GD25LD10C/05C

DATASHEET

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CONTENTS

1. FEATURES 4
2. GENERAL DESCRIPTION 5
3. MEMORY ORGANIZATION 7
4. DEVICE OPERATION 8
5. DATA PROTECTION 9
6. STATUS REGISTER 10
7. COMMANDS DESCRIPTION 11
7.1. WRITE ENABLE (WREN) (06H) 13
7.2. WRITE DISABLE (WRDI) (04H) 13
7.3. READ STATUS REGISTER (RDSR) (05H) 13
7.4. WRITE STATUS REGISTER (WRSR) (01H) 14
7.5. READ DATA BYTES (READ) (03H) 15
7.6. READ DATA BYTES AT HIGHER SPEED (FAST READ) (0BH) 15
7.7. DUAL OUTPUT FAST READ (3BH) 16
7.8. PAGE PROGRAM (PP) (02H) 16
7.9. SECTOR ERASE (SE) (20H) 17
7.10. 32KB BLOCK ERASE (BE) (52H) 18
7.11. 64KB BLOCK ERASE (BE) (D8H) 18
7.12. CHIP ERASE (CE) (60/C7H) 19
7.13. DEEP POWER-DOWN (DP) (B9H) 19
7.14. RELEASE FROM DEEP POWER-DOWN / READ DEVICE ID (ABH) 20
7.15. READ MANUFACTURE ID/ DEVICE ID (REMS) (90H) 21
7.16. READ IDENTIFICATION (RDID) (9FH) 21
7.17. READ UNIQUE ID (4BH) 22
8. ELECTRICAL CHARACTERISTICS 23
8.1. POWER-ON TIMING 23
8.2. INITIAL DELIVERY STATE 23
8.3. ABSOLUTE MAXIMUM RATINGS 23
8.4. CAPACITANCE MEASUREMENT CONDITIONS 24
8.5. DC CHARACTERISTICS 25
8.6. AC CHARACTERISTICS 28
9. ORDERING INFORMATION 32
9.1. VALID PART NUMBERS 33
10. PACKAGE INFORMATION 35
10.1. PACKAGE SOP8 150MIL 35
10.2. PACKAGE SOP8 208MIL 36
10.3. PACKAGE TSSOP8 173MIL 37

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10.4. PACKAGE DIP8 300MIL 38
10.5. PACKAGE USON8 (1.5*1.5MM) 39
10.6. PACKAGE USON8 (3*2MM, 0.45MM THICKNESS) 40

11. REVISION HISTORY 41

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1. FEATURES

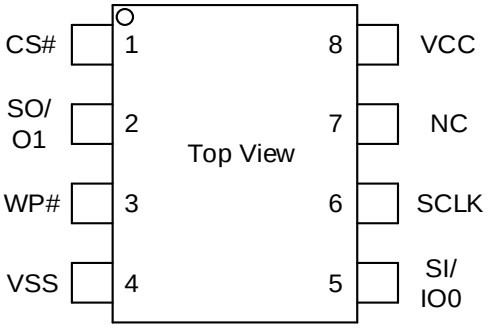
- 1M/512K-bit Serial Flash
  - -128K/64K-byte
  - -256 bytes per programmable page
- Standard, Dual Output
  - -Standard SPI: SCLK, CS#, SI, SO, WP#
  - -Dual Output: SCLK, CS#, IO0, O1, WP#
- Clock Frequency
  - -50MHz for fast read with 30PF load
  - -Dual Output Data transfer up to 80Mbits/s
- Software/Hardware Write Protection
  - -Write protect all/portion of memory via software
  - -Enable/Disable protection with WP# Pin
- Advanced Security Features
  - -128-bit Unique ID for each device
- Minimum 100,000 Program/Erase Cycles
- Data Retention
  - -20-year data retention typical
- Fast Program/Erase Speed
  - -Page Program time: 1.6ms typical
  - -Sector Erase time: 150ms typical
  - -Block Erase time: 0.5/0.8s typical
  - -Chip Erase time: 1.5/0.8s typical
- Flexible Architecture
  - -Uniform Sector of 4K-byte
  - -Uniform Block of 32/64K-byte
- Low Power Consumption
  - -0.1uA typical stand-by current
  - -0.1uA typical power down current
- Single Power Supply Voltage
  - -Full voltage range: 1.65~2.0V
- Package option
  - -SOP8 150mil
  - -SOP8 208mil
  - -TSSOP8 173mil
  - -DIP8 300mil
  - -USON8 1.5*1.5mm
  - -USON8 3*2mm

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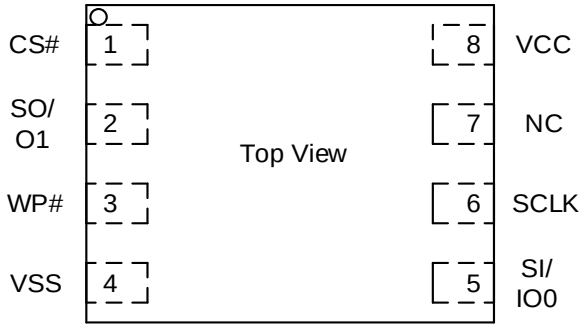
2. GENERAL DESCRIPTION

The GD25LD10C/05C (1M/512K-bit) Serial flash supports the standard Serial Peripheral Interface (SPI), and supports the Dual Output: Serial Clock, Chip Select, Serial Data I/O0 (SI), O1 (SO). The Dual Output data is transferred with speed of 80Mbits/s.

CONNECTION DIAGRAM



8 – LEAD
VSOP/SOP/DIP



8 – LEAD WSON/USON

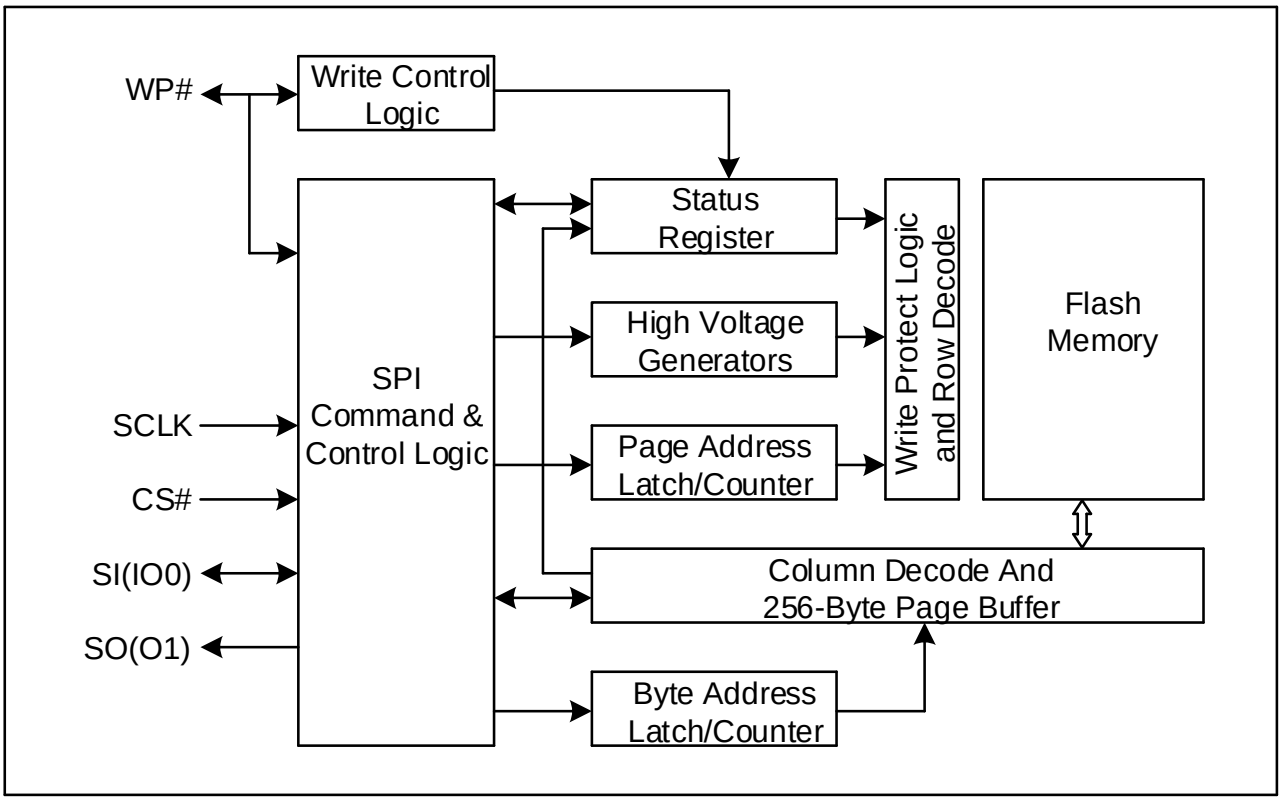
PIN DESCRIPTION

Pin Name	I/O	Description
CS#	**I**	Chip Select Input
SO (O1)	**O**	Data Output (Data Output 1)
WP#	**I**	Write Protect Input
VSS		Ground
SI (IO0)	**I/O**	Data Input (Data Input Output 0)
SCLK	**I**	Serial Clock Input
NC		No Connection
VCC		Power Supply

Note: CS# must be driven high if chip is not selected. Please don't leave CS# floating any time after power is on.

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BLOCK DIAGRAM



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3. MEMORY ORGANIZATION

GD25LD10C

Each device has	Each block has	Each sector has	Each page has	
128K	64/32K	4K	256	bytes
512	256/128	16	-	pages
32	16/8	-	-	sectors
2/4	-	-	-	blocks

GD25LD05C

Each device has	Each block has	Each sector has	Each page has	
64K	64/32K	4K	256	Bytes
256	256/128	16	-	pages
16	16/8	-	-	sectors
1/2	-	-	-	blocks

UNIFORM BLOCK SECTOR ARCHITECTURE

GD25LD10C 64K Bytes Block Sector Architecture

Block	Sector	Address range	
1	31	01F000H	01FFFFH
	……	……	……
	16	010000H	010FFFH
0	15	00F000H	00FFFFH
	……	……	……
	0	000000H	000FFFH

GD25LD05C 64K Bytes Block Sector Architecture

Block	Sector	Address range	
0	15	00F000H	00FFFFH
	……	……	……
	0	000000H	000FFFH

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4. DEVICE OPERATION

SPI Mode

Standard SPI

The GD25LD10C/05C features a serial peripheral interface on 4 signals bus: Serial Clock (SCLK), Chip Select (CS#), Serial Data Input (SI) and Serial Data Output (SO). Both SPI bus mode 0 and 3 are supported. Input data is latched on the rising edge of SCLK and data shifts out on the falling edge of SCLK.

Dual SPI

The GD25LD10C/05C supports Dual Output operation when using the “Dual Output Fast Read” (3BH) commands. These commands allow data to be transferred to or from the device at twice the rate of the standard SPI. When using the Dual Output command the SI and SO pins become bidirectional I/O pins: IO0 and O1.

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5. DATA PROTECTION

The GD25LD10C/05C provides the following data protection methods:

- Write Enable (WREN) command: The WREN command is set the Write Enable Latch bit (WEL). The WEL bit will reset to 0 in the following situations:
  -Power-Up
  -Write Disable (WRDI)
  -Write Status Register (WRSR)
  -Page Program (PP)
  -Sector Erase (SE) / Block Erase (BE) / Chip Erase (CE)
- Software Protection Mode: The Block Protect (BP2, BP1, BP0) bits define the section of the protected memory area which is read-only and unalterable.
- Hardware Protection Mode: WP# goes low to protect the BP0~BP2 bits and SRP bits.
- Deep Power-Down Mode: In Deep Power-Down Mode, all commands are ignored except the Release from Deep Power-Down Mode command.
- Write Inhibit Voltage (VWI): Device would reset automatically when VCC is below a certain threshold VWI.

Table1(a) GD25LD10C Protected area size

Status Register Content			Memory Content			
BP2	**BP1**	**BP0**	**Blocks**	**Addresses**	**Density**	**Portion**
0	0	0	NONE	NONE	NONE	NONE
0	0	1	Sector 0 to 29	000000H-01DFFFH	120KB	Lower 30/32
0	1	0	Sector 0 to 27	000000H-01BFFFH	112KB	Lower 28/32
0	1	1	Sector 0 to 23	000000H-017FFFH	96KB	Lower 24/32
1	0	0	Sector 0 to 15	000000H-00FFFFH	64KB	Lower 16/32
1	0	1	All	000000H-01FFFFH	128KB	ALL
1	1	X	All	000000H-01FFFFH	128KB	ALL

Table1(b) GD25LD05C Protected area size

Status Register Content			Memory Content			
BP2	**BP1**	**BP0**	**Blocks**	**Addresses**	**Density**	**Portion**
0	0	0	NONE	NONE	NONE	NONE
0	0	1	Sector 0 to 13	000000H-00DFFFH	56KB	Lower 14/16
0	1	0	Sector 0 to 11	000000H-00BFFFH	48KB	Lower 12/16
0	1	1	Sector 0 to 7	000000H-007FFFH	32KB	Lower 8/16
1	X	X	All	000000H-00FFFFH	64KB	ALL

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6. STATUS REGISTER

S7	S6	S5	S4	S3	S2	S1	S0
SRP	Reserved	Reserved	BP2	BP1	BP0	WEL	WIP

The status and control bits of the Status Register are as follows:

WIP bit.

The Write In Progress (WIP) bit indicates whether the memory is busy in program/erase/write status register progress. When WIP bit is set to 1, it means the device is busy in program/erase/write status register progress. when WIP bit is cleared to 0, it means the device is not in program/erase/write status register progress. The default value of WIP is 0.

WEL bit.

The Write Enable Latch (WEL) bit indicates the status of the internal Write Enable Latch. When set to 1 the internal Write Enable Latch is set, when set to 0 the internal Write Enable Latch is reset and no Write Status Register, Program or Erase command is accepted. The default value of WEL is 0.

BP2, BP1, BP0 bits.

The Block Protect (BP2, BP1, BP0) bits are non-volatile. They define the size of the area to be software protected against Program and Erase commands. These bits are written with the Write Status Register (WRSR) command. When the Block Protect (BP2, BP1, BP0) bits are set to 1, the relevant memory area (as defined in Table1).becomes protected against Page Program (PP), Sector Erase (SE) and Block Erase (BE) commands. The Block Protect (BP2, BP1, BP0) bits can be written provided that the Hardware Protected mode has not been set. The Chip Erase (CE) command is executed, if the Block Protect (BP2, BP1, BP0) bits are all 0. The default value of BP2:0 are 0s.

