

# MX25L6436F

**3V, 64M-BIT [x 1/x 2/x 4]  
CMOS MXSMIO<sup>®</sup> (SERIAL MULTI I/O)  
FLASH MEMORY**

## ***Key Features***

- *Special Block Protection Levels*
- *Multi I/O Support - Single I/O, Dual I/O and Quad I/O*
- *Hold Feature*
- *Program Suspend/Resume & Erase Suspend/Resume*

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**64M-BIT [x 1 / x 2 / x 4] CMOS MXSMIO® (SERIAL MULTI I/O)  
FLASH MEMORY****1. FEATURES****GENERAL**

- Supports Serial Peripheral Interface -- Mode 0 and Mode 3
- 67,108,864 x 1 bit structure  
or 33,554,432 x 2 bits (two I/O read mode) structure  
or 16,777,216 x 4 bits (four I/O mode) structure
- 2048 Equal Sectors with 4K bytes each
  - Any Sector can be erased individually
- 256 Equal Blocks with 32K bytes each
  - Any Block can be erased individually
- 128 Equal Blocks with 64K bytes each
  - Any Block can be erased individually
- Power Supply Operation
  - 2.65 to 3.6 volt for read, erase, and program operations
- Latch-up protected to 100mA from -1V to Vcc +1V

**PERFORMANCE**

- High Performance  
VCC = 2.65~3.6V
  - Normal read
    - 50MHz
  - Fast read
    - FAST\_READ, DREAD, QREAD: 133MHz with 8 dummy cycles
      - 2READ: 80MHz with 4 dummy cycle, 133MHz with 8 dummy cycle
      - 4READ: 80MHz with 6 dummy cycle, 133MHz with 10 dummy cycle
      - Configurable dummy cycle number for 2READ and 4READ operation
      - 8/16/32/64 byte Wrap-Around Burst Read Mode
- Low Power Consumption
- Typical 100,000 erase/program cycles
- 20 years data retention

**SOFTWARE FEATURES**

- Input Data Format
  - 1-byte Command code

- Advanced Security Features
  - Special Block lock protection  
The BP0-BP3 and T/B status bits define the size of the area to be protected against program and erase instructions
- Additional 8K-bit bit security OTP
  - Features unique identifier
  - Factory locked identifiable, and customer lockable
- Auto Erase and Auto Program Algorithms
  - Automatically erases and verifies data at selected sector
  - Automatically programs and verifies data at selected page by an internal algorithm that automatically times the program pulse width (Any page to be programmed should have page in the erased state first.)
- Status Register Feature
- Command Reset
- Program/Erase Suspend
- Program/Erase Resume
- Electronic Identification
  - JEDEC 1-byte Manufacturer ID and 2-byte Device ID
  - RES command for 1-byte Device ID
- Support Serial Flash Discoverable Parameters (SFDP) mode

**HARDWARE FEATURES**

- SCLK Input
  - Serial clock input
- SI/SIO0
  - Serial Data Input or Serial Data Input/Output for 2 x I/O mode or Serial Data Input/Output for 4 x I/O mode
- SO/SIO1
  - Serial Data Output or Serial Data Input/Output for 2 x I/O mode or Serial Data Input/Output for 4 x I/O mode
- WP#/SIO2
  - Hardware write protection or serial data Input/Output for 4 x I/O mode
- HOLD#/SIO3
  - To pause the device without deselecting the device or serial data Input/Output for 4 x I/O mode
- PACKAGE
  - 8-pin SOP (200mil)
  - **All devices are RoHS Compliant and Halogen-free**

## 2. GENERAL DESCRIPTION

MX25L6436F is 64Mb bits Serial NOR Flash memory, which is configured as 8,388,608 x 8 internally. When it is in four I/O mode, the structure becomes 16,777,216 bits x 4. When it is in two I/O mode, the structure becomes 33,554,432 bits x 2.

MX25L6436F features a serial peripheral interface and software protocol allowing operation on a simple 3-wire bus while it is in single I/O mode. The three bus signals are a clock input (SCLK), a serial data input (SI), and a serial data output (SO). Serial access to the device is enabled by CS# input.

MX25L6436F, MXSMIO<sup>®</sup> (Serial Multi I/O) flash memory, provides sequential read operation on the whole chip and multi-I/O features.

When it is in quad I/O mode, the SI pin, SO pin, WP# pin and HOLD# pin become SIO0 pin, SIO1 pin, SIO2 pin and SIO3 pin for address/dummy bits input and data Input/Output.

After program/erase command is issued, auto program/erase algorithms which program/erase and verify the specified page or sector/block locations will be executed. Program command is executed on byte basis, or page (256 bytes) basis. Erase command is executed on 4K-byte sector, 32K-byte/64K-byte block, or whole chip basis.

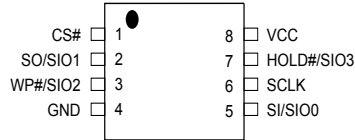
To provide user with ease of interface, a status register is included to indicate the status of the chip. The status read command can be issued to detect completion status of a program or erase operation via WIP bit.

When the device is not in operation and CS# is high, it is put in standby mode.

The MX25L6436F utilizes Macronix's proprietary memory cell, which reliably stores memory contents even after 100,000 program and erase cycles.

### 3. PIN CONFIGURATION

#### 8-PIN SOP (200mil)

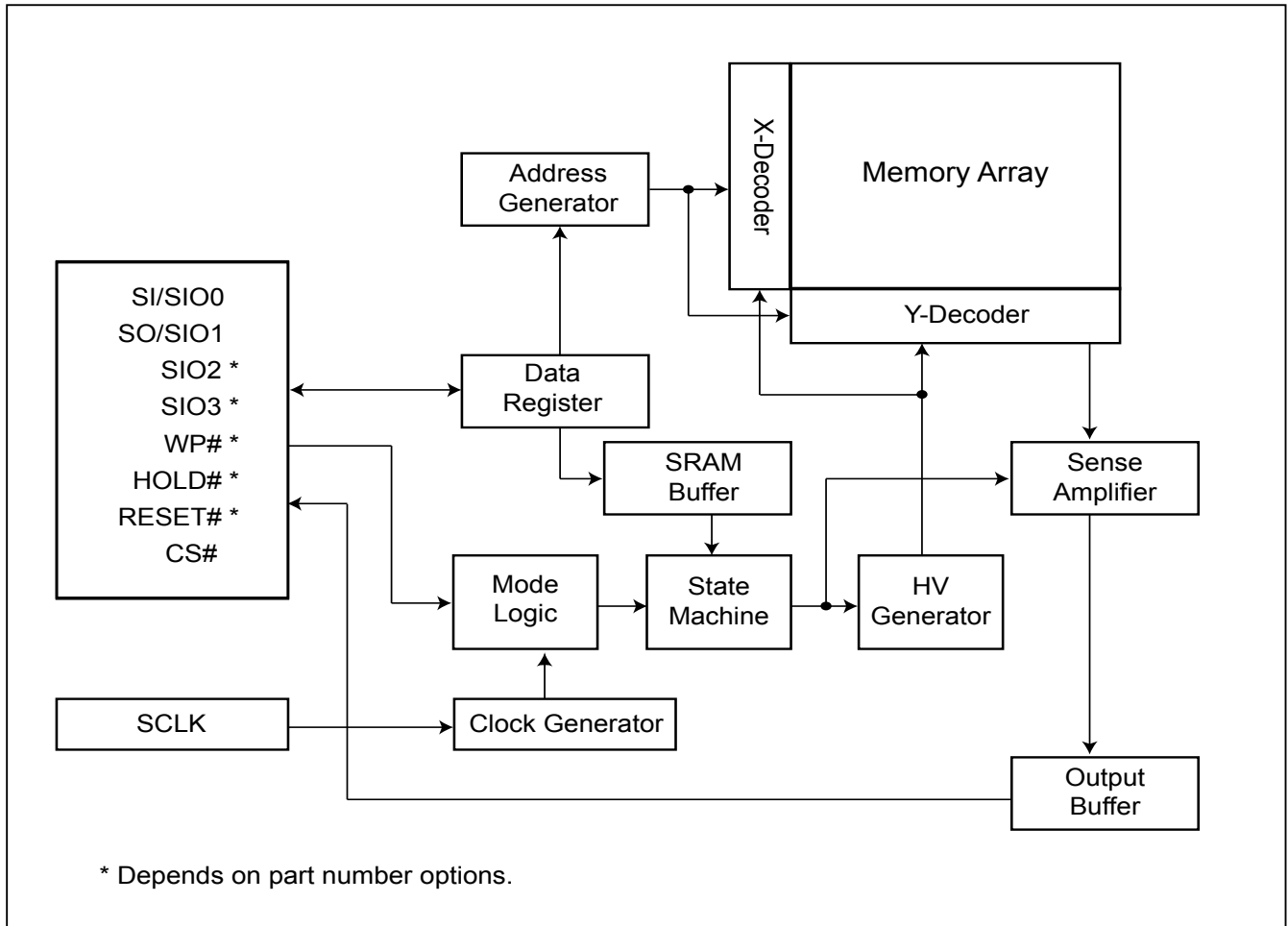


### 4. PIN DESCRIPTION

| SYMBOL     | DESCRIPTION   |
|------------|---|
| CS#        | Chip Select   |
| SI/SIO0    | Serial Data Input (for 1xI/O)/ Serial Data Input & Output (for 2xI/O mode and 4xI/O mode)       |
| SO/SIO1    | Serial Data Output (for 1xI/O)/Serial Data Input & Output (for 2xI/O mode and 4xI/O mode)       |
| SCLK       | Clock Input   |
| WP#/SIO2   | Write protection Active Low or Serial Data Input & Output (for 4xI/O mode)                      |
| HOLD#/SIO3 | To pause the device without deselecting the device or Serial data Input/Output for 4 x I/O mode |
| VCC        | + 3.0V Power Supply   |
| GND        | Ground  |
| NC         | No Connection   |

**Note:** The HOLD# pin has internal pull up.

**5. BLOCK DIAGRAM**



## 6. DATA PROTECTION

During power transition, there may be some false system level signals which result in inadvertent erasure or programming. The device is designed to protect itself from these accidental write cycles.

The state machine will be reset as standby mode automatically during power up. In addition, the control register architecture of the device constrains that the memory contents can only be changed after specific command sequences have completed successfully.

In the following, there are several features to protect the system from the accidental write cycles during VCC power-up and power-down or from system noise.

- Valid command length checking: The command length will be checked whether it is at byte base and completed on byte boundary.
- Write Enable (WREN) command: WREN command is required to set the Write Enable Latch bit (WEL) before other command to change data.
- Deep Power Down Mode: By entering deep power down mode, the flash device also is under protected from writing all commands except Release from Deep Power Down mode command (RDP) and Read Electronic Signature command (RES).

### I. Block lock protection

- The Software Protected Mode (SPM) uses (TB, BP3, BP2, BP1, BP0) bits to allow part of memory to be protected as read only. The protected area definition is shown as table of "[Table 1. Protected Area Sizes](#)", the protected areas are more flexible which may protect various areas by setting value of TB, BP0-BP3 bits.
- The Hardware Protected Mode (HPM) uses WP#/SIO2 to protect the (BP3, BP2, BP1, BP0, TB) bits and SRWD bit.



**Table 1. Protected Area Sizes**

**Protected Area Sizes (T/B bit = 0)**

| Status bit |     |     |     | Protect Level   |
|------------|-----|-----|-----|---|
| BP3        | BP2 | BP1 | BP0 | 64Mb  |
| 0          | 0   | 0   | 0   | 0 (none)  |
| 0          | 0   | 0   | 1   | 1 (2block, block 126 <sup>th</sup> -127 <sup>th</sup> )   |
| 0          | 0   | 1   | 0   | 2 (4blocks, block 124 <sup>th</sup> -127 <sup>th</sup> )  |
| 0          | 0   | 1   | 1   | 3 (8blocks, block 120 <sup>th</sup> -127 <sup>th</sup> )  |
| 0          | 1   | 0   | 0   | 4 (16blocks, block 112 <sup>th</sup> -127 <sup>th</sup> ) |
| 0          | 1   | 0   | 1   | 5 (32blocks, block 96 <sup>th</sup> -127 <sup>th</sup> )  |
| 0          | 1   | 1   | 0   | 6 (64blocks, block 64 <sup>th</sup> -127 <sup>th</sup> )  |
| 0          | 1   | 1   | 1   | 7 (128blocks, protect all)                                |
| 1          | 0   | 0   | 0   | 8 (128blocks, protect all)                                |
| 1          | 0   | 0   | 1   | 9 (64blocks, 0 <sup>th</sup> -63 <sup>rd</sup> )          |
| 1          | 0   | 1   | 0   | 10 (96blocks, 0 <sup>th</sup> -95 <sup>th</sup> )         |
| 1          | 0   | 1   | 1   | 11 (112blocks, 0 <sup>th</sup> -111 <sup>st</sup> )       |
| 1          | 1   | 0   | 0   | 12 (120blocks, 0 <sup>th</sup> -119 <sup>th</sup> )       |
| 1          | 1   | 0   | 1   | 13 (124blocks, 0 <sup>th</sup> -123 <sup>rd</sup> )       |
| 1          | 1   | 1   | 0   | 14 (126blocks, 0 <sup>th</sup> -125 <sup>th</sup> )       |
| 1          | 1   | 1   | 1   | 15 (128blocks, protect all)                               |

**Protected Area Sizes (T/B bit = 1)**

| Status bit |     |     |     | Protect Level  |
|------------|-----|-----|-----|--|
| BP3        | BP2 | BP1 | BP0 | 64Mb   |
| 0          | 0   | 0   | 0   | 0 (none)   |
| 0          | 0   | 0   | 1   | 1 (2blocks, block 0 <sup>th</sup> -1 <sup>st</sup> )     |
| 0          | 0   | 1   | 0   | 2 (4blocks, block 0 <sup>th</sup> -3 <sup>rd</sup> )     |
| 0          | 0   | 1   | 1   | 3 (8blocks, block 0 <sup>th</sup> -7 <sup>th</sup> )     |
| 0          | 1   | 0   | 0   | 4 (16blocks, block 0 <sup>th</sup> -15 <sup>th</sup> )   |
| 0          | 1   | 0   | 1   | 5 (32blocks, block 0 <sup>th</sup> -31 <sup>st</sup> )   |
| 0          | 1   | 1   | 0   | 6 (64blocks, block 0 <sup>th</sup> -63 <sup>rd</sup> )   |
| 0          | 1   | 1   | 1   | 7 (128blocks, protect all)                               |
| 1          | 0   | 0   | 0   | 8 (128blocks, protect all)                               |
| 1          | 0   | 0   | 1   | 9 (64blocks, block 64 <sup>th</sup> -127 <sup>th</sup> ) |
| 1          | 0   | 1   | 0   | 10 (96blocks, 32 <sup>nd</sup> -127 <sup>th</sup> )      |
| 1          | 0   | 1   | 1   | 11 (112blocks, 16 <sup>th</sup> -127 <sup>th</sup> )     |
| 1          | 1   | 0   | 0   | 12 (120blocks, 8 <sup>th</sup> -127 <sup>th</sup> )      |
| 1          | 1   | 0   | 1   | 13 (124blocks, 4 <sup>th</sup> -127 <sup>th</sup> )      |
| 1          | 1   | 1   | 0   | 14 (126blocks, 2 <sup>nd</sup> -127 <sup>th</sup> )      |
| 1          | 1   | 1   | 1   | 15 (128blocks, protect all)                              |

**Note:** The device is ready to accept a Chip Erase instruction if, and only if, all Block Protect (BP3, BP2, BP1, BP0) are 0.

**II. Additional 8K-bit secured OTP** for unique identifier: to provide 8K-bit One-Time Program area for setting device unique serial number - Which may be set by factory or system maker.

The 8K-bit secured OTP area is composed of two rows of 4K-bit. Customer could lock the first 4K-bit OTP area and factory could lock the other.

- Security register bit 0 indicates whether the 2<sup>nd</sup> 4K-bit is locked by factory or not.
- Customer may lock-down the customer lockable secured OTP by writing WRSCUR(write security register) command to set customer lock-down bit1 as "1". Please refer to table of "[Table 10. Security Register Definition](#)" for security register bit definition and table of "[Table 2. 8K-bit Secured OTP Definition](#)" for address range definition.
- To program 8K-bit secured OTP by entering secured OTP mode (with ENSO command), and going through normal program procedure, and then exiting secured OTP mode by writing EXSO command.

**Note:** Once lock-down whatever by factory or customer, the corresponding secured area cannot be changed any more. While in 8K-bit Secured OTP mode, array access is not allowed.

**Table 2. 8K-bit Secured OTP Definition**

| Address range | Size     | Lock-down              |
|---------------|----------|------------------------|
| xxx000~xxx1FF | 4096-bit | Determined by Customer |
| xxx200~xxx3FF | 4096-bit | Determined by Factory  |

**7. MEMORY ORGANIZATION**

**Table 3. Memory Organization**

| Block(64K-byte) | Block(32K-byte) | Sector (4K-byte) | Address Range |          |  |
|-----------------|-----------------|------------------|---------------|----------|--|
| 127             | 255             | 2047             | 7FF000h       | 7FFFFFFh |  |
|                 |                 | ⋮                |               |          |  |
|                 |                 | 2040             | 7F8000h       | 7F8FFFh  |  |
|                 |                 | 2039             | 7F7000h       | 7F7FFFh  |  |
|                 | 254             | ⋮                |               |          |  |
|                 |                 | 2032             | 7F0000h       | 7F0FFFh  |  |
|                 |                 | 2031             | 7EF000h       | 7EFFFFh  |  |
|                 |                 | ⋮                |               |          |  |
| 126             | 253             | 2024             | 7E8000h       | 7E8FFFh  |  |
|                 |                 | ⋮                |               |          |  |
|                 |                 | 2023             | 7E7000h       | 7E7FFFh  |  |
|                 |                 | ⋮                |               |          |  |
|                 | 252             | 2016             | 7E0000h       | 7E0FFFh  |  |
|                 |                 | ⋮                |               |          |  |
|                 |                 | 2015             | 7DF000h       | 7DFFFFh  |  |
|                 |                 | ⋮                |               |          |  |
| 125             | 251             | 2008             | 7D8000h       | 7D8FFFh  |  |
|                 |                 | ⋮                |               |          |  |
|                 |                 | 2007             | 7D7000h       | 7D7FFFh  |  |
|                 |                 | ⋮                |               |          |  |
|                 | 250             | 2000             | 7D0000h       | 7D0FFFh  |  |
|                 |                 | ⋮                |               |          |  |
|                 |                 | ⋮                |               |          |  |
|                 |                 | ⋮                |               |          |  |

individual block  
lock/unlock unit:64K-byte

individual 16 sectors  
lock/unlock unit:4K-byte

individual block  
lock/unlock unit:64K-byte



|   |   |         |         |         |
|---|---|---------|---------|---------|
| 2 | 5 | 47      | 02F000h | 02FFFFh |
|   |   | ⋮       |         |         |
|   | 4 | 40      | 028000h | 028FFFh |
|   |   | 39      | 027000h | 027FFFh |
| 1 | 3 | ⋮       |         |         |
|   |   | 32      | 020000h | 020FFFh |
|   |   | 31      | 01F000h | 01FFFFh |
|   | 2 | ⋮       |         |         |
|   |   | 24      | 018000h | 018FFFh |
|   |   | 23      | 017000h | 017FFFh |
| 0 | 1 | ⋮       |         |         |
|   |   | 16      | 010000h | 010FFFh |
|   |   | 15      | 00F000h | 00FFFFh |
|   | 0 | ⋮       |         |         |
|   |   | 8       | 008000h | 008FFFh |
|   |   | 7       | 007000h | 007FFFh |
| 0 | 0 | 000000h | 000FFFh |         |

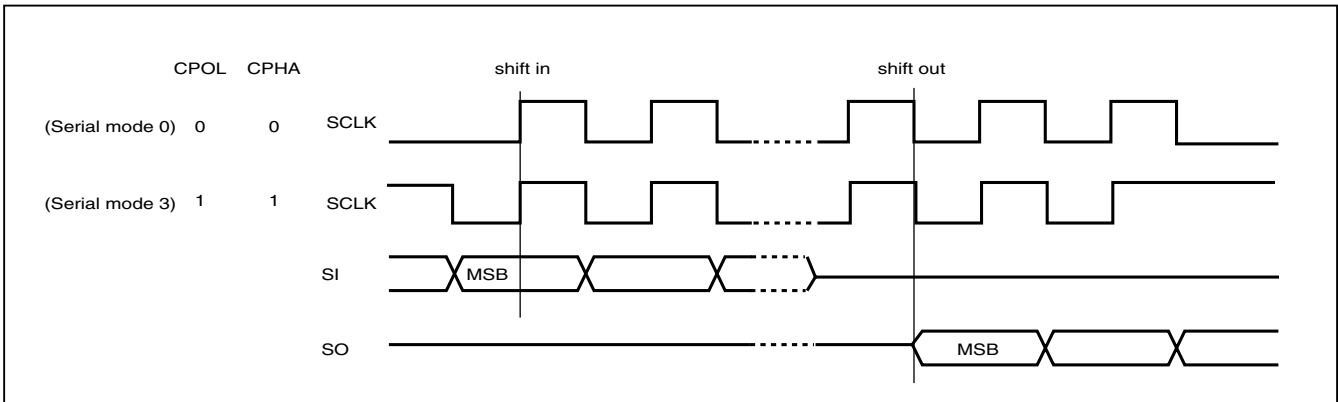
individual block  
lock/unlock unit:64K-byte

individual 16 sectors  
lock/unlock unit:4K-byte

**8. DEVICE OPERATION**

1. Before a command is issued, status register should be checked to ensure device is ready for the intended operation.
2. When incorrect command is inputted to this device, it enters standby mode and remains in standby mode until next CS# falling edge. In standby mode, SO pin of the device is High-Z.
3. When correct command is inputted to this device, it enters active mode and remains in active mode until next CS# rising edge.
4. For standard single data rate serial mode, input data is latched on the rising edge of Serial Clock(SCLK) and data is shifted out on the falling edge of SCLK. The difference of Serial mode 0 and mode 3 is shown as *"Figure 1. Serial Modes Supported (for Normal Serial mode)"*.
5. For the following instructions: READ, FAST\_READ, 2READ, DREAD, 4READ, QREAD, RDSR, RDCR, RDID, RES, REMS, RDSCUR, RDSFDP, and RDSPB the shifted-in instruction sequence is followed by a data-out sequence. After any bit of data being shifted out, the CS# can be high. For the following instructions: WREN, WRDI, WRSR, SE, BE, BE32K, CE, PP, 4PP, DP, RDP, Suspend, Resume, ENSO, EXSO, WRSCUR, RSTEN, RST, SBL, NOP, WRSPB, ESSPB and WPSEL, the CS# must go high exactly at the byte boundary; otherwise, the instruction will be rejected and not executed.
6. While a Write Status Register, Program, or Erase operation is in progress, access to the memory array is neglected and will not affect the current operation of Write Status Register, Program, Erase.

**Figure 1. Serial Modes Supported (for Normal Serial mode)**



**Note:**

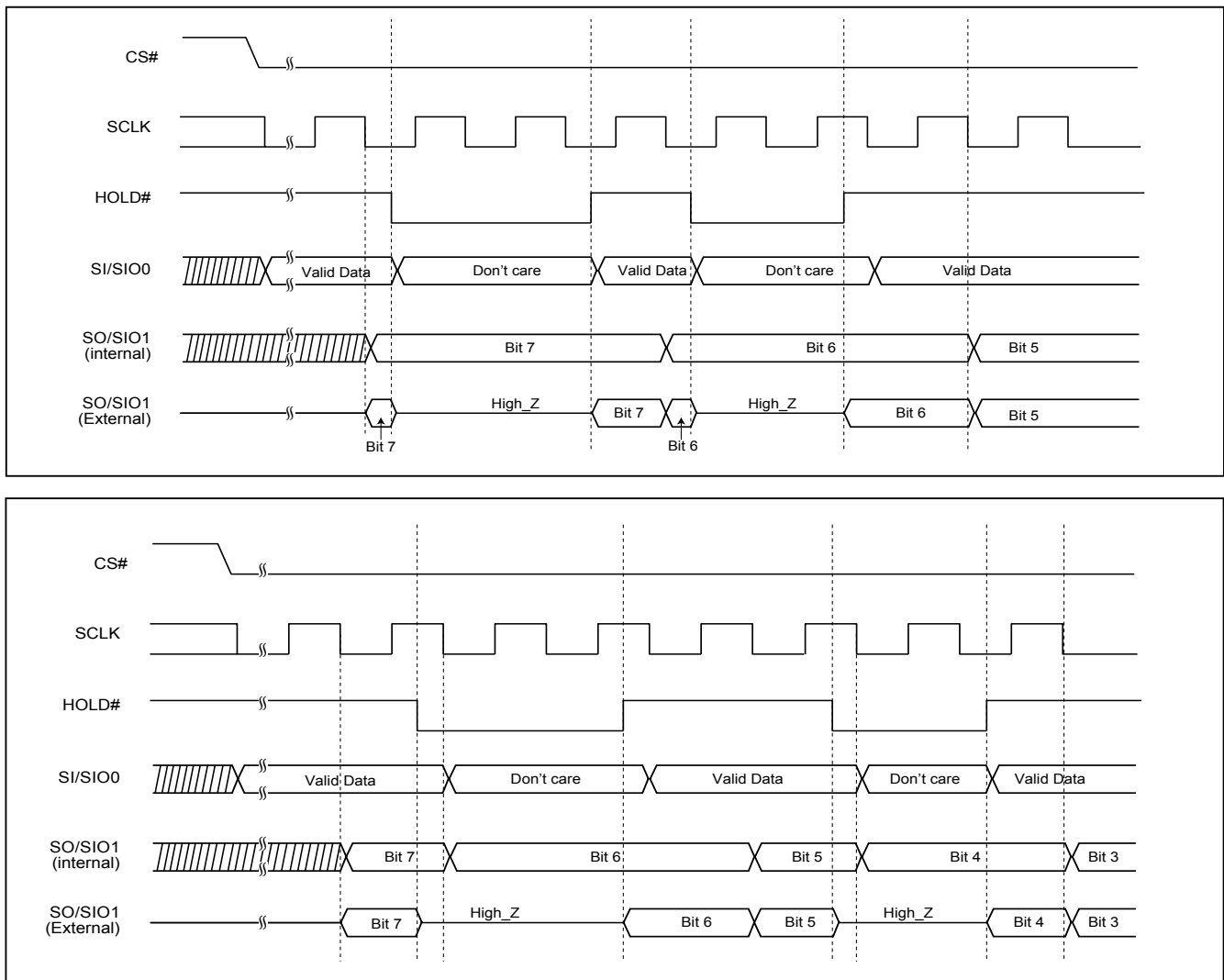
CPOL indicates clock polarity of Serial master, CPOL=1 for SCLK high while idle, CPOL=0 for SCLK low while not transmitting. CPHA indicates clock phase. The combination of CPOL bit and CPHA bit decides which Serial mode is supported.

## 9. HOLD FEATURE

HOLD# pin signal goes low to hold any serial communications with the device. The HOLD feature will not stop the operation of write status register, programming, or erasing in progress.

The operation of HOLD requires Chip Select (CS#) keeping low and starts on falling edge of HOLD# pin signal while Serial Clock (SCLK) signal is being low (if Serial Clock signal is not being low, HOLD operation will not start until Serial Clock signal being low). The HOLD condition ends on the rising edge of HOLD# pin signal while Serial Clock(SCLK) signal is being low (if Serial Clock signal is not being low, HOLD operation will not end until Serial Clock being low).

**Figure 2. Hold Condition Operation**



During the HOLD operation, the Serial Data Output (SO) is high impedance when Hold# pin goes low and will keep high impedance until Hold# pin goes high. The Serial Data Input (SI) is don't care if both Serial Clock (SCLK) and Hold# pin goes low and will keep the state until SCLK goes low and Hold# pin goes high. If Chip Select (CS#) drives high during HOLD operation, it will reset the internal logic of the device. To re-start communication with chip, the HOLD# must be at high and CS# must be at low.

**Note:** The HOLD feature is disabled during Quad I/O mode.

## 10. COMMAND DESCRIPTION

**Table 4. Command Sets**

### Read Commands

| I/O                  | 1  | 1  | 2   | 2  | 4  | 4                             |
|----------------------|--|--|---|--|--|-------------------------------|
| Command              | READ<br>(normal read)                      | FAST READ<br>(fast read data)              | 2READ<br>(2 x I/O read<br>command)                    | DREAD<br>(1I / 2O read<br>command)                           | 4READ<br>(4 x I/O read<br>command)                 | QREAD (1I/4O<br>read command) |
| 1 <sup>st</sup> byte | 03 (hex)                                   | 0B (hex)                                   | BB (hex)  | 3B (hex)   | EB (hex)   | 6B (hex)                      |
| 2 <sup>nd</sup> byte | ADD1(8)                                    | ADD1(8)                                    | ADD1(4)   | ADD1(8)  | ADD1(2)  | ADD1(8)                       |
| 3 <sup>rd</sup> byte | ADD2(8)                                    | ADD2(8)                                    | ADD2(4)   | ADD2(8)  | ADD2(2)  | ADD2(8)                       |
| 4 <sup>th</sup> byte | ADD3(8)                                    | ADD3(8)                                    | ADD3(4)   | ADD3(8)  | ADD3(2)  | ADD3(8)                       |
| 5 <sup>th</sup> byte |  | Dummy(8)                                   | Dummy*  | Dummy(8)   | Dummy*   | Dummy(8)                      |
| Action               | n bytes read out<br>until CS# goes<br>high | n bytes read out<br>until CS# goes<br>high | n bytes read out<br>by 2 x I/O until<br>CS# goes high | n bytes read out<br>by Dual Output<br>until CS# goes<br>high | Quad I/O read<br>with configurable<br>dummy cycles |                               |

**Note:** \*Dummy cycle number will be different, depending on the bit6 (DC) setting of Configuration Register. Please refer to "[Configuration Register](#)" Table.

