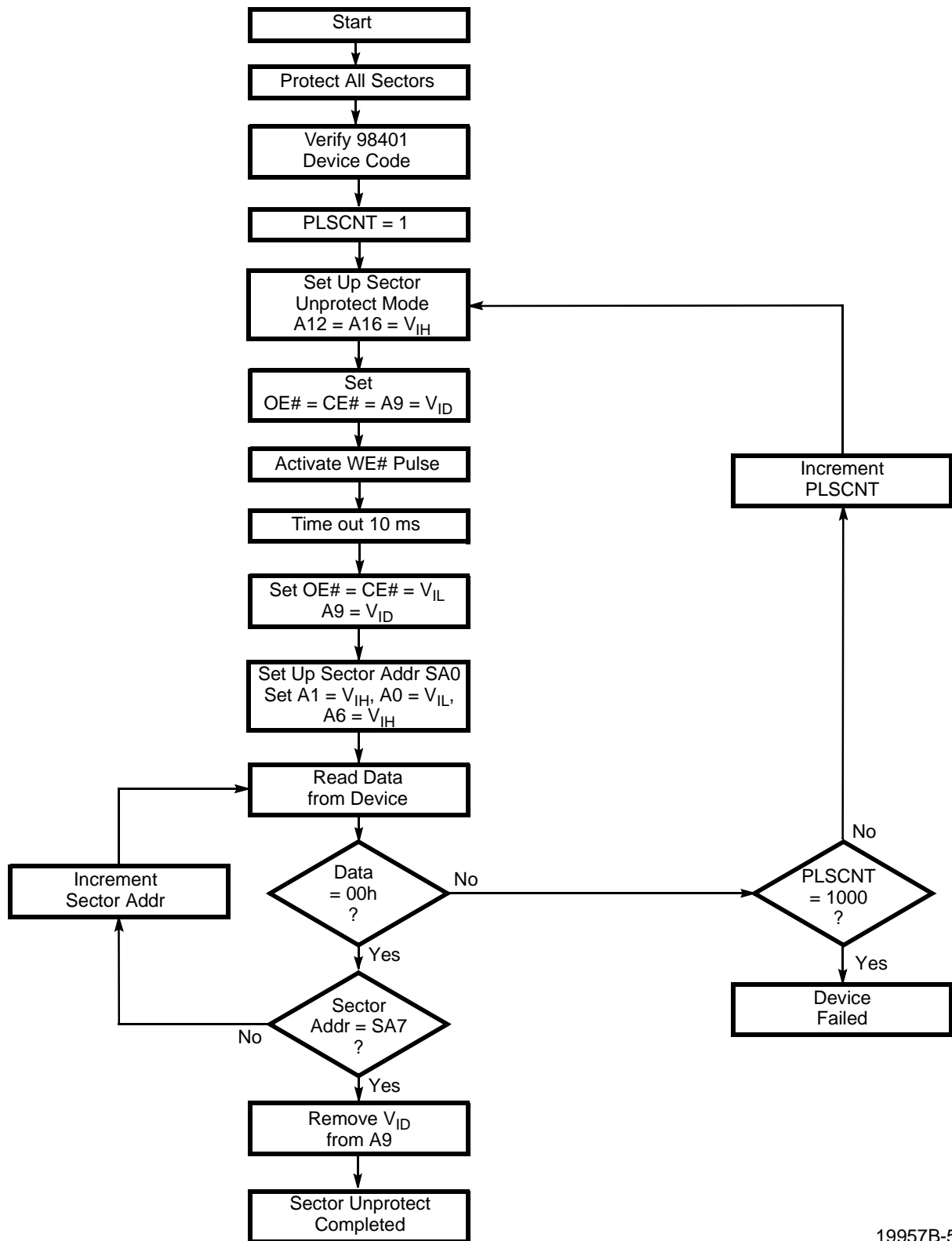
SWITCHING WAVEFORMS



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Figure 4. AC Waveforms for Sector Unprotection for Device Based on 98406 and 98403 Die