SRP bit

The Status Register Protect (SRP) bit operates in conjunction with the Write Protect (WP#) signal. The Status Register Write Protect (SRP) bit and Write Protect (WP#) signal set the device to the Hardware Protected mode. When the Status Register Protect (SRP) bit is set to 1, and Write Protect (WP#) is driven Low. In this mode, the non-volatile bits of the Status Register(SRP, BP2, BP1, BP0) become read-only bits and the Write Status Register (WRSR) instruction is not execution. The default value of SRP is 0.

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7. COMMANDS DESCRIPTION

All commands, addresses and data are shifted in and out of the device by the host system, with the most significant bit first. On the first rising edge of SCLK after CS# is driven low, the one-byte command code must be shifted into the device, with the most significant bit first on SI, and each bit being latched on the rising edges of SCLK.

See Table2, every command sequence starts with a one-byte command code. Depending on the command, this might be followed by address bytes, or data bytes, or dummy bytes. CS# must be driven high after the last bit of the command sequence has been completed.

For the command of Read, Fast Read, Read Status Register or Release from Deep Power-Down, and Read Device ID, the shifted-in command sequence is followed by a data-out sequence. All read instruction can be completed after any bit of the data-out sequence is being shifted out, and then CS# must be driven high to return to deselected status.

For the command of Page Program, Sector Erase, Block Erase, Chip Erase, Write Status Register, Write Enable, Write Disable or Deep Power-Down command, CS# must be driven high exactly at a byte boundary, which means the clock pulse number should be an exact multiple of eight. Otherwise the command is rejected to executed. Especially for Page Program command, if at any time the input end is not a completed byte, nothing will be written into the memory array, neither would WEL bit be reset.

Table2. Commands

Command Name	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	n-Bytes
Write Enable	06H						
Write Disable	04H						
Read Status Register	05H	(S7-S0)					(continuous)
Write Status Register	01H	S7-S0					
Read Data	03H	A23-A16	A15-A8	A7-A0	(D7-D0)	(Next byte)	(continuous)
Fast Read	0BH	A23-A16	A15-A8	A7-A0	dummy	(D7-D0)	(continuous)
Dual Output Fast Read	3BH	A23-A16	A15-A8	A7-A0	dummy	(D7-D0)(1)	(continuous)
Page Program	02H	A23-A16	A15-A8	A7-A0	D7-D0	Next byte	
Sector Erase	20H	A23-A16	A15-A8	A7-A0			
Block Erase(32K)	52H	A23-A16	A15-A8	A7-A0			
Block Erase(64K)	D8H	A23-A16	A15-A8	A7-A0			
Chip Erase	C7/60 H						
Deep Power-Down	B9H						
Release From Deep Power-Down, And Read Device ID	ABH	dummy	dummy	dummy	(DID7-DID0)		(continuous)
Release From Deep Power-Down	ABH						
Manufacturer/ Device ID	90H	00H	00H	00H	(MID7-MID0)	(DID7-DID0)	(continuous)
Read Identification	9FH	(MID7-MID0)	(JDID15-JDID8)	(JDID7-JDID0)			(continuous)
Read Unique ID	4BH	00H	00H	00H	dummy	(UID7-UID0)	(continuous)

NOTE:

1. Dual Output data

   IO0 = (D6, D4, D2, D0)

   O1 = (D7, D5, D3, D1)

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TABLE OF ID DEFINATION:

GD25LD10C

Operation Code	M7-M0	ID15-ID8	ID7-ID0
9FH	C8	60	11
90H	C8		10
ABH			10

GD25LD05C

Operation Code	M7-M0	ID15-ID8	ID7-ID0
9FH	C8	60	10
90H	C8		05
ABH			05

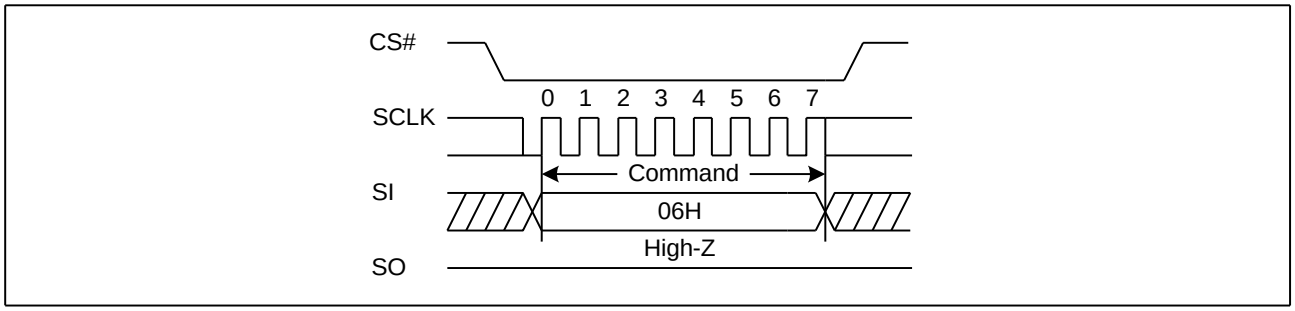
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7.1. Write Enable (WREN) (06H)

The Write Enable (WREN) command is for setting the Write Enable Latch (WEL) bit to 1. The Write Enable Latch (WEL) bit must be set prior to every Page Program (PP), Sector Erase (SE), Block Erase (BE), Chip Erase (CE) and Write Status Register (WRSR) command.

The Write Enable (WREN) command sequence: CS# goes low → sending the Write Enable command → CS# goes high.

Figure1. Write Enable Sequence Diagram

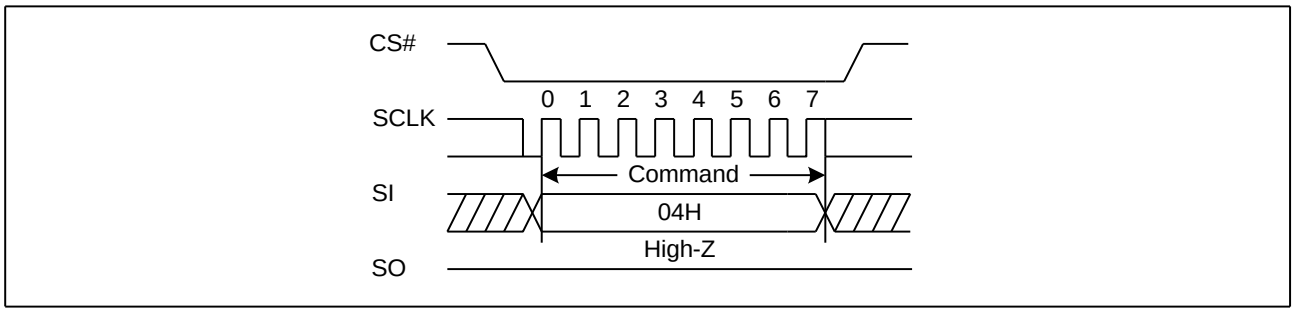


7.2. Write Disable (WRDI) (04H)

The Write Disable command is for resetting the Write Enable Latch (WEL) bit to 0. The WEL bit is reset by following condition: Power-up and upon completion of the Write Status Register, Page Program, Sector Erase, Block Erase and Chip Erase commands.

The Write Disable command sequence: CS# goes low→Sending the Write Disable command →CS# goes high.

Figure2. Write Disable Sequence Diagram



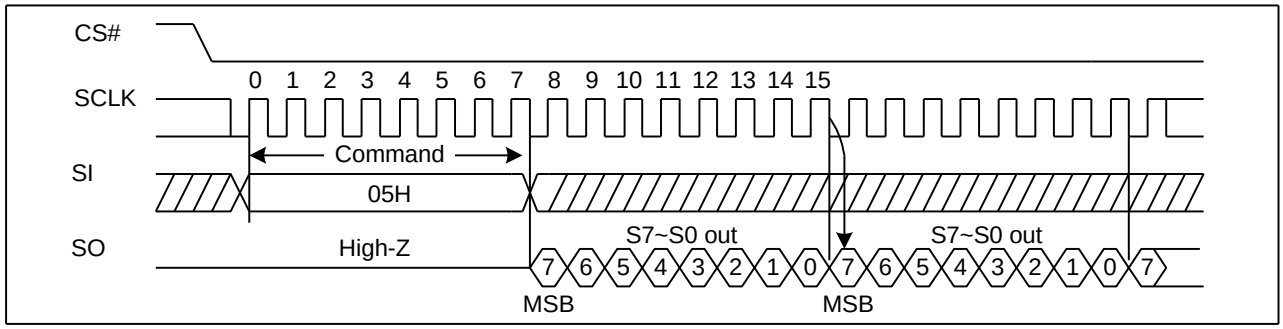
7.3. Read Status Register (RDSR) (05H)

The Read Status Register (RDSR) command is for reading the Status Register. The Status Register may be read at any time, even while a Program, Erase or Write Status Register cycle is in progress.

When one of these cycles is in progress, it is recommended to check the Write In Progress (WIP) bit before sending a new command to the device. It is also possible to read the Status Register continuously. For command code “05H”, the SO will output Status Register bits S7~S0.

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Figure3. Read Status Register Sequence Diagram



7.4. Write Status Register (WRSR) (01H)

The Write Status Register (WRSR) instruction allows new values to be written to the Status Register. A Write Enable (WREN) instruction must be executed previously to set the Write Enable Latch (WEL) bit, before it can be accepted.

The Write Status Register (WRSR) instruction is entered by driving Chip Select (CS#) Low, followed by the instruction code and the data byte on Serial Data Input (DI).

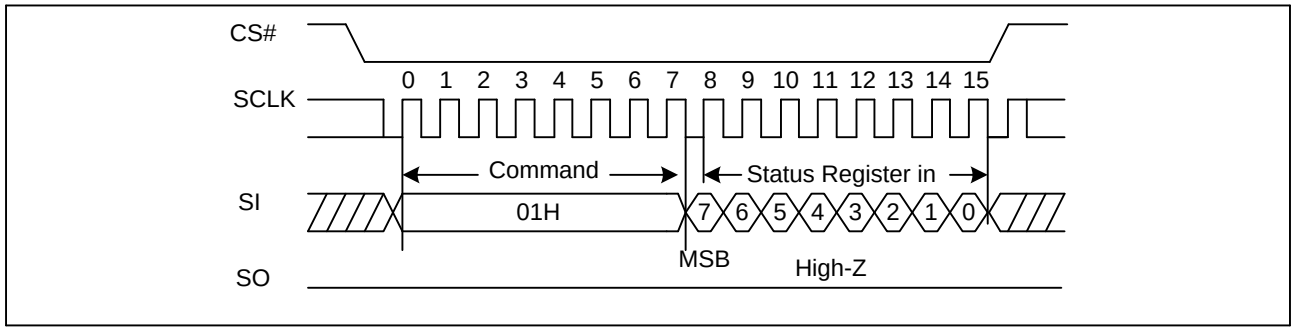
The Write Status Register (WRSR) instruction has no effect on S6, S5, S1 and S0 of the Status Register. S6 and S5 are always read as 0. Chip Select (CS#) must be driven High after the eighth bit of the data byte has been latched in. Otherwise, the Write Status Register (WRSR) instruction is not executed. As soon as Chip Select (CS#) is driven High, the self-timed Write Status Register cycle (the duration is tW) is initiated. While the Write Status Register cycle is in progress, reading Status Register to check the Write In Progress (WIP) bit is achievable.

The Write In Progress (WIP) bit is 1 during the self-timed Write Status Register cycle, and turn to 0 on the completion of the Write Status Register. When the cycle is completed, the Write Enable Latch (WEL) is reset to 0.

The Write Status Register (WRSR) instruction allows the user to change the values of the Block Protect (BP2, BP1, BP0) bits, which are utilized to define the size of the read-only area.

The Write Status Register (WRSR) instruction also allows the user to set or reset the Status Register Protect (SRP) bit in accordance with the Write Protect (WP#) signal, by setting which the device can enter into Hardware Protected Mode. The Write Status Register (WRSR) instruction is not executed once enter into the Hardware Protected Mode.

Figure4. Write Status Register Sequence Diagram

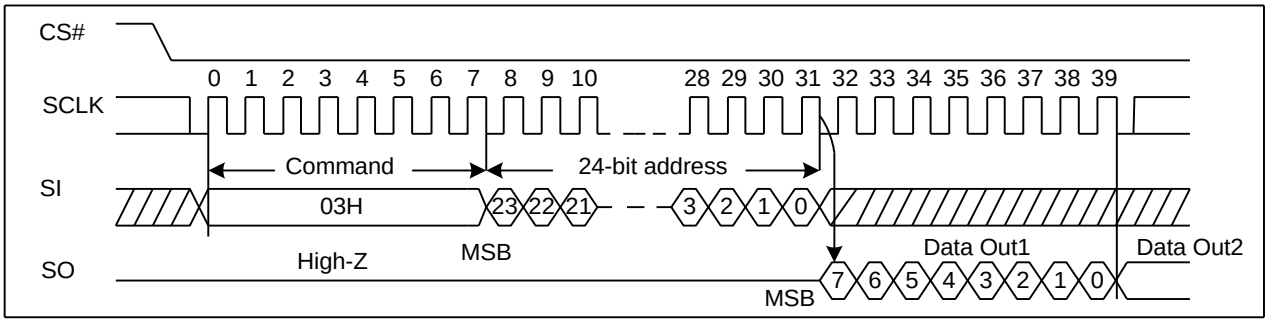


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7.5. Read Data Bytes (READ) (03H)

The Read Data Bytes (READ) command is followed by a 3-byte address (A23-A0), and each bit being latched-in on the rising edge of SCLK. Then the memory content, at that address, is shifted out on SO, and each bit being shifted out, at a Max frequency f_R, on the falling edge of SCLK. The first byte addressed can be at any location. The address is automatically incremented to the next higher address after each byte of data is shifted out. The whole memory can, therefore, be read with a single Read Data Bytes (READ) command. Any Read Data Bytes (READ) command, while an Erase, Program or Write cycle is in progress, is rejected without having any effects on the cycle that is in progress.