**Other Commands**

| Command              | WREN (write enable)                   | WRDI (write disable)                    | RDSR (read status register)                   | RDCR (read configuration register)                   | WRSR (write status/configuration register)               | 4PP (quad page program)                 | SE (sector erase)            |
|----------------------|---------------------------------------|---|---|--|--|---|------------------------------|
| 1 <sup>st</sup> byte | 06 (hex)                              | 04 (hex)                                | 05 (hex)                                      | 15 (hex)   | 01 (hex)   | 38 (hex)                                | 20 (hex)                     |
| 2 <sup>nd</sup> byte |                                       |   |   |  | Values   | ADD1                                    | ADD1                         |
| 3 <sup>rd</sup> byte |                                       |   |   |  | Values   | ADD2                                    | ADD2                         |
| 4 <sup>th</sup> byte |                                       |   |   |  |  | ADD3                                    | ADD3                         |
| Action               | sets the (WEL) write enable latch bit | resets the (WEL) write enable latch bit | to read out the values of the status register | to read out the values of the configuration register | to write new values of the configuration/status register | quad input to program the selected page | to erase the selected sector |

| Command              | BE 32K (block erase 32KB)        | BE (block erase 64KB)            | CE (chip erase)     | PP (page program)            | DP (Deep power down)        | RDP (Release from deep power down) | PGM/ERS Suspend (Suspend Program/ Erase)                  |
|----------------------|----------------------------------|----------------------------------|---------------------|------------------------------|-----------------------------|------------------------------------|---|
| 1 <sup>st</sup> byte | 52 (hex)                         | D8 (hex)                         | 60 or C7 (hex)      | 02 (hex)                     | B9 (hex)                    | AB (hex)                           | 75/B0 (hex)   |
| 2 <sup>nd</sup> byte | ADD1                             | ADD1                             |                     | ADD1                         |                             |                                    |   |
| 3 <sup>rd</sup> byte | ADD2                             | ADD2                             |                     | ADD2                         |                             |                                    |   |
| 4 <sup>th</sup> byte | ADD3                             | ADD3                             |                     | ADD3                         |                             |                                    |   |
| Action               | to erase the selected 32KB block | to erase the selected 64KB block | to erase whole chip | to program the selected page | enters deep power down mode | release from deep power down mode  | program/erase operation is interrupted by suspend command |

| Command              | PGM/ERS Resume (Resumes Program/ Erase)                     | RDID (read identification)                                  | RES (read electronic ID)     | REMS (read electronic manufacturer & device ID) | ENSO (enter secured OTP)             | EXSO (exit secured OTP)             | WRSCUR (write security register)                                 |
|----------------------|---|---|------------------------------|---|--------------------------------------|-------------------------------------|--|
| 1 <sup>st</sup> byte | 7A/30 (hex)   | 9F (hex)  | AB (hex)                     | 90 (hex)  | B1 (hex)                             | C1 (hex)                            | 2F (hex)   |
| 2 <sup>nd</sup> byte |   |   | x                            | x   |                                      |                                     |  |
| 3 <sup>rd</sup> byte |   |   | x                            | x   |                                      |                                     |  |
| 4 <sup>th</sup> byte |   |   | x                            | ADD   |                                      |                                     |  |
| Action               | to continue performing the suspended program/erase sequence | outputs JEDEC ID: 1-byte Manufacturer ID & 2-byte Device ID | to read out 1-byte Device ID | output the Manufacturer ID & Device ID          | to enter the 8K-bit secured OTP mode | to exit the 8K-bit secured OTP mode | to set the lockdown bit as "1" (once lockdown, cannot be update) |

| Command (byte)       | RDSCUR (read security register)    | WPSEL* (Write Protect Selection)                  | RDSFDP         | SBL (Set Burst Length) | RSTEN (Reset Enable) | RST (Reset Memory) | NOP (No Operation) |
|----------------------|------------------------------------|---|----------------|------------------------|----------------------|--------------------|--------------------|
| 1 <sup>st</sup> byte | 2B (hex)                           | 68 (hex)  | 5A (hex)       | C0/77 (hex)            | 66 (hex)             | 99 (hex)           | 00 (hex)           |
| 2 <sup>nd</sup> byte |                                    |   | ADD1(8)        |                        |                      |                    |                    |
| 3 <sup>rd</sup> byte |                                    |   | ADD2(8)        |                        |                      |                    |                    |
| 4 <sup>th</sup> byte |                                    |   | ADD3(8)        |                        |                      |                    |                    |
| 5 <sup>th</sup> byte |                                    |   | Dummy(8)       |                        |                      |                    |                    |
| 6 <sup>th</sup> byte |                                    |   |                |                        |                      |                    |                    |
| Action               | to read value of security register | to enter and enable individual block protect mode | Read SFDP mode | to set Burst length    |                      | (Note 2)           |                    |

| Command (byte)       | WRSPB* (SPB bit program) | ESSPB* (all SPB bit erase) | RDSPB* (read SPB status) | WRDPB* (write DPB register) | RDDPB* (read DPB register) | GBLK* (gang block lock)  | GBULK* (gang block unlock) |
|----------------------|--------------------------|----------------------------|--------------------------|-----------------------------|----------------------------|--------------------------|----------------------------|
| 1 <sup>st</sup> byte | E3 (hex)                 | E4 (hex)                   | E2 (hex)                 | E1 (hex)                    | E0 (hex)                   | 7E (hex)                 | 98 (hex)                   |
| 2 <sup>nd</sup> byte | ADD1                     |                            | ADD1                     | ADD1                        | ADD1                       |                          |                            |
| 3 <sup>rd</sup> byte | ADD2                     |                            | ADD2                     | ADD2                        | ADD2                       |                          |                            |
| 4 <sup>th</sup> byte | ADD3                     |                            | ADD3                     | ADD3                        | ADD3                       |                          |                            |
| 5 <sup>th</sup> byte | ADD4                     |                            | ADD4                     | ADD4                        | ADD4                       |                          |                            |
| 6 <sup>th</sup> byte |                          |                            |                          |                             |                            |                          |                            |
| Action               |                          |                            |                          |                             |                            | whole chip write protect | whole chip unprotect       |

*\*MX25L6436FM2I-08Q does not support the advanced sector protection command E3h, E4h, E2h, E1h, E0h, 7Eh, and 98h. Its WPSEL bit (command 68h) is always kept as 0.*

Note 1: It is not recommended to adopt any other code not in the command definition table, which will potentially enter the hidden mode.

Note 2: The RSTEN command must be executed before executing the RST command. If any other command is issued in-between RSTEN and RST, the RST command will be ignored.

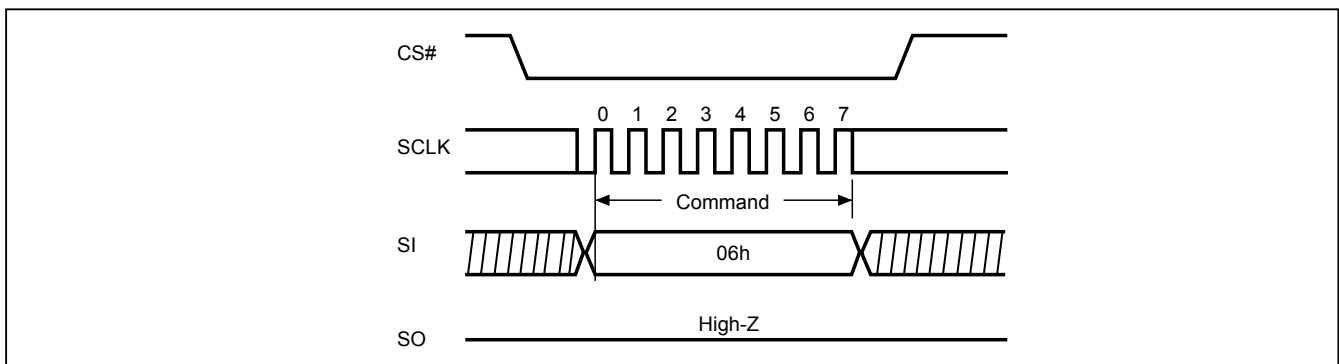


**10-1. Write Enable (WREN)**

The Write Enable (WREN) instruction is for setting Write Enable Latch (WEL) bit. For those instructions like PP, 4PP, SE, BE, BE32K, CE, and WRSR which are intended to change the device content, should be set every time after the WREN instruction setting the WEL bit.

The sequence of issuing WREN instruction is: CS# goes low→ sending WREN instruction code→ CS# goes high.

The SIO[3:1] are don't care.

**Figure 3. Write Enable (WREN) Sequence (Command 06)**

**10-2. Write Disable (WRDI)**

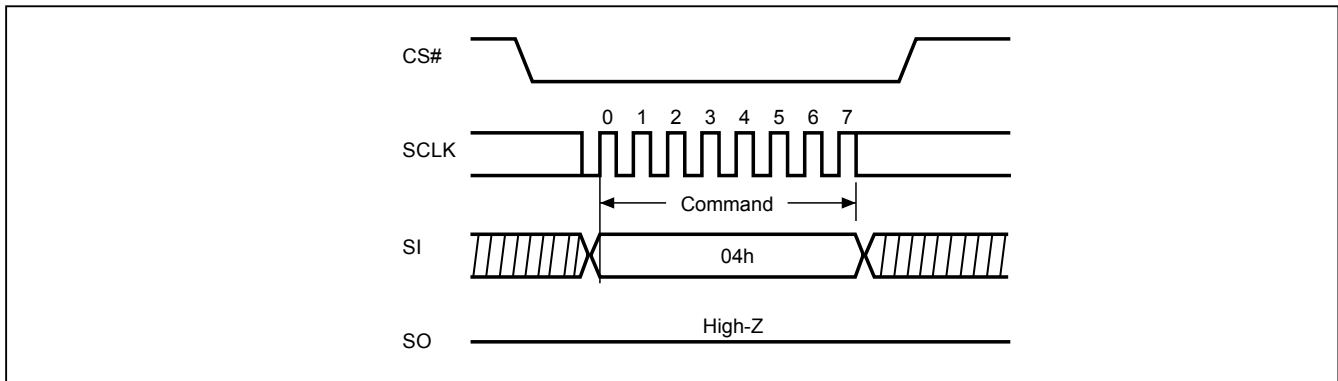
The Write Disable (WRDI) instruction is for resetting Write Enable Latch (WEL) bit.

The sequence of issuing WRDI instruction is: CS# goes low → sending WRDI instruction code → CS# goes high.

The WEL bit is reset by following situations:

- Power-up
- WRDI command completion
- WRSR command completion
- PP command completion
- 4PP command completion
- SE command completion
- BE32K command completion
- BE command completion
- CE command completion
- PGM/ERS Suspend command completion
- Softreset command completion
- WRSCUR command completion
- GBLK command completion
- GBULK command completion
- WRSPB command completion
- WRDPB command completion
- ESSPB command completion

**Figure 4. Write Disable (WRDI) Sequence (Command 04)**



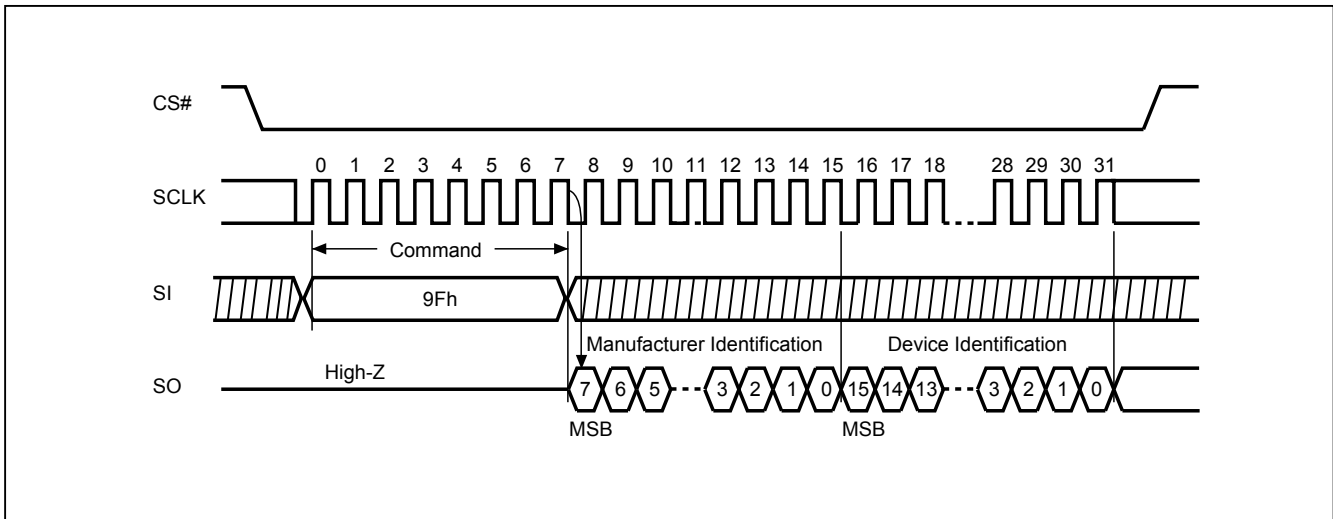
**10-3. Read Identification (RDID)**

The RDID instruction is for reading the manufacturer ID of 1-byte and followed by Device ID of 2-byte. The Macronix Manufacturer ID and Device ID are listed as table of "Table 9. ID Definitions".

The sequence of issuing RDID instruction is: CS# goes low → sending RDID instruction code → 24-bits ID data out on SO → to end RDID operation can use CS# to high at any time during data out.

While Program/Erase operation is in progress, it will not decode the RDID instruction, so there's no effect on the cycle of program/erase operation which is currently in progress. When CS# goes high, the device is at standby stage.

**Figure 5. Read Identification (RDID) Sequence (Command 9F)**



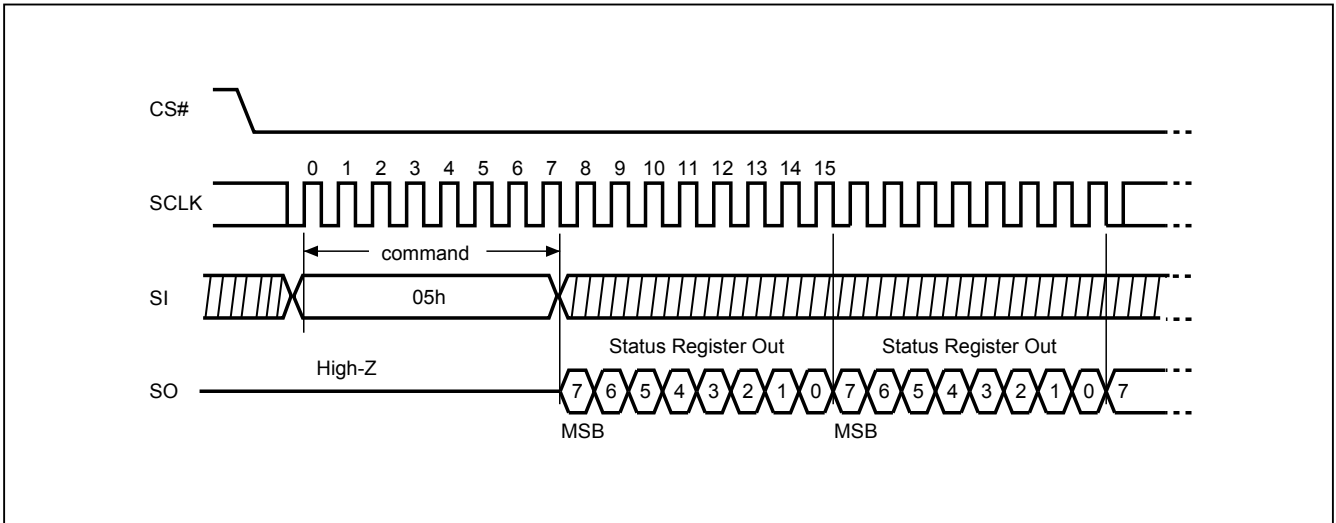
**10-4. Read Status Register (RDSR)**

The RDSR instruction is for reading Status Register. The Read Status Register can be read at any time (even in program/erase/write status register condition) and continuously. It is recommended to check the Write in Progress (WIP) bit before sending a new instruction when a program, erase, or write status register operation is in progress.

The sequence of issuing RDSR instruction is: CS# goes low→ sending RDSR instruction code→ Status Register data out on SO.

The SIO[3:1] are don't care.

**Figure 6. Read Status Register (RDSR) Sequence (Command 05)**



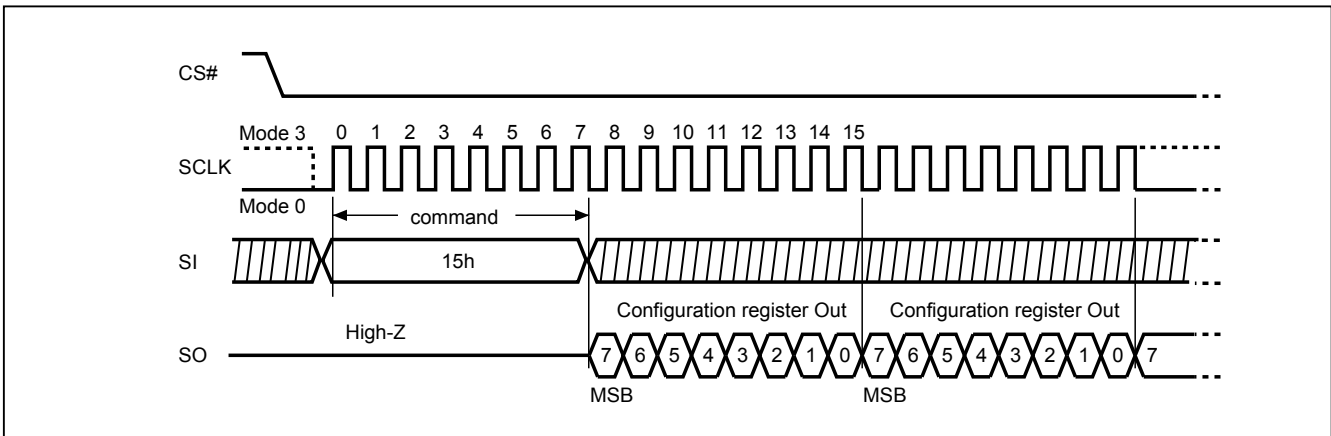
**10-5. Read Configuration Register (RDCR)**

The RDCR instruction is for reading Configuration Register Bits. The Read Configuration Register can be read at any time (even in program/erase/write configuration register condition). It is recommended to check the Write in Progress (WIP) bit before sending a new instruction when a program, erase, or write configuration register operation is in progress.

The sequence of issuing RDCR instruction is: CS# goes low→ sending RDCR instruction code→ Configuration Register data out on SO.

The SIO[3:1] are don't care.

**Figure 7. Read Configuration Register (RDCR) Sequence**



**Status Register**

The definition of the status register bits is as below:

**WIP bit.** The Write in Progress (WIP) bit, a volatile bit, indicates whether the device is busy in program/erase/write status register progress. When WIP bit sets to 1, which means the device is busy in program/erase/write status register progress. When WIP bit sets to 0, which means the device is not in progress of program/erase/write status register cycle.

**WEL bit.** The Write Enable Latch (WEL) bit is a volatile bit that is set to “1” by the WREN instruction. WEL needs to be set to “1” before the device can accept program and erase instructions, otherwise the program and erase instructions are ignored. WEL automatically clears to “0” when a program or erase operation completes. To ensure that both WIP and WEL are “0” and the device is ready for the next program or erase operation, it is recommended that WIP be confirmed to be “0” before checking that WEL is also “0”. If a program or erase instruction is applied to a protected memory area, the instruction will be ignored and WEL will clear to “0”.

**BP3, BP2, BP1, BP0 bits.** The Block Protect (BP3, BP2, BP1, BP0) bits, non-volatile bits, indicate the protected area (as defined in *"Table 1. Protected Area Sizes"*) of the device to against the program/erase instruction without hardware protection mode being set. To write the Block Protect (BP3, BP2, BP1, BP0) bits requires the Write Status Register (WRSR) instruction to be executed. Those bits define the protected area of the memory to against Page Program (PP), Sector Erase (SE), Block Erase (BE) and Chip Erase (CE) instructions (only if all Block Protect bits set to 0, the CE instruction can be executed). The BP3, BP2, BP1, BP0 bits are "0" as default. Which is un-protected.

**QE bit.** The Quad Enable (QE) bit is a non-volatile bit with a factory default of “0”. When QE is “0”, Quad mode commands are ignored; pins WP#/SIO2 and HOLD#/SIO3 function as WP# and HOLD#, respectively. When QE is “1”, Quad mode is enabled and Quad mode commands are supported along with Single and Dual mode commands. Pins WP#/SIO2 and HOLD#/SIO3 function as SIO2 and SIO3, respectively, and their alternate pin functions are disabled. Enabling Quad mode also disables the HPM and HOLD features.

**SRWD bit.** The Status Register Write Disable (SRWD) bit, non-volatile bit, default value is "0". SRWD bit is operated together with Write Protection (WP#/SIO2) pin for providing hardware protection mode. The hardware protection mode requires SRWD sets to 1 and WP#/SIO2 pin signal is low stage. In the hardware protection mode, the Write Status Register (WRSR) instruction is no longer accepted for execution and the SRWD bit and Block Protect bits (BP3, BP2, BP1, BP0) are read only. The SRWD bit defaults to be "0".

**Table 5. Status Register**

| bit7  | bit6                                | bit5                           | bit4                           | bit3                           | bit2                           | bit1                                 | bit0  |
|---|-------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------------|---|
| SRWD (Status Register Write Disable)                                | QE (Quad Enable)                    | BP3 (level of protected block) | BP2 (level of protected block) | BP1 (level of protected block) | BP0 (level of protected block) | WEL (write enable latch)             | WIP (write in progress bit)                   |
| 1=status register write disabled<br>0=status register write enabled | 1= Quad Enable<br>0=not Quad Enable | <i>(note 1)</i>                | <i>(note 1)</i>                | <i>(note 1)</i>                | <i>(note 1)</i>                | 1=write enable<br>0=not write enable | 1=write operation<br>0=not in write operation |
| Non-volatile bit  | Non-volatile bit                    | Non-volatile bit               | Non-volatile bit               | Non-volatile bit               | Non-volatile bit               | volatile bit                         | volatile bit                                  |

**Note 1:** Please refer to *"Table 1. Protected Area Sizes"*.

### Configuration Register

The Configuration Register is able to change the default status of Flash memory. Flash memory will be configured after the CR bit is set.

#### ODS bit

The output driver strength ODS bit are volatile bits, which indicate the output driver level of the device. The Output Driver Strength is defaulted=1 when delivered from factory. To write the ODS bit requires the Write Status Register (WRSR) instruction to be executed.

#### TB bit

The Top/Bottom (TB) bit is a OTP bit. The Top/Bottom (TB) bit is used to configure the Block Protect area by BP bit (BP3, BP2, BP1, BP0), starting from TOP or Bottom of the memory array. The TB bit is defaulted as "0", which means Top area protect. When it is set as "1", the protect area will change to Bottom area of the memory device. To write the TB bit requires the Write Status Register (WRSR) instruction to be executed.

**Table 6. Configuration Register**

| bit7     | bit6                    | bit5     | bit4     | bit3  | bit2     | bit1     | bit0   |
|----------|-------------------------|----------|----------|---|----------|----------|--|
| Reserved | DC (Dummy Cycle)        | Reserved | Reserved | TB (top/bottom selected)                                | Reserved | Reserved | ODS  |
| x        | 2READ/4READ Dummy Cycle | x        | x        | 0=Top area protect<br>1=Bottom area protect (Default=0) | x        | x        | 0, Output driver strength=1<br>1, Output driver strength=1/4 (Default=0) |
| x        | volatile                | x        | x        | OTP   | x        | x        | volatile   |

**Note:** Please refer to "[Table 7. Dummy Cycle and Frequency Table](#)", with "Don't Care" on other Reserved Configuration Registers.

**Table 7. Dummy Cycle and Frequency Table**

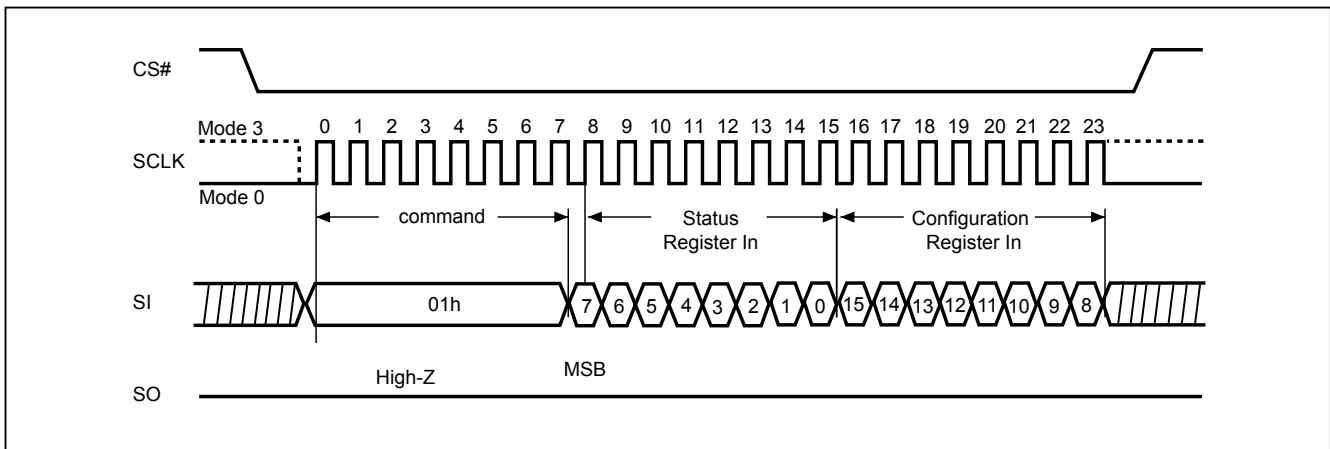
|       | DC          | Numbers of Dummy Cycles | Freq. (MHz)                |
|-------|-------------|-------------------------|----------------------------|
| 2READ | 0 (default) | 4                       | 80 @ $2.65V \leq VCC < 3V$ |
|       |             |                         | 104 @ $VCC \geq 3V$        |
|       | 1           | 8                       | 133                        |
| 4READ | 0 (default) | 6                       | 80 @ $2.65V \leq VCC < 3V$ |
|       |             |                         | 104 @ $VCC \geq 3V$        |
|       | 1           | 10                      | 133                        |

**10-6. Write Status Register (WRSR)**

The WRSR instruction is for changing the values of Status Register Bits and Configuration Register Bits. Before sending WRSR instruction, the Write Enable (WREN) instruction must be decoded and executed to set the Write Enable Latch (WEL) bit in advance. The WRSR instruction can change the value of Block Protect (BP3, BP2, BP1, BP0) bits to define the protected area of memory (as shown in "Table 1. Protected Area Sizes"). The WRSR also can set or reset the Quad enable (QE) bit and set or reset the Status Register Write Disable (SRWD) bit in accordance with Write Protection (WP#/SIO2) pin signal, but has no effect on bit1(WEL) and bit0 (WIP) of the status register. The WRSR instruction cannot be executed once the Hardware Protected Mode (HPM) is entered.

The sequence of issuing WRSR instruction is: CS# goes low→ sending WRSR instruction code→ Status Register data on SI→ CS# goes high.

**Figure 8. Write Status Register (WRSR) Sequence (Command 01)**





The CS# must go high exactly at the byte boundary; otherwise, the instruction will be rejected and not executed. The self-timed Write Status Register cycle time (tW) is initiated as soon as Chip Select (CS#) goes high. The Write in Progress (WIP) bit still can be checked out during the Write Status Register cycle is in progress. The WIP sets 1 during the tW timing, and sets 0 when Write Status Register Cycle is completed, and the Write Enable Latch (WEL) bit is reset.

**Table 8. Protection Modes**

| Mode                           | Status register condition   | WP# and SRWD bit status  | Memory   |
|--------------------------------|---|--|--|
| Software protection mode (SPM) | Status register can be written in (WEL bit is set to "1") and the SRWD, BP0-BP3 bits can be changed | WP#=1 and SRWD bit=0, or WP#=0 and SRWD bit=0, or WP#=1 and SRWD=1 | The protected area cannot be programmed or erased. |
| Hardware protection mode (HPM) | The SRWD, BP0-BP3, TB of status register bits cannot be changed                                     | WP#=0, SRWD bit=1  | The protected area cannot be programmed or erased. |

**Note:** As defined by the values in the Block Protect (BP3, BP2, BP1, BP0, TB) bits of the Status Register, as shown in "Table 1. Protected Area Sizes".

As the table above showing, the summary of the Software Protected Mode (SPM) and Hardware Protected Mode (HPM):

Software Protected Mode (SPM):

- When SRWD bit=0, no matter WP#/SIO2 is low or high, the WREN instruction may set the WEL bit and can change the values of SRWD, BP3, BP2, BP1, BP0. The protected area, which is defined by BP3, BP2, BP1, BP0, is at software protected mode (SPM).
- When SRWD bit=1 and WP#/SIO2 is high, the WREN instruction may set the WEL bit can change the values of SRWD, BP3, BP2, BP1, BP0. The protected area, which is defined by BP3, BP2, BP1, BP0, is at software protected mode (SPM)

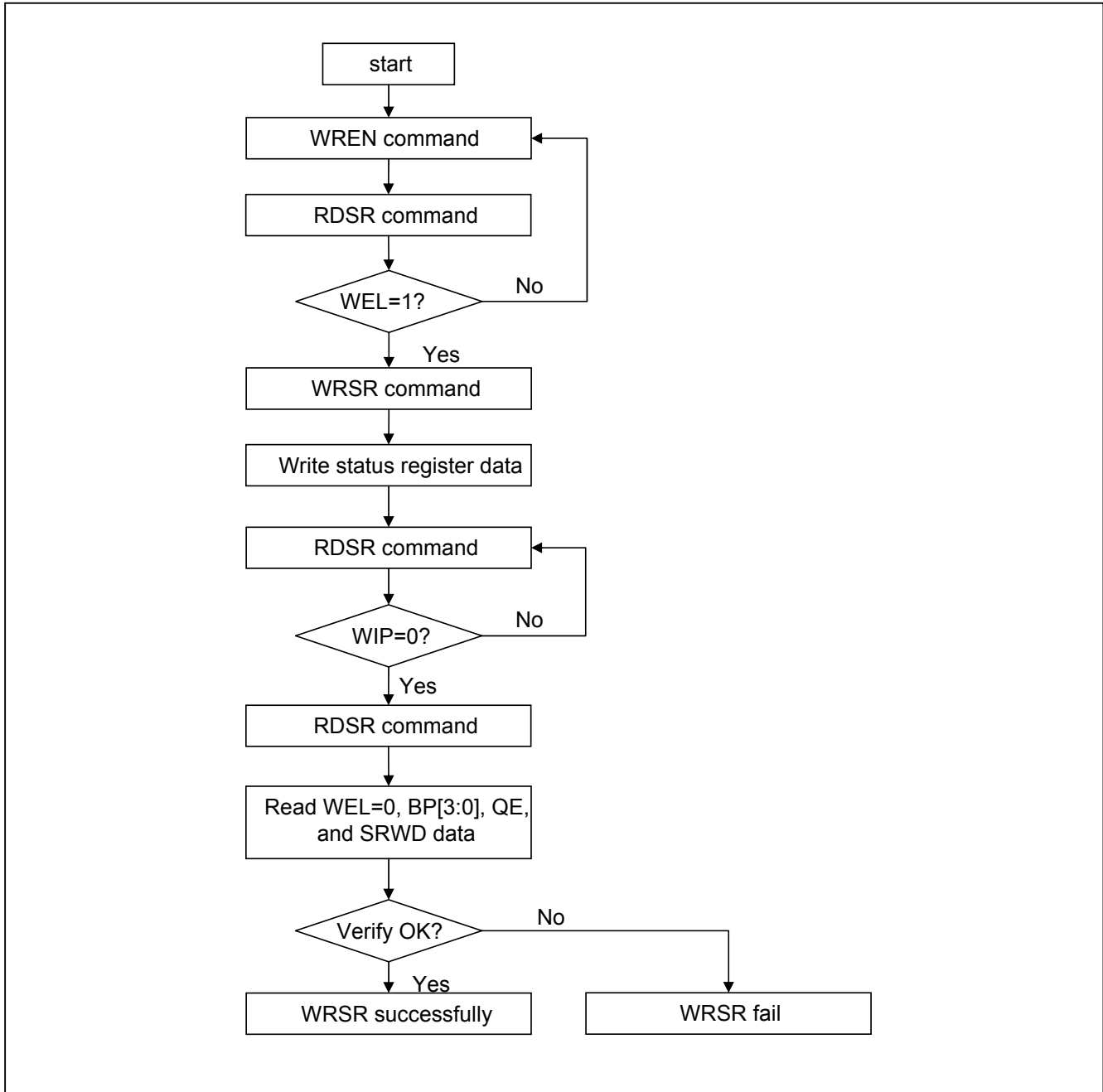
Hardware Protected Mode (HPM):

- When SRWD bit=1, and then WP#/SIO2 is low (or WP#/SIO2 is low before SRWD bit=1), it enters the hardware protected mode (HPM). The data of the protected area is protected by software protected mode by BP3, BP2, BP1, BP0, TB and hardware protected mode by the WP#/SIO2 to against data modification.

**Note:**

To exit the hardware protected mode requires WP#/SIO2 driving high once the hardware protected mode is entered. If the WP#/SIO2 pin is permanently connected to high, the hardware protected mode can never be entered; only can use software protected mode via BP3, BP2, BP1, BP0, TB.

If the system goes into four I/O mode, the feature of HPM will be disabled.

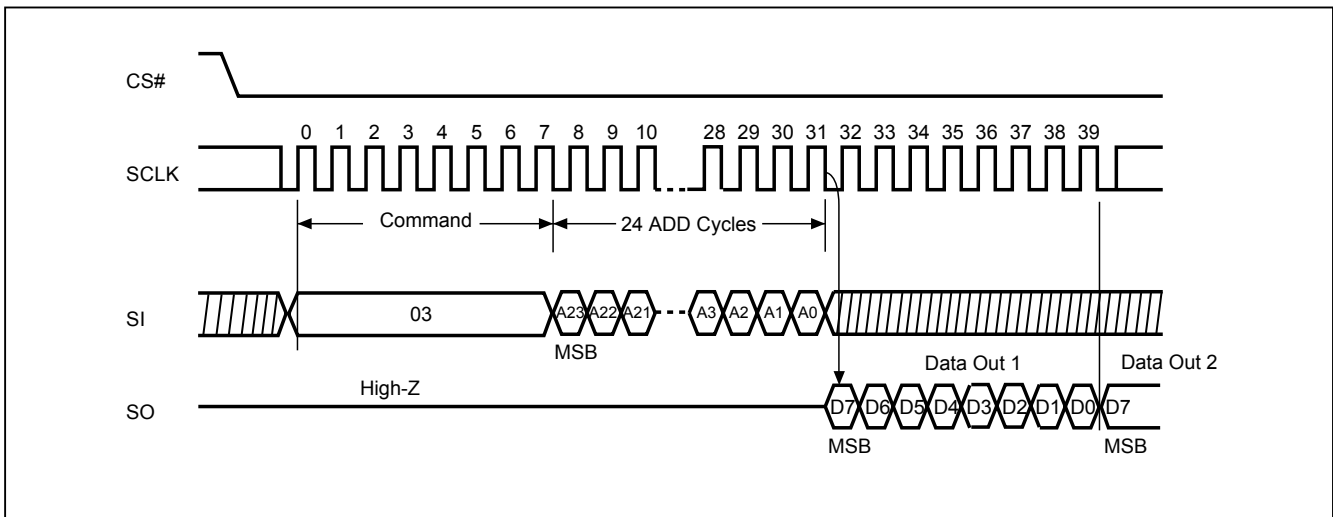
**Figure 9. WRSR flow**

**10-7. Read Data Bytes (READ)**

The read instruction is for reading data out. The address is latched on rising edge of SCLK, and data shifts out on the falling edge of SCLK at a maximum frequency fR. The first address byte can be at any location. The address is automatically increased to the next higher address after each byte data is shifted out, so the whole memory can be read out at a single READ instruction. The address counter rolls over to 0 when the highest address has been reached.