SWITCHING WAVEFORMS



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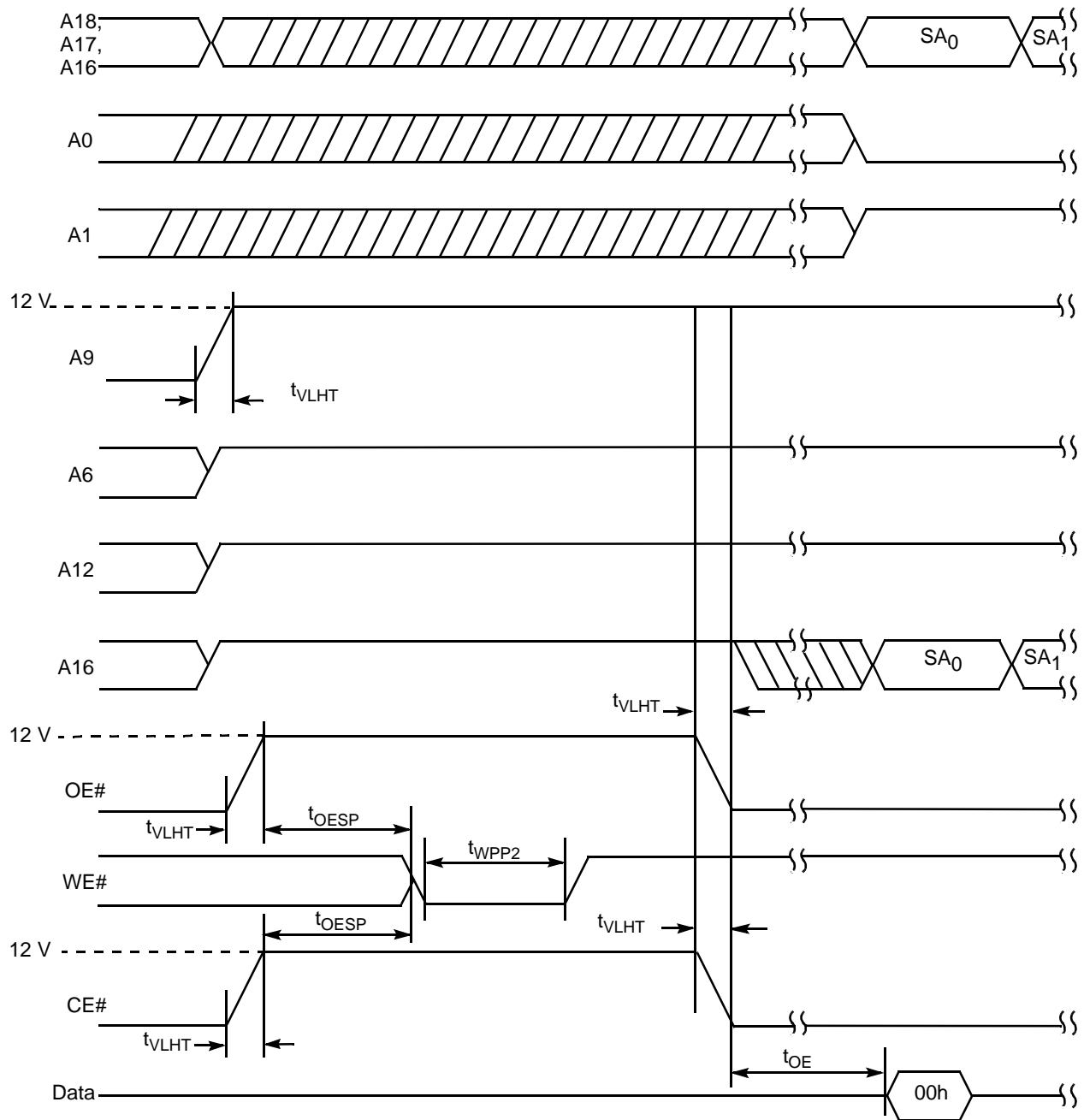
Notes:

SA0 = Sector Address for initial sector

SA7 = Sector Address for last sector

Figure 5. Sector Unprotect Algorithm for Device Based on 98401 Die

SWITCHING WAVEFORMS



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Figure 6. AC Waveforms for Sector Unprotect for Device Based on 98401 Die

REVISION SUMMARY FOR AM29F040B PROGRAMMER SUPPLEMENT

Global

Updated Am29F040 references to Am29F040B where appropriate. Added 98406 references to include new Am29F040B die. Changed all active low signals to have a trailing pound symbol (#) in place of the overbar.

Table 1, Sector Protection/Unprotection Codes

Deleted redundant DQ7–DQ0 columns. Integrated sector protect/unprotect verification rows.

DC Characteristics

Added table.

Revision E (May 20, 1999)

AC Characteristics—98406 and 98403 Sector Protect/Unprotect Operations

t_{VLHT} : Added “Note 1. Not 100% tested”.

t_{WPP1} : Added “Note 2. These timings are for Sector Protect operation”.

t_{WPP2} : Added “Note 3. These timings are for Sector Unprotect operation”.

AC Characteristics—98401 Sector Protect/Unprotect Operations

t_{WPP1} : Added “Note 3. These timings are for Sector Protect operation”.

t_{WPP2} : Added “Note 4. These timings are for Sector Unprotect operation”.

t_{OESP} t_{CSP} : Added “Note 2. Not 100% tested”.

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