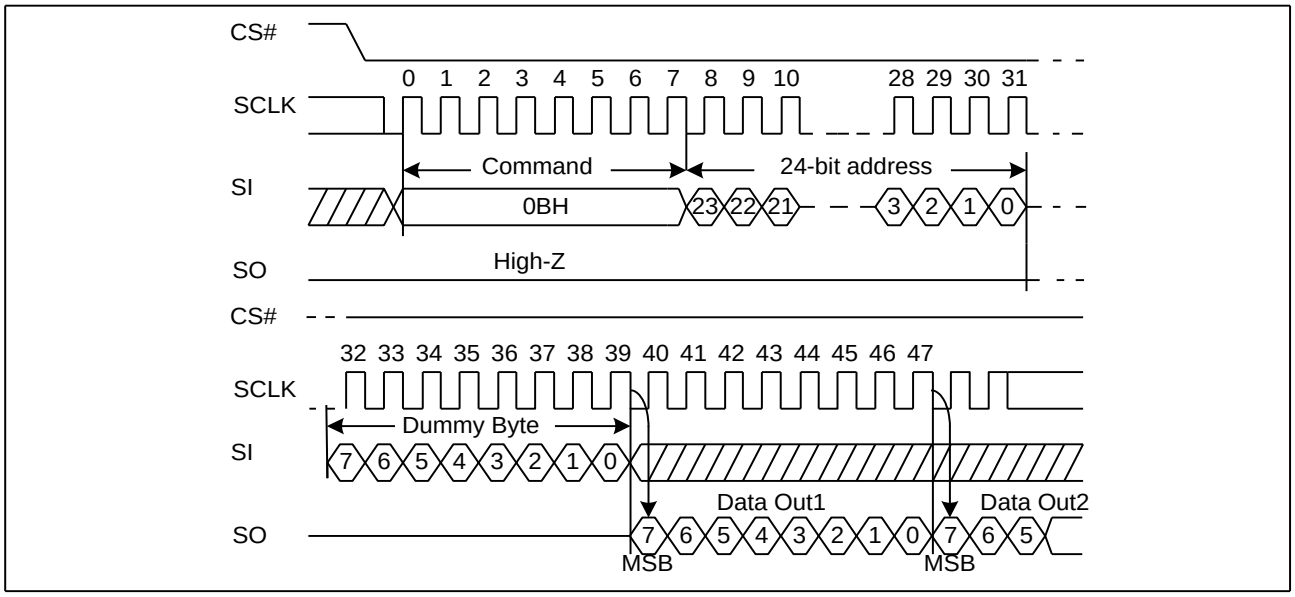
Figure5. Read Data Bytes Sequence Diagram



7.6. Read Data Bytes at Higher Speed (Fast Read) (0BH)

The Read Data Bytes at Higher Speed (Fast Read) command is for quickly reading data out. It is followed by a 3-byte address (A23-A0) and a dummy byte, and each bit being latched-in on the rising edge of SCLK. Then the memory content, at that address, is shifted out on SO, and each bit being shifted out, at a Max frequency f_C, on the falling edge of SCLK. The first byte addressed can be at any location. The address is automatically incremented to the next higher address after each byte of data is shifted out.

Figure6. Read Data Bytes at Higher Speed Sequence Diagram

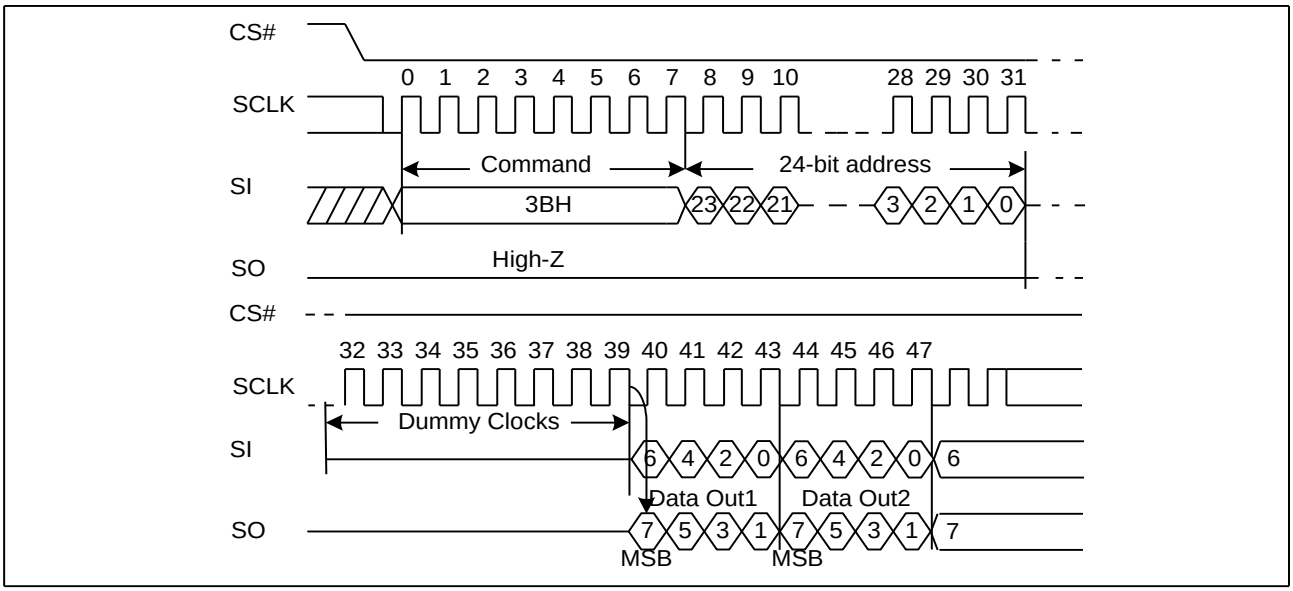


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7.7. Dual Output Fast Read (3BH)

The Dual Output Fast Read command is followed by 3-byte address (A23-A0) and a dummy byte, and each bit being latched in on the rising edge of SCLK, then the memory contents are shifted out 2-bit per clock cycle from SI and SO. The command sequence is shown in followed Figure7. The first byte addressed can be at any location. The address is automatically incremented to the next higher address after each byte of data is shifted out.

Figure7. Dual Output Fast Read Sequence Diagram



7.8. Page Program (PP) (02H)

The Page Program (PP) command is for programming the memory. A Write Enable (WREN) command must previously have been executed to set the Write Enable Latch (WEL) bit before sending the Page Program command.

The Page Program (PP) command is entered by driving CS# Low, followed by the command code, three address bytes and at least one data byte on SI.

If the 8 least significant address bits (A7-A0) are not all zero, all transmitted data that goes beyond the end of the current page are programmed from the start address of the same page (from the address whose 8 least significant bits (A7-A0) are all zero). CS# must be driven low for the entire duration of the sequence.

The Page Program command sequence: CS# goes low → sending Page Program command → 3-byte address on SI → at least 1 byte data on SI → CS# goes high. The command sequence is shown in Figure8.

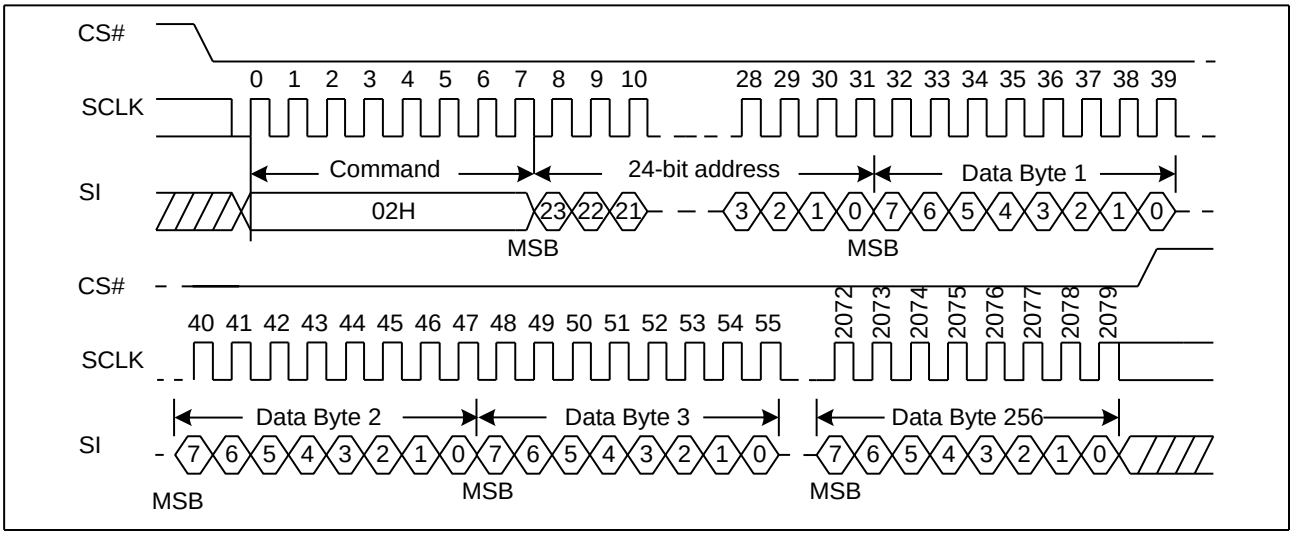
If more than 256 bytes are sent to the device, previously latched data are discarded and the last 256 data bytes are guaranteed to be programmed correctly within the same page. If less than 256 data bytes are sent to device, they are correctly programmed at the requested addresses without having any effects on the other bytes of the same page. CS# must be driven high after the eighth bit of the last data byte has been latched in; otherwise the Page Program (PP) command is not executed.

As soon as CS# is driven high, the self-timed Page Program cycle (whose duration is t_{PP}) is initiated. While the Page Program cycle is in progress, the Status Register may be read to check the value of the Write In Progress (WIP) bit. The Write In Progress (WIP) bit is 1 during the self-timed Page Program cycle, and is 0 when it is completed. At some unspecified time before the cycle is completed, the Write Enable Latch (WEL) bit is reset.

A Page Program (PP) command is not executed when it is applied to a page protected by the Block Protect (BP2, BP1, BP0).

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Figure8. Page Program Sequence Diagram

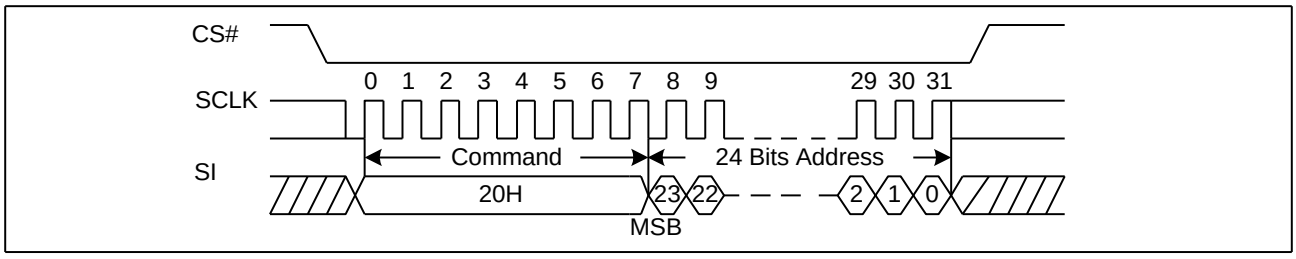


7.9. Sector Erase (SE) (20H)

The Sector Erase (SE) command is for erasing the all data of the specific sector. A Write Enable (WREN) command must previously have been executed to set the Write Enable Latch (WEL) bit. The Sector Erase (SE) command is entered by driving CS# low, followed by the command code, and 3-address byte on SI. Any address inside the sector is a valid address for the Sector Erase (SE) command. CS# must be driven low for the entire duration of the sequence.

The Sector Erase command sequence: CS# goes low → sending Sector Erase command → 3-byte address on SI → CS# goes high. The command sequence is shown in Figure9. CS# must be driven high after the eighth bit of the last address byte has been latched in; otherwise the Sector Erase (SE) command is not executed. As soon as CS# is driven high, the self-timed Sector Erase cycle (whose duration is t_{SE}) is initiated. While the Sector Erase cycle is in progress, the Status Register is accessed to check the value of the Write In Progress (WIP) bit. The Write In Progress (WIP) bit is 1 during the self-timed Sector Erase cycle, and becomes 0 when it is completed. At some unspecified time before the cycle is completed, the Write Enable Latch (WEL) bit is reset. A Sector Erase (SE) command applied to a sector which is protected by the Block Protect (BP2, BP1, BP0) bit (see Table1) is not executed.

Figure9. Sector Erase Sequence Diagram



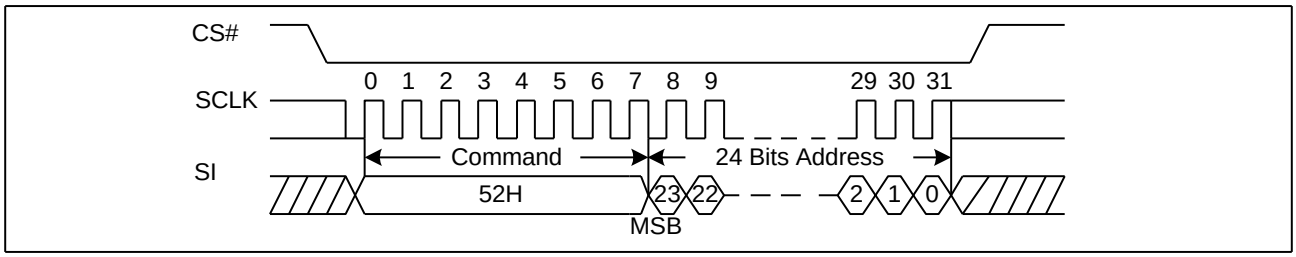
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7.10. 32KB Block Erase (BE) (52H)

The 32KB Block Erase (BE) command is for erasing the all data of the chosen block. A Write Enable (WREN) command must previously have been executed to set the Write Enable Latch (WEL) bit. The 32KB Block Erase (BE) command is entered by driving CS# low, followed by the command code, and three address bytes on SI. Any address inside the block is a valid address for the 32KB Block Erase (BE) command. CS# must be driven low for the entire duration of the sequence.