The sequence of issuing READ instruction is: CS# goes low→ sending READ instruction code→3-byte address on SI →data out on SO→ to end READ operation can use CS# to high at any time during data out.

**Figure 10. Read Data Bytes (READ) Sequence (Command 03)**



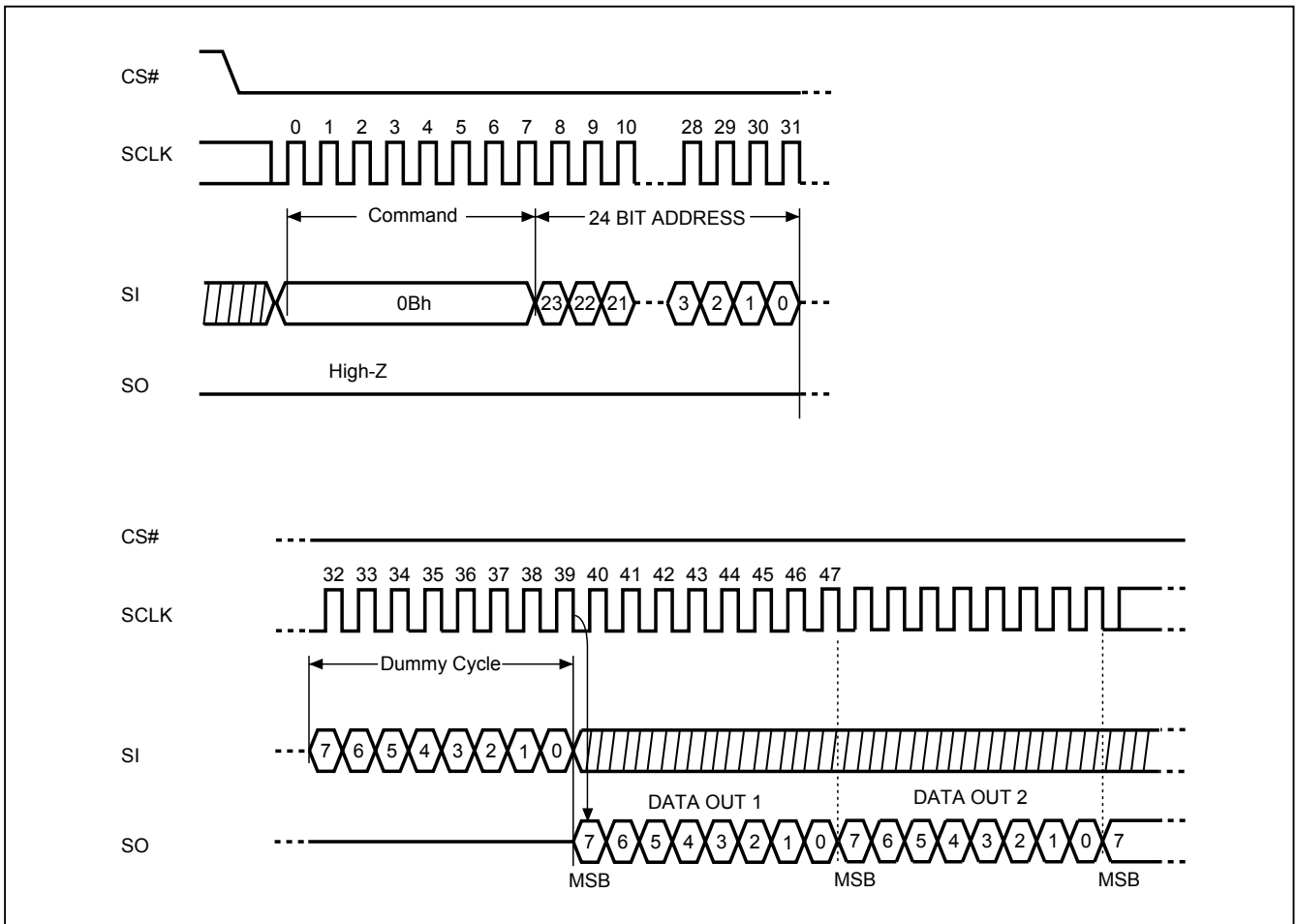
**10-8. Read Data Bytes at Higher Speed (FAST\_READ)**

The FAST\_READ instruction is for quickly reading data out. The address is latched on rising edge of SCLK, and data of each bit shifts out on the falling edge of SCLK at a maximum frequency fC. The first address byte can be at any location. The address is automatically increased to the next higher address after each byte data is shifted out, so the whole memory can be read out at a single FAST\_READ instruction. The address counter rolls over to 0 when the highest address has been reached.

The sequence of issuing FAST\_READ instruction is: CS# goes low→ sending FAST\_READ instruction code→ 3-byte address on SI→1-dummy byte (default) address on SI→ data out on SO→ to end FAST\_READ operation can use CS# to high at any time during data out. (Please refer to "Figure 11. Read at Higher Speed (FAST\_READ) Sequence (Command 0B)")

While Program/Erase/Write Status Register cycle is in progress, FAST\_READ instruction is rejected without any impact on the Program/Erase/Write Status Register current cycle.

**Figure 11. Read at Higher Speed (FAST\_READ) Sequence (Command 0B)**



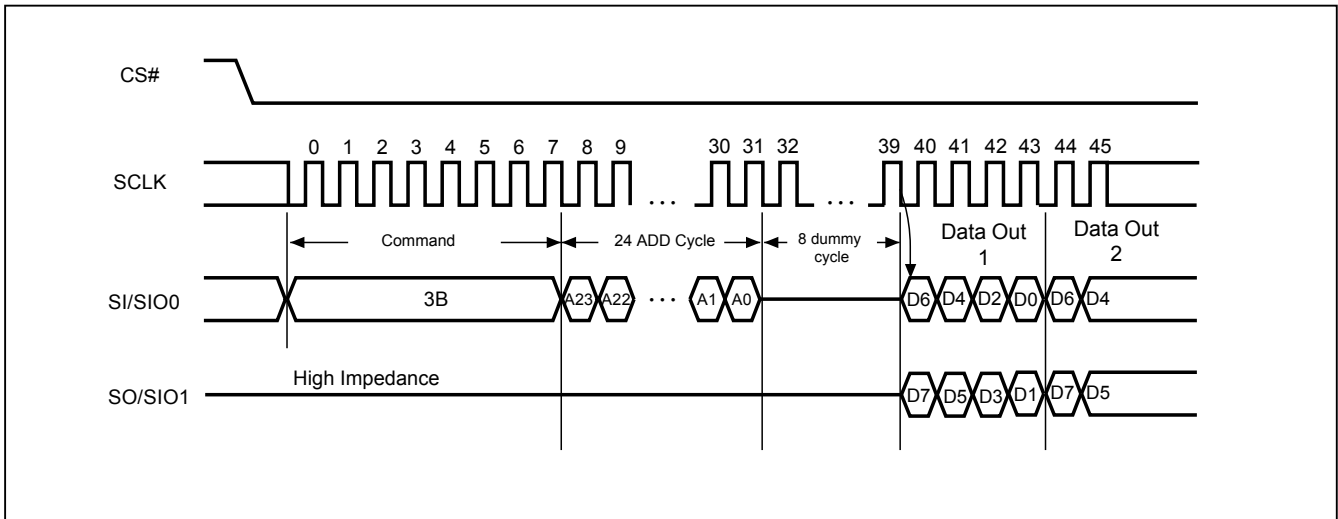
**10-9. Dual Read Mode (DREAD)**

The DREAD instruction enable double throughput of Serial NOR Flash in read mode. The address is latched on rising edge of SCLK, and data of every two bits (interleave on 2 I/O pins) shift out on the falling edge of SCLK at a maximum frequency fT. The first address byte can be at any location. The address is automatically increased to the next higher address after each byte data is shifted out, so the whole memory can be read out at a single DREAD instruction. The address counter rolls over to 0 when the highest address has been reached. Once writing DREAD instruction, the following data out will perform as 2-bit instead of previous 1-bit.

The sequence of issuing DREAD instruction is: CS# goes low → sending DREAD instruction → 3-byte address on SI → 8-bit dummy cycle → data out interleave on SIO1 & SIO0 → to end DREAD operation can use CS# to high at any time during data out.

While Program/Erase/Write Status Register cycle is in progress, DREAD instruction is rejected without any impact on the Program/Erase/Write Status Register current cycle.

**Figure 12. Dual Read Mode Sequence (Command 3B)**



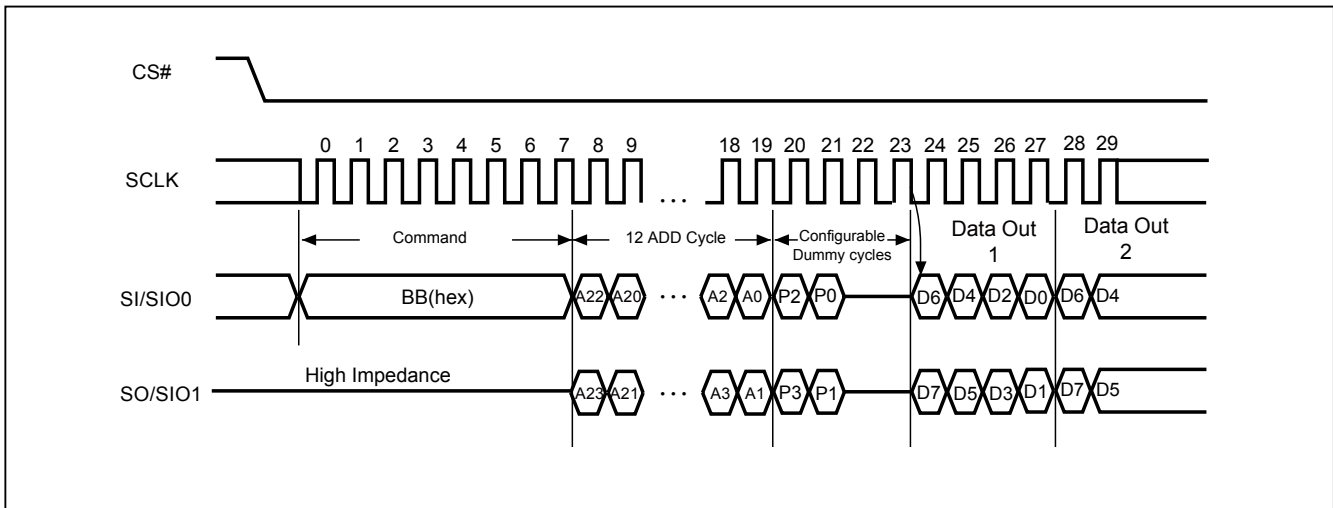
**10-10. 2 x I/O Read Mode (2READ)**

The 2READ instruction enables Double Transfer Rate of Serial NOR Flash in read mode. The address is latched on rising edge of SCLK, and data of every two bits (interleave on 2 I/O pins) shift out on the falling edge of SCLK at a maximum frequency fT. The first address byte can be at any location. The address is automatically increased to the next higher address after each byte data is shifted out, so the whole memory can be read out at a single 2READ instruction. The address counter rolls over to 0 when the highest address has been reached. Once writing 2READ instruction, the following address/dummy/data out will perform as 2-bit instead of previous 1-bit.

The sequence of issuing 2READ instruction is: CS# goes low→ sending 2READ instruction→ 24-bit address interleave on SIO1 & SIO0→ 4 dummy cycles(default) on SIO1 & SIO0→ data out interleave on SIO1 & SIO0→ to end 2READ operation can use CS# to high at any time during data out.

While Program/Erase/Write Status Register cycle is in progress, 2READ instruction is rejected without any impact on the Program/Erase/Write Status Register current cycle.

**Figure 13. 2 x I/O Read Mode Sequence (Command BB)**



**Note:** SI/SIO0 or SO/SIO1 should be kept "0h" or "Fh" in the first two dummy cycles. In other words, P2=P0 or P3=P1 is necessary.

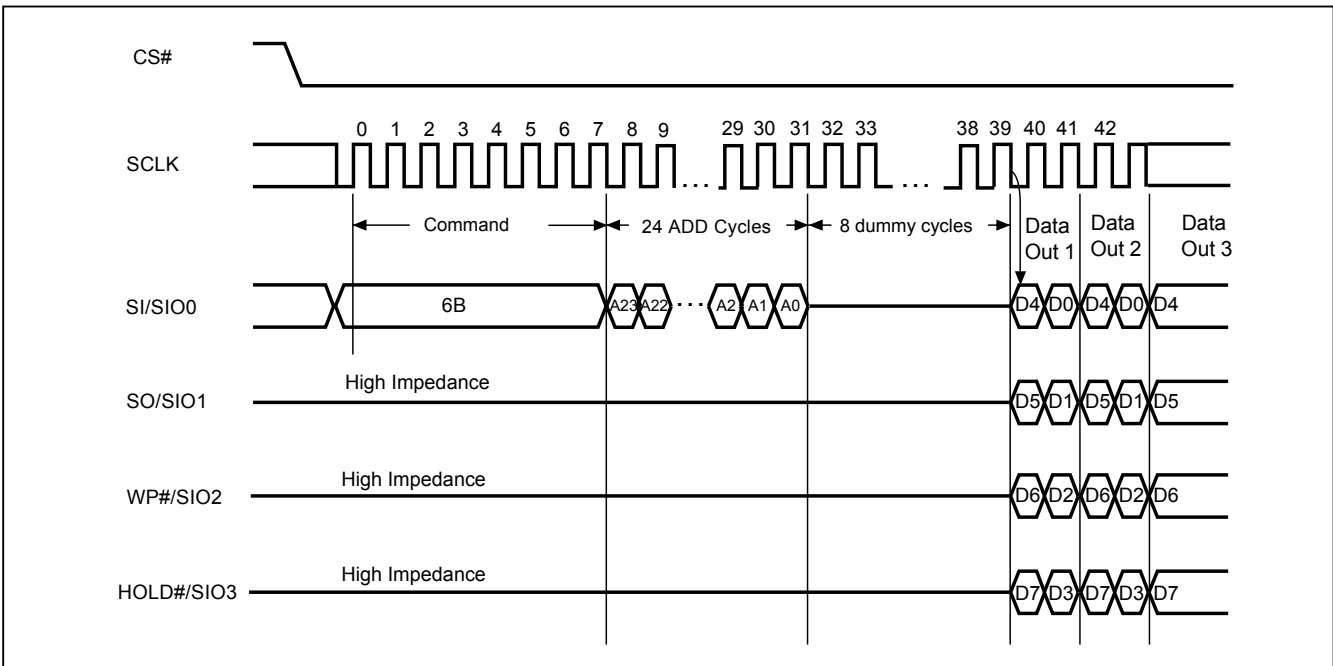
**10-11. Quad Read Mode (QREAD)**

The QREAD instruction enable quad throughput of Serial NOR Flash in read mode. A Quad Enable (QE) bit of status Register must be set to "1" before sending the QREAD instruction. The address is latched on rising edge of SCLK, and data of every four bits (interleave on 4 I/O pins) shift out on the falling edge of SCLK at a maximum frequency fQ. The first address byte can be at any location. The address is automatically increased to the next higher address after each byte data is shifted out, so the whole memory can be read out at a single QREAD instruction. The address counter rolls over to 0 when the highest address has been reached. Once writing QREAD instruction, the following data out will perform as 4-bit instead of previous 1-bit.

The sequence of issuing QREAD instruction is: CS# goes low → sending QREAD instruction → 3-byte address on SI → 8-bit dummy cycle → data out interleave on SIO3, SIO2, SIO1 & SIO0 → to end QREAD operation can use CS# to high at any time during data out.

While Program/Erase/Write Status Register cycle is in progress, QREAD instruction is rejected without any impact on the Program/Erase/Write Status Register current cycle.

**Figure 14. Quad Read Mode Sequence (Command 6B)**

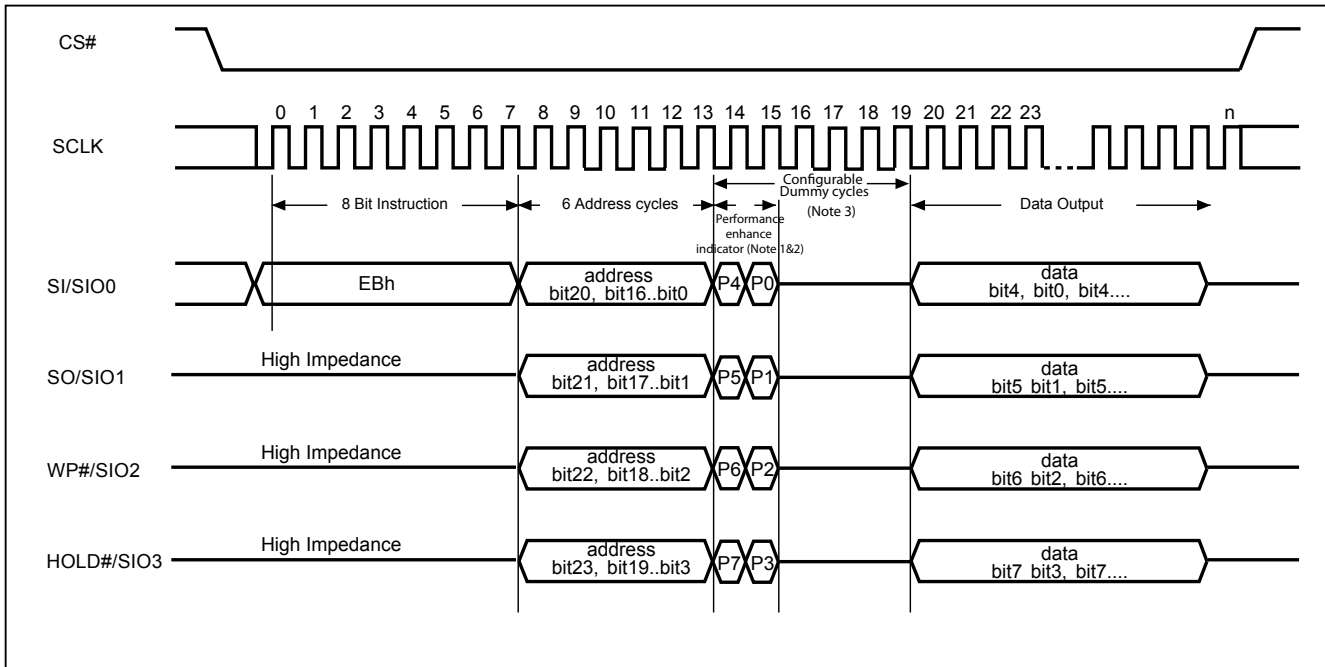


**10-12. 4 x I/O Read Mode (4READ)**

The 4READ instruction enables quad throughput of Serial NOR Flash in read mode. A Quad Enable (QE) bit of status Register must be set to "1" before sending the 4READ instruction. The address is latched on rising edge of SCLK, and data of every four bits (interleave on 4 I/O pins) shift out on the falling edge of SCLK at a maximum frequency fQ. The first address byte can be at any location. The address is automatically increased to the next higher address after each byte data is shifted out, so the whole memory can be read out at a single 4READ instruction. The address counter rolls over to 0 when the highest address has been reached. Once writing 4READ instruction, the following address/dummy/data out will perform as 4-bit instead of previous 1-bit.

The sequence of issuing 4READ instruction is: CS# goes low→ sending 4READ instruction→ 24-bit address interleave on SIO3, SIO2, SIO1 & SIO0→2+4 dummy cycles (default) →data out interleave on SIO3, SIO2, SIO1 & SIO0→ to end 4READ operation can use CS# to high at any time during data out. (Please refer to the figure below)

**Figure 15. 4 x I/O Read Mode Sequence (Command EB)**



**Notes:**

1. Hi-impedance is inhibited for the two clock cycles.
2. P7≠P3, P6≠P2, P5≠P1 & P4≠P0 (Toggling) is inhibited.
3. The Configurable Dummy Cycle is set by Configuration Register Bit. Please see ["Dummy Cycle and Frequency Table"](#)



Another sequence of issuing 4READ instruction especially useful in random access is : CS# goes low→ sending 4READ instruction→ 3-bytes address interleave on SIO3, SIO2, SIO1 & SIO0 →performance enhance toggling bit P[7:0]→ 4 dummy cycles → data out until CS# goes high → CS# goes low (reduce 4READ instruction) → 24-bit random access address (Please refer to "[Figure 16. 4 x I/O Read enhance performance Mode Sequence \(Command EB\) \(SPI Mode\)](#)").

In the performance-enhancing mode (Notes of "[Figure 16. 4 x I/O Read enhance performance Mode Sequence \(Command EB\) \(SPI Mode\)](#)"), P[7:4] must be toggling with P[3:0]; likewise P[7:0]=A5h, 5Ah, F0h or 0Fh can make this mode continue and reduce the next 4READ instruction. Once P[7:4] is no longer toggling with P[3:0]; likewise P[7:0]=FFh, 00h, AAh or 55h. These commands will reset the performance enhance mode. And afterwards CS# is raised and then lowered, the system then will return to normal operation.

While Program/Erase/Write Status Register cycle is in progress, 4READ instruction is rejected without any impact on the Program/Erase/Write Status Register current cycle.

**10-13. Performance Enhance Mode**

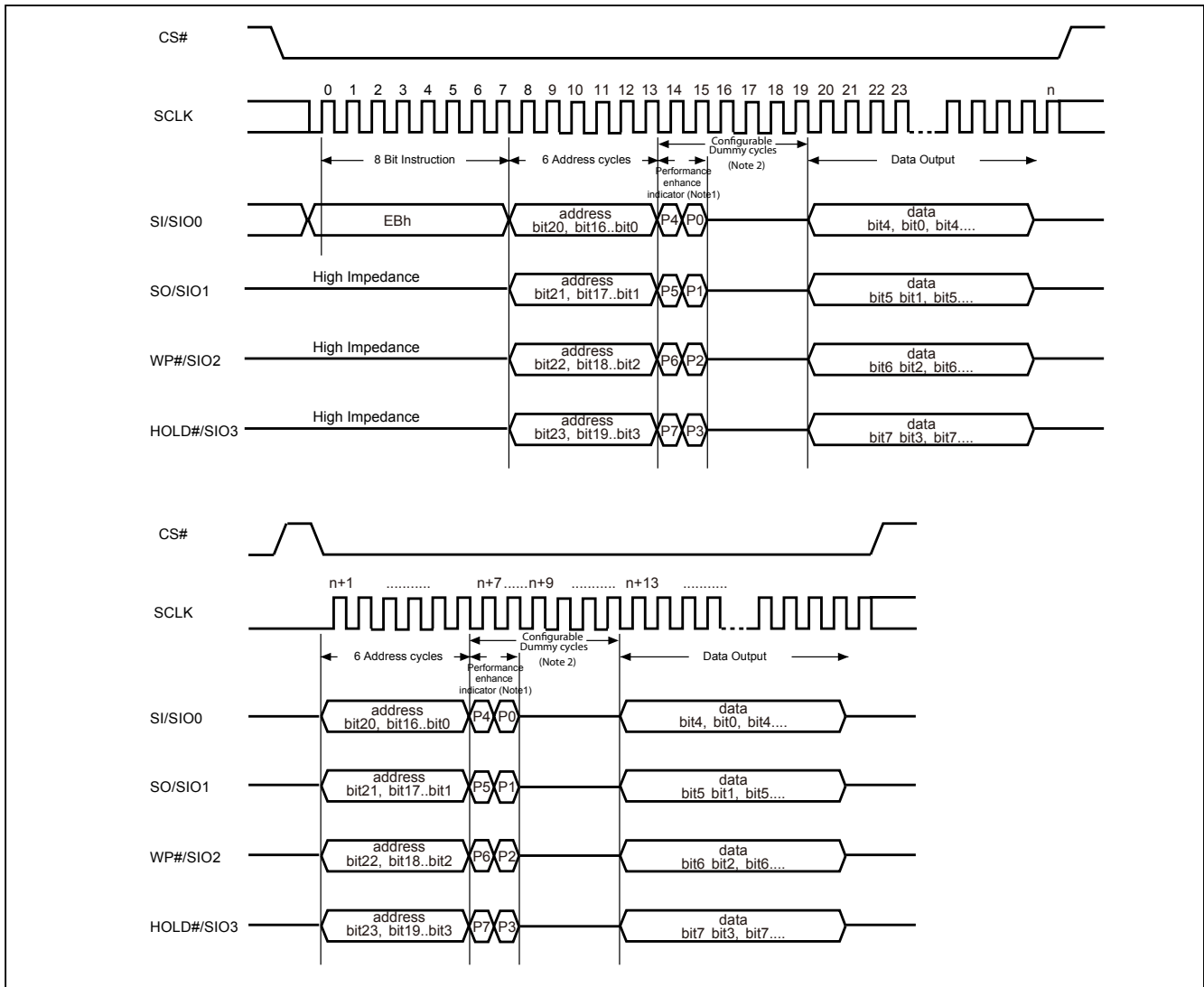
The device could waive the command cycle bits if the two cycle bits after address cycle toggles. (Please note ["Figure 16. 4 x I/O Read enhance performance Mode Sequence \(Command EB\) \(SPI Mode\)"](#))

Performance enhance mode is supported for 4READ mode.  
"EBh" commands support enhance mode.

After entering enhance mode, following CS# go high, the device will stay in the read mode and treat CS# go low of the first clock as address instead of command cycle.

To exit enhance mode, a new fast read command whose first two dummy cycles is not toggle then exit. Or issue "FFh" data cycles to exit enhance mode.

**Figure 16. 4 x I/O Read enhance performance Mode Sequence (Command EB) (SPI Mode)**



**Notes:**

- Performance enhance mode, if  $P7 \neq P3$  &  $P6 \neq P2$  &  $P5 \neq P1$  &  $P4 \neq P0$  (Toggling), ex: A5, 5A, 0F, if not using performance enhance recommend to keep 1 or 0 in performance enhance indicator.  
Reset the performance enhance mode, if  $P7 = P3$  or  $P6 = P2$  or  $P5 = P1$  or  $P4 = P0$ , ex: AA, 00, FF
- The Configurable Dummy Cycle is set by Configuration Register Bit. Please refer to ["Table 7. Dummy Cycle and Frequency Table"](#).

**10-14. Burst Read**

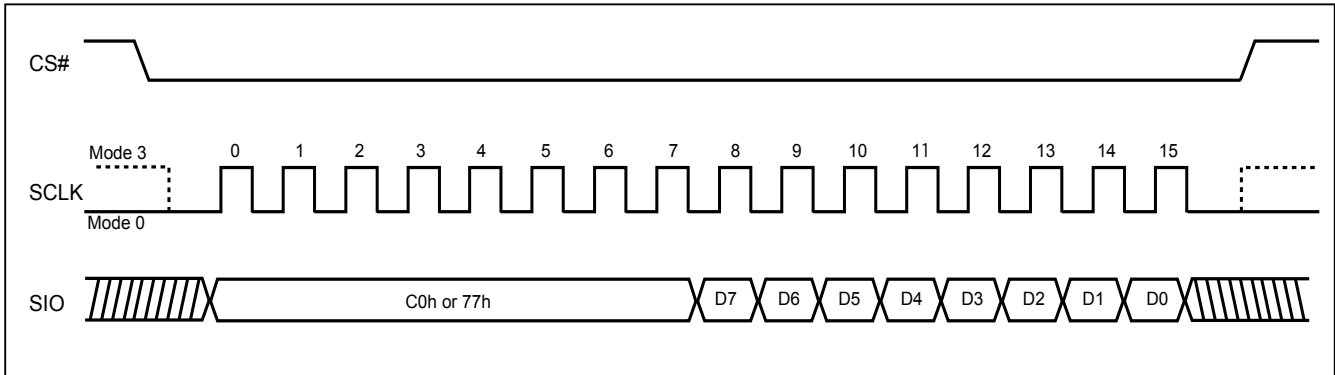
The Burst Read feature allows applications to fill a cache line with a fixed length of data without using multiple read commands. Burst Read is disabled by default at power-up or reset. Burst Read is enabled by setting the Burst Length. When the Burst Length is set, reads will wrap on the selected boundary (8/16/32/64-bytes) containing the initial target address. For example if an 8-byte Wrap Depth is selected, reads will wrap on the 8-byte-page-aligned boundary containing the initial read address.

To set the Burst Length, drive CS# low → send SET BURST LENGTH instruction code → send WRAP CODE → drive CS# high. Refer to the table below for valid 8-bit Wrap Codes and their corresponding Wrap Depth.

| Data | Wrap Around | Wrap Depth |
|------|-------------|------------|
| 00h  | Yes         | 8-byte     |
| 01h  | Yes         | 16-byte    |
| 02h  | Yes         | 32-byte    |
| 03h  | Yes         | 64-byte    |
| 1xh  | No          | X          |

Once Burst Read is enabled, it will remain enabled until the device is power-cycled or reset. The 4READ read command supports the wrap around feature after Burst Read is enabled. To change the wrap depth, resend the Burst Read instruction with the appropriate Wrap Code. To disable Burst Read, send the Burst Read instruction with Wrap Code 1xh. "EBh" supports wrap around feature after wrap around is enabled.

**Figure 17. Burst Read**



**10-15. Sector Erase (SE)**

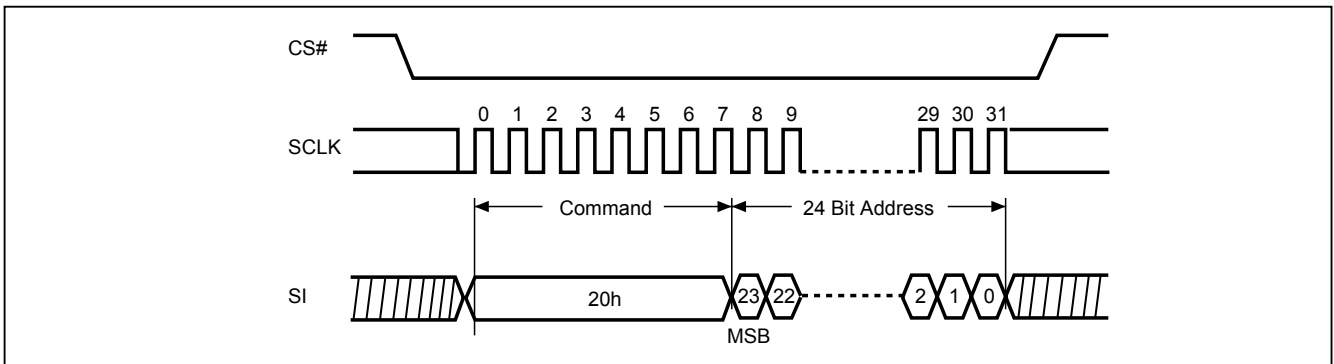
The Sector Erase (SE) instruction is for erasing the data of the chosen sector to be "1". The instruction is used for any 4K-byte sector. A Write Enable (WREN) instruction must be executed to set the Write Enable Latch (WEL) bit before sending the Sector Erase (SE). Any address of the sector (Please refer to "Table 3. Memory Organization" ) is a valid address for Sector Erase (SE) instruction. The CS# must go high exactly at the byte boundary (the least significant bit of the address has been latched-in); otherwise, the instruction will be rejected and not executed.

The sequence of issuing SE instruction is: CS# goes low → sending SE instruction code → 3-byte address on SI → CS# goes high.

The SIO[3:1] are don't care.

The self-timed Sector Erase Cycle time (tSE) is initiated as soon as Chip Select (CS#) goes high. The Write in Progress (WIP) bit still can be checked while the Sector Erase cycle is in progress. The WIP sets during the tSE timing, and clears when Sector Erase Cycle is completed, and the Write Enable Latch (WEL) bit is cleared. If the sector is protected by BP3~0, the array data will be protected (no change) and the WEL bit still be reset.

**Figure 18. Sector Erase (SE) Sequence (Command 20)**



**10-16. Block Erase (BE)**

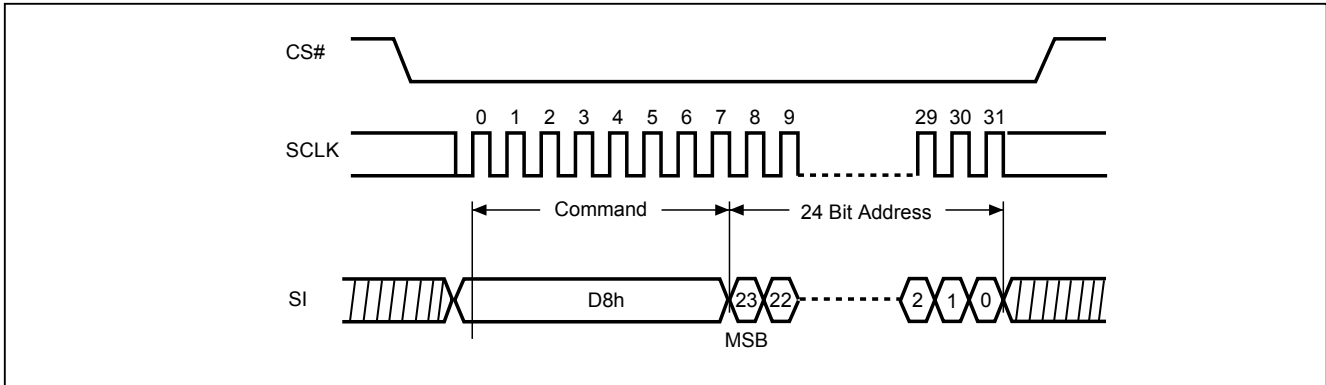
The Block Erase (BE) instruction is for erasing the data of the chosen block to be "1". The instruction is used for 64K-byte block erase operation. A Write Enable (WREN) instruction must be executed to set the Write Enable Latch (WEL) bit before sending the Block Erase (BE). Any address of the block (Please refer to "Table 3. Memory Organization") is a valid address for Block Erase (BE) instruction. The CS# must go high exactly at the byte boundary (the least significant bit of address byte has been latched-in); otherwise, the instruction will be rejected and not executed.

The sequence of issuing BE instruction is: CS# goes low → sending BE instruction code → 3-byte address on SI → CS# goes high.

The SIO[3:1] are don't care.

The self-timed Block Erase Cycle time (tBE) is initiated as soon as Chip Select (CS#) goes high. The Write in Progress (WIP) bit still can be checked while the Block Erase cycle is in progress. The WIP sets during the tBE timing, and clears when Block Erase Cycle is completed, and the Write Enable Latch (WEL) bit is cleared. If the block is protected by BP3~0, the array data will be protected (no change) and the WEL bit still be reset.

**Figure 19. Block Erase (BE) Sequence (Command D8)**



**10-17. Block Erase (BE32K)**

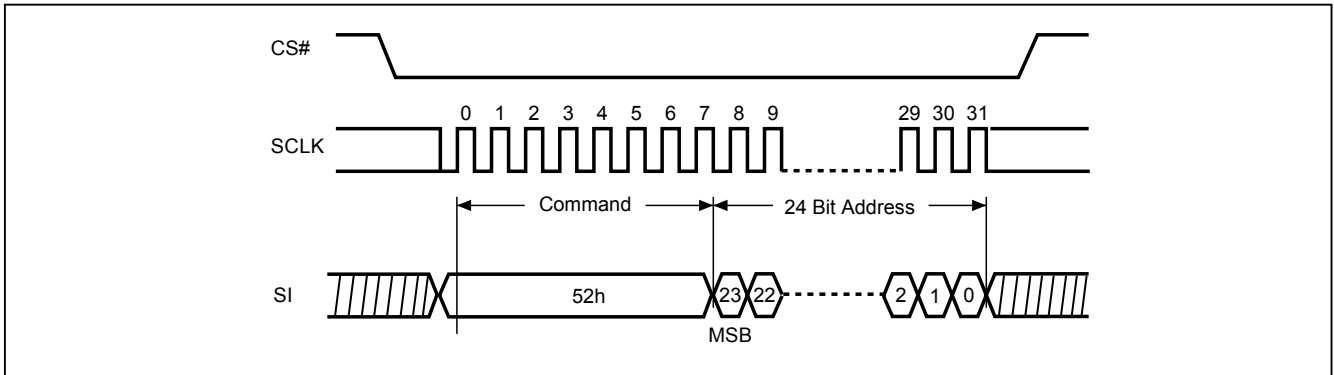
The Block Erase (BE32K) instruction is for erasing the data of the chosen block to be "1". The instruction is used for 32K-byte block erase operation. A Write Enable (WREN) instruction must be executed to set the Write Enable Latch (WEL) bit before sending the Block Erase (BE32K). Any address of the block (Please refer to "Table 3. Memory Organization") is a valid address for Block Erase (BE32K) instruction. The CS# must go high exactly at the byte boundary (the least significant bit of address byte has been latched-in); otherwise, the instruction will be rejected and not executed.

The sequence of issuing BE32K instruction is: CS# goes low → sending BE32K instruction code → 3-byte address on SI → CS# goes high.

The SIO[3:1] are don't care.

The self-timed Block Erase Cycle time (tBE32K) is initiated as soon as Chip Select (CS#) goes high. The Write in Progress (WIP) bit still can be checked while the Block Erase cycle is in progress. The WIP sets during the tBE32K timing, and clears when Block Erase Cycle is completed, and the Write Enable Latch (WEL) bit is cleared. If the block is protected by BP3~0, the array data will be protected (no change) and the WEL bit still be reset.

**Figure 20. Block Erase 32KB (BE32K) Sequence (Command 52)**



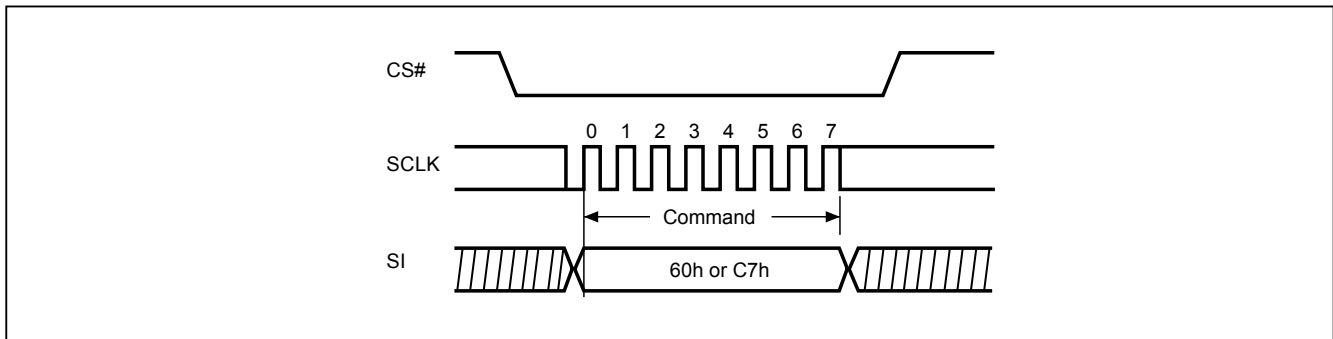
**10-18. Chip Erase (CE)**

The Chip Erase (CE) instruction is for erasing the data of the whole chip to be "1". A Write Enable (WREN) instruction must be executed to set the Write Enable Latch (WEL) bit before sending the Chip Erase (CE). The CS# must go high exactly at the byte boundary; otherwise, the instruction will be rejected and not executed.

The sequence of issuing CE instruction is: CS# goes low → sending CE instruction code → CS# goes high.

The SIO[3:1] are don't care.

The self-timed Chip Erase Cycle time ( $t_{CE}$ ) is initiated as soon as Chip Select (CS#) goes high. The Write in Progress (WIP) bit still can be checked while the Chip Erase cycle is in progress. The WIP sets during the  $t_{CE}$  timing, and clears when Chip Erase Cycle is completed, and the Write Enable Latch (WEL) bit is cleared. If the chip is protected the Chip Erase (CE) instruction will not be executed, but WEL will be reset.

**Figure 21. Chip Erase (CE) Sequence (Command 60 or C7)**

**10-19. Page Program (PP)**

The Page Program (PP) instruction is for programming memory bits to "0". One to 256 bytes can be sent to the device to be programmed. A Write Enable (WREN) instruction must be executed to set the Write Enable Latch (WEL) bit before sending the Page Program (PP). If more than 256 data bytes are sent to the device, only the last 256 data bytes will be accepted and the previous data bytes will be disregarded. The Page Program instruction requires that all the data bytes fall within the same 256-byte page. The low order address byte A[7:0] specifies the starting address within the selected page. Bytes that will cross a page boundary will wrap to the beginning of the selected page. The device can accept (256 minus A[7:0]) data bytes without wrapping. If 256 data bytes are going to be programmed, A[7:0] should be set to 0.

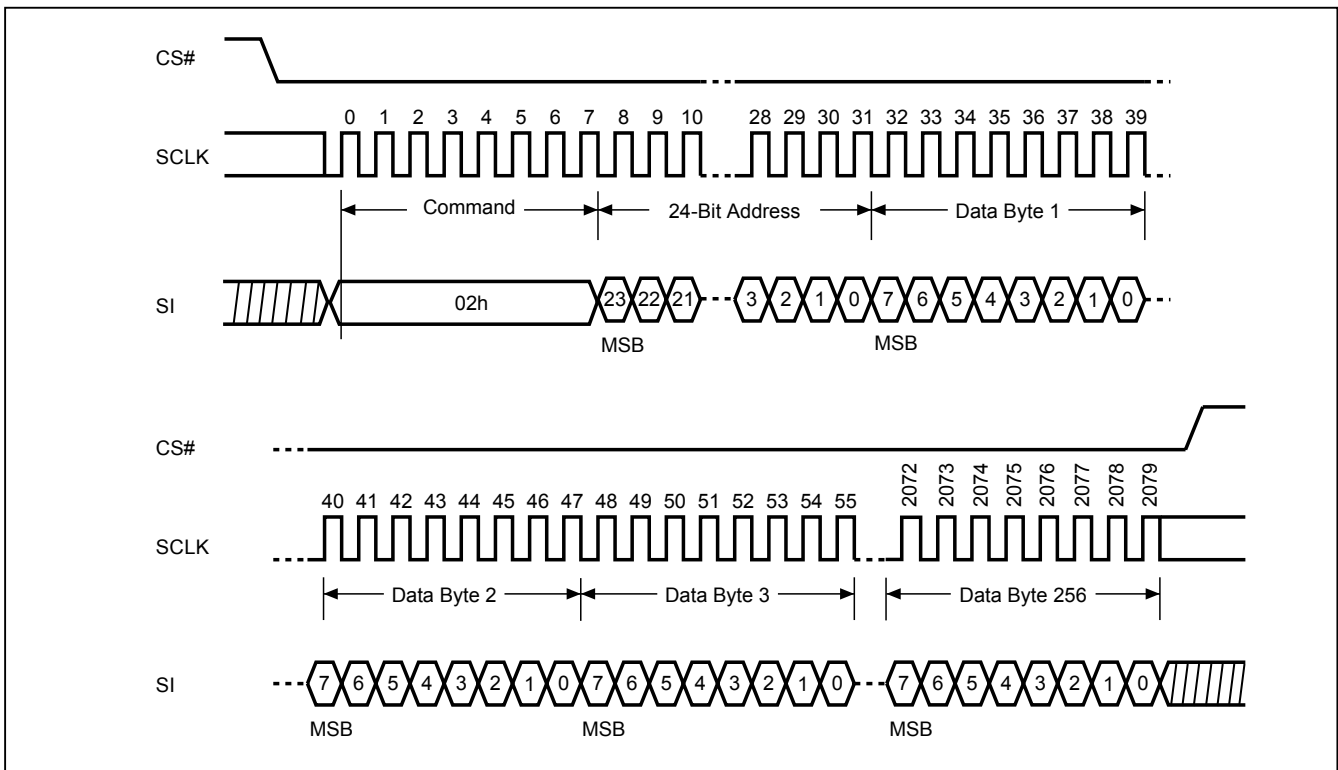
The sequence of issuing PP instruction is: CS# goes low → sending PP instruction code → 3-byte address on SI → at least 1-byte on data on SI → CS# goes high.

The CS# must be kept to low during the whole Page Program cycle; The CS# must go high exactly at the byte boundary (the latest eighth bit of data being latched in), otherwise, the instruction will be rejected and will not be executed.

The self-timed Page Program Cycle time (t<sub>PP</sub>) is initiated as soon as Chip Select (CS#) goes high. The Write in Progress (WIP) bit still can be checked while the Page Program cycle is in progress. The WIP sets during the t<sub>PP</sub> timing, and clears when Page Program Cycle is completed, and the Write Enable Latch (WEL) bit is cleared. If the page is protected by BP3~0, the array data will be protected (no change) and the WEL bit will still be reset.

The SIO[3:1] are don't care.

**Figure 22. Page Program (PP) Sequence (Command 02)**





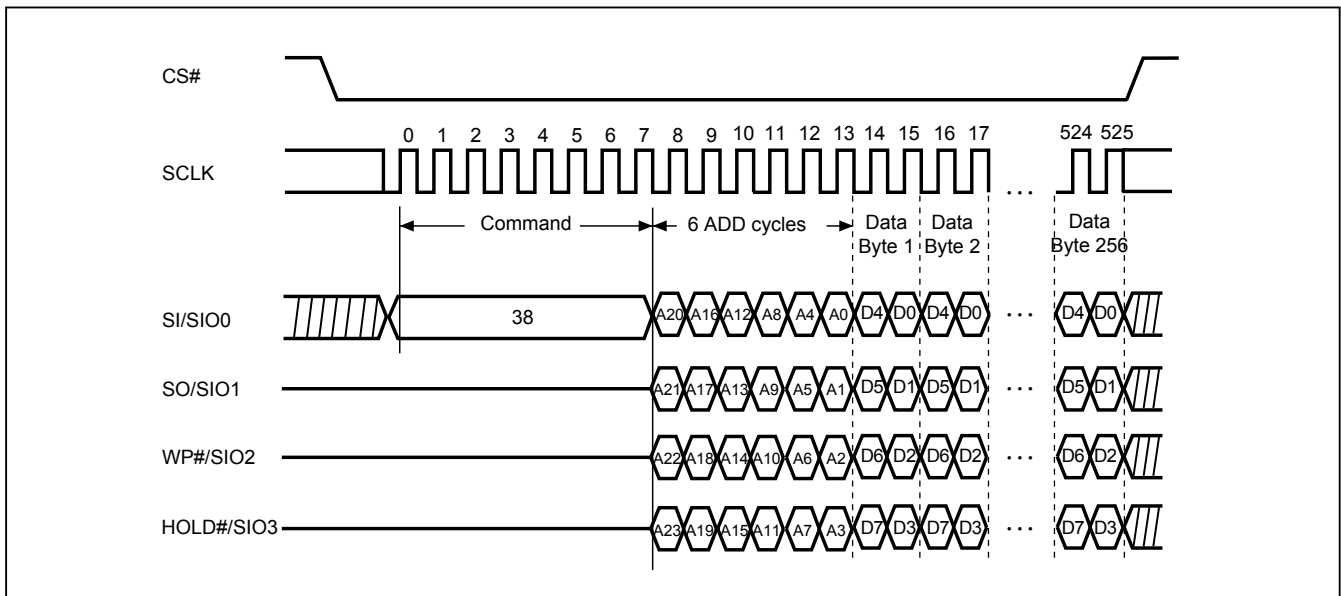
**10-20. 4 x I/O Page Program (4PP)**

The Quad Page Program (4PP) instruction is for programming the memory to be "0". A Write Enable (WREN) instruction must be executed to set the Write Enable Latch (WEL) bit and Quad Enable (QE) bit must be set to "1" before sending the Quad Page Program (4PP). The Quad Page Programming takes four pins: SIO0, SIO1, SIO2, and SIO3, which can raise programmer performance and the effectiveness of application of lower clock less than f4PP. For system with faster clock, the Quad page program cannot provide more performance, because the required internal page program time is far more than the time data flows in. Therefore, we suggest that while executing this command (especially during sending data), user can slow the clock speed down to f4PP below. The other function descriptions are as same as standard page program.

The sequence of issuing 4PP instruction is: CS# goes low→ sending 4PP instruction code→ 3-byte address on SIO[3:0]→ at least 1-byte on data on SIO[3:0]→ CS# goes high.

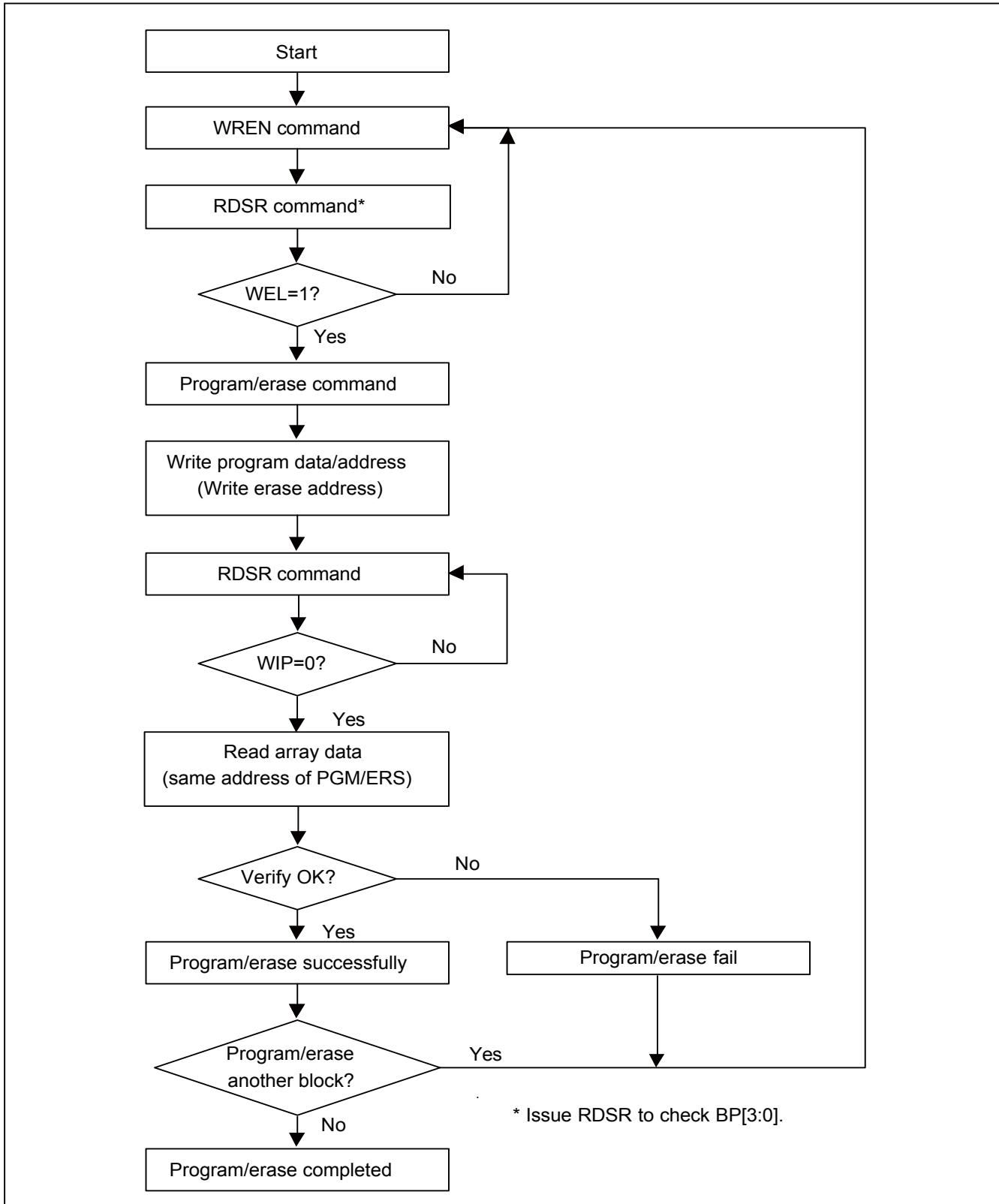
If the page is protected by BP3~0, the array data will be protected (no change) and the WEL bit will still be reset.

**Figure 23. 4 x I/O Page Program (4PP) Sequence (Command 38)**

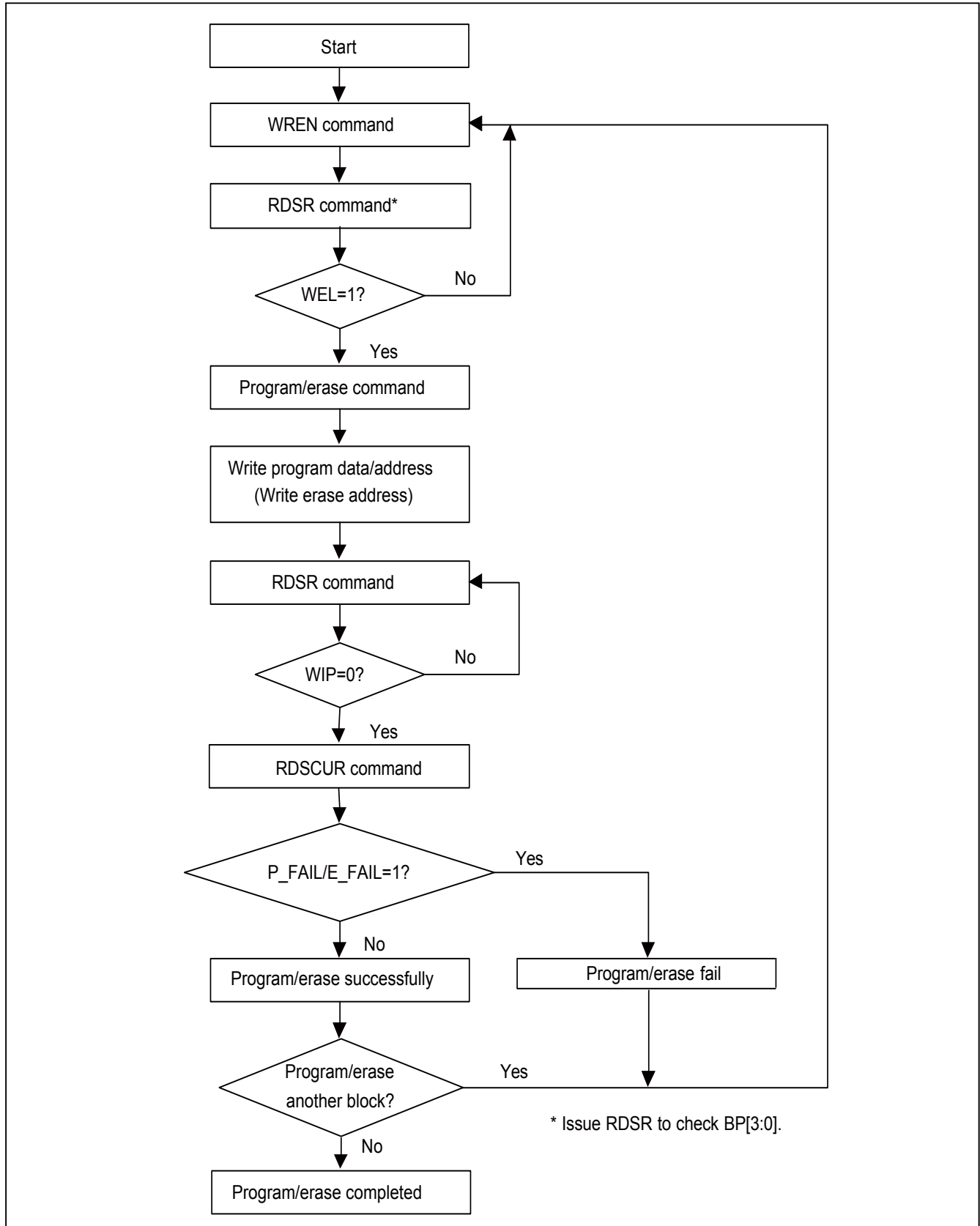


The Program/Erase function instruction function flow is as follows:

**Figure 24. Program/Erase Flow(1) with read array data**



**Figure 25. Program/Erase Flow(2) without read array data**



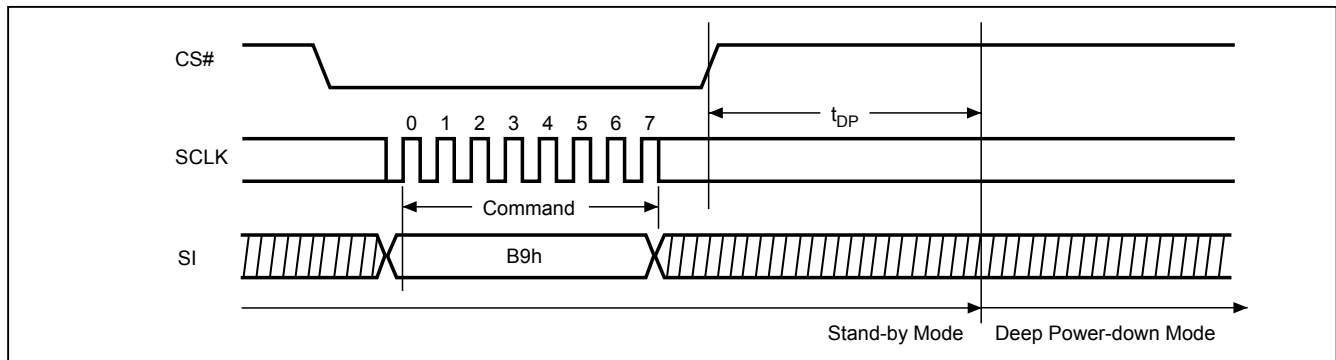
**10-21. Deep Power-down (DP)**

The Deep Power-down (DP) instruction places the device into a minimum power consumption state, Deep Power-down mode, in which the quiescent current is reduced from ISB1 to ISB2.

The sequence of issuing DP instruction: CS# goes low → send DP instruction code → CS# goes high. The CS# must go high at the byte boundary (after exactly eighth bits of the instruction code have been latched-in); otherwise the instruction will not be executed. SIO[3:1] are "don't care".

After CS# goes high there is a delay of  $t_{DP}$  before the device transitions from Stand-by mode to Deep Power-down mode and before the current reduces from ISB1 to ISB2. Once in Deep Power-down mode, all instructions will be ignored except Release from Deep Power-down (RDP).

The device exits Deep Power-down mode and returns to Stand-by mode if it receives a Release from Deep Power-down (RDP) instruction, power-cycle, or reset.

**Figure 26. Deep Power-down (DP) Sequence (Command B9)**

**10-22. Release from Deep Power-down (RDP), Read Electronic Signature (RES)**

The Release from Deep Power-down (RDP) instruction is completed by driving Chip Select (CS#) High. When Chip Select (CS#) is driven High, the device is put in the standby Power mode. If the device was not previously in the Deep Power-down mode, the transition to the standby Power mode is immediate. If the device was previously in the Deep Power-down mode, though, the transition to the standby Power mode is delayed by tRES2, and Chip Select (CS#) must remain High for at least tRES2(max), as specified in "Table 21. AC Characteristics". Once in the standby mode, the device waits to be selected, so that it can receive, decode and execute instructions.

RES instruction is for reading out the old style of 8-bit Electronic Signature, whose values are shown as "Table 9. ID Definitions". This is not the same as RDID instruction. It is not recommended to use for new design. For new design, please use RDID instruction. Even in Deep power-down mode, the RDP and RES are also allowed to be executed, only except the device is in progress of program/erase/write cycles; there's no effect on the current program/erase/write cycles in progress.

The SIO[3:1] are don't care when during this mode.

The RES instruction is ended by CS# goes high after the ID been read out at least once. The ID outputs repeatedly if continuously send the additional clock cycles on SCLK while CS# is at low. If the device was not previously in Deep Power-down mode, the device transition to standby mode is immediate. If the device was previously in Deep Power-down mode, there's a delay of tRES2 to transit to standby mode, and CS# must remain to high at least tRES2(max). Once in the standby mode, the device waits to be selected, so it can receive, decode, and execute instruction.

The RDP instruction is for releasing from Deep Power-down Mode.

**Figure 27. Read Electronic Signature (RES) Sequence (Command AB)**

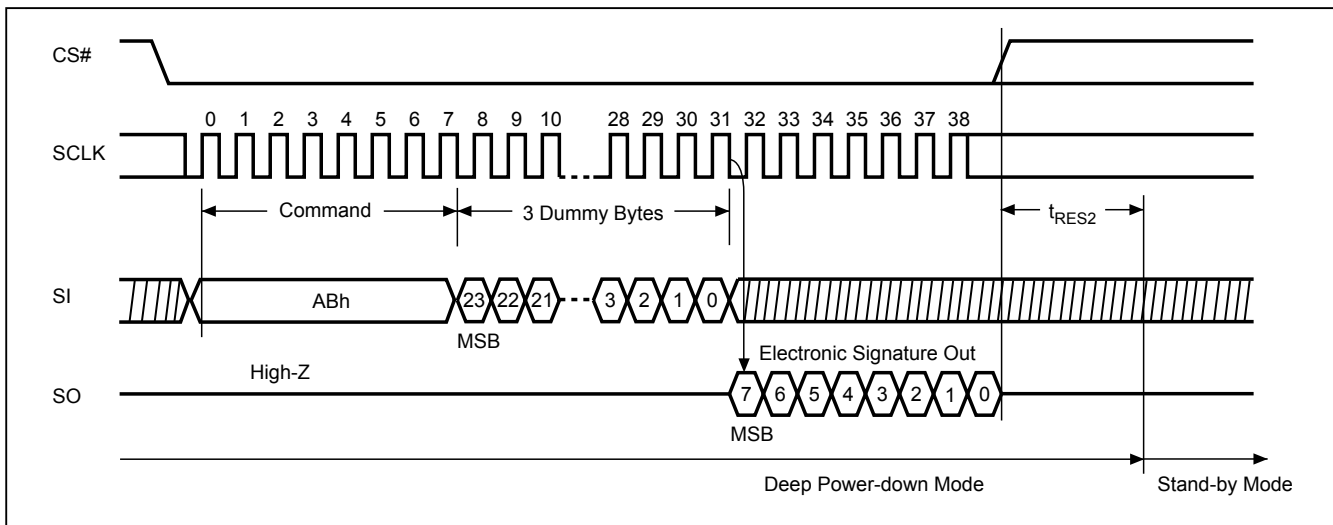
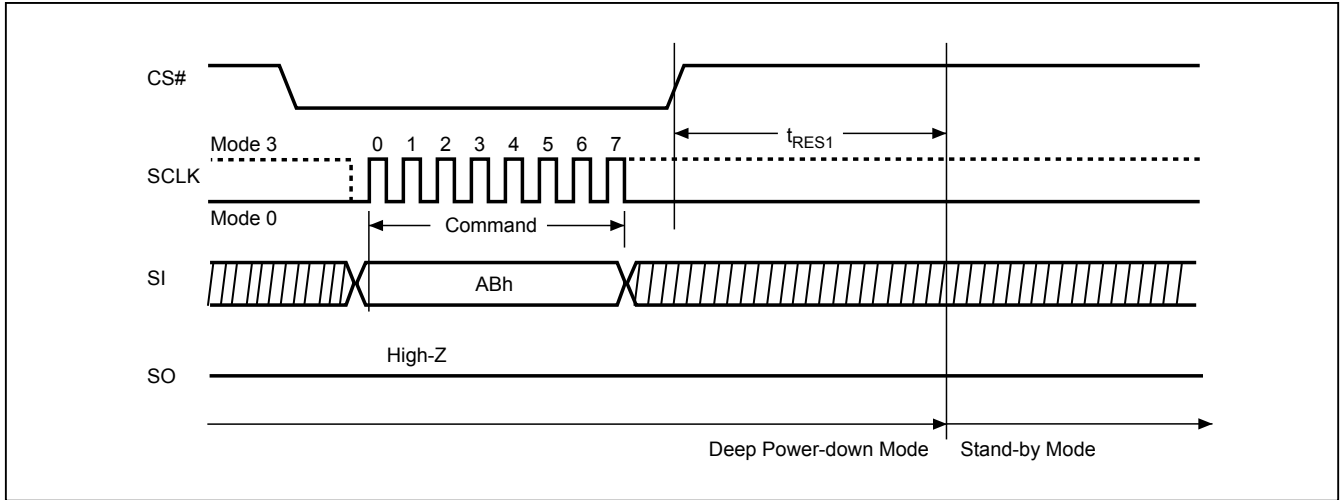


Figure 28. Release from Deep Power-down (RDP) Sequence

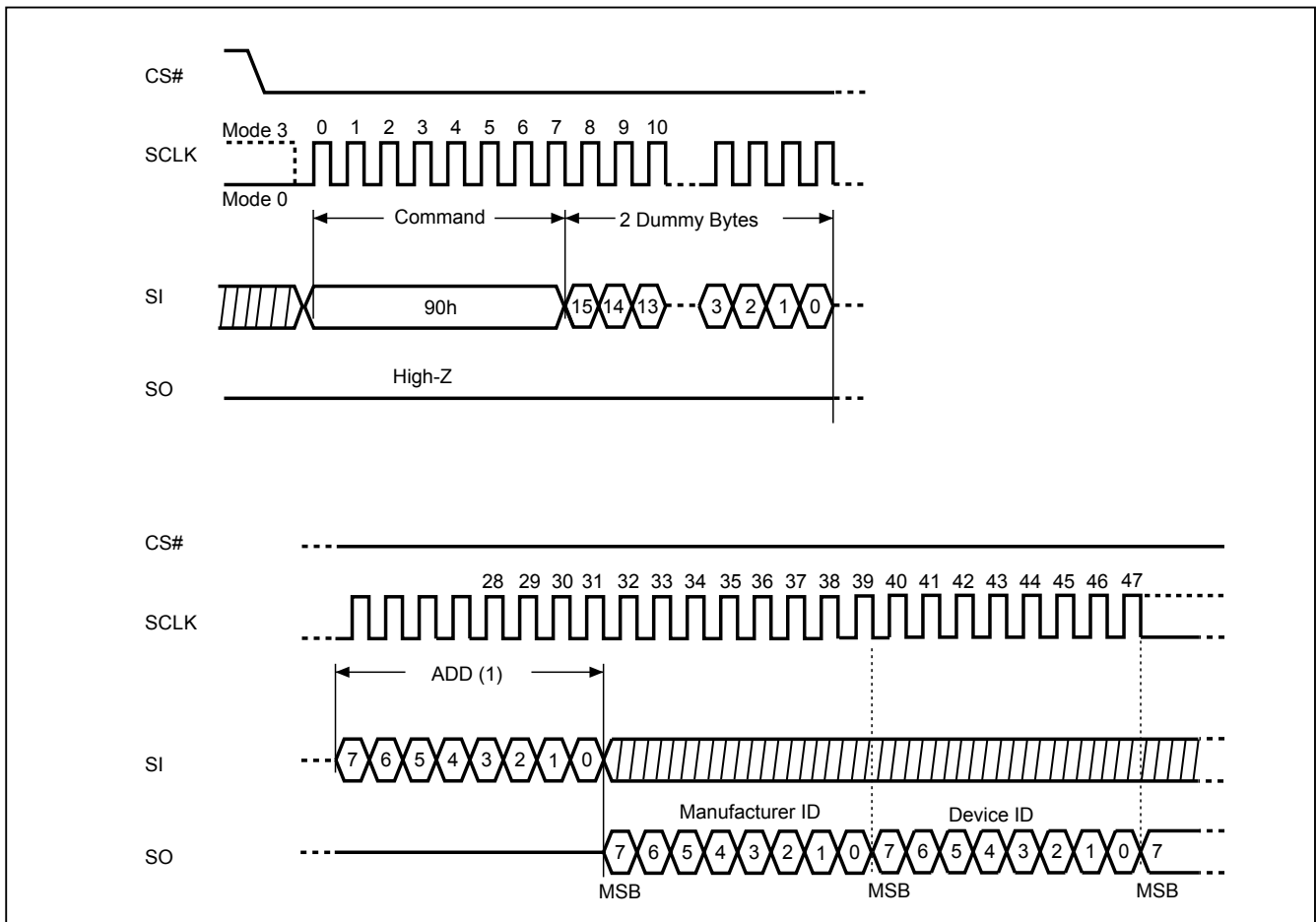


**10-23. Read Electronic Manufacturer ID & Device ID (REMS)**

The REMS instruction returns both the JEDEC assigned manufacturer ID and the device ID. The Device ID values are listed in "Table 9. ID Definitions".