The 32KB Block Erase command sequence: CS# goes low → sending 32KB Block Erase command → 3-byte address on SI → CS# goes high. The command sequence is shown in Figure10. CS# must be driven high after the eighth bit of the last address byte has been latched in; otherwise the 32KB Block Erase (BE) command is not executed. As soon as CS# is driven high, the self-timed Block Erase cycle (whose duration is t_{BE}) is initiated. While the Block Erase cycle is in progress, the Status Register is accessed to check the value of the Write In Progress (WIP) bit. The Write In Progress (WIP) bit is 1 during the self-timed Block Erase cycle, and becomes 0 when it is completed. At some unspecified time before the cycle is completed, the Write Enable Latch (WEL) bit is reset. A 32KB Block Erase (BE) command applied to a block which is protected by the Block Protect (BP2, BP1, BP0) bits (see Table1) is not executed.

Figure10. 32KB Block Erase Sequence Diagram



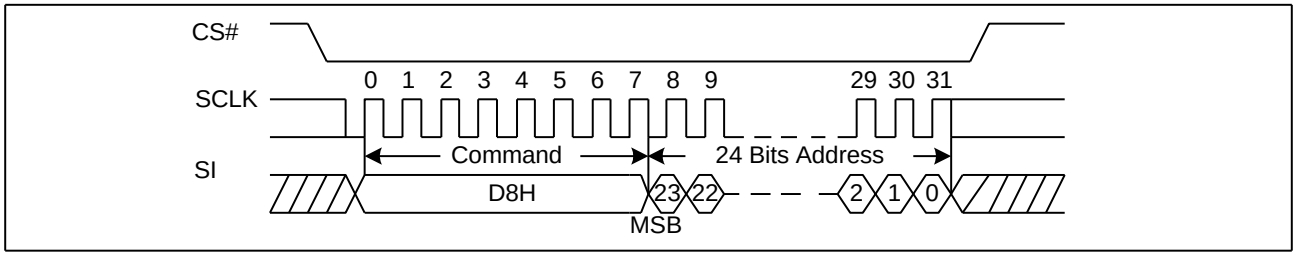
7.11. 64KB Block Erase (BE) (D8H)

The 64KB Block Erase (BE) command is for erasing the all data of the chosen block. A Write Enable (WREN) command must previously have been executed to set the Write Enable Latch (WEL) bit. The 64KB Block Erase (BE) command is entered by driving CS# low, followed by the command code, and three address bytes on SI. Any address inside the block is a valid address for the 64KB Block Erase (BE) command. CS# must be driven low for the entire duration of the sequence.

The 64KB Block Erase command sequence: CS# goes low → sending 64KB Block Erase command → 3-byte address on SI → CS# goes high. The command sequence is shown in Figure11. CS# must be driven high after the eighth bit of the last address byte has been latched in; otherwise the 64KB Block Erase (BE) command is not executed. As soon as CS# is driven high, the self-timed Block Erase cycle (whose duration is t_{BE}) is initiated. While the Block Erase cycle is in progress, the Status Register is accessed to check the value of the Write In Progress (WIP) bit. The Write In Progress (WIP) bit is 1 during the self-timed Block Erase cycle, and becomes 0 when it is completed. At some unspecified time before the cycle is completed, the Write Enable Latch (WEL) bit is reset. A 64KB Block Erase (BE) command applied to a block which is protected by the Block Protect (BP2, BP1, BP0) bits (see Table1) is not executed.

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Figure11. 64KB Block Erase Sequence Diagram

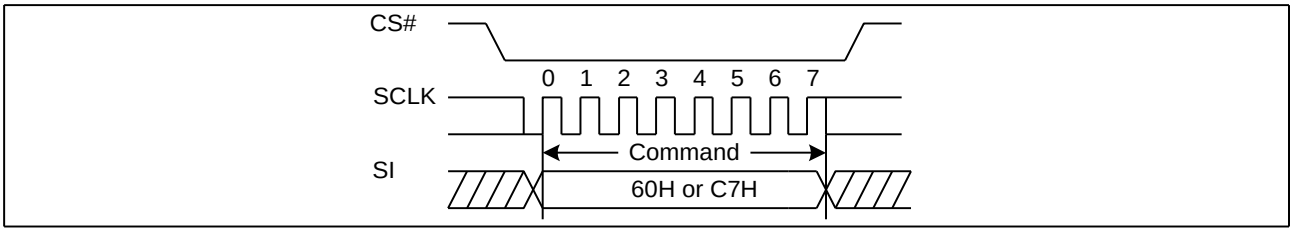


7.12. Chip Erase (CE) (60/C7H)

The Chip Erase (CE) command is for erasing the all data of the chip. A Write Enable (WREN) command must previously have been executed to set the Write Enable Latch (WEL) bit .The Chip Erase (CE) command is entered by driving CS# Low, followed by the command code on Serial Data Input (SI). CS# must be driven Low for the entire duration of the sequence.

The Chip Erase command sequence: CS# goes low → sending Chip Erase command → CS# goes high. The command sequence is shown in Figure12. CS# must be driven high after the eighth bit of the command code has been latched in, otherwise the Chip Erase command is not executed. As soon as CS# is driven high, the self-timed Chip Erase cycle (whose duration is t_{CE}) is initiated. While the Chip Erase cycle is in progress, the Status Register may be read to check the value of the Write In Progress (WIP) bit. The Write In Progress (WIP) bit is 1 during the self-timed Chip Erase cycle, and is 0 when it is completed. At some unspecified time before the cycle is completed, the Write Enable Latch (WEL) bit is reset. The Chip Erase (CE) command is executed if the Block Protect (BP2, BP1, BP0) bits are all 0. The Chip Erase (CE) command is not executed if any sector is under protection.

Figure12. Chip Erase Sequence Diagram



7.13. Deep Power-Down (DP) (B9H)

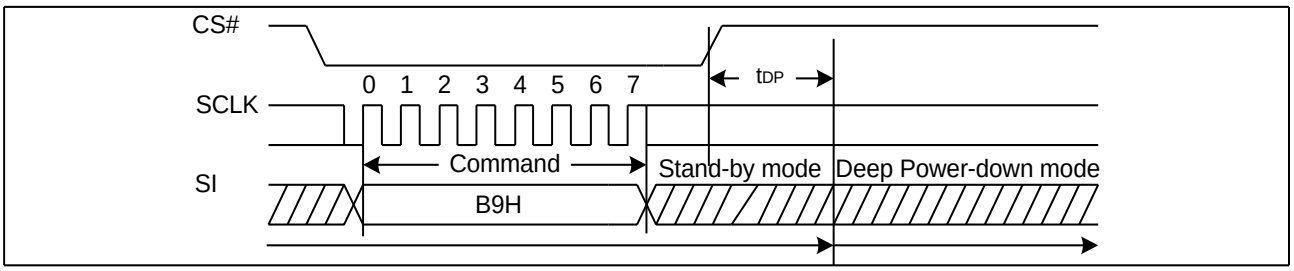
Executing the Deep Power-Down (DP) command is the only way to enter the lowest consumption mode (the Deep Power-Down Mode). Unlike deselecting the device by driving CS# high, or entering into the Standby Mode (if there is no internal cycle currently in progress), the Deep Power-Down Mode provides an extra software protection mechanism while the device is not in active use. The only access to this mode is by executing the Deep Power-Down (DP) command. Since in the Deep Power-Down mode, the device ignores all Write, Program and Erase commands. Once the device is in the Deep Power-Down Mode, all commands are ignored except the Release from Deep Power-Down and Read Device ID (RDI) command. The Release from Deep Power-Down and Read Device ID (RDI) command releases the device from Deep Power-Down mode, also allows the Device ID of the device to be output on SO.

The Deep Power-Down Mode automatically stops at Power-Down, and the device is in the Standby Mode after Power-Up.

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The Deep Power-Down command sequence: CS# goes low → sending Deep Power-Down command → CS# goes high. The command sequence is shown in Figure13. CS# must be driven high after the eighth bit of the command code has been latched in; otherwise the Deep Power-Down (DP) command is not executed. As soon as CS# is driven high, it requires a delay of t_{DP} before the supply current is reduced to I_{CC2} and the Deep Power-Down Mode is entered. Any Deep Power-Down (DP) command, while an Erase, Program or Write cycle is in progress, is rejected without having any effects on the cycle that is in progress.

Figure13. Deep Power-Down Sequence Diagram



7.14. Release from Deep Power-Down / Read Device ID (ABH)

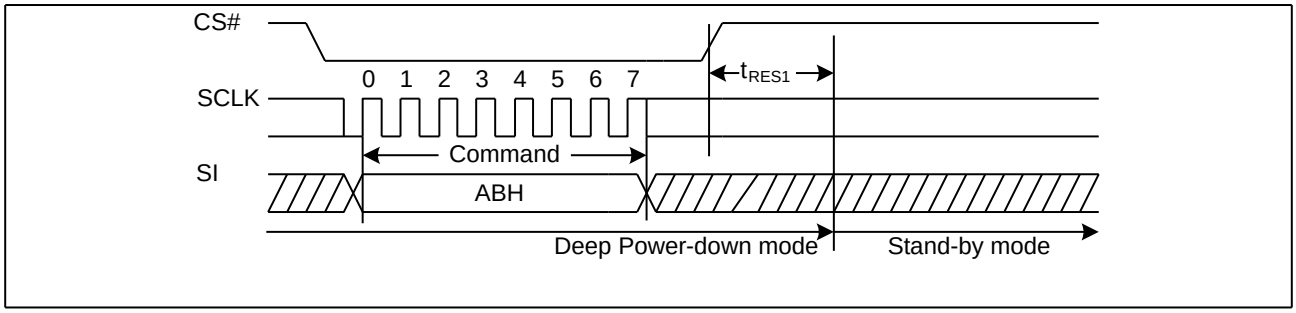
The Release from Power-Down and Read Device ID command is a multi-purpose command, which can be used to release the device from the Power-Down state or obtain the devices electronic identification (ID) number.

When used to release the device from the Power-Down state, the command is issued by driving the CS# pin low, shifting the instruction code “ABH” and driving CS# high as shown in Figure14. Release from Power-Down will take the time duration of t_{RES1} (See AC Characteristics) before the device will resume normal operation and other command are accepted. The CS# pin must keep high during the t_{RES1} time duration.

When used only to obtain the Device ID while not in the Power-Down state, the command is initiated by driving the CS# pin low and shifting the instruction code “ABH” followed by 3-dummy byte. The Device ID bits are then shifted out on the falling edge of SCLK with most significant bit (MSB) first as shown in Figure15. The Device ID value for the GD25LD10C/05C is listed in Manufacturer and Device Identification table. The Device ID can be read continuously. The command is completed by driving CS# high.

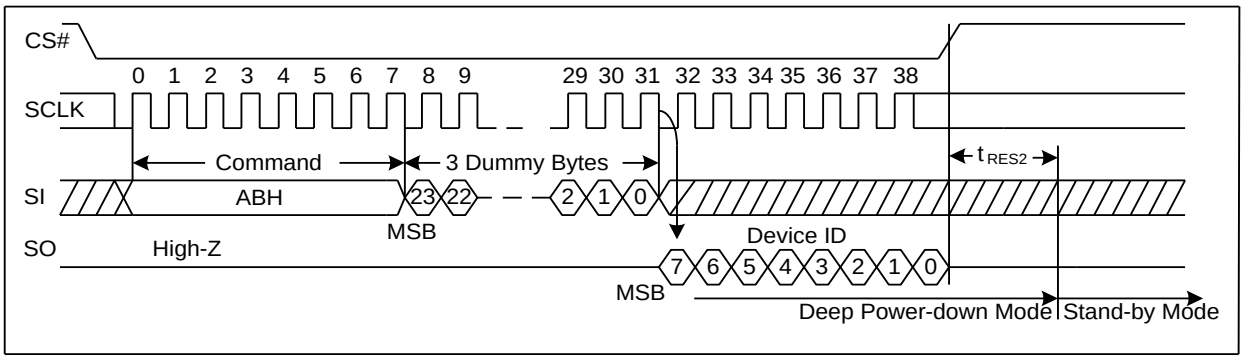
When used to release the device from the Power-Down state and obtain the Device ID, the command is the same as previously described, and shown in Figure15, except that after CS# is driven high it must remain high for a time duration of t_{RES2} (See AC Characteristics). After this time duration the device will resume normal operation and other command will be accepted. If the Release from Power-Down and Read Device ID command is issued while an Erase, Program or Write cycle is in process (when WIP equal 1) the command is ignored and will not have any effects on the current cycle.

Figure14. Release Power-Down Sequence Diagram



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Figure15. Release Power-Down and Read Device ID Sequence Diagram

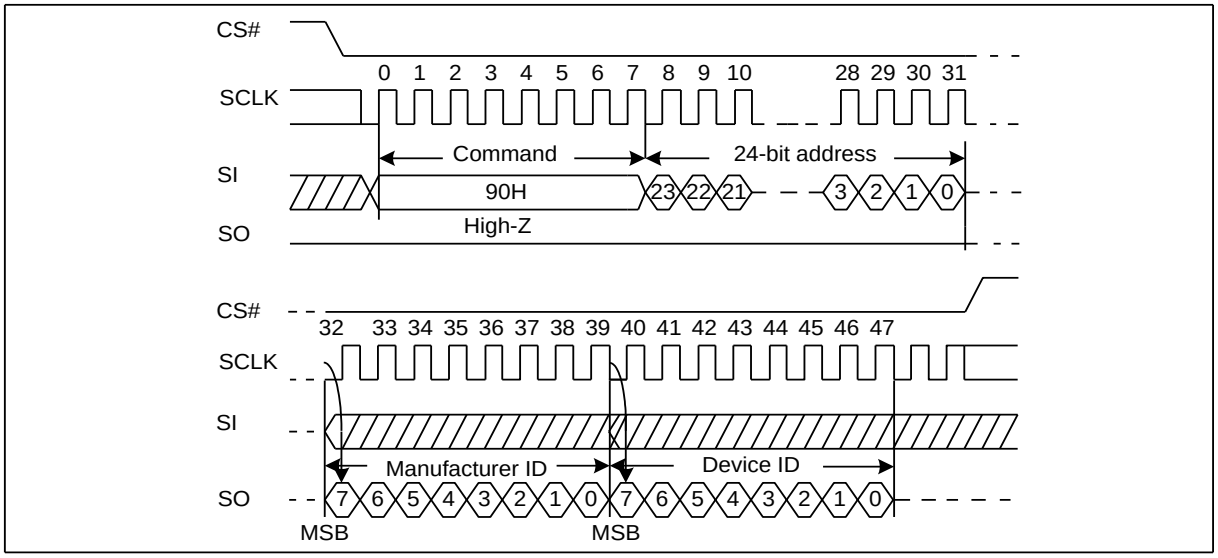


7.15. Read Manufacture ID/ Device ID (REMS) (90H)

The Read Manufacturer/Device ID command is an alternative to the Release from Power-Down / Device ID command that provides both the JEDEC assigned Manufacturer ID and the specific Device ID.