The REMS instruction is initiated by driving the CS# pin low and sending the instruction code "90h" followed by two dummy bytes and one address byte (A7~A0). After which the manufacturer ID for Macronix (C2h) and the device ID are shifted out on the falling edge of SCLK with the most significant bit (MSB) first. If the address byte is 00h, the manufacturer ID will be output first, followed by the device ID. If the address byte is 01h, then the device ID will be output first, followed by the manufacturer ID. While CS# is low, the manufacturer and device IDs can be read continuously, alternating from one to the other. The instruction is completed by driving CS# high.

**Figure 29. Read Electronic Manufacturer & Device ID (REMS) Sequence**



**Note:** ADD=00H will output the manufacturer's ID first and ADD=01H will output device ID first.

**Table 9. ID Definitions**

| Command Type | MX25L6436F      |                 |             |
|--------------|-----------------|-----------------|-------------|
|              | RDID            | Manufacturer ID | Memory Type |
| C2           |                 | 20              | 17          |
| RES          | Electronic ID   |                 |             |
|              | 16              |                 |             |
| REMS         | Manufacturer ID | Device ID       |             |
|              | C2              | 16              |             |

**10-24. Enter Secured OTP (ENSO)**

The ENSO instruction is for entering the additional 8K-bit Secured OTP mode. While the device is in 8K-bit Secured OTP mode, array access is not available. The additional 8K-bit Secured OTP is independent from main array, which may use to store unique serial number for system identifier. After entering the Secured OTP mode, and then follow standard read or program procedure to read out the data or update data.

The Secured OTP data cannot be updated again once it is lock-down.

The sequence of issuing ENSO instruction is: CS# goes low→ sending ENSO instruction to enter Secured OTP mode→ CS# goes high.

The SIO[3:1] are don't care.

Please note that WRSR/WRSCUR/CE/BE/SE/BE32K commands are not acceptable during the access of secure OTP region, once Security OTP is locked down, only read related commands are valid.

**10-25. Exit Secured OTP (EXSO)**

The EXSO instruction is for exiting the additional 8K-bit Secured OTP mode.

The sequence of issuing EXSO instruction is: CS# goes low→ sending EXSO instruction to exit Secured OTP mode→ CS# goes high.

The SIO[3:1] are don't care.

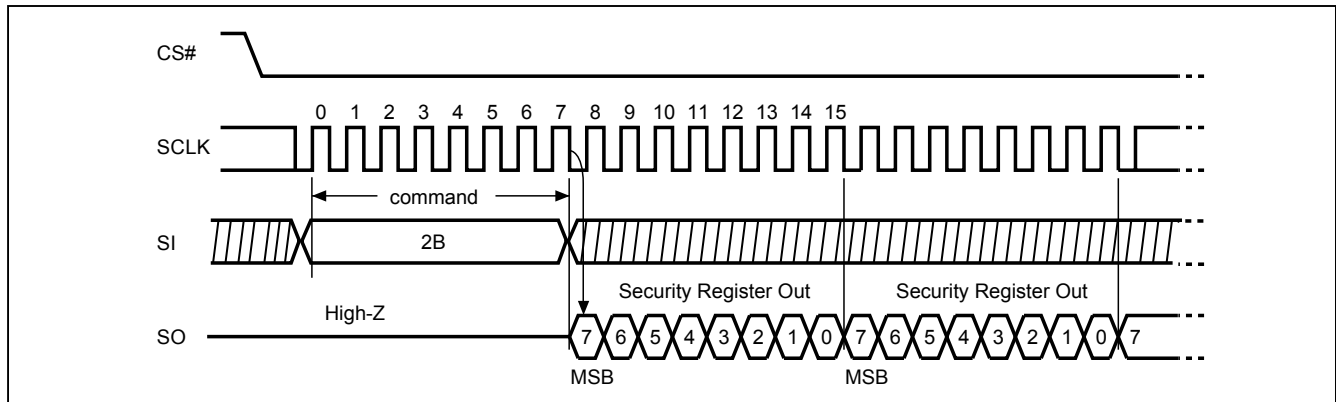


**10-26. Read Security Register (RDSCUR)**

The RDSCUR instruction is for reading the value of Security Register. The Read Security Register can be read at any time (even in program/erase/write status register/write security register condition) and continuously.

The sequence of issuing RDSCUR instruction is : CS# goes low→ sending RDSCUR instruction → Security Register data out on SO→ CS# goes high.

The SIO[3:1] are don't care.

**Figure 30. Read Security Register (RDSCUR) Sequence (Command 2B)**

The definition of the Security Register is as below:

**Secured OTP Indicator bit.** The Secured OTP indicator bit shows the chip is locked by factory before ex-factory or not. When it is "0", it indicates non-factory lock; "1" indicates factory- lock.

**Lock-down Secured OTP (LDSO) bit.** By writing WRSCUR instruction, the LDSO bit may be set to "1" for customer lock-down purpose. However, once the bit is set to "1" (lock-down), the LDSO bit and the 1<sup>st</sup> 4K-bit Secured OTP area cannot be updated any more.

**Program Suspend Status bit.** Program Suspend Bit (PSB) indicates the status of Program Suspend operation. Users may use PSB to identify the state of flash memory. After the flash memory is suspended by Program Suspend command, PSB is set to "1". PSB is cleared to "0" after program operation resumes.

**Erase Suspend Status bit.** Erase Suspend Bit (ESB) indicates the status of Erase Suspend operation. Users may use ESB to identify the state of flash memory. After the flash memory is suspended by Erase Suspend command, ESB is set to "1". ESB is cleared to "0" after erase operation resumes.

**Program Fail Flag bit.** While a program failure happened, the Program Fail Flag bit would be set. If the program operation fails on a protected memory region, this bit will also be set. This bit can be the failure indication of one or more program operations. This fail flag bit will be cleared automatically after the next successful program operation.

**Erase Fail Flag bit.** While an erase failure happened, the Erase Fail Flag bit would be set. If the erase operation fails on a protected memory region, this bit will also be set. This bit can be the failure indication of one or more erase operations. This fail flag bit will be cleared automatically after the next successful erase operation.

**Write Protection Selection bit.** Please refer to ["10-28. Write Protection Selection \(WPSEL\)"](#).

**Table 10. Security Register Definition**

| bit7   | bit6  | bit5  | bit4         | bit3   | bit2   | bit1   | bit0   |
|--|---|---|--------------|--|--|--|--|
| WPSEL  | E_FAIL  | P_FAIL  | Reserved     | ESB (Erase Suspend status)                                   | PSB (Program Suspend status)                                     | LDSO (lock-down 1 <sup>st</sup> 4K-bit Secured OTP)          | Secured OTP Indicator bit (2 <sup>nd</sup> 4K-bit Secured OTP) |
| 0=normal BP Protection mode<br>1=Advanced Sector Protection mode (default=0) | 0=normal Erase succeed<br>1=indicate Erase failed (default=0) | 0=normal Program succeed<br>1=indicate Program failed (default=0) | Reserved     | 0=Erase is not suspended<br>1=Erase is suspended (default=0) | 0=Program is not suspended<br>1=Program is suspended (default=0) | 0 = not lockdown<br>1 = lock-down (cannot program/erase OTP) | 0 = nonfactory lock<br>1 = factory lock                        |
| Non-volatile bit   | volatile bit  | volatile bit  | volatile bit | volatile bit   | volatile bit   | non-volatile bit   | non-volatile bit   |
| OTP  | Read Only   | Read Only   |              | Read Only  | Read Only  | OTP  | Read Only  |

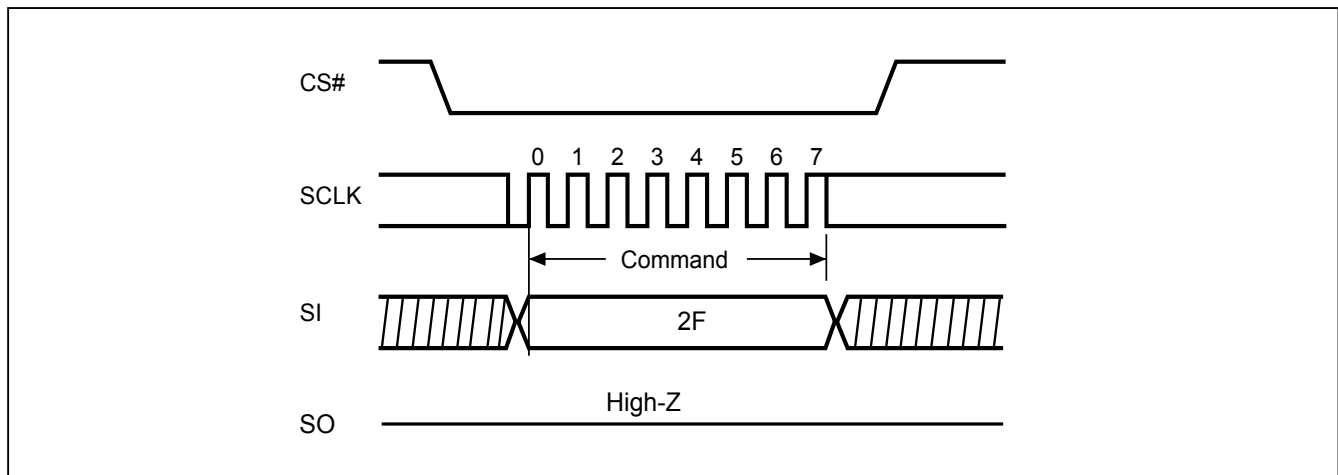
**10-27. Write Security Register (WRSCUR)**

The WRSCUR instruction is for changing the values of Security Register Bits. Unlike write status register, the WREN instruction is required before sending WRSCUR instruction. The WRSCUR instruction may change the values of bit1 (LDSO bit) for customer to lock-down the 1<sup>st</sup> 4K-bit Secured OTP area. Once the LDSO bit is set to "1", the 1<sup>st</sup> 4K-bit Secured OTP area cannot be updated any more.

The sequence of issuing WRSCUR instruction is :CS# goes low→ sending WRSCUR instruction → CS# goes high.

The SIO[3:1] are don't care.

The CS# must go high exactly at the boundary; otherwise, the instruction will be rejected and not executed.

**Figure 31. Write Security Register (WRSCUR) Sequence (Command 2F) (SPI mode)**

**10-28. Write Protection Selection (WPSEL)**

There are two write protection methods provided on this device, (1) Block Protection (BP) mode or (2) Advanced Sector Protection mode. The protection modes are mutually exclusive. The WPSEL bit selects which protection mode is enabled. If WPSEL=0 (factory default), BP mode is enabled and Advanced Sector Protection mode is disabled. If WPSEL=1, Advanced Sector Protection mode is enabled and BP mode is disabled. The WPSEL command is used to set WPSEL=1. A WREN command must be executed to set the WEL bit before sending the WPSEL command. **Please note that the WPSEL bit is an OTP bit. Once WPSEL is set to “1”, it cannot be programmed back to “0”.**

When WPSEL = 0: Block Protection (BP) mode.

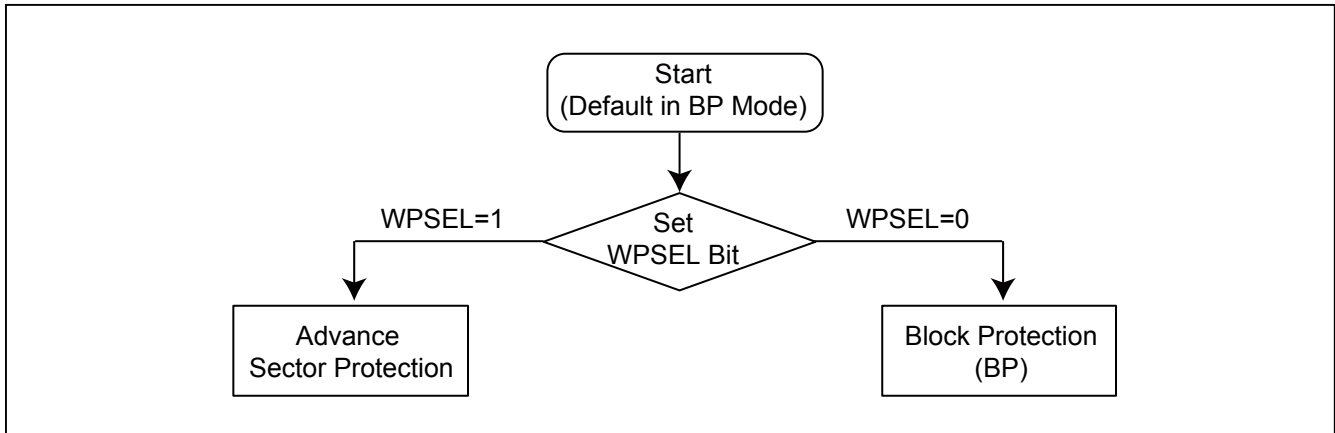
The memory array is write protected by the BP3~BP0 bits. Please refer to *"Table 1. Protected Area Sizes"*.

When WPSEL = 1: Advanced Sector Protection mode.

Blocks are individually protected by their own SPB or DPB. On power-up, all blocks are write protected by the Dynamic Protection Bits (DPB) by default. The Advanced Sector Protection instructions WRSPB, ESSPB, WRDPB, RDDPB, GBLK, and GBULK are activated. The BP3~BP0 bits of the Status Register are disabled and have no effect. Hardware protection is performed by driving WP#=0. Once WP#=0 all blocks and sectors are write protected regardless of the state of each SPB or DPB.

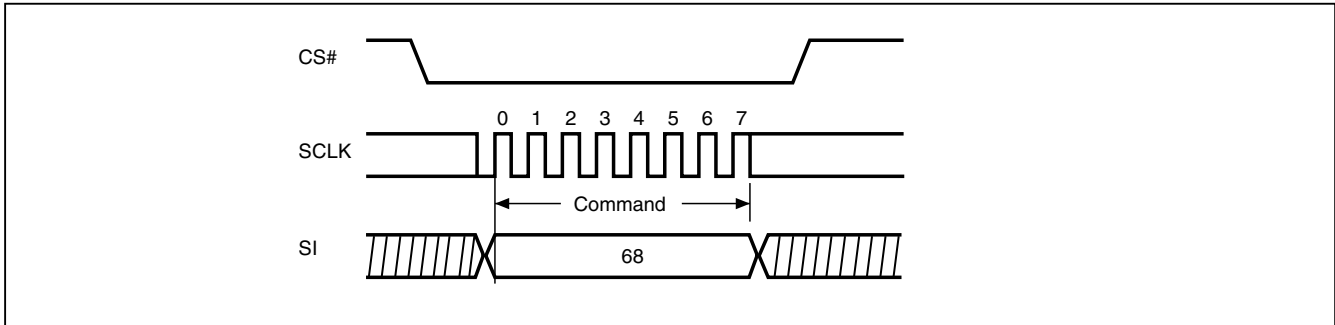
The sequence of issuing WPSEL instruction is: CS# goes low → send WPSEL instruction to enable the Advanced Sector Protect mode → CS# goes high.

**Figure 32. Write Protection Selection**

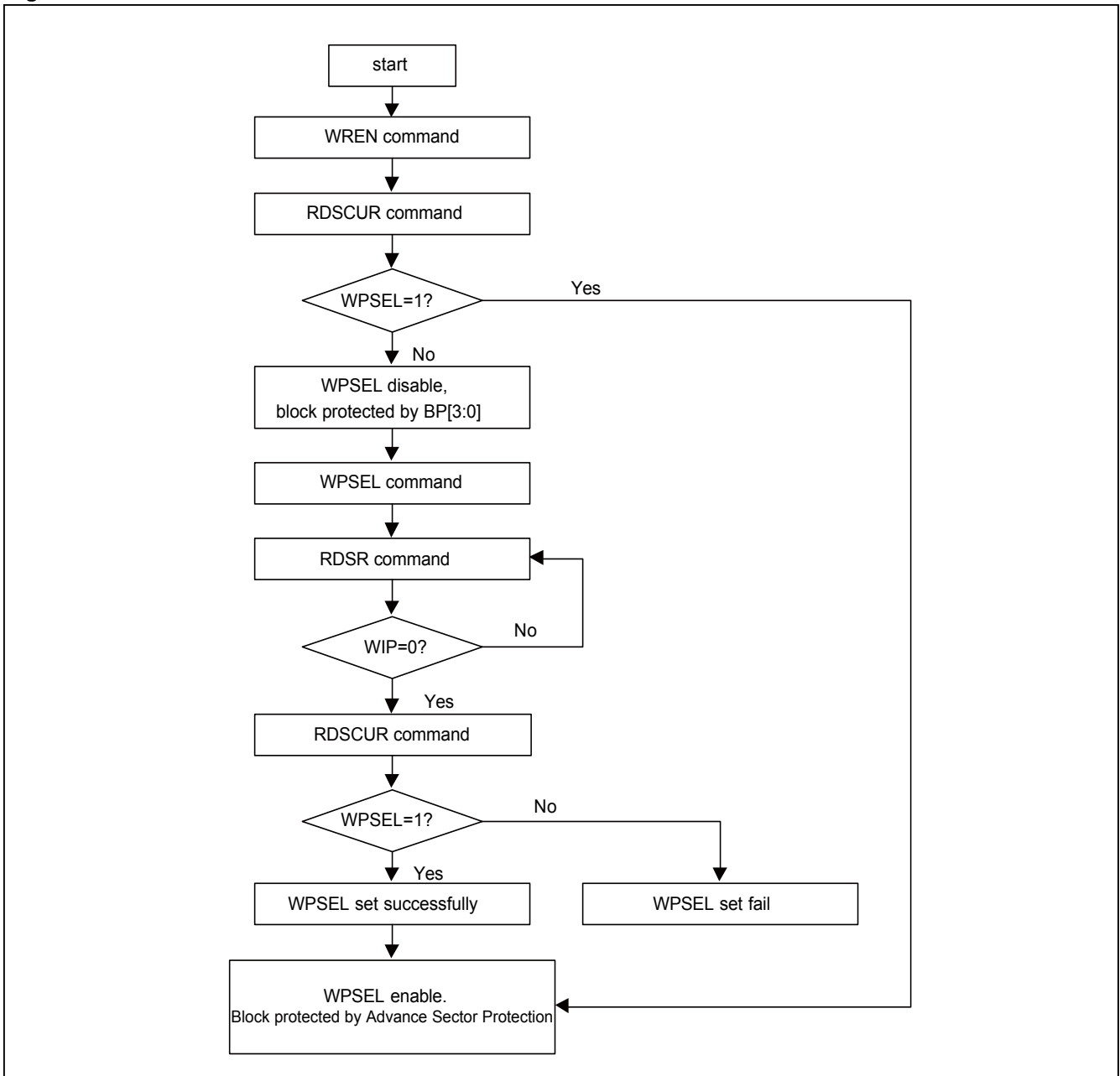


*\*MX25L6436FM2I-08Q does not support the advanced sector protection commands, and its WPSEL bit is always kept as 0.*

**Figure 33. Write Protection Selection (WPSEL) Sequence (Command 68)**



**Figure 34. WPSEL Flow**



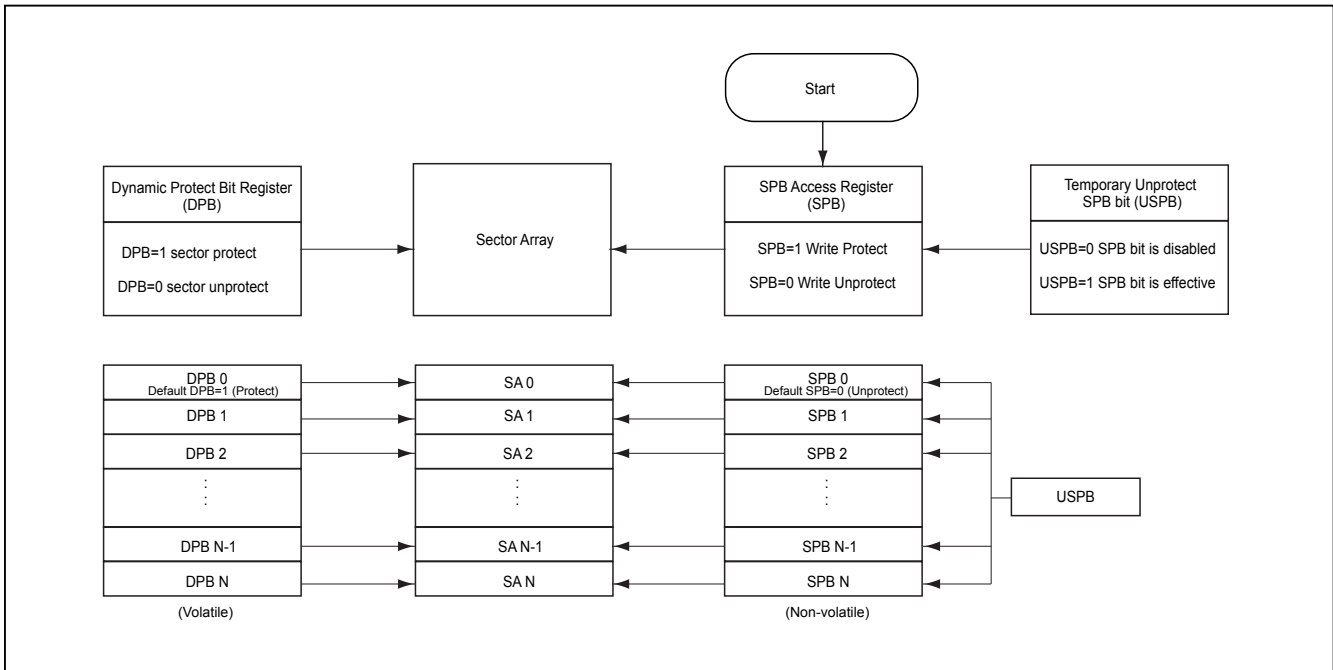
**10-29. Advanced Sector Protection**

Advanced Sector Protection can protect individual 4KB sectors in the bottom and top 64KB of memory and protect individual 64KB blocks in the rest of memory.

There is one non-volatile Solid Protection Bit (SPB) and one volatile Dynamic Protection Bit (DPB) assigned to each 4KB sector at the bottom and top 64KB of memory and to each 64KB block in the rest of memory. A sector or block is write-protected from programming or erasing when its associated SPB or DPB is set to “1”. The Unprotect Solid Protect Bit (USPB) can temporarily override and disable the write-protection provided by the SPB bits.

The figure below is an overview of Advanced Sector Protection. (Note: MX25L6436FM2I-08Q does not support advanced sector protection.)

**Figure 35. Advanced Sector Protection Overview**



### 10-30. Solid Protection Bits

The Solid Protection Bits (SPBs) are nonvolatile bits for enabling or disabling write-protection to sectors and blocks. The SPB bits have the same endurance as the Flash memory. An SPB is assigned to each 4KB sector in the bottom and top 64KB of memory and to each 64KB block in the remaining memory. The factory default state of the SPB bits is “0”, which has the sector/block write-protection disabled.

When an SPB is set to “1”, the associated sector or block is write-protected. Program and erase operations on the sector or block will be inhibited. SPBs can be individually set to “1” by the WRSPB command. However, the SPBs cannot be individually cleared to “0”. Issuing the ESSPB command clears all SPBs to “0”. A WREN command must be executed to set the WEL bit before sending the WRSPB or ESSPB command.

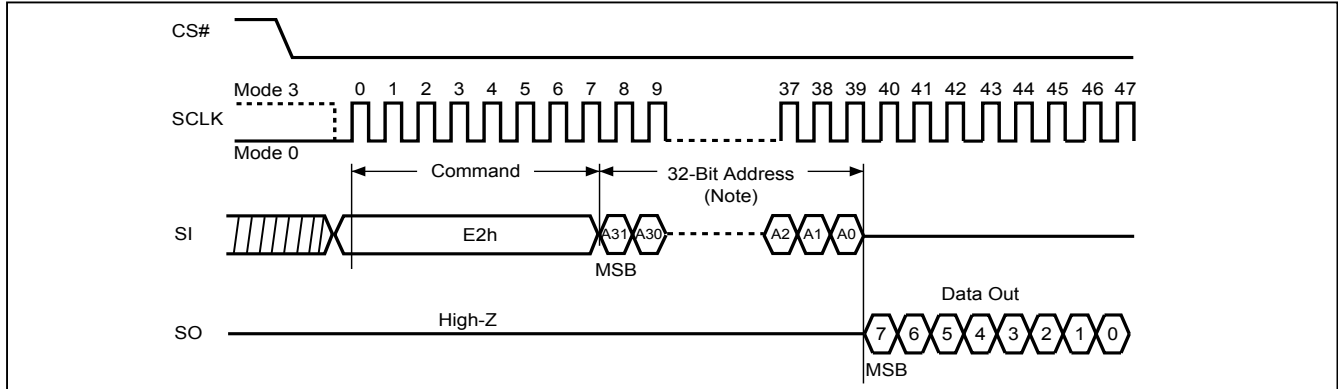
The RDSPB command reads the status of the SPB of a sector or block. The RDSPB command returns 00h if the SPB is “0”, indicating write-protection is disabled. The RDSPB command returns FFh if the SPB is “1”, indicating write-protection is enabled.

In Advanced sector protection mode, the Unprotect Solid Protect Bit (USPB) can temporarily mask the SPB bits and disable the write-protection provided by the SPB bits.

#### SPB Register

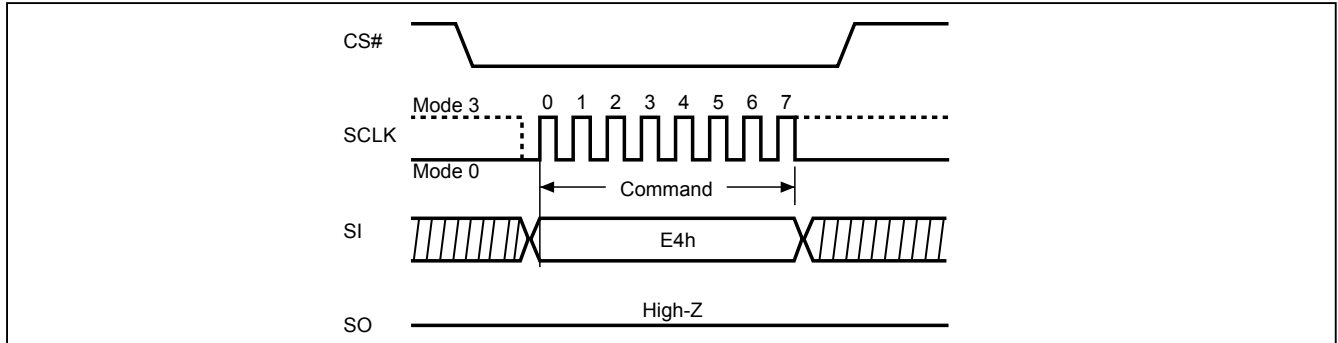
| Bit    | Description                | Bit Status   | Default | Type         |
|--------|----------------------------|--|---------|--------------|
| 7 to 0 | SPB (Solid Protection Bit) | 00h = Unprotect Sector / Block<br>FFh = Protect Sector / Block | 00h     | Non-volatile |

**Figure 36. Read SPB Status (RDSPB) Sequence**

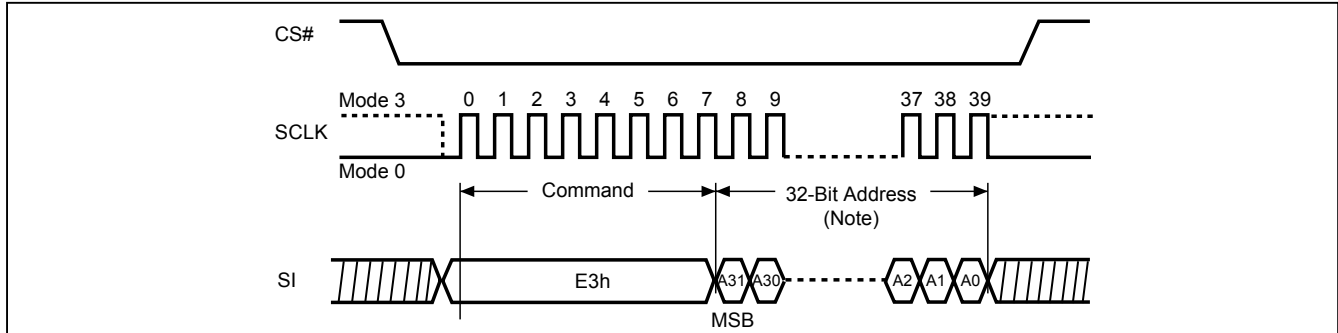


**Note:** A31-A24 are don't care.

**Figure 37. SPB Erase (ESSPB) Sequence**



**Figure 38. SPB Program (WRSPB) Sequence**



**Note:** A31-A24 are don't care.



**10-30-1. Dynamic Protection Bits**

The Dynamic Protection Bits (DPBs) are volatile bits for quickly and easily enabling or disabling write-protection to sectors and blocks. A DPB is assigned to each 4KB sector in the bottom and top 64KB of memory and to each 64KB block in the rest of the memory. The DBPs can enable write-protection on a sector or block regardless of the state of the corresponding SPB. However, the DPB bits can only unprotect sectors or blocks whose SPB bits are “0” (unprotected).