The command is initiated by driving the CS# pin low and shifting the command code "90H" followed by a 24-bit address (A23-A0) of 000000H. After that, the Manufacturer ID and the Device ID are shifted out on the falling edge of SCLK with most significant bit (MSB) first as shown in Figure16. If the 24-bit address is initially set to 000001H, the Device ID will be read first.

Figure16. Read Manufacture ID/ Device ID Sequence Diagram



7.16. Read Identification (RDID) (9FH)

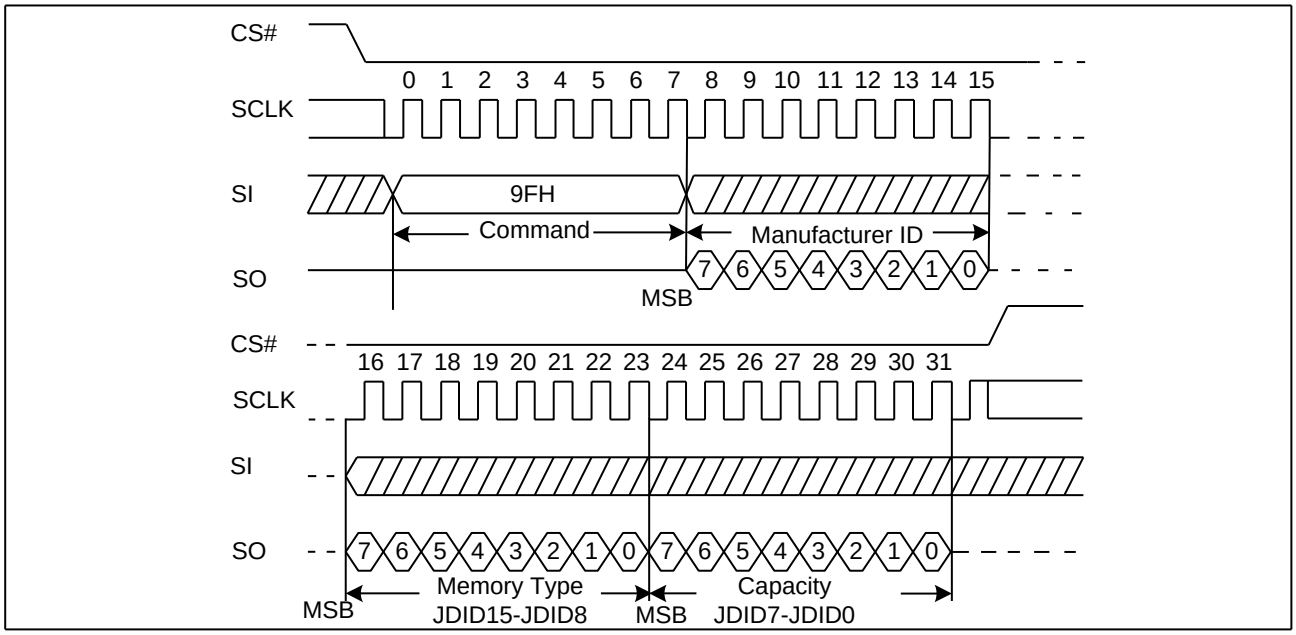
The Read Identification (RDID) command allows the 8-bit manufacturer identification to be read, followed by two bytes of device identification. The device identification indicates the memory type in the first byte, and the memory capacity of the device in the second byte. Any Read Identification (RDID) command while an Erase or Program cycle is in progress is not decoded, and has no effect on the cycle that is in progress. The Read Identification (RDID) command should not be issued while the device is in Deep Power-Down Mode.

The device is first selected by driving CS# low. Then, the 8-bit command code for the command is shifted in. This is

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followed by the 24-bit device identification, stored in the memory. Each bit is shifted out on the falling edge of Serial Clock. The command sequence is shown in Figure17. The Read Identification (RDID) command is terminated by driving CS# high at any time during data output. When CS# is driven high, the device is in the Standby Mode. Once in the Standby Mode, the device waits to be selected, so that it can receive, decode and execute commands.

Figure17. Read Identification ID Sequence Diagram

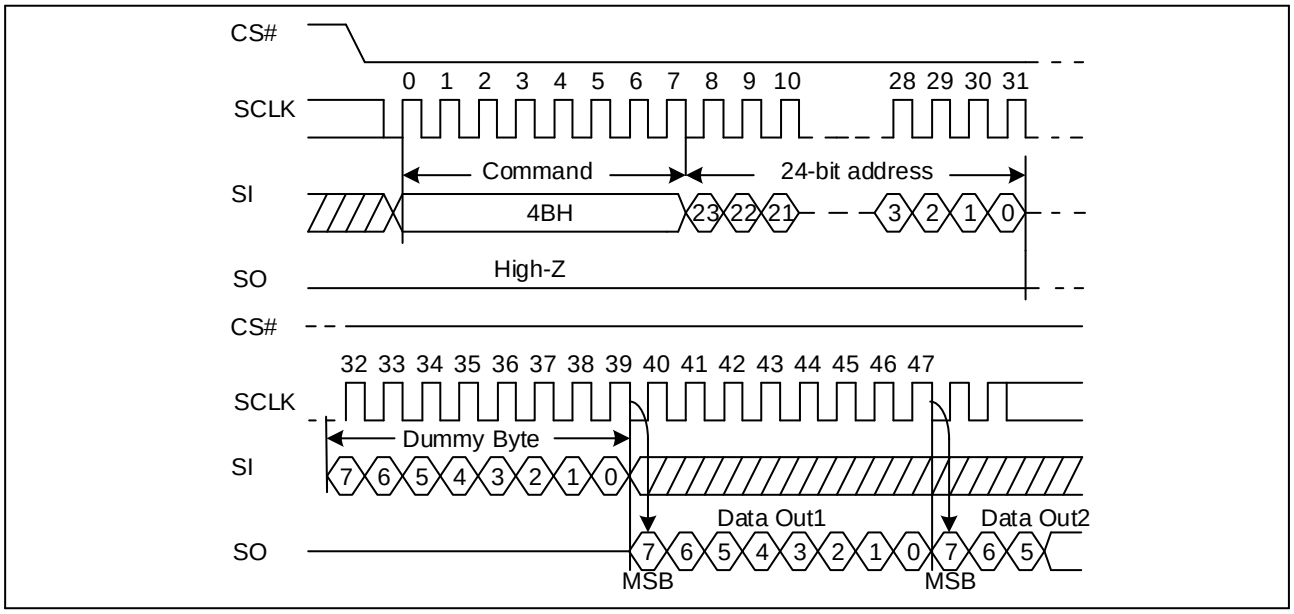


7.17. Read Unique ID (4BH)

The Read Unique ID command accesses a factory-set read-only 128bit number that is unique to each device. The Unique ID can be used in conjunction with user software methods to help prevent copying or cloning of a system.

The Read Unique ID command sequence: CS# goes low → sending Read Unique ID command → 3-Byte Address (000000H) →Dummy Byte→128bit Unique ID Out →CS# goes high.

Figure18. Read Unique ID Sequence Diagram



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8. ELECTRICAL CHARACTERISTICS

8.1. POWER-ON TIMING

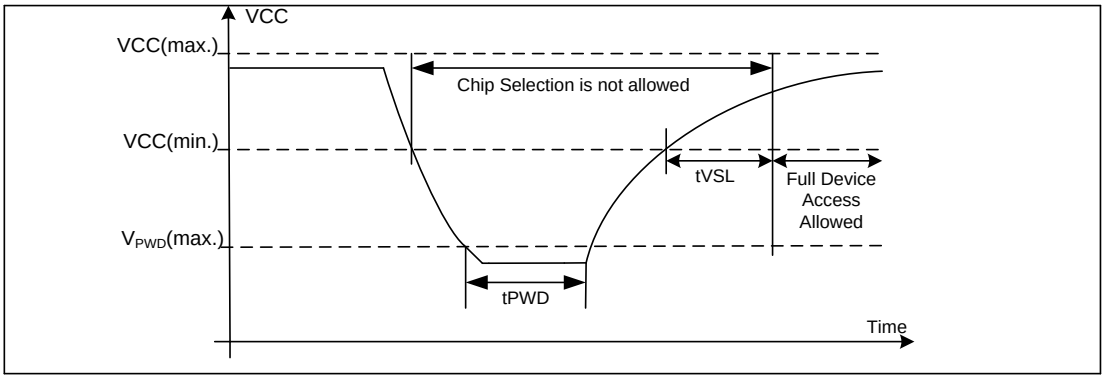


Table 3. Power-Up Timing and Write Inhibit Threshold

Symbol	Parameter	Min.	Max.	Unit
tVSL	VCC (min.) to device operation	0.3		ms
VWI	Write Inhibit Voltage	1	1.55	V
VPWD	VCC voltage needed to below VPWD for ensuring initialization will occur		0.5	V
tPWD	The minimum duration for ensuring initialization will occur	300		us

8.2. INITIAL DELIVERY STATE

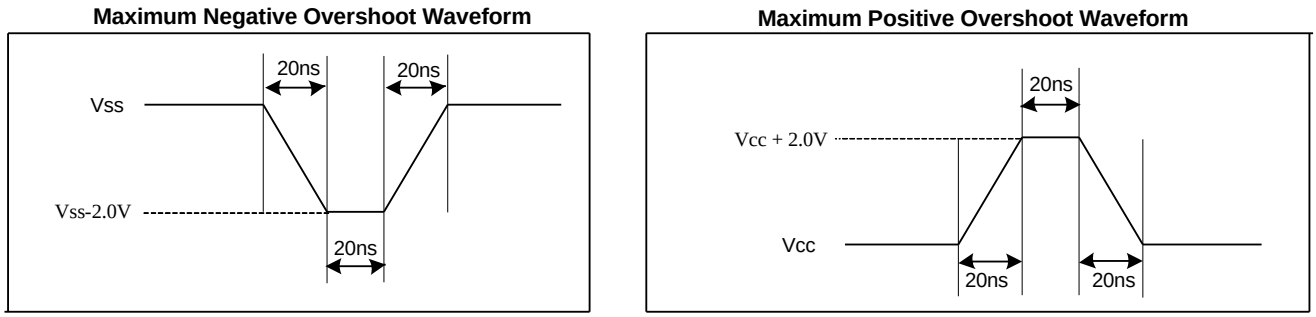
The device is delivered with the memory array erased: all bits are set to 1(each byte contains FFH).The Status Register contains 00H (all Status Register bits are 0).

8.3. ABSOLUTE MAXIMUM RATINGS

Parameter	Value	Unit
Ambient Operating Temperature	--40 to 85 -40 to 105 -40 to 125	℃
Storage Temperature	-65 to 150	℃
Transient Input/Output Voltage (**note**: overshoot)	-2.0 to VCC+2.0	V
Applied Input/Output Voltage	-0.6 to VCC+0.4	V
VCC	-0.6 to 2.5	V

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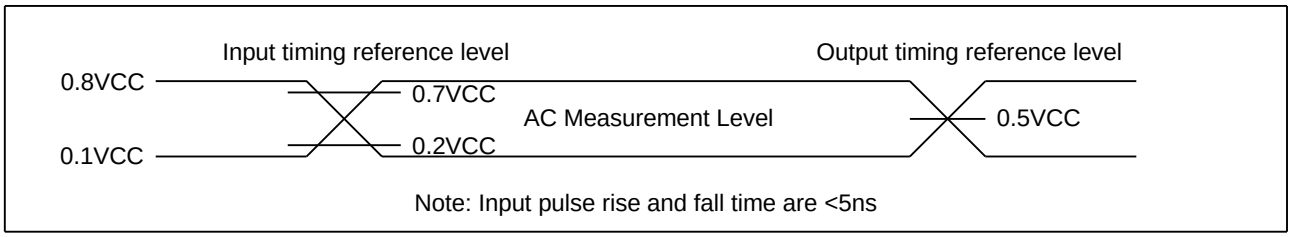
Figure19. Maximum Negative/positive Overshoot Diagram



8.4. CAPACITANCE MEASUREMENT CONDITIONS

Symbol	Parameter	Min	Tpy	Max	Unit	Conditions
CIN	Input Capacitance			6	pF	VIN=0V
COUT	Output Capacitance			8	pF	VOUT=0V
C_L	Load Capacitance		30		pF	
	Input Rise And Fall time			5	ns	
	Input Pulse Voltage	0.1VCC to 0.8VCC			V	
	Input Timing Reference Voltage	0.2VCC to 0.7VCC			V	
	Output Timing Reference Voltage	0.5VCC			V	

Figure 20. Input Test Waveform and Measurement Level



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8.5. DC CHARACTERISTICS

(T= -40℃~85℃, VCC=1.65~2.0V)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit.
I_{LI}	Input Leakage Current				±2	μA
I_{LO}	Output Leakage Current				±2	μA
I_{CC1}	Standby Current	CS#=VCC, V_{IN}=VCC or VSS		0.1	2	μA
I_{CC2}	Deep Power-Down Current	CS#=VCC, V_{IN}=VCC or VSS		0.1	2	μA
I_{CC3}	Operating Current (Read)	CLK=0.1VCC / 0.9VCC at 50MHz, Q=Open(*1 I/O)		1.3	2	mA
		CLK=0.1VCC / 0.9VCC at 40MHz, Q=Open(*1 I/O,*2 Output)		1.6	3	mA
I_{CC4}	Operating Current (PP)	CS#=VCC			10	mA
I_{CC5}	Operating Current (WRSR)	CS#=VCC			10	mA
I_{CC6}	Operating Current (SE)	CS#=VCC			10	mA
I_{CC7}	Operating Current (BE)	CS#=VCC			10	mA
I_{CC8}	Operating Current (CE)	CS#=VCC			10	mA
V_{IL}	Input Low Voltage		-0.5		0.2VCC	V
V_{IH}	Input High Voltage		0.7VCC		VCC+0.4	V
V_{OL}	Output Low Voltage	I_{OL} = 100μA			0.4	V
V_{OH}	Output High Voltage	I_{OH} =-100μA	VCC-0.2			V

Note:

1. Typical values given for TA=25°C VCC = 1.8V.
2. Value guaranteed by design and/or characterization, not 100% tested in production.