When a DPB is “1”, the associated sector or block will be write-protected, preventing any program or erase operation on the sector or block. All DPBs default to “1” after power-on or reset. When a DPB is cleared to “0”, the associated sector or block will be unprotected if the corresponding SPB is also “0”.

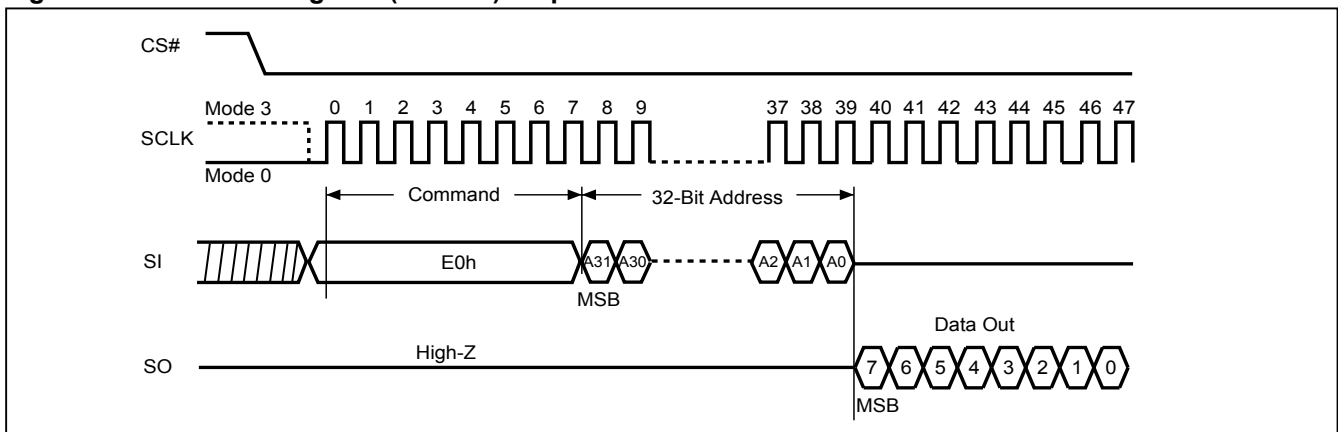
DPB bits can be individually set to “1” or “0” by the WRDPB command. The DBP bits can also be globally cleared to “0” with the GBULK command or globally set to “1” with the GBLK command. A WREN command must be executed to set the WEL bit before sending the WRDPB, GBULK, or GBLK command.

The RDDPB command reads the status of the DPB of a sector or block. The RDDPB command returns 00h if the DPB is “0”, indicating write-protection is disabled. The RDDPB command returns FFh if the DPB is “1”, indicating write-protection is enabled.

**DPB Register**

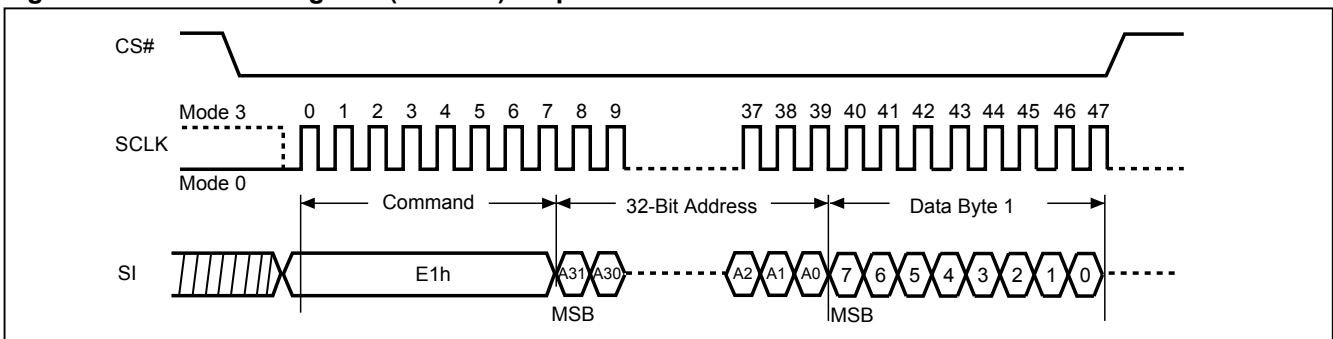
| Bit    | Description                  | Bit Status   | Default | Type     |
|--------|------------------------------|--|---------|----------|
| 7 to 0 | DPB (Dynamic Protection Bit) | 00h = Unprotect Sector / Block<br>FFh = Protect Sector / Block | FFh     | Volatile |

**Figure 39. Read DPB Register (RDDPB) Sequence**



**Note:** A31-A24 are don't care.

**Figure 40. Write DPB Register (WRDPB) Sequence**



**Note:** A31-A24 are don't care.

**10-30-2. Unprotect Solid Protect Bit (USPB)**

The Unprotect Solid Protect Bit is a volatile bit that defaults to “1” after power-on or reset. When USPB=1, the SPBs have their normal function. When USPB=0 all SPBs are masked and their write-protected sectors and blocks are temporarily unprotected (as long as their corresponding DPBs are “0”). The USPB provides a means to temporarily override the SPBs without having to issue the ESSPB and WRSPB commands to clear and set the SPBs. The USPB can be set or cleared as often as needed.

Please refer to ["10-30-4. Sector Protection States Summary Table"](#) for the sector state with the protection status of DPB/SPB/USPB bits.

**10-30-3. Gang Block Lock/Unlock (GBLK/GBULK)**

These instructions are only effective if WPSEL=1. The GBLK and GBULK instructions provide a quick method to set or clear all DPB bits at once.

The WREN (Write Enable) instruction is required before issuing the GBLK/GBULK instruction. The sequence of issuing GBLK/GBULK instruction is: CS# goes low → send GBLK/GBULK (7Eh/98h) instruction → CS# goes high.

The GBLK and GBULK commands are accepted in both SPI and QPI mode.

The CS# must go high exactly at the byte boundary, otherwise, the instruction will be rejected and not be executed.

**10-30-4. Sector Protection States Summary Table**

| Protection Status |         |          | Sector State |
|-------------------|---------|----------|--------------|
| DPB bit           | SPB bit | USPB bit |              |
| 0                 | 0       | 0        | Unprotected  |
| 0                 | 0       | 1        | Unprotected  |
| 0                 | 1       | 0        | Unprotected  |
| 0                 | 1       | 1        | Protected    |
| 1                 | 0       | 0        | Protected    |
| 1                 | 0       | 1        | Protected    |
| 1                 | 1       | 0        | Protected    |
| 1                 | 1       | 1        | Protected    |

**10-31. Program Suspend and Erase Suspend**

The Suspend instruction interrupts a Page Program, Sector Erase, or Block Erase operation to allow access to the memory array. After the program or erase operation has entered the suspended state, the memory array can be read except for the page being programmed or the sector or block being erased ("[Table 11. Readable Area of Memory While a Program or Erase Operation is Suspended](#)").

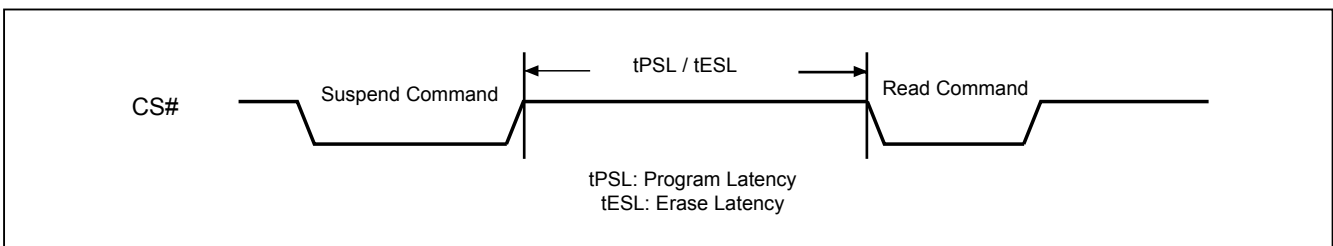
**Table 11. Readable Area of Memory While a Program or Erase Operation is Suspended**

| Suspended Operation | Readable Region of Memory Array     |
|---------------------|-------------------------------------|
| Page Program        | All but the Page being programmed   |
| Sector Erase (4KB)  | All but the 4KB Sector being erased |
| Block Erase (32KB)  | All but the 32KB Block being erased |
| Block Erase (64KB)  | All but the 64KB Block being erased |

When the serial flash receives the Suspend instruction, there is a latency of tPSL or tESL ("[Figure 41. Suspend to Read Latency](#)") before the Write Enable Latch (WEL) bit clears to "0" and the PSB or ESB sets to "1", after which the device is ready to accept one of the commands listed in "[Table 12. Acceptable Commands During Program/Erase Suspend after tPSL/tESL](#)" (e.g. FAST READ). Refer to "[Table 21. AC Characteristics](#)" for tPSL and tESL timings. "[Table 13. Acceptable Commands During Suspend \(tPSL/tESL not required\)](#)" lists the commands for which the tPSL and tESL latencies do not apply. For example, RDSR, RDSCUR, RSTEN, and RST can be issued at any time after the Suspend instruction.

Security Register bit 2 (PSB) and bit 3 (ESB) can be read to check the suspend status. The PSB (Program Suspend Bit) sets to "1" when a program operation is suspended. The ESB (Erase Suspend Bit) sets to "1" when an erase operation is suspended. The PSB or ESB clears to "0" when the program or erase operation is resumed.

**Figure 41. Suspend to Read Latency**



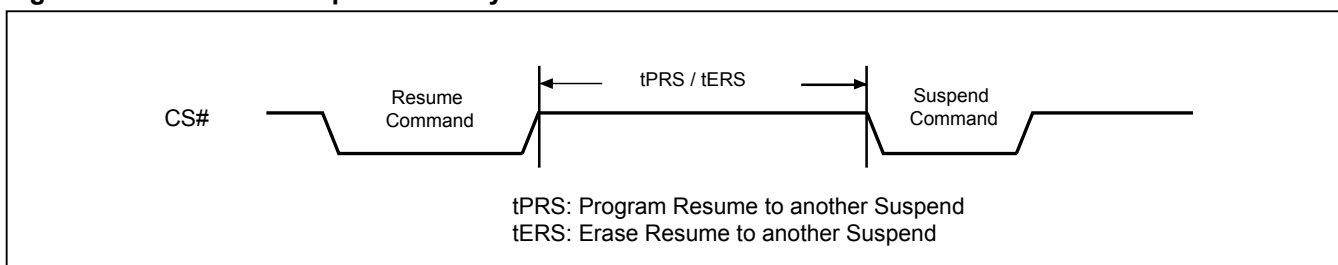
**Table 12. Acceptable Commands During Program/Erase Suspend after tPSL/tESL**

| Command Name | Command Code | Suspend Type    |               |
|--------------|--------------|-----------------|---------------|
|              |              | Program Suspend | Erase Suspend |
| READ         | 03h          | •               | •             |
| FAST READ    | 0Bh          | •               | •             |
| DREAD        | 3Bh          | •               | •             |
| QREAD        | 6Bh          | •               | •             |
| 2READ        | BBh          | •               | •             |
| 4READ        | EBh          | •               | •             |
| RDSFDP       | 5Ah          | •               | •             |
| RDID         | 9Fh          | •               | •             |
| REMS         | 90h          | •               | •             |
| RDSPB        | E2h          | •               | •             |
| RDDPB        | E0h          | •               | •             |
| ENSO         | B1h          | •               | •             |
| EXSO         | C1h          | •               | •             |
| SBL          | C0h or 77h   | •               | •             |
| WREN         | 06h          |                 | •             |
| RESUME       | 7Ah or 30h   | •               | •             |
| PP           | 02h          |                 | •             |
| 4PP          | 38h          |                 | •             |

**Table 13. Acceptable Commands During Suspend (tPSL/tESL not required)**

| Command Name | Command Code | Suspend Type    |               |
|--------------|--------------|-----------------|---------------|
|              |              | Program Suspend | Erase Suspend |
| WRDI         | 04h          | •               | •             |
| RDSR         | 05h          | •               | •             |
| RDCR         | 15h          | •               | •             |
| RDSCUR       | 2Bh          | •               | •             |
| RES          | ABh          | •               | •             |
| RSTEN        | 66h          | •               | •             |
| RST          | 99h          | •               | •             |
| NOP          | 00h          | •               | •             |

**Figure 42. Resume to Suspend Latency**

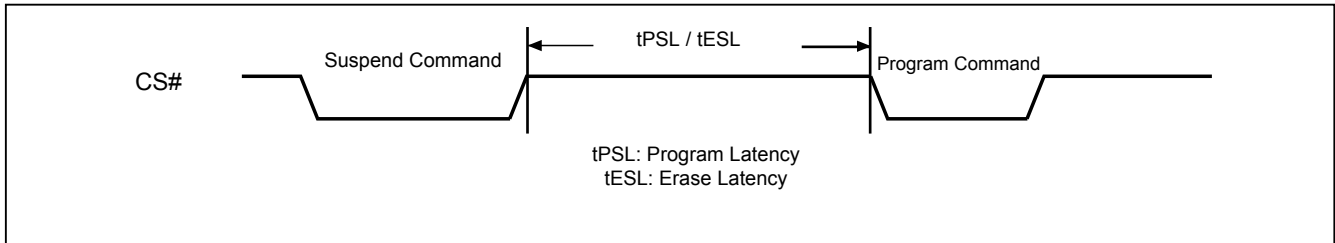


**10-31-1. Erase Suspend to Program**

The “Erase Suspend to Program” feature allows Page Programming while an erase operation is suspended. Page Programming is permitted in any unprotected memory except within the sector of a suspended Sector Erase operation or within the block of a suspended Block Erase operation. The Write Enable (WREN) instruction must be issued before any Page Program instruction.

A Page Program operation initiated within a suspended erase cannot itself be suspended and must be allowed to finish before the suspended erase can be resumed. The Status Register can be polled to determine the status of the Page Program operation. The WEL and WIP bits of the Status Register will remain “1” while the Page Program operation is in progress and will both clear to “0” when the Page Program operation completes.

**Figure 43. Suspend to Program Latency**



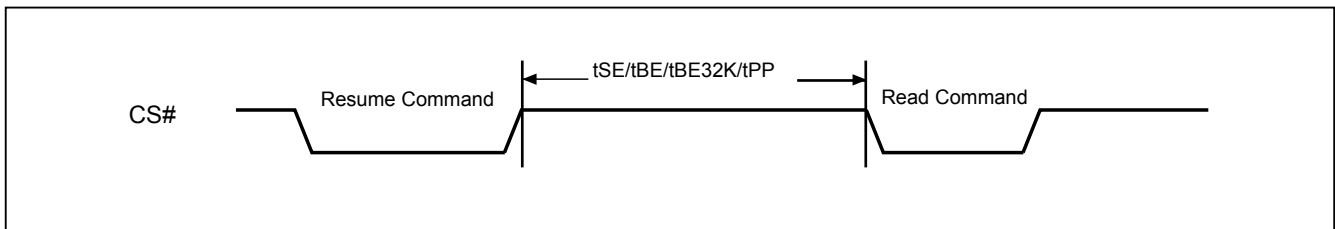
**10-32. Program Resume and Erase Resume**

The Resume instruction resumes a suspended Page Program, Sector Erase, or Block Erase operation. Before issuing the Resume instruction to restart a suspended erase operation, make sure that there is no Page Program operation in progress.

Immediately after the serial flash receives the Resume instruction, the WEL and WIP bits are set to “1” and the PSB or ESB is cleared to “0”. The program or erase operation will continue until finished (“[Figure 44. Resume to Read Latency](#)”) or until another Suspend instruction is received. A resume-to-suspend latency of tPRS or tERS must be observed before issuing another Suspend instruction (“[Figure 42. Resume to Suspend Latency](#)”).

Please note that the Resume instruction will be ignored if the serial flash is in “Performance Enhance Mode”. Make sure the serial flash is not in “Performance Enhance Mode” before issuing the Resume instruction.

**Figure 44. Resume to Read Latency**



**10-33. No Operation (NOP)**

The "No Operation" command is only able to terminate the Reset Enable (RSTEN) command and will not affect any other command.

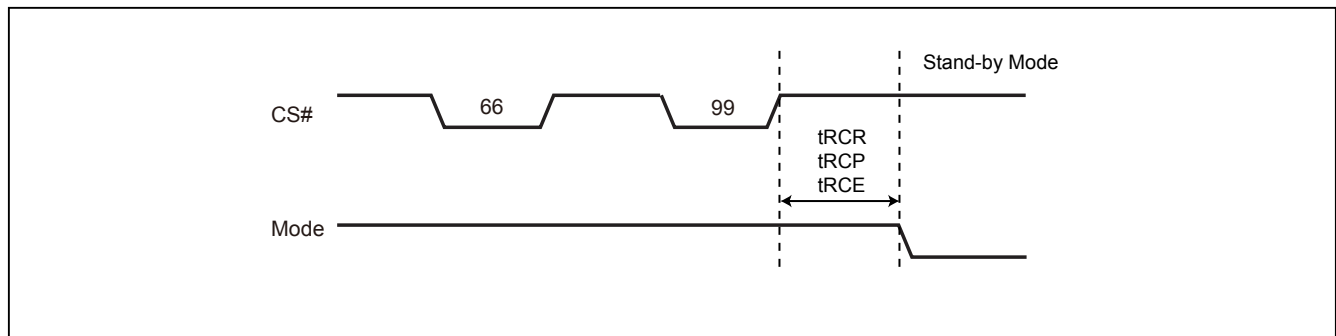
**10-34. Software Reset (Reset-Enable (RSTEN) and Reset (RST))**

The Software Reset operation combines two instructions: Reset-Enable (RSTEN) command and Reset (RST) command. It returns the device to a standby mode. All the volatile bits and settings will be cleared then, which makes the device return to the default status as power on.

To execute Reset command (RST), the Reset-Enable (RSTEN) command must be executed first to perform the Reset operation. If there is any other command to interrupt after the Reset-Enable command, the Reset-Enable will be invalid.

If the Reset command is executed during program or erase operation, the operation will be disabled, the data under processing could be damaged or lost.

The reset time is different depending on the last operation. Longer latency time is required to recover from a program operation than from other operations.

**Figure 45. Software Reset Recovery**

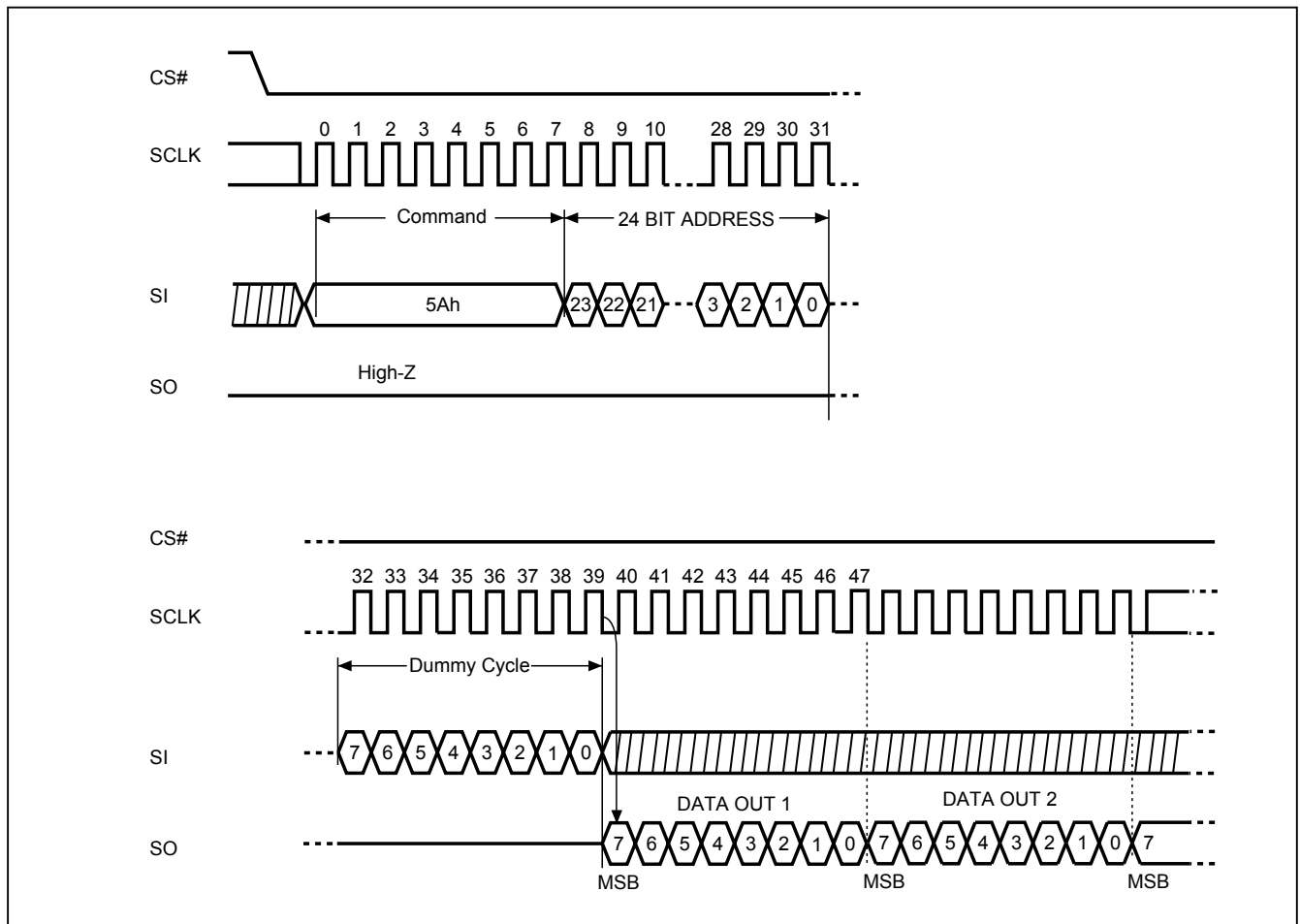
**10-35. Read SFDP Mode (RDSFDP)**

The Serial Flash Discoverable Parameter (SFDP) standard provides a consistent method of describing the functional and feature capabilities of serial flash devices in a standard set of internal parameter tables. These parameter tables can be interrogated by host system software to enable adjustments needed to accommodate divergent features from multiple vendors. The concept is similar to the one found in the Introduction of JEDEC Standard, JESD68 on CFI.

The sequence of issuing RDSFDP instruction is CS# goes low→send RDSFDP instruction (5Ah)→send 3 address bytes on SI pin→send 1 dummy byte on SI pin→read SFDP code on SO→to end RDSFDP operation can use CS# to high at any time during data out.

SFDP is a JEDEC Standard, JESD216.

**Figure 46. Read Serial Flash Discoverable Parameter (RDSFDP) Sequence**



**Table 14. Signature and Parameter Identification Data Values**

SFDP Table (JESD216) below is for MX25L6436FM2I-08G

| Description                                | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |
|--|--|-------------------|-----------------|-----------------------|-------------|
| SFDP Signature                             | Fixed: 50444653h   | 00h               | 07:00           | 53h                   | 53h         |
|  |  | 01h               | 15:08           | 46h                   | 46h         |
|  |  | 02h               | 23:16           | 44h                   | 44h         |
|  |  | 03h               | 31:24           | 50h                   | 50h         |
| SFDP Minor Revision Number                 | Start from 00h   | 04h               | 07:00           | 00h                   | 00h         |
| SFDP Major Revision Number                 | Start from 01h   | 05h               | 15:08           | 01h                   | 01h         |
| Number of Parameter Headers                | This number is 0-based. Therefore, 0 indicates 1 parameter header. | 06h               | 23:16           | 01h                   | 01h         |
| Unused                                     |  | 07h               | 31:24           | FFh                   | FFh         |
| ID number (JEDEC)                          | 00h: it indicates a JEDEC specified header.                        | 08h               | 07:00           | 00h                   | 00h         |
| Parameter Table Minor Revision Number      | Start from 00h   | 09h               | 15:08           | 00h                   | 00h         |
| Parameter Table Major Revision Number      | Start from 01h   | 0Ah               | 23:16           | 01h                   | 01h         |
| Parameter Table Length<br>(in double word) | How many DWORDs in the Parameter table                             | 0Bh               | 31:24           | 09h                   | 09h         |
| Parameter Table Pointer (PTP)              | First address of JEDEC Flash Parameter table                       | 0Ch               | 07:00           | 30h                   | 30h         |
|  |  | 0Dh               | 15:08           | 00h                   | 00h         |
|  |  | 0Eh               | 23:16           | 00h                   | 00h         |
| Unused                                     |  | 0Fh               | 31:24           | FFh                   | FFh         |
| ID number<br>(Macronix manufacturer ID)    | it indicates Macronix manufacturer ID                              | 10h               | 07:00           | C2h                   | C2h         |
| Parameter Table Minor Revision Number      | Start from 00h   | 11h               | 15:08           | 00h                   | 00h         |
| Parameter Table Major Revision Number      | Start from 01h   | 12h               | 23:16           | 01h                   | 01h         |
| Parameter Table Length<br>(in double word) | How many DWORDs in the Parameter table                             | 13h               | 31:24           | 04h                   | 04h         |
| Parameter Table Pointer (PTP)              | First address of Macronix Flash Parameter table                    | 14h               | 07:00           | 60h                   | 60h         |
|  |  | 15h               | 15:08           | 00h                   | 00h         |
|  |  | 16h               | 23:16           | 00h                   | 00h         |
| Unused                                     |  | 17h               | 31:24           | FFh                   | FFh         |



**Table 15. Parameter Table (0): JEDEC Flash Parameter Tables**

SFDP Table below is for MX25L6436FM2I-08G

| Description  | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |
|--|--|-------------------|-----------------|-----------------------|-------------|
| Block/Sector Erase sizes   | 00: Reserved, 01: 4KB erase,<br>10: Reserved,<br>11: not support 4KB erase   | 30h               | 01:00           | 01b                   | E5h         |
| Write Granularity  | 0: 1Byte, 1: 64Byte or larger  |                   | 02              | 1b                    |             |
| Write Enable Instruction Required<br>for Writing to Volatile Status<br>Registers | 0: not required<br>1: required 00h to be written to the<br>status register   |                   | 03              | 0b                    |             |
| Write Enable Opcode Select for<br>Writing to Volatile Status Registers           | 0: use 50h opcode,<br>1: use 06h opcode<br>Note: If target flash status register is<br>nonvolatile, then bits 3 and 4 must<br>be set to 00b. |                   | 04              | 0b                    |             |
| Unused   | Contains 111b and can never be<br>changed  |                   | 07:05           | 111b                  |             |
| 4KB Erase Opcode   |  | 31h               | 15:08           | 20h                   | 20h         |
| (1-1-2) Fast Read (Note2)  | 0=not support 1=support  | 32h               | 16              | 1b                    | F1h         |
| Address Bytes Number used in<br>addressing flash array                           | 00: 3Byte only, 01: 3 or 4Byte,<br>10: 4Byte only, 11: Reserved  |                   | 18:17           | 00b                   |             |
| Double Transfer Rate (DTR)<br>Clocking   | 0=not support 1=support  |                   | 19              | 0b                    |             |
| (1-2-2) Fast Read  | 0=not support 1=support  |                   | 20              | 1b                    |             |
| (1-4-4) Fast Read  | 0=not support 1=support  |                   | 21              | 1b                    |             |
| (1-1-4) Fast Read  | 0=not support 1=support  |                   | 22              | 1b                    |             |
| Unused   |  |                   | 23              | 1b                    |             |
| Unused   |  | 33h               | 31:24           | FFh                   | FFh         |
| Flash Memory Density   |  | 37h:34h           | 31:00           | 03FF FFFFh            |             |
| (1-4-4) Fast Read Number of Wait<br>states (Note3)                               | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8   | 38h               | 04:00           | 0 0100b               | 44h         |
| (1-4-4) Fast Read Number of<br>Mode Bits (Note4)                                 | Mode Bits:<br>000b: Not supported; 010b: 2 bits  |                   | 07:05           | 010b                  |             |
| (1-4-4) Fast Read Opcode   |  | 39h               | 15:08           | EBh                   | EBh         |
| (1-1-4) Fast Read Number of Wait<br>states                                       | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8   | 3Ah               | 20:16           | 0 1000b               | 08h         |
| (1-1-4) Fast Read Number of<br>Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits  |                   | 23:21           | 000b                  |             |
| (1-1-4) Fast Read Opcode   |  | 3Bh               | 31:24           | 6Bh                   | 6Bh         |

SFDP Table below is for MX25L6436FM2I-08G

| Description                             | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |
|---|--|-------------------|-----------------|-----------------------|-------------|
| (1-1-2) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 3Ch               | 04:00           | 0 1000b               | 08h         |
| (1-1-2) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 07:05           | 000b                  |             |
| (1-1-2) Fast Read Opcode                |  | 3Dh               | 15:08           | 3Bh                   | 3Bh         |
| (1-2-2) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 3Eh               | 20:16           | 0 0100b               | 04h         |
| (1-2-2) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 23:21           | 000b                  |             |
| (1-2-2) Fast Read Opcode                |  | 3Fh               | 31:24           | BBh                   | BBh         |
| (2-2-2) Fast Read                       | 0=not support 1=support  | 40h               | 00              | 0b                    | EEh         |
| Unused                                  |  |                   | 03:01           | 111b                  |             |
| (4-4-4) Fast Read                       | 0=not support 1=support  |                   | 04              | 0b                    |             |
| Unused                                  |  |                   | 07:05           | 111b                  |             |
| Unused                                  |  | 43h:41h           | 31:08           | FFh                   | FFh         |
| Unused                                  |  | 45h:44h           | 15:00           | FFh                   | FFh         |
| (2-2-2) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 46h               | 20:16           | 0 0000b               | 00h         |
| (2-2-2) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 23:21           | 000b                  |             |
| (2-2-2) Fast Read Opcode                |  | 47h               | 31:24           | FFh                   | FFh         |
| Unused                                  |  | 49h:48h           | 15:00           | FFh                   | FFh         |
| (4-4-4) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 4Ah               | 20:16           | 0 0000b               | 00h         |
| (4-4-4) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 23:21           | 000b                  |             |
| (4-4-4) Fast Read Opcode                |  | 4Bh               | 31:24           | FFh                   | FFh         |
| Sector Type 1 Size                      | Sector/block size = 2 <sup>N</sup> bytes (Note5)<br>0Ch: 4KB; 0Fh: 32KB; 10h: 64KB | 4Ch               | 07:00           | 0Ch                   | 0Ch         |
| Sector Type 1 erase Opcode              |  | 4Dh               | 15:08           | 20h                   | 20h         |
| Sector Type 2 Size                      | Sector/block size = 2 <sup>N</sup> bytes<br>00h: N/A; 0Fh: 32KB; 10h: 64KB         | 4Eh               | 23:16           | 0Fh                   | 0Fh         |
| Sector Type 2 erase Opcode              |  | 4Fh               | 31:24           | 52h                   | 52h         |
| Sector Type 3 Size                      | Sector/block size = 2 <sup>N</sup> bytes<br>00h: N/A; 0Fh: 32KB; 10h: 64KB         | 50h               | 07:00           | 10h                   | 10h         |
| Sector Type 3 erase Opcode              |  | 51h               | 15:08           | D8h                   | D8h         |
| Sector Type 4 Size                      | 00h: N/A, This sector type doesn't exist   | 52h               | 23:16           | 00h                   | 00h         |
| Sector Type 4 erase Opcode              |  | 53h               | 31:24           | FFh                   | FFh         |