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(T= -40℃~105℃, VCC=1.65~2.0V)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit.
I_{LI}	Input Leakage Current				±2	μA
I_{LO}	Output Leakage Current				±2	μA
I_{CC1}	Standby Current	CS#=VCC, V_{IN}=VCC or VSS		0.1	8	μA
I_{CC2}	Deep Power-Down Current	CS#=VCC, V_{IN}=VCC or VSS		0.1	8	μA
I_{CC3}	Operating Current (Read)	CLK=0.1VCC / 0.9VCC at 50MHz, Q=Open(*1 I/O)		1.3	8	mA
		CLK=0.1VCC / 0.9VCC at 40MHz, Q=Open(*1 I/O,*2 Output)		1.6	8	mA
I_{CC4}	Operating Current (PP)	CS#=VCC			12	mA
I_{CC5}	Operating Current (WRSR)	CS#=VCC			12	mA
I_{CC6}	Operating Current (SE)	CS#=VCC			12	mA
I_{CC7}	Operating Current (BE)	CS#=VCC			12	mA
I_{CC8}	Operating Current (CE)	CS#=VCC			12	mA
V_{IL}	Input Low Voltage		-0.5		0.2VCC	V
V_{IH}	Input High Voltage		0.7VCC		VCC+0.4	V
V_{OL}	Output Low Voltage	I_{OL} =100μA			0.4	V
V_{OH}	Output High Voltage	I_{OH} =-100μA	VCC-0.2			V

Note:

1. Typical values given for TA=25°C VCC = 1.8V.
2. Value guaranteed by design and/or characterization, not 100% tested in production.

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(T= -40℃~125℃, VCC=1.65~2.0V)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit.
I_{LI}	Input Leakage Current				±2	μA
I_{LO}	Output Leakage Current				±2	μA
I_{CC1}	Standby Current	CS#=VCC, V_{IN}=VCC or VSS		0.1	10	μA
I_{CC2}	Deep Power-Down Current	CS#=VCC, V_{IN}=VCC or VSS		0.1	10	μA
I_{CC3}	Operating Current (Read)	CLK=0.1VCC / 0.9VCC at 50MHz, Q=Open(*1 I/O)		1.3	10	mA
		CLK=0.1VCC / 0.9VCC at 40MHz, Q=Open(*1 I/O,*2 Output)		1.6	10	mA
I_{CC4}	Operating Current (PP)	CS#=VCC			15	mA
I_{CC5}	Operating Current (WRSR)	CS#=VCC			15	mA
I_{CC6}	Operating Current (SE)	CS#=VCC			15	mA
I_{CC7}	Operating Current (BE)	CS#=VCC			15	mA
I_{CC8}	Operating Current (CE)	CS#=VCC			15	mA
V_{IL}	Input Low Voltage		-0.5		0.2VCC	V
V_{IH}	Input High Voltage		0.7VCC		VCC+0.4	V
V_{OL}	Output Low Voltage	I_{OL} =100μA			0.4	V
V_{OH}	Output High Voltage	I_{OH} =-100μA	VCC-0.2			V

Note:

1. Typical values given for TA=25°C VCC = 1.8V.
2. Value guaranteed by design and/or characterization, not 100% tested in production.

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8.6. AC CHARACTERISTICS

(T= -40℃~85℃, VCC=1.65~2.0V, C_L=30pf)

Symbol	Parameter	Min.	Typ.	Max.	Unit.
f_C	Serial Clock Frequency For: Fast read (0BH)			50	MHz
f_R	Serial Clock Frequency For: Read (03H), Dual Output (3BH)			40	MHz
t_{CLH}	Serial Clock High Time	8			ns
t_{CLL}	Serial Clock Low Time	8			ns
t_{CLCH}	Serial Clock Rise Time (Slew Rate)	0.1			V/ns
t_{CHCL}	Serial Clock Fall Time (Slew Rate)	0.1			V/ns
t_{SLCH}	CS# Active Setup Time	10			ns
t_{CHSH}	CS# Active Hold Time	10			ns
t_{SHCH}	CS# Not Active Setup Time	10			ns
t_{CHSL}	CS# Not Active Hold Time	10			ns
t_{SHSL}	CS# High Time (Read/Write)	40			ns
t_{SHQZ}	Output Disable Time			12	ns
t_{CLQX}	Output Hold Time	0			ns
t_{DVCH}	Data In Setup Time	4			ns
t_{CHDX}	Data In Hold Time	4			ns
t_{CLQV}	Clock Low To Output Valid			12	ns
t_{WHSL}	Write Protect Setup Time Before CS# Low	20			ns
t_{SHWL}	Write Protect Hold Time After CS# High	100			ns
t_{DP}	CS# High To Deep Power-Down Mode			0.1	μs
t_{RES1}	CS# High To Standby Mode Without Electronic Signature Read			0.1	μs
t_{RES2}	CS# High To Standby Mode With Electronic Signature Read			0.1	μs
t_W	Write Status Register Cycle Time		5	40	ms
t_{BP1}	Byte Program Time (First Byte)		40	55	μs
t_{BP2}	Addition Byte Program Time (After First Byte)		5	10	μs
t_{PP}	Page Programming Time		1.6	6	ms
t_{SE}	Sector Erase Time		150	500	ms
t_{BE1}	Block Erase Time (32K Bytes)		0.5	2	s
t_{BE2}	Block Erase Time (64K Bytes)		0.8	3	s
t_{CE}	Chip Erase Time (GD25LD10C/05C)		1.5/0.8	5/3	s

Note:

1. Typical values given for TA=25°C VCC = 1.8V.
2. Value guaranteed by design and/or characterization, not 100% tested in production.

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(T= -40℃~105℃, VCC=1.65~2.0V, C_L=30pf)

Symbol	Parameter	Min.	Typ.	Max.	Unit.
f_C	Serial Clock Frequency For: Fast read (0BH)			50	MHz
f_R	Serial Clock Frequency For: Read (03H), Dual Output (3BH)			40	MHz
t_{CLH}	Serial Clock High Time	8			ns
t_{CLL}	Serial Clock Low Time	8			ns
t_{CLCH}	Serial Clock Rise Time (Slew Rate)	0.1			V/ns
t_{CHCL}	Serial Clock Fall Time (Slew Rate)	0.1			V/ns
t_{SLCH}	CS# Active Setup Time	10			ns
t_{CHSH}	CS# Active Hold Time	10			ns
t_{SHCH}	CS# Not Active Setup Time	10			ns
t_{CHSL}	CS# Not Active Hold Time	10			ns
t_{SHSL}	CS# High Time (Read/Write)	40			ns
t_{SHQZ}	Output Disable Time			12	ns
t_{CLQX}	Output Hold Time	0			ns
t_{DVCH}	Data In Setup Time	4			ns
t_{CHDX}	Data In Hold Time	4			ns
t_{CLQV}	Clock Low To Output Valid			12	ns
t_{WHSL}	Write Protect Setup Time Before CS# Low	20			ns
t_{SHWL}	Write Protect Hold Time After CS# High	100			ns
t_{DP}	CS# High To Deep Power-Down Mode			0.1	μs
t_{RES1}	CS# High To Standby Mode Without Electronic Signature Read			0.1	μs
t_{RES2}	CS# High To Standby Mode With Electronic Signature Read			0.1	μs
t_W	Write Status Register Cycle Time		5	40	ms
t_{BP1}	Byte Program Time(First Byte)		40	120	μs
t_{BP2}	Addition Byte Program Time(After First Byte)		5	15	μs
t_{PP}	Page Programming Time		1.6	7	ms
t_{SE}	Sector Erase Time		150	600	ms
t_{BE1}	Block Erase Time (32K Bytes)		0.5	3.5	s
t_{BE2}	Block Erase Time (64K Bytes)		0.8	5	s
t_{CE}	Chip Erase Time (GD25LD10C)		1.5	6.5	s
t_{CE}	Chip Erase Time (GD25LD05C)		0.8	3.5	s

Note:

1. Typical values given for TA=25°C VCC = 1.8V.
2. Value guaranteed by design and/or characterization, not 100% tested in production.

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(T= -40℃~125℃, VCC=1.65~2.0V, C_L=30pf)

Symbol	Parameter	Min.	Typ.	Max.	Unit.
f_C	Serial Clock Frequency For: Fast read (0BH)			50	MHz
f_R	Serial Clock Frequency For: Read (03H), Dual Output (3BH)			40	MHz
t_{CLH}	Serial Clock High Time	8			ns
t_{CLL}	Serial Clock Low Time	8			ns
t_{CLCH}	Serial Clock Rise Time (Slew Rate)	0.1			V/ns
t_{CHCL}	Serial Clock Fall Time (Slew Rate)	0.1			V/ns
t_{SLCH}	CS# Active Setup Time	10			ns
t_{CHSH}	CS# Active Hold Time	10			ns
t_{SHCH}	CS# Not Active Setup Time	10			ns
t_{CHSL}	CS# Not Active Hold Time	10			ns
t_{SHSL}	CS# High Time (Read/Write)	40			ns
t_{SHQZ}	Output Disable Time			12	ns
t_{CLQX}	Output Hold Time	0			ns
t_{DVCH}	Data In Setup Time	4			ns
t_{CHDX}	Data In Hold Time	4			ns
t_{CLQV}	Clock Low To Output Valid			12	ns
t_{WHSL}	Write Protect Setup Time Before CS# Low	20			ns
t_{SHWL}	Write Protect Hold Time After CS# High	100			ns
t_{DP}	CS# High To Deep Power-Down Mode			0.1	μs
t_{RES1}	CS# High To Standby Mode Without Electronic Signature Read			0.1	μs
t_{RES2}	CS# High To Standby Mode With Electronic Signature Read			0.1	μs
t_W	Write Status Register Cycle Time		5	40	ms
t_{BP1}	Byte Program Time(First Byte)		40	150	μs
t_{BP2}	Addition Byte Program Time(After First Byte)		5	20	μs
t_{PP}	Page Programming Time		1.6	9	ms
t_{SE}	Sector Erase Time		150	700	ms
t_{BE1}	Block Erase Time (32K Bytes)		0.5	5	s
t_{BE2}	Block Erase Time (64K Bytes)		0.8	6.5	s
t_{CE}	Chip Erase Time (GD25LD10C)		1.5	8	s
t_{CE}	Chip Erase Time (GD25LD05C)		0.8	4	s

Note:

1. Typical values given for TA=25°C VCC = 1.8V.
2. Value guaranteed by design and/or characterization, not 100% tested in production.

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Figure21. Serial Input Timing

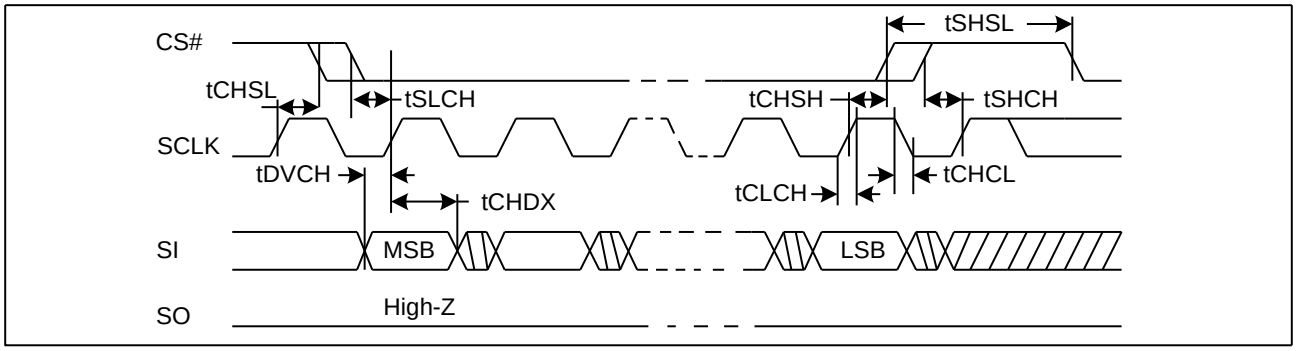
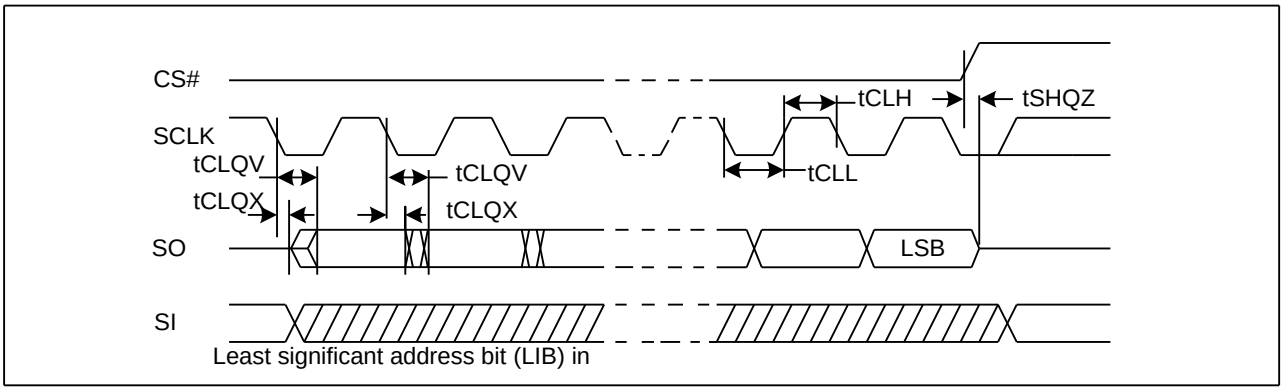
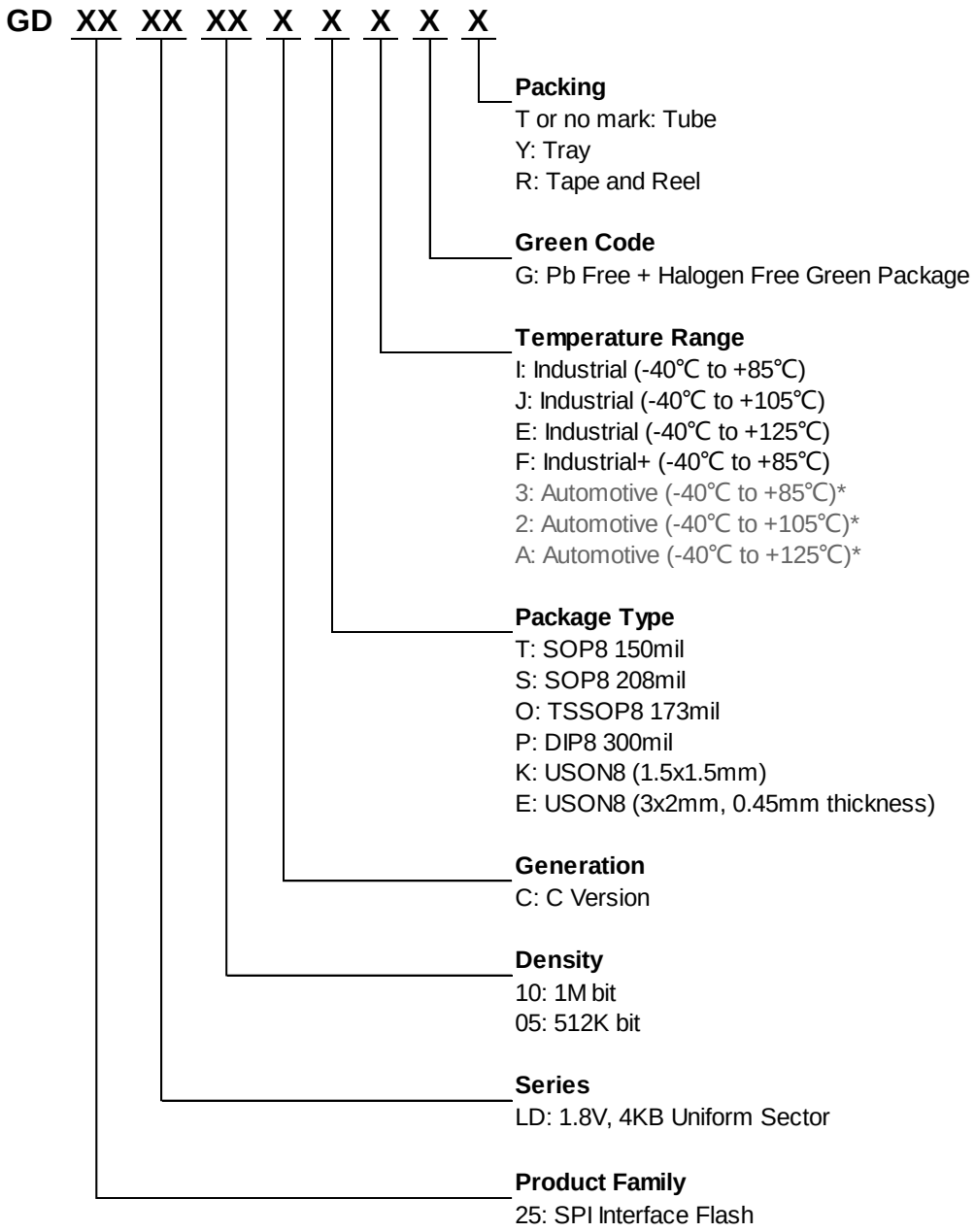