**Table 16. Parameter Table (1): Macronix Flash Parameter Tables**

SFDP Table below is for MX25L6436FM2I-08G

| Description   | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |     |
|---|--|-------------------|-----------------|-----------------------|-------------|-----|
| Vcc Supply Maximum Voltage  | 2000h=2.000V<br>2700h=2.700V<br>3600h=3.600V   | 61h:60h           | 07:00<br>15:08  | 00h<br>36h            | 00h<br>36h  |     |
| Vcc Supply Minimum Voltage  | 1650h=1.650V, 1750h=1.750V<br>2250h=2.250V, 2300h=2.300V<br>2350h=2.350V, 2650h=2.650V<br>2700h=2.700V | 63h:62h           | 23:16<br>31:24  | 50h<br>26h            | 50h<br>26h  |     |
| H/W Reset# pin  | 0=not support 1=support  | 65h:64h           | 00              | 0b                    | F99Eh       |     |
| H/W Hold# pin   | 0=not support 1=support  |                   | 01              | 1b                    |             |     |
| Deep Power Down Mode  | 0=not support 1=support  |                   | 02              | 1b                    |             |     |
| S/W Reset   | 0=not support 1=support  |                   | 03              | 1b                    |             |     |
| S/W Reset Opcode  | Reset Enable (66h) should be issued before Reset Opcode  |                   | 11:04           | 1001 1001b (99h)      |             |     |
| Program Suspend/Resume  | 0=not support 1=support  |                   | 12              | 1b                    |             |     |
| Erase Suspend/Resume  | 0=not support 1=support  |                   | 13              | 1b                    |             |     |
| Unused  |  |                   | 14              | 1b                    |             |     |
| Wrap-Around Read mode   | 0=not support 1=support  |                   | 15              | 1b                    |             |     |
| Wrap-Around Read mode Opcode                                      |  |                   | 66h             | 23:16                 |             | 77h |
| Wrap-Around Read data length                                      | 08h:support 8B wrap-around read<br>16h:8B&16B<br>32h:8B&16B&32B<br>64h:8B&16B&32B&64B                  | 67h               | 31:24           | 64h                   | 64h         |     |
| Individual block lock   | 0=not support 1=support  | 6Bh:68h           | 00              | 1b                    | CB85h       |     |
| Individual block lock bit (Volatile/Nonvolatile)                  | 0=Volatile 1=Nonvolatile   |                   | 01              | 0b                    |             |     |
| Individual block lock Opcode                                      |  |                   | 09:02           | 1110 0001b (E1h)      |             |     |
| Individual block lock Volatile protect bit default protect status | 0=protect 1=unprotect  |                   | 10              | 0b                    |             |     |
| Secured OTP   | 0=not support 1=support  |                   | 11              | 1b                    |             |     |
| Read Lock   | 0=not support 1=support  |                   | 12              | 0b                    |             |     |
| Permanent Lock  | 0=not support 1=support  |                   | 13              | 0b                    |             |     |
| Unused  |  |                   | 15:14           | 11b                   |             |     |
| Unused  |  |                   | 31:16           | FFh                   |             | FFh |
| Unused  |  |                   | 6Fh:6Ch         | 31:00                 |             | FFh |

**Table 17. Signature and Parameter Identification Data Values**

SFDP Table (JESD216) below is for MX25L6436FM2I-08Q

| Description                             | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |
|---|--|-------------------|-----------------|-----------------------|-------------|
| SFDP Signature                          | Fixed: 50444653h   | 00h               | 07:00           | 53h                   | 53h         |
|   |  | 01h               | 15:08           | 46h                   | 46h         |
|   |  | 02h               | 23:16           | 44h                   | 44h         |
|   |  | 03h               | 31:24           | 50h                   | 50h         |
| SFDP Minor Revision Number              | Start from 00h   | 04h               | 07:00           | 00h                   | 00h         |
| SFDP Major Revision Number              | Start from 01h   | 05h               | 15:08           | 01h                   | 01h         |
| Number of Parameter Headers             | This number is 0-based. Therefore, 0 indicates 1 parameter header. | 06h               | 23:16           | 01h                   | 01h         |
| Unused                                  |  | 07h               | 31:24           | FFh                   | FFh         |
| ID number (JEDEC)                       | 00h: it indicates a JEDEC specified header.                        | 08h               | 07:00           | 00h                   | 00h         |
| Parameter Table Minor Revision Number   | Start from 00h   | 09h               | 15:08           | 00h                   | 00h         |
| Parameter Table Major Revision Number   | Start from 01h   | 0Ah               | 23:16           | 01h                   | 01h         |
| Parameter Table Length (in double word) | How many DWORDs in the Parameter table                             | 0Bh               | 31:24           | 09h                   | 09h         |
| Parameter Table Pointer (PTP)           | First address of JEDEC Flash Parameter table                       | 0Ch               | 07:00           | 30h                   | 30h         |
|   |  | 0Dh               | 15:08           | 00h                   | 00h         |
|   |  | 0Eh               | 23:16           | 00h                   | 00h         |
| Unused                                  |  | 0Fh               | 31:24           | FFh                   | FFh         |
| ID number (Macronix manufacturer ID)    | it indicates Macronix manufacturer ID                              | 10h               | 07:00           | C2h                   | C2h         |
| Parameter Table Minor Revision Number   | Start from 00h   | 11h               | 15:08           | 00h                   | 00h         |
| Parameter Table Major Revision Number   | Start from 01h   | 12h               | 23:16           | 01h                   | 01h         |
| Parameter Table Length (in double word) | How many DWORDs in the Parameter table                             | 13h               | 31:24           | 04h                   | 04h         |
| Parameter Table Pointer (PTP)           | First address of Macronix Flash Parameter table                    | 14h               | 07:00           | 60h                   | 60h         |
|   |  | 15h               | 15:08           | 00h                   | 00h         |
|   |  | 16h               | 23:16           | 00h                   | 00h         |
| Unused                                  |  | 17h               | 31:24           | FFh                   | FFh         |

**Table 18. Parameter Table (0): JEDEC Flash Parameter Tables**

SFDP Table below is for MX25L6436FM2I-08Q

| Description  | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |
|--|--|-------------------|-----------------|-----------------------|-------------|
| Block/Sector Erase sizes   | 00: Reserved, 01: 4KB erase,<br>10: Reserved,<br>11: not support 4KB erase   | 30h               | 01:00           | 01b                   | E5h         |
| Write Granularity  | 0: 1Byte, 1: 64Byte or larger  |                   | 02              | 1b                    |             |
| Write Enable Instruction Required<br>for Writing to Volatile Status<br>Registers | 0: not required<br>1: required 00h to be written to the<br>status register   |                   | 03              | 0b                    |             |
| Write Enable Opcode Select for<br>Writing to Volatile Status Registers           | 0: use 50h opcode,<br>1: use 06h opcode<br>Note: If target flash status register is<br>nonvolatile, then bits 3 and 4 must<br>be set to 00b. |                   | 04              | 0b                    |             |
| Unused   | Contains 111b and can never be<br>changed  |                   | 07:05           | 111b                  |             |
| 4KB Erase Opcode   |  | 31h               | 15:08           | 20h                   | 20h         |
| (1-1-2) Fast Read (Note2)  | 0=not support 1=support  | 32h               | 16              | 1b                    | F1h         |
| Address Bytes Number used in<br>addressing flash array                           | 00: 3Byte only, 01: 3 or 4Byte,<br>10: 4Byte only, 11: Reserved  |                   | 18:17           | 00b                   |             |
| Double Transfer Rate (DTR)<br>Clocking   | 0=not support 1=support  |                   | 19              | 0b                    |             |
| (1-2-2) Fast Read  | 0=not support 1=support  |                   | 20              | 1b                    |             |
| (1-4-4) Fast Read  | 0=not support 1=support  |                   | 21              | 1b                    |             |
| (1-1-4) Fast Read  | 0=not support 1=support  |                   | 22              | 1b                    |             |
| Unused   |  |                   | 23              | 1b                    |             |
| Unused   |  | 33h               | 31:24           | FFh                   | FFh         |
| Flash Memory Density   |  | 37h:34h           | 31:00           | 03FF FFFFh            |             |
| (1-4-4) Fast Read Number of Wait<br>states (Note3)                               | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8   | 38h               | 04:00           | 0 0100b               | 44h         |
| (1-4-4) Fast Read Number of<br>Mode Bits (Note4)                                 | Mode Bits:<br>000b: Not supported; 010b: 2 bits  |                   | 07:05           | 010b                  |             |
| (1-4-4) Fast Read Opcode   |  | 39h               | 15:08           | EBh                   | EBh         |
| (1-1-4) Fast Read Number of Wait<br>states                                       | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8   | 3Ah               | 20:16           | 0 1000b               | 08h         |
| (1-1-4) Fast Read Number of<br>Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits  |                   | 23:21           | 000b                  |             |
| (1-1-4) Fast Read Opcode   |  | 3Bh               | 31:24           | 6Bh                   | 6Bh         |

SFDP Table below is for MX25L6436FM2I-08Q

| Description                             | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |
|---|--|-------------------|-----------------|-----------------------|-------------|
| (1-1-2) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 3Ch               | 04:00           | 0 1000b               | 08h         |
| (1-1-2) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 07:05           | 000b                  |             |
| (1-1-2) Fast Read Opcode                |  | 3Dh               | 15:08           | 3Bh                   | 3Bh         |
| (1-2-2) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 3Eh               | 20:16           | 0 0100b               | 04h         |
| (1-2-2) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 23:21           | 000b                  |             |
| (1-2-2) Fast Read Opcode                |  | 3Fh               | 31:24           | BBh                   | BBh         |
| (2-2-2) Fast Read                       | 0=not support 1=support  | 40h               | 00              | 0b                    | EEh         |
| Unused                                  |  |                   | 03:01           | 111b                  |             |
| (4-4-4) Fast Read                       | 0=not support 1=support  |                   | 04              | 0b                    |             |
| Unused                                  |  |                   | 07:05           | 111b                  |             |
| Unused                                  |  | 43h:41h           | 31:08           | FFh                   | FFh         |
| Unused                                  |  | 45h:44h           | 15:00           | FFh                   | FFh         |
| (2-2-2) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 46h               | 20:16           | 0 0000b               | 00h         |
| (2-2-2) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 23:21           | 000b                  |             |
| (2-2-2) Fast Read Opcode                |  | 47h               | 31:24           | FFh                   | FFh         |
| Unused                                  |  | 49h:48h           | 15:00           | FFh                   | FFh         |
| (4-4-4) Fast Read Number of Wait states | 0 0000b: Not supported; 0 0100b: 4<br>0 0110b: 6; 0 1000b: 8                       | 4Ah               | 20:16           | 0 0000b               | 00h         |
| (4-4-4) Fast Read Number of Mode Bits   | Mode Bits:<br>000b: Not supported; 010b: 2 bits                                    |                   | 23:21           | 000b                  |             |
| (4-4-4) Fast Read Opcode                |  | 4Bh               | 31:24           | FFh                   | FFh         |
| Sector Type 1 Size                      | Sector/block size = 2 <sup>N</sup> bytes (Note5)<br>0Ch: 4KB; 0Fh: 32KB; 10h: 64KB | 4Ch               | 07:00           | 0Ch                   | 0Ch         |
| Sector Type 1 erase Opcode              |  | 4Dh               | 15:08           | 20h                   | 20h         |
| Sector Type 2 Size                      | Sector/block size = 2 <sup>N</sup> bytes<br>00h: N/A; 0Fh: 32KB; 10h: 64KB         | 4Eh               | 23:16           | 0Fh                   | 0Fh         |
| Sector Type 2 erase Opcode              |  | 4Fh               | 31:24           | 52h                   | 52h         |
| Sector Type 3 Size                      | Sector/block size = 2 <sup>N</sup> bytes<br>00h: N/A; 0Fh: 32KB; 10h: 64KB         | 50h               | 07:00           | 10h                   | 10h         |
| Sector Type 3 erase Opcode              |  | 51h               | 15:08           | D8h                   | D8h         |
| Sector Type 4 Size                      | 00h: N/A, This sector type doesn't exist   | 52h               | 23:16           | 00h                   | 00h         |
| Sector Type 4 erase Opcode              |  | 53h               | 31:24           | FFh                   | FFh         |

**Table 19. Parameter Table (1): Macronix Flash Parameter Tables**

SFDP Table below is for MX25L6436FM2I-08Q

| Description   | Comment  | Add (h)<br>(Byte) | DW Add<br>(Bit) | Data (h/b)<br>(Note1) | Data<br>(h) |     |
|---|--|-------------------|-----------------|-----------------------|-------------|-----|
| Vcc Supply Maximum Voltage  | 2000h=2.000V<br>2700h=2.700V<br>3600h=3.600V   | 61h:60h           | 07:00<br>15:08  | 00h<br>36h            | 00h<br>36h  |     |
| Vcc Supply Minimum Voltage  | 1650h=1.650V, 1750h=1.750V<br>2250h=2.250V, 2300h=2.300V<br>2350h=2.350V, 2650h=2.650V<br>2700h=2.700V | 63h:62h           | 23:16<br>31:24  | 50h<br>26h            | 50h<br>26h  |     |
| H/W Reset# pin  | 0=not support 1=support  | 65h:64h           | 00              | 0b                    | F99Eh       |     |
| H/W Hold# pin   | 0=not support 1=support  |                   | 01              | 1b                    |             |     |
| Deep Power Down Mode  | 0=not support 1=support  |                   | 02              | 1b                    |             |     |
| S/W Reset   | 0=not support 1=support  |                   | 03              | 1b                    |             |     |
| S/W Reset Opcode  | Reset Enable (66h) should be issued before Reset Opcode  |                   | 11:04           | 1001 1001b (99h)      |             |     |
| Program Suspend/Resume  | 0=not support 1=support  |                   | 12              | 1b                    |             |     |
| Erase Suspend/Resume  | 0=not support 1=support  |                   | 13              | 1b                    |             |     |
| Unused  |  |                   | 14              | 1b                    |             |     |
| Wrap-Around Read mode   | 0=not support 1=support  |                   | 15              | 1b                    |             |     |
| Wrap-Around Read mode Opcode                                      |  |                   | 66h             | 23:16                 |             | 77h |
| Wrap-Around Read data length                                      | 08h:support 8B wrap-around read<br>16h:8B&16B<br>32h:8B&16B&32B<br>64h:8B&16B&32B&64B                  | 67h               | 31:24           | 64h                   | 64h         |     |
| Individual block lock   | 0=not support 1=support  | 6Bh:68h           | 00              | 0b                    | CFFEh       |     |
| Individual block lock bit (Volatile/Nonvolatile)                  | 0=Volatile 1=Nonvolatile   |                   | 01              | 1b                    |             |     |
| Individual block lock Opcode                                      |  |                   | 09:02           | 1111 1111b (FFh)      |             |     |
| Individual block lock Volatile protect bit default protect status | 0=protect 1=unprotect  |                   | 10              | 1b                    |             |     |
| Secured OTP   | 0=not support 1=support  |                   | 11              | 1b                    |             |     |
| Read Lock   | 0=not support 1=support  |                   | 12              | 0b                    |             |     |
| Permanent Lock  | 0=not support 1=support  |                   | 13              | 0b                    |             |     |
| Unused  |  |                   | 15:14           | 11b                   |             |     |
| Unused  |  |                   | 31:16           | FFh                   |             | FFh |
| Unused  |  |                   | 6Fh:6Ch         | 31:00                 |             | FFh |

Note 1: h/b is hexadecimal or binary.

Note 2: **(x-y-z)** means I/O mode nomenclature used to indicate the number of active pins used for the opcode (x), address (y), and data (z). At the present time, the only valid Read SFDP instruction modes are: (1-1-1), (2-2-2), and (4-4-4)

Note 3: **Wait States** is required dummy clock cycles after the address bits or optional mode bits.

Note 4: **Mode Bits** is optional control bits that follow the address bits. These bits are driven by the system controller if they are specified. (eg,read performance enhance toggling bits)

Note 5: 4KB=2<sup>0</sup>Ch, 32KB=2<sup>0</sup>Fh, 64KB=2<sup>1</sup>0h

Note 6: All unused and undefined area data is blank FFh for SFDP Tables that are defined in Parameter Identification Header. All other areas beyond defined SFDP Table are reserved by Macronix.



## 11. POWER-ON STATE

The device is at the following states after power-up:

- Standby mode
- Write Enable Latch (WEL) bit is reset

The device must not be selected during power-up and power-down stage until the VCC reaches the following levels:

- VCC minimum at power-up stage and then after a delay of tVSL
- GND at power-down

Please note that a pull-up resistor on CS# may ensure a safe and proper power-up/down level.

An internal Power-on Reset (POR) circuit may protect the device from data corruption and inadvertent data change during power up state.

For further protection on the device, if the VCC does not reach the VCC minimum level, the correct operation is not guaranteed. The read, write, erase, and program command should be sent after the time delay:

- tVSL after VCC reached VCC minimum level

The device can accept read command after VCC reached VCC minimum and a time delay of tVSL.

### Note:

- To stabilize the VCC level, the VCC rail decoupled by a suitable capacitor close to package pins is recommended. (generally around 0.1uF)

## 12. Electrical Specifications

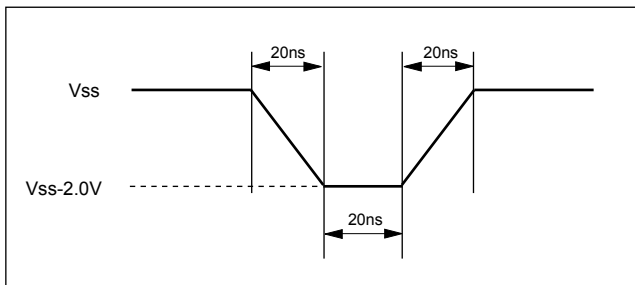
### 12-1. Absolute Maximum Ratings

| RATING                        |                  | VALUE          |
|-------------------------------|------------------|----------------|
| Ambient Operating Temperature | Industrial grade | -40°C to 85°C  |
| Storage Temperature           |                  | -65°C to 150°C |
| Applied Input Voltage         |                  | -0.5V to 4.6V  |
| Applied Output Voltage        |                  | -0.5V to 4.6V  |
| VCC to Ground Potential       |                  | -0.5V to 4.6V  |

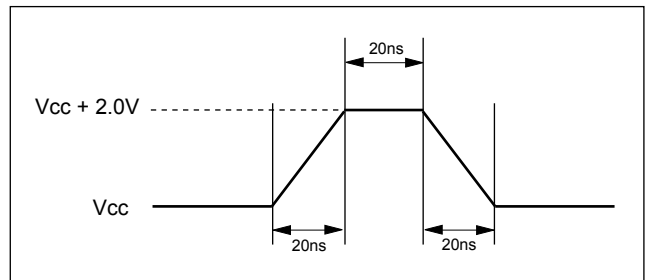
**NOTICE:**

- Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is stress rating only and functional operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended period may affect reliability.
- Specifications contained within the following tables are subject to change.
- During voltage transitions, all pins may overshoot Vss to -2.0V and Vcc to +2.0V for periods up to 20ns, see the figures below.

**Figure 47. Maximum Negative Overshoot Waveform**



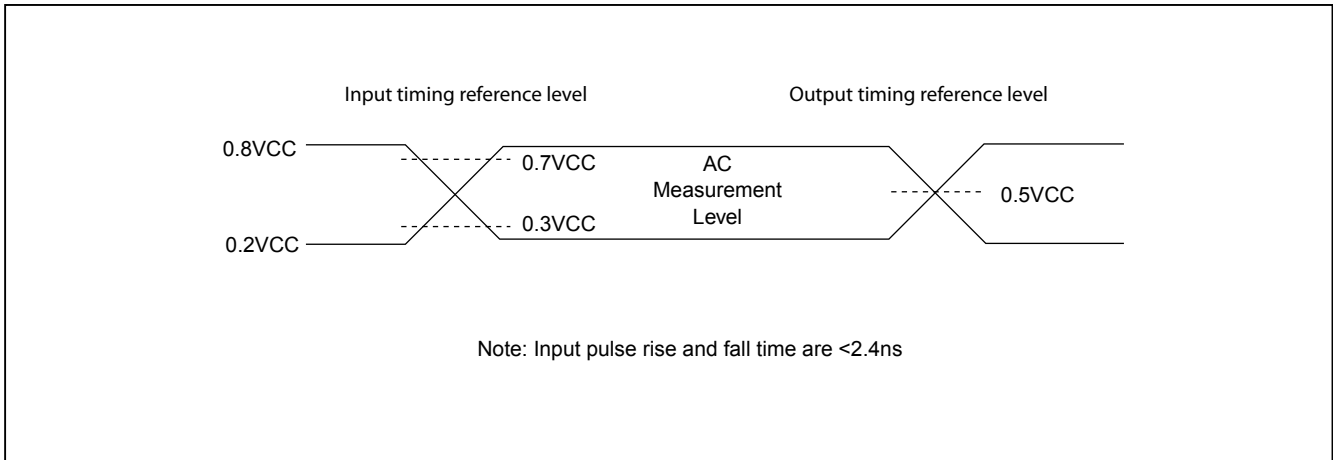
**Figure 48. Maximum Positive Overshoot Waveform**



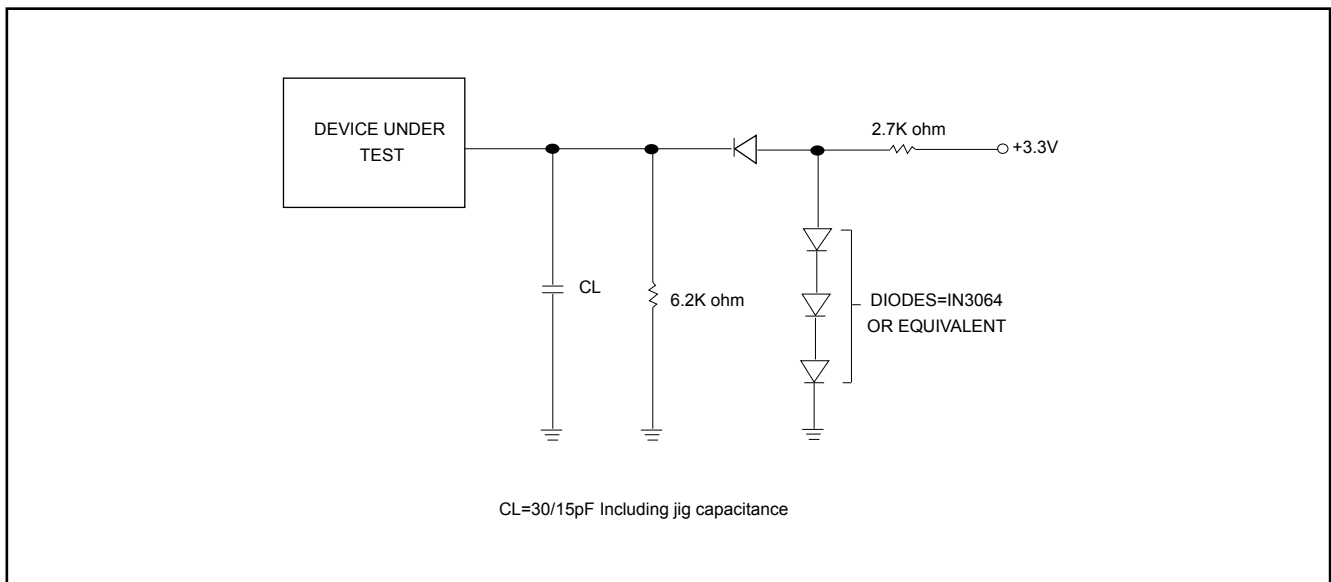
### 12-2. Capacitance TA = 25°C, f = 1.0 MHz

| Symbol | Parameter          | Min. | Typ. | Max. | Unit | Conditions |
|--------|--------------------|------|------|------|------|------------|
| CIN    | Input Capacitance  |      |      | 6    | pF   | VIN = 0V   |
| COUT   | Output Capacitance |      |      | 8    | pF   | VOUT = 0V  |

**Figure 49. Input Test Waveforms and Measurement Level**



**Figure 50. Output Loading**



**Table 20. DC Characteristics**

Temperature = -40°C to 85°C for Industrial grade, VCC = 2.65V ~ 3.6V

| Symbol | Parameter                                | Notes | Min.    | Typ. | Max.    | Units | Test Conditions  |
|--------|--|-------|---------|------|---------|-------|--|
| ILI    | Input Load Current                       | 1     |         |      | ± 2     | uA    | VCC = VCC Max,<br>VIN = VCC or GND                         |
| ILO    | Output Leakage Current                   | 1     |         |      | ± 2     | uA    | VCC = VCC Max,<br>VOUT = VCC or GND                        |
| ISB1   | VCC Standby Current                      | 1     |         | 10   | 50      | uA    | VIN = VCC or GND, CS# = VCC                                |
| ISB2   | Deep Power-down Current                  |       |         | 3    | 20      | uA    | VIN = VCC or GND, CS# = VCC                                |
| ICC1   | VCC Read                                 | 1     |         | 10   | 17      | mA    | fQ=133MHz (4 x I/O read)<br>SCLK=0.1VCC/0.9VCC,<br>SO=Open |
|        |  |       |         | 2.5  | 5       | mA    | f=50MHz,<br>SCLK=0.1VCC/0.9VCC,<br>SO=Open                 |
| ICC2   | VCC Program Current (PP)                 | 1     |         | 10   | 15      | mA    | Program in Progress, CS# = VCC                             |
| ICC3   | VCC Write Status Register (WRSR) Current |       |         | 10   | 15      | mA    | Program status register in progress, CS#=VCC               |
| ICC4   | VCC Sector Erase Current (SE)            | 1     |         | 10   | 15      | mA    | Erase in Progress, CS#=VCC                                 |
| ICC5   | VCC Chip Erase Current (CE)              | 1     |         | 10   | 15      | mA    | Erase in Progress, CS#=VCC                                 |
| VIL    | Input Low Voltage                        |       | -0.5    |      | 0.8     | V     |  |
| VIH    | Input High Voltage                       |       | 0.7VCC  |      | VCC+0.4 | V     |  |
| VOL    | Output Low Voltage                       |       |         |      | 0.4     | V     | IOL = 1.6mA  |
| VOH    | Output High Voltage                      |       | VCC-0.2 |      |         | V     | IOH = -100uA   |

**Notes :**

1. Typical values at VCC = 3.3V, T = 25°C. These currents are valid for all product versions (package and speeds).
2. Typical value is calculated by simulation.
3. The value guaranteed by characterization, not 100% tested in production.

**Table 21. AC Characteristics**

Temperature = -40°C to 85°C for Industrial grade, VCC = 2.65V ~ 3.6V

| Symbol               | Alt. | Parameter   | Min.                    | Typ.            | Max. | Unit |
|----------------------|------|---|-------------------------|-----------------|------|------|
| fSCLK                | fC   | Clock Frequency for the following instructions:<br>FAST_READ, PP, SE, BE32K, BE, CE, RES, WREN,<br>WRDI, RDID, RDSR, WRSR | D.C.                    |                 | 133  | MHz  |
| fRSCLK               | fR   | Clock Frequency for READ instructions   |                         |                 | 50   | MHz  |
| fTCLK                | fT   | Clock Frequency for 2READ/DREAD instructions  |                         |                 | 133  | MHz  |
|                      | fQ   | Clock Frequency for 4READ/QREAD instructions  |                         |                 | 133  | MHz  |
| f4PP                 |      | Clock Frequency for 4PP (Quad page program)   |                         |                 | 133  | MHz  |
| tCH <sup>(1)</sup>   | tCLH | Clock High Time   | Normal Read (fRSCLK)    | 9               |      | ns   |
|                      |      |   | Others (fSCLK)          | 45% x (1/fSCLK) |      | ns   |
| tCL <sup>(1)</sup>   | tCLL | Clock Low Time  | Normal Read (fRSCLK)    | 9               |      | ns   |
|                      |      |   | Others (fSCLK)          | 45% x (1/fSCLK) |      | ns   |
| tCLCH <sup>(2)</sup> |      | Clock Rise Time (peak to peak)  | 0.1                     |                 |      | V/ns |
| tCHCL <sup>(2)</sup> |      | Clock Fall Time (peak to peak)  | 0.1                     |                 |      | V/ns |
| tSLCH                | tCSS | CS# Active Setup Time (relative to SCLK)  | 4                       |                 |      | ns   |
| tCHSL                |      | CS# Not Active Hold Time (relative to SCLK)   | 4                       |                 |      | ns   |
| tDVCH                | tDSU | Data In Setup Time  | 2                       |                 |      | ns   |
| tCHDX                | tDH  | Data In Hold Time   | 3                       |                 |      | ns   |
| tCHSH                |      | CS# Active Hold Time (relative to SCLK)   | 4                       |                 |      | ns   |
| tSHCH                |      | CS# Not Active Setup Time (relative to SCLK)  | 4                       |                 |      | ns   |
| tSHSL                | tCSH | CS# Deselect Time   | Read                    | 15              |      | ns   |
|                      |      |   | Write/Erase/<br>Program | 50              |      | ns   |
| tSHQZ <sup>(2)</sup> | tDIS | Output Disable Time   | 2.65V-3.6V              |                 | 10   | ns   |
|                      |      |   | 3.0V-3.6V               |                 | 8    | ns   |
| tHLCH                |      | HOLD# Setup Time (relative to SCLK)   | 5                       |                 |      | ns   |
| tCHHH                |      | HOLD# Hold Time (relative to SCLK)  | 5                       |                 |      | ns   |
| tHHCH                |      | HOLD Setup Time (relative to SCLK)  | 5                       |                 |      | ns   |
| tCHHL                |      | HOLD Hold Time (relative to SCLK)   | 5                       |                 |      | ns   |
| tHHQX                | tLZ  | HOLD to Output Low-Z<br>Loading=30pF  | 2.65V-3.6V              |                 | 10   | ns   |
|                      |      |   | 3.0V-3.6V               |                 | 8    | ns   |
| tHLQZ                | tHZ  | HOLD# to Output High-Z<br>Loading=30pF  | 2.65V-3.6V              |                 | 10   | ns   |
|                      |      |   | 3.0V-3.6V               |                 | 8    | ns   |
| tCLQV                | tV   | Clock Low to Output Valid<br>VCC=2.65V~3.6V   | Loading: 15pF           |                 | 6    | ns   |
|                      |      |   | Loading: 30pF           |                 | 8    | ns   |
| tCLQX                | tHO  | Output Hold Time  | 1                       |                 |      | ns   |
| tWHS <sup>(3)</sup>  |      | Write Protect Setup Time  | 20                      |                 |      | ns   |
| tSHW <sup>(3)</sup>  |      | Write Protect Hold Time   | 100                     |                 |      | ns   |
| tESL <sup>(4)</sup>  |      | Erase Suspend Latency   |                         |                 | 20   | us   |
| tPSL <sup>(4)</sup>  |      | Program Suspend Latency   |                         |                 | 20   | us   |
| tPRS <sup>(5)</sup>  |      | Latency between Program Resume and next Suspend   | 0.3                     | 100             |      | us   |
| tERS <sup>(6)</sup>  |      | Latency between Erase Resume and next Suspend   | 0.3                     | 200             |      | us   |

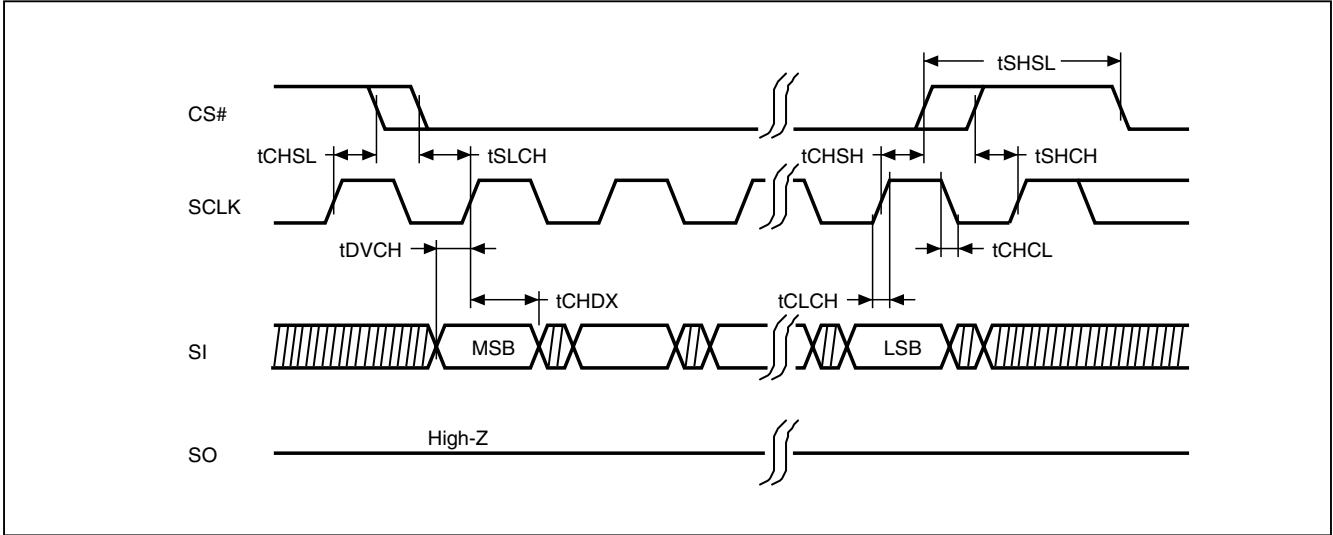
| Symbol | Alt. | Parameter  | Min. | Typ. | Max. | Unit |
|--------|------|--|------|------|------|------|
| tRCR   |      | Recovery Time from Read                                    | 20   |      |      | us   |
| tRCP   |      | Recovery Time from Program                                 | 20   |      |      | us   |
| tRCE   |      | Recovery Time from Erase                                   | 12   |      |      | ms   |
| tDP    |      | CS# High to Deep Power-down Mode                           |      |      | 10   | us   |
| tRES1  |      | CS# High to Standby Mode without Electronic Signature Read |      |      | 100  | us   |
| tRES2  |      | CS# High to Standby Mode with Electronic Signature Read    |      |      | 100  | us   |
| tW     |      | Write Status Register Cycle Time                           |      |      | 40   | ms   |
| tBP    |      | Byte-Program   |      | 10   | 50   | us   |
| tPP    |      | Page Program Cycle Time                                    |      | 0.33 | 1.2  | ms   |
| tSE    |      | Sector Erase Cycle Time (4KB)                              |      | 25   | 200  | ms   |
| tBE32K |      | Block Erase Cycle Time (32KB)                              |      | 0.14 | 0.6  | s    |
| tBE    |      | Block Erase Cycle Time (64KB)                              |      | 0.25 | 1    | s    |
| tCE    |      | Chip Erase Cycle Time                                      |      | 20   | 60   | s    |
| tWSR   |      | Write Security Register Time                               |      |      | 1    | ms   |

**Notes:**

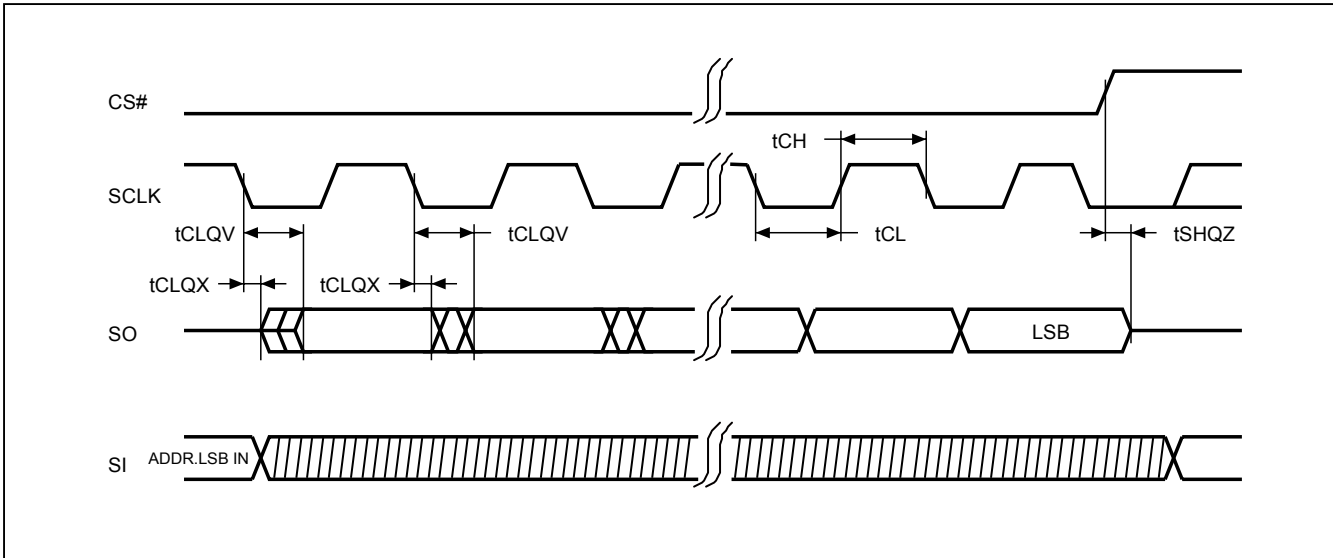
1. tCH + tCL must be greater than or equal to 1/ fC.
2. The value guaranteed by characterization, not 100% tested in production.
3. Only applicable as a constraint for a WRSR instruction when SRWD is set at 1.
4. Latency time is required to complete Erase/Program Suspend operation until WIP bit is "0".
5. For tPRS, minimum timing must be observed before issuing the next program suspend command. However, a period equal to or longer than the typical timing is required in order for the program operation to make progress.
6. For tERS, minimum timing must be observed before issuing the next erase suspend command. However, a period equal to or longer than the typical timing is required in order for the erase operation to make progress.