Figure22. Output Timing



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9. ORDERING INFORMATION



***Please contact GigaDevice sales for automotive products.**

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9.1. Valid Part Numbers

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

Temperature Range I: Industrial (-40℃ to +85℃)

Product Number	Density	Package Type
GD25LD10CTIG	1Mbit	SOP8 150mil
GD25LD05CTIG	512Kbit	
GD25LD10CSIG	1Mbit	SOP8 208mil
GD25LD05CSIG	512Kbit	
GD25LD10COIG	1Mbit	TSSOP8 173mil
GD25LD05COIG	512Kbit	
GD25LD10CPIG	1Mbit	DIP8 300mil
GD25LD05CPIG	512Kbit	
GD25LD10CKIG	1Mbit	USON8 (1.5x1.5mm)
GD25LD05CKIG	512Kbit	
GD25LD10CEIG	1Mbit	USON8 (3x2mm, 0.45mm thickness)
GD25LD05CEIG	512Kbit	

Temperature Range J: Industrial (-40℃ to +105℃)

Product Number	Density	Package Type
GD25LD10CTJG	1Mbit	SOP8 150mil
GD25LD05CTJG	512Kbit	
GD25LD10CSJG	1Mbit	SOP8 208mil
GD25LD05CSJG	512Kbit	
GD25LD10COJG	1Mbit	TSSOP8 173mil
GD25LD05COJG	512Kbit	
GD25LD10CPJG	1Mbit	DIP8 300mil
GD25LD05CPJG	512Kbit	
GD25LD10CKJG	1Mbit	USON8 (1.5x1.5mm)
GD25LD05CKJG	512Kbit	
GD25LD10CEJG	1Mbit	USON8 (3x2mm, 0.45mm thickness)
GD25LD05CEJG	512Kbit	

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Temperature Range E: Industrial (-40℃ to +125℃)

Product Number	Density	Package Type
GD25LD10CTEG	1Mbit	SOP8 150mil
GD25LD05CTEG	512Kbit	
GD25LD10CSEG	1Mbit	SOP8 208mil
GD25LD05CSEG	512Kbit	
GD25LD10COEG	1Mbit	TSSOP8 173mil
GD25LD05COEG	512Kbit	
GD25LD10CPEG	1Mbit	DIP8 300mil
GD25LD05CPEG	512Kbit	
GD25LD10CKEG	1Mbit	USON8 (1.5x1.5mm)
GD25LD05CKEG	512Kbit	
GD25LD10CEEG	1Mbit	USON8 (3x2mm, 0.45mm thickness)
GD25LD05CEEG	512Kbit	

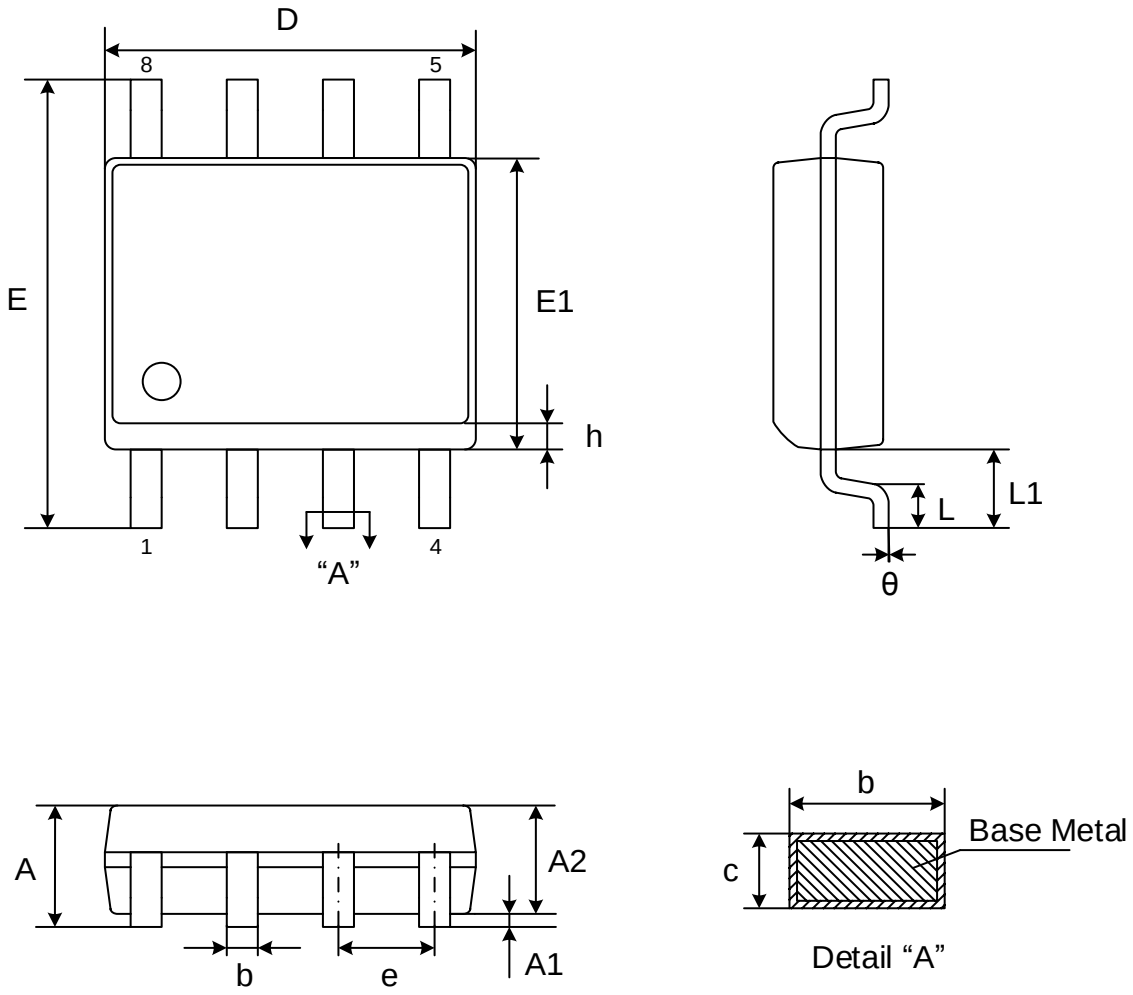
Temperature Range F: Industrial+ (-40℃ to +85℃)

Product Number	Density	Package Type
GD25LD10CTFG	1Mbit	SOP8 150mil
GD25LD05CTFG	512Kbit	
GD25LD10CSFG	1Mbit	SOP8 208mil
GD25LD05CSFG	512Kbit	
GD25LD10COFG	1Mbit	TSSOP8 173mil
GD25LD05COFG	512Kbit	
GD25LD10CPFG	1Mbit	DIP8 300mil
GD25LD05CPFG	512Kbit	
GD25LD10CKFG	1Mbit	USON8 (1.5x1.5mm)
GD25LD05CKFG	512Kbit	
GD25LD10CEFG	1Mbit	USON8 (3x2mm, 0.45mm thickness)
GD25LD05CEFG	512Kbit	

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10. PACKAGE INFORMATION

10.1. Package SOP8 150MIL



Dimensions

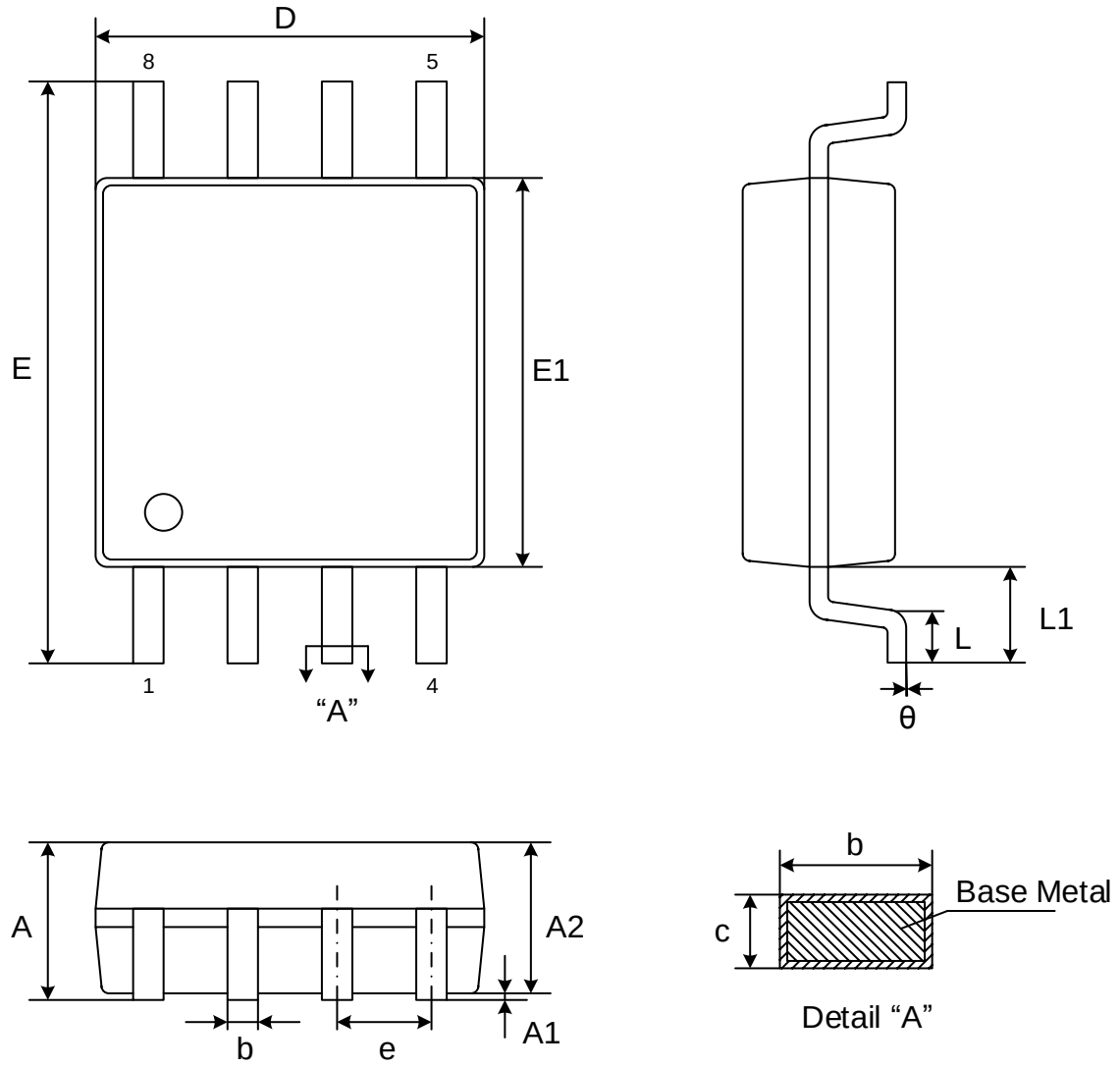
Symbol / Unit		A	A1	A2	b	c	D	E	E1	e	L	L1	h	θ
mm	Min	-	0.10	1.25	0.31	0.10	4.80	5.80	3.80	1.27	0.40	1.04	0.25	0°
	Nom	-	0.15	1.45	0.41	0.20	4.90	6.00	3.90		-		-	-
	Max	1.75	0.25	1.55	0.51	0.25	5.00	6.20	4.00		0.90		0.50	8°