**13. TIMING ANALYSIS**

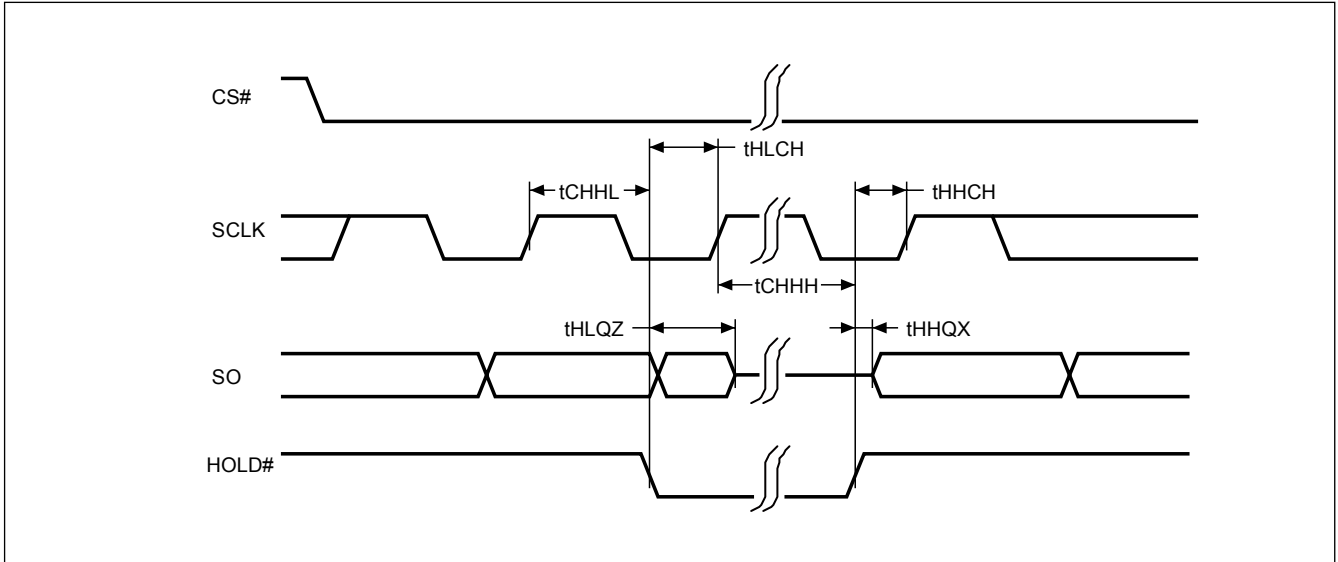
**Figure 51. Serial Input Timing**



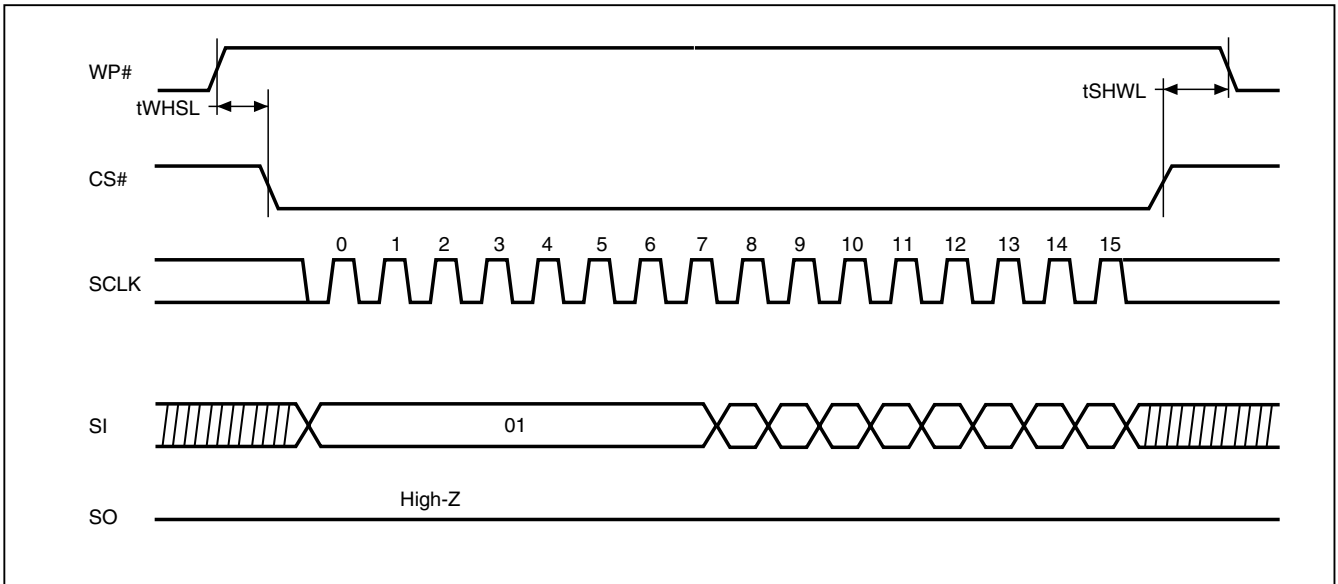
**Figure 52. Output Timing**



**Figure 53. Hold Timing**



**Figure 54. WP# Setup Timing and Hold Timing during WRSR when SRWD=1**





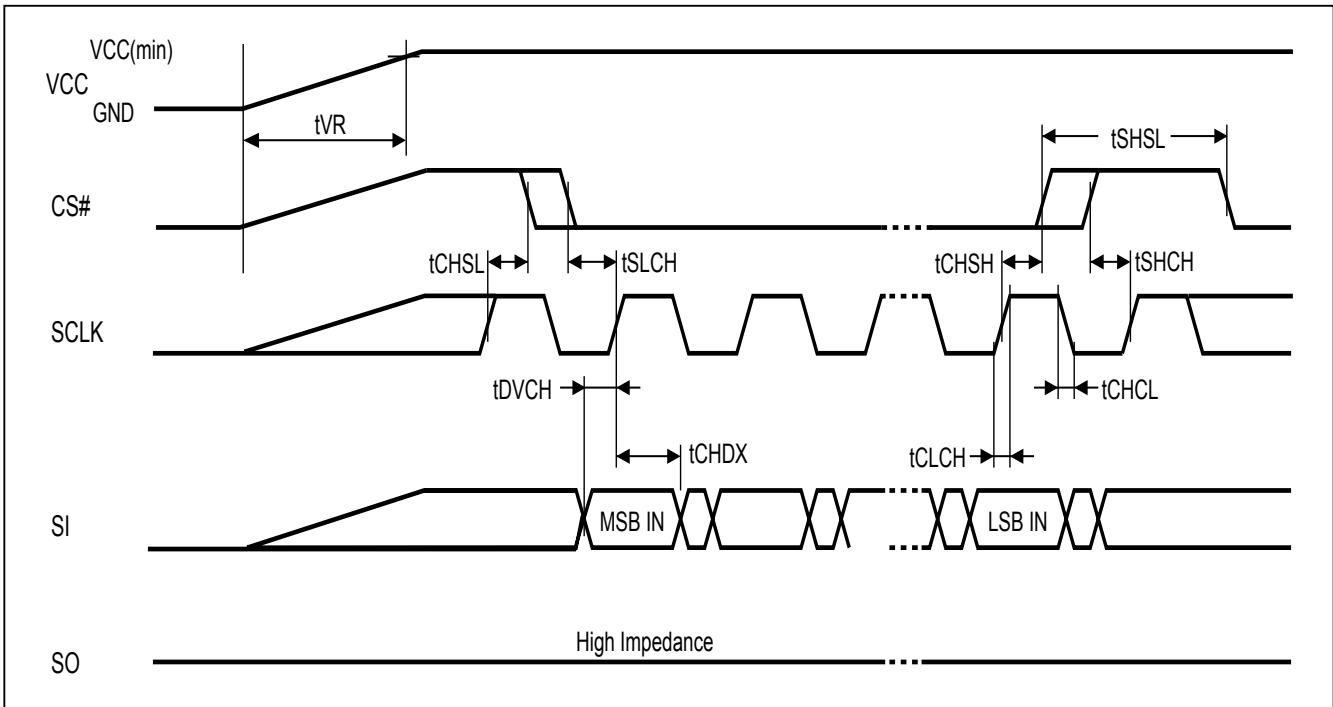
**14. OPERATING CONDITIONS**

**At Device Power-Up and Power-Down**

AC timing illustrated in "Figure 55. AC Timing at Device Power-Up" and "Figure 56. Power-Down Sequence" are for the supply voltages and the control signals at device power-up and power-down. If the timing in the figures is ignored, the device will not operate correctly.

During power-up and power-down, CS# needs to follow the voltage applied on VCC to keep the device not to be selected. The CS# can be driven low when VCC reach Vcc(min.) and wait a period of tVSL.

**Figure 55. AC Timing at Device Power-Up**



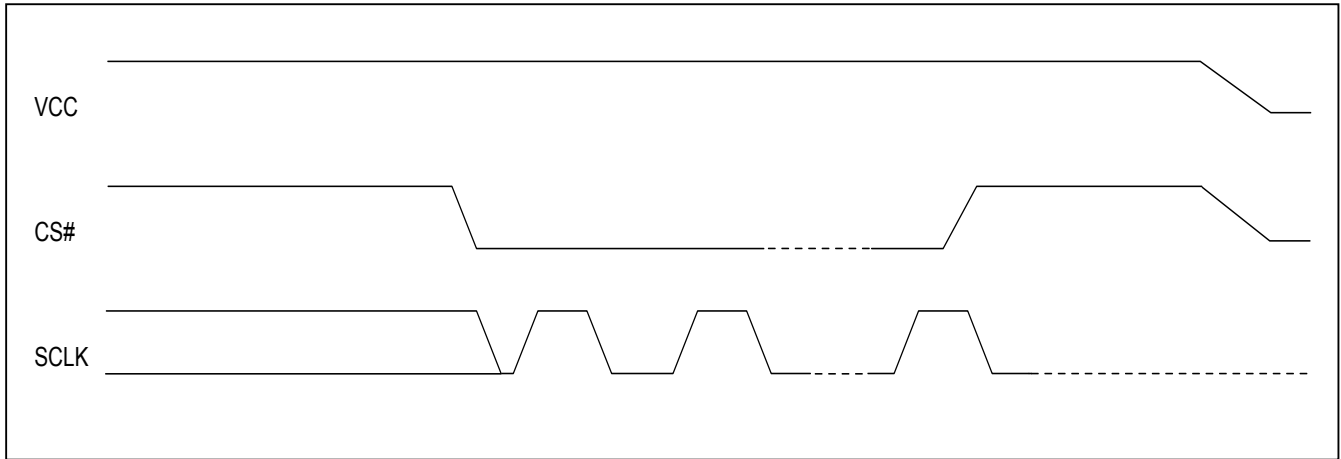
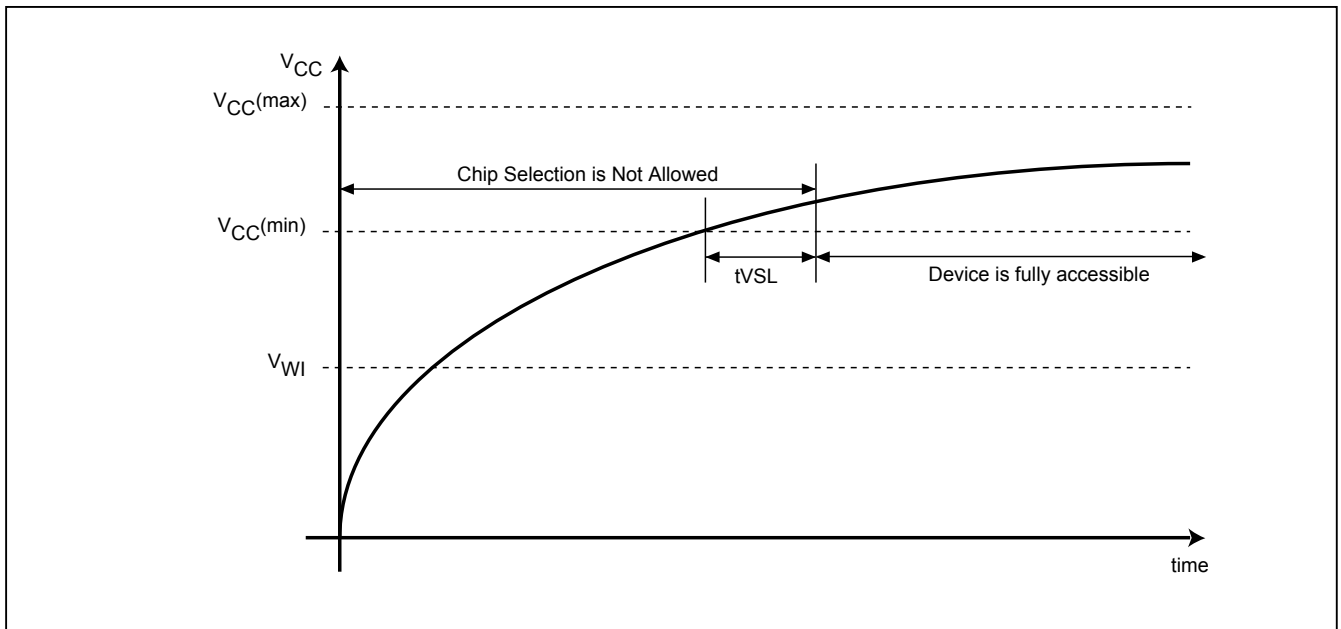
| Symbol | Parameter     | Notes | Min. | Max.   | Unit |
|--------|---------------|-------|------|--------|------|
| tVR    | VCC Rise Time | 1     |      | 500000 | us/V |

**Notes :**

1. Sampled, not 100% tested.
2. For AC spec tCHSL, tSLCH, tDVCH, tCHDX, tSHSL, tCHSH, tSHCH, tCHCL, tCLCH in the figure, please refer to "Table 21. AC Characteristics"

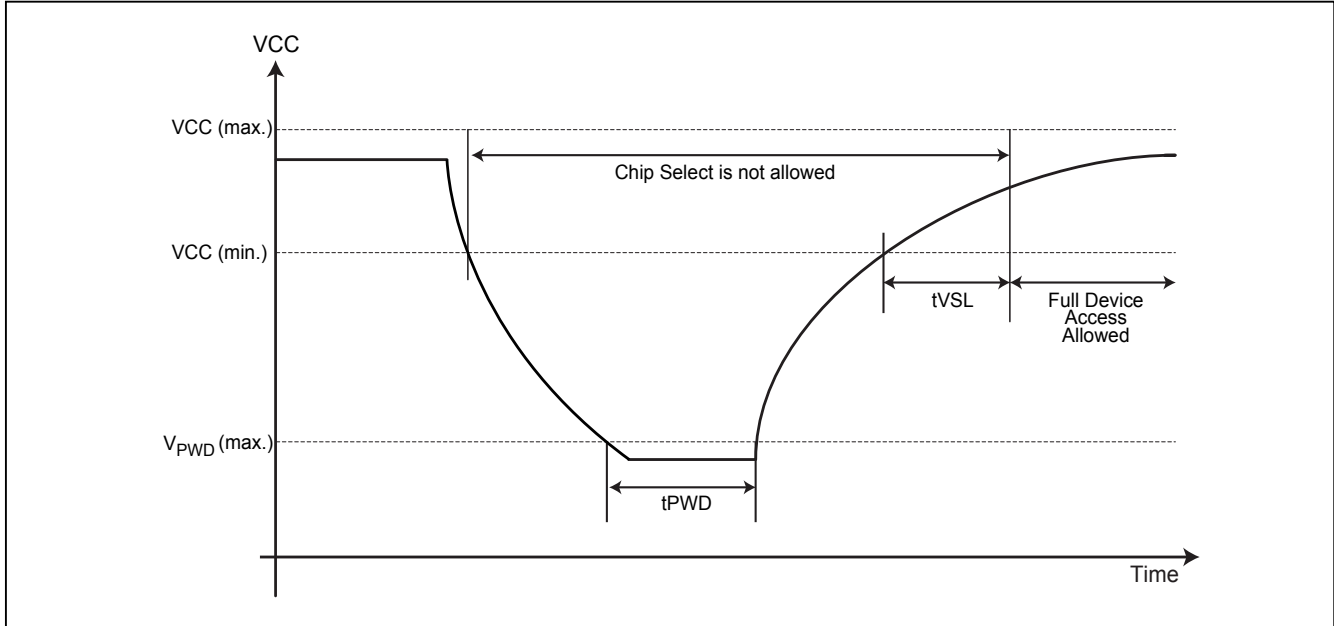
**Figure 56. Power-Down Sequence**

During power-down, CS# needs to follow the voltage drop on VCC to avoid mis-operation.

**Figure 57. Power-up Timing**

**Figure 58. Power Up/Down and Voltage Drop**

When powering down the device, VCC must drop below  $V_{PVD}$  for at least  $t_{PVD}$  to ensure the device will initialize correctly during power up. Please refer to "Figure 58. Power Up/Down and Voltage Drop" and "Table 22. Power-Up/Down Voltage and Timing" below for more details.



**Table 22. Power-Up/Down Voltage and Timing**

| Symbol    | Parameter  | Min. | Max. | Unit |
|-----------|--|------|------|------|
| $t_{VSL}$ | VCC(min.) to device operation  | 800  |      | us   |
| VWI       | Write Inhibit Voltage  | 1.5  | 2.5  | V    |
| $V_{PVD}$ | VCC voltage needed to below $V_{PVD}$ for ensuring initialization will occur |      | 0.9  | V    |
| $t_{PVD}$ | The minimum duration for ensuring initialization will occur                  | 300  |      | us   |
| VCC       | VCC Power Supply   | 2.65 | 3.6  | V    |

**Note:** These parameters are characterized only.

**14-1. Initial Delivery State**

The device is delivered with the memory array erased: all bits are set to 1 (each byte contains FFh). The Status Register contains 00h (all Status Register bits are 0).

## 15. ERASE AND PROGRAMMING PERFORMANCE

| Parameter                                    | Typ. <sup>(1)</sup> | Max. <sup>(2)</sup> | Unit   |
|--|---------------------|---------------------|--------|
| Write Status Register Cycle Time             |                     | 40                  | ms     |
| Sector Erase Time (4KB)                      | 25                  | 200                 | ms     |
| Block Erase Time (64KB)                      | 0.25                | 1                   | s      |
| Block Erase Time (32KB)                      | 0.14                | 0.6                 | s      |
| Chip Erase Time                              | 20                  | 60                  | s      |
| Byte Program Time (via page program command) | 10                  | 50                  | us     |
| Page Program Time                            | 0.33                | 1.2                 | ms     |
| Erase/Program Cycle                          | 100,000             |                     | cycles |

### Notes:

1. Typical program and erase time assumes the following conditions: 25°C, 3.3V, and checkerboard pattern.
2. Under worst conditions of 85°C and 2.65V.
3. System-level overhead is the time required to execute the first-bus-cycle sequence for the programming command.

## 16. DATA RETENTION

| Parameter      | Condition | Min. | Max. | Unit  |
|----------------|-----------|------|------|-------|
| Data retention | 55°C      | 20   |      | years |

## 17. LATCH-UP CHARACTERISTICS

|  | Min.   | Max.       |
|--|--------|------------|
| Input Voltage with respect to GND on all power pins, SI, CS# | -1.0V  | 2 VCCmax   |
| Input Voltage with respect to GND on SO                      | -1.0V  | VCC + 1.0V |
| Current  | -100mA | +100mA     |

Includes all pins except VCC. Test conditions: VCC = 3.0V, one pin at a time.

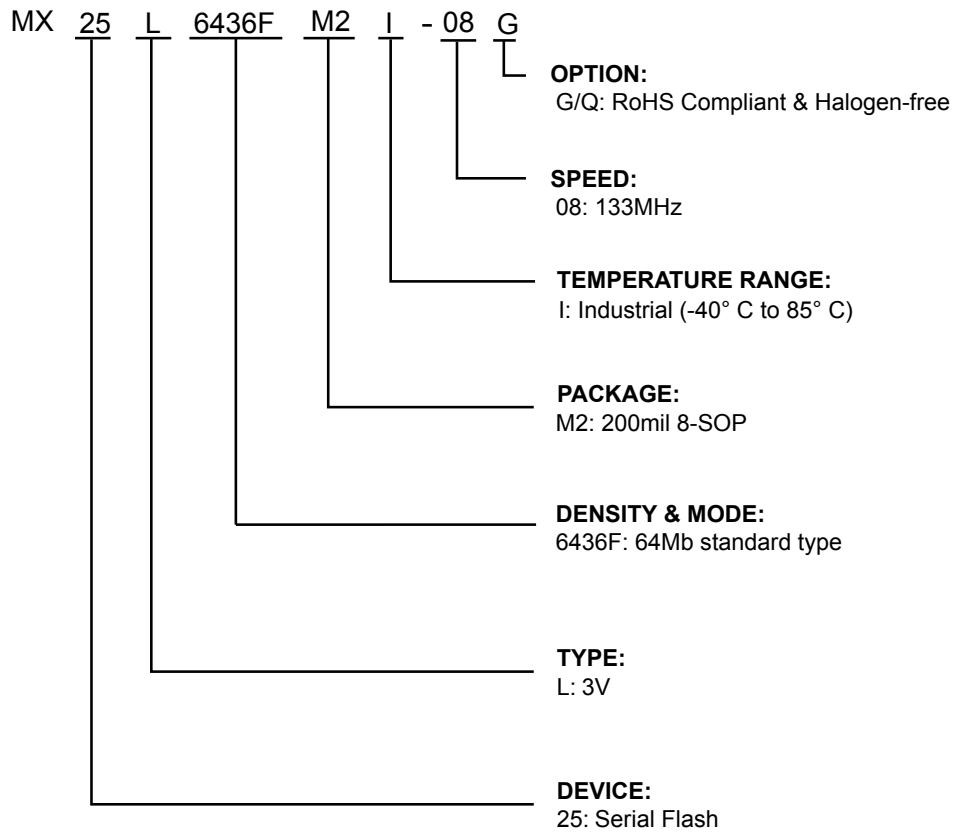


**18. ORDERING INFORMATION**

Please contact Macronix regional sales for the latest product selection and available form factors.

| <b>PART NO.</b>   | <b>CLOCK (MHz)</b> | <b>TEMPERATURE</b> | <b>PACKAGE</b>    | <b>Remark</b>                      |
|-------------------|--------------------|--------------------|-------------------|------------------------------------|
| MX25L6436FM2I-08G | 133                | -40°C to 85°C      | 8-SOP<br>(200mil) |                                    |
| MX25L6436FM2I-08Q | 133                | -40°C to 85°C      | 8-SOP<br>(200mil) | Not support Advanced Security Mode |

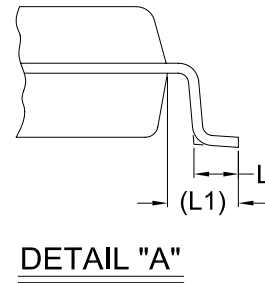
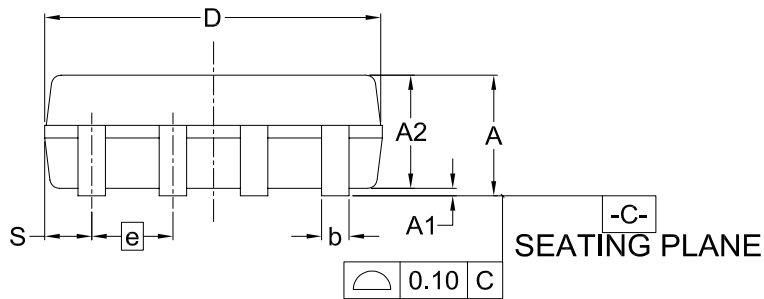
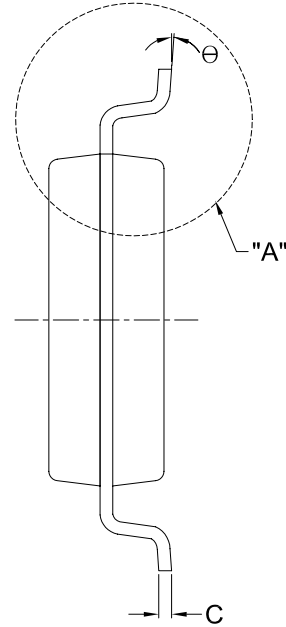
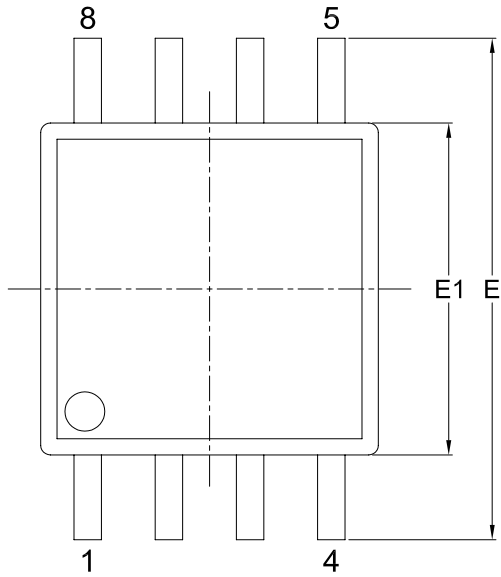
**19. PART NAME DESCRIPTION**



**20. PACKAGE INFORMATION**

**20-1. 8-pin SOP (200mil)**

Doc. Title: Package Outline for SOP 8L 200MIL (official name - 209MIL)



Dimensions (inch dimensions are derived from the original mm dimensions)

| SYMBOL |      | A     | A1    | A2    | b     | C     | D     | E     | E1    | e     | L     | L1    | S     | θ  |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| UNIT   |      |       |       |       |       |       |       |       |       |       |       |       |       |    |
| mm     | Min. | 1.75  | 0.05  | 1.70  | 0.36  | 0.19  | 5.13  | 7.70  | 5.18  | —     | 0.50  | 1.21  | 0.62  | 0° |
|        | Nom. | 1.95  | 0.15  | 1.80  | 0.41  | 0.20  | 5.23  | 7.90  | 5.28  | 1.27  | 0.65  | 1.31  | 0.74  | 5° |
|        | Max. | 2.16  | 0.20  | 1.91  | 0.51  | 0.25  | 5.33  | 8.10  | 5.38  | —     | 0.80  | 1.41  | 0.88  | 8° |
| Inch   | Min. | 0.069 | 0.002 | 0.067 | 0.014 | 0.007 | 0.202 | 0.303 | 0.204 | —     | 0.020 | 0.048 | 0.024 | 0° |
|        | Nom. | 0.077 | 0.006 | 0.071 | 0.016 | 0.008 | 0.206 | 0.311 | 0.208 | 0.050 | 0.026 | 0.052 | 0.029 | 5° |
|        | Max. | 0.085 | 0.008 | 0.075 | 0.020 | 0.010 | 0.210 | 0.319 | 0.212 | —     | 0.031 | 0.056 | 0.035 | 8° |

| Dwg. No.  | Revision | Reference |      |  |
|-----------|----------|-----------|------|--|
|           |          | JEDEC     | EIAJ |  |
| 6110-1406 | 5        |           |      |  |

## 21. REVISION HISTORY

| <b>Revision No.</b> | <b>Description</b>   | <b>Page</b>                   | <b>Date</b> |
|---------------------|--|-------------------------------|-------------|
| 0.00                | 1. Initial Release   | All                           | OCT/22/2015 |
| 1.0                 | 1. Removed document status "ADVANCED INFORMATION"<br>2. Modified QE bit descriptions.<br>3. Added a statement for product ordering information.<br>4. Description modifications. | All<br>P22<br>P81<br>P79      | APR/06/2016 |
| 1.1                 | 1. Added 08Q part names of 8-SOP<br>2. Updated tVR values.<br>3. Description modifications.  | P54,81,82<br>P77,79<br>P35,40 | OCT/11/2016 |
| 1.2                 | 1. Added notes for MX25L6436FM2I-08Q.<br>2. Updated SFDP tables.   | P16,52,85<br>P68-71           | OCT/18/2016 |





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