Note:

1. Both the package length and width include the mold flash.
2. Seating plane: Max. 0.1mm.

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10.2. Package SOP8 208MIL



Dimensions

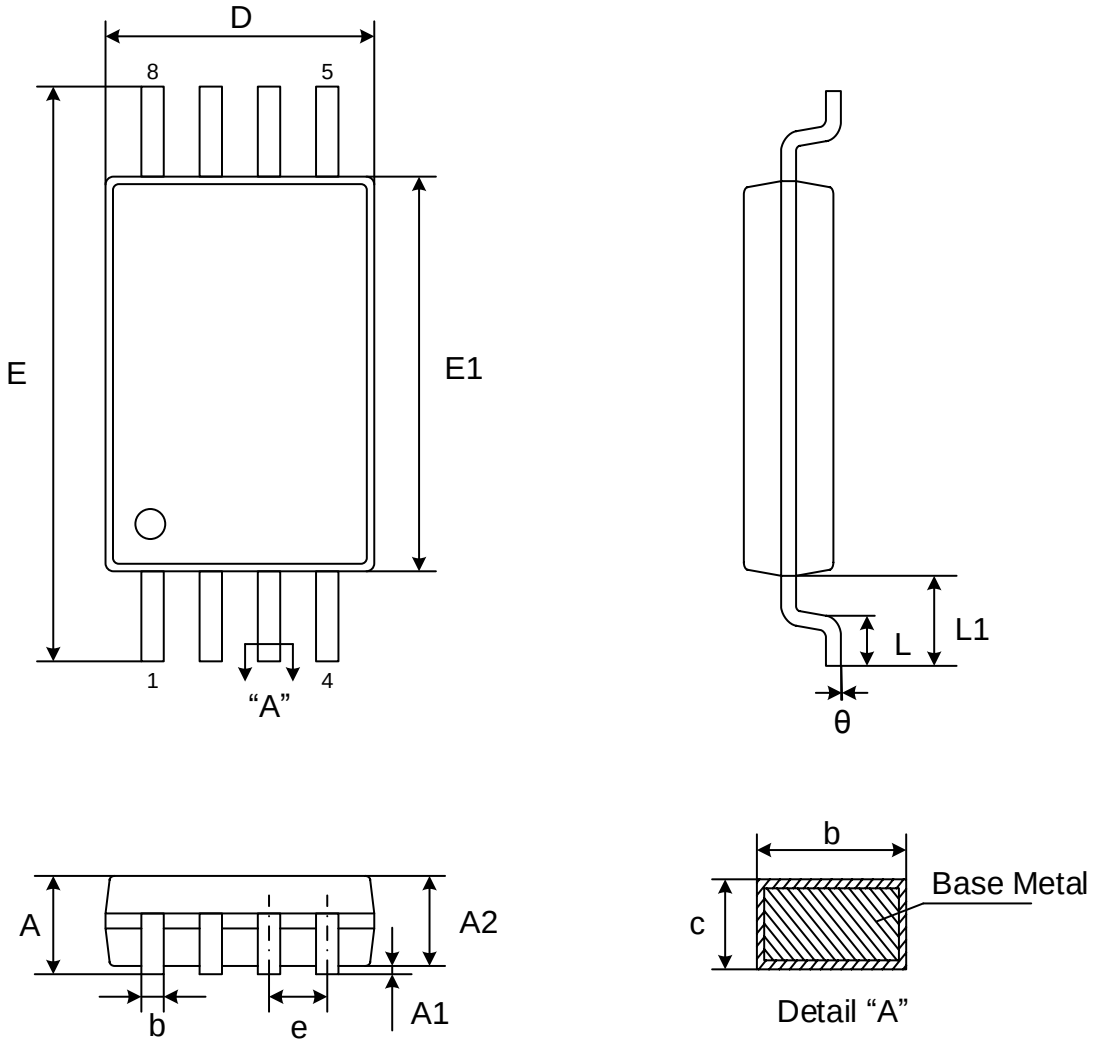
Symbol / Unit		A	A1	A2	b	c	D	E	E1	e	L	L1	θ
mm	Min	-	0.05	1.70	0.31	0.15	5.13	7.70	5.18	1.27	0.50	1.31	0°
	Nom	-	0.15	1.80	0.41	0.20	5.23	7.90	5.28		-		-
	Max	2.16	0.25	1.90	0.51	0.25	5.33	8.10	5.38		0.85		8°

Note:

1. Both the package length and width do not include the mold flash.
2. Seating plane: Max. 0.1mm.

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10.3. Package TSSOP8 173MIL



Dimensions

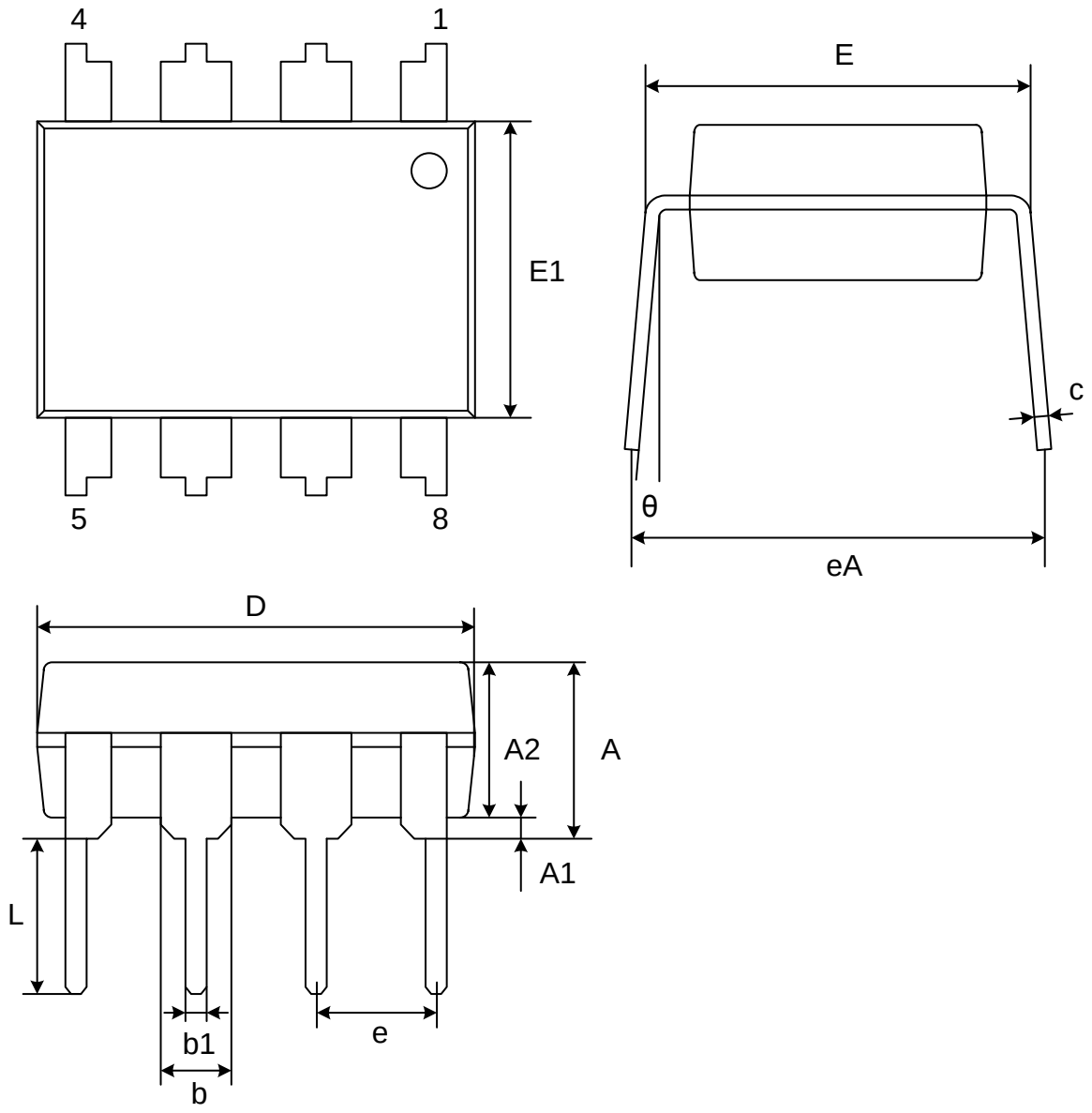
Symbol / Unit		A	A1	A2	b	c	D	E	E1	e	L	L1	θ
mm	Min	-	0.05	0.80	0.19	0.09	2.90	6.20	4.30	0.65	0.45	1.00	0°
	Nom	-	0.10	1.00	0.25	0.15	3.00	6.40	4.40		-		-
	Max	1.20	0.15	1.05	0.30	0.20	3.10	6.60	4.50		0.75		8°

Notes:

1. Both package length and width do not include mold flash.
2. Seating plane: Max. 0.1mm.

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10.4. Package DIP8 300MIL



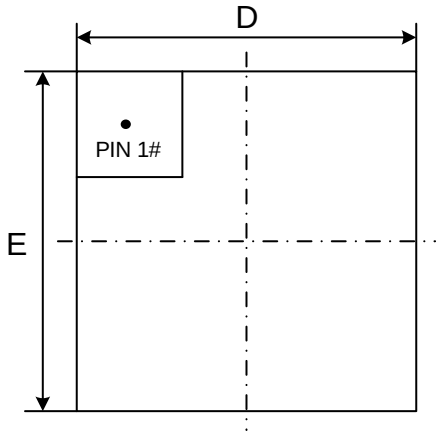
Dimensions

Symbol / Unit		A	A1	A2	b	b1	C	D	E	E1	e	L	eA	θ
mm	Min	-	0.38	3.00	1.14	0.36	0.20	9.02	7.62	6.10	2.54	2.92	8.45	0°
	Nom	-	-	3.30	1.52	0.46	0.25	9.27	7.87	6.35		3.30	8.90	-
	Max	3.88	-	3.50	1.78	0.56	0.35	9.59	8.26	6.60		3.81	9.35	11°

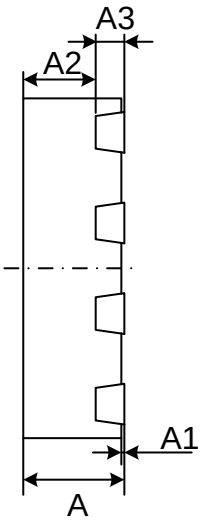
Note: Both the package length and width do not include the mold flash.

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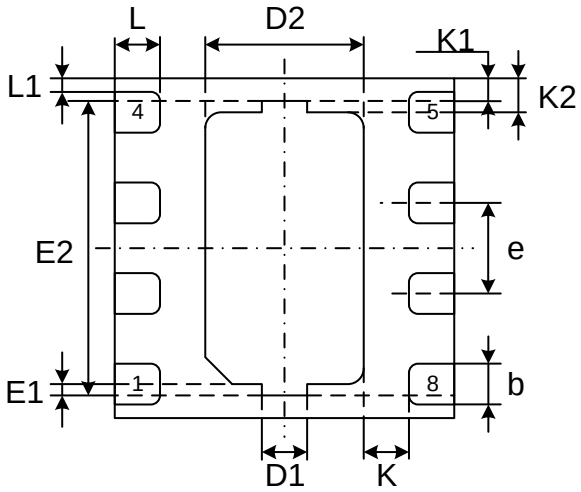
10.5. Package USON8 (1.5*1.5mm)



Top View



Side View



Bottom View

Dimensions

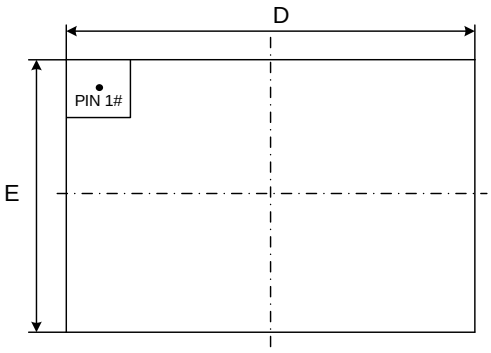
Symbol / Unit		A	A1	A2	A3	b	D	E	D1	E1	D2	E2	e	L	L1	K	K1	K2
mm	Min	0.40	0.00	0.33 REF	0.127 REF	0.13	1.40	1.40	0.20 REF	0.05 REF	0.60	1.20	0.40 REF	0.15	0.06 REF	0.20 REF	0.10 REF	0.15 REF
	Nom	0.45	0.02			0.18	1.50	1.50			0.70	1.30		0.20				
	Max	0.50	0.05			0.25	1.60	1.60			0.80	1.40		0.25				

Note:

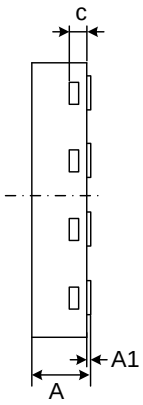
1. Both the package length and width do not include the mold flash.
2. The exposed metal pad area on the bottom of the package is floating.
3. Coplanarity ≤0.08mm. Package edge tolerance≤0.10mm.
4. The lead shape may be of little difference according to different package factories. These lead shapes are compatible with each other.

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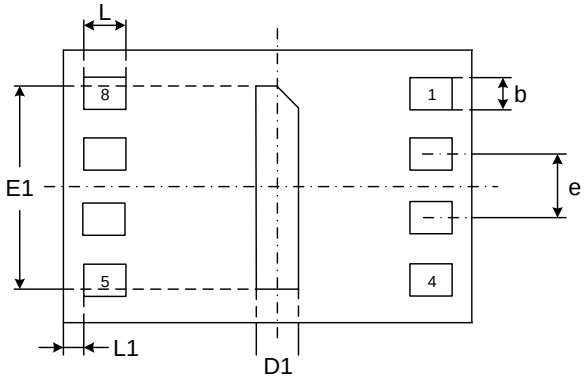
10.6. Package USON8 (3*2mm, 0.45mm thickness)



Top View



Side View



Bottom View

Dimensions

Symbol / Unit		A	A1	c	b	D	D1	E	E1	e	L	L1
mm	Min	0.40	0.00	0.10	0.20	2.90	0.15	1.90	1.55	0.50	0.30	0.10
	Nom	0.45	0.02	0.15	0.25	3.00	0.20	2.00	1.60		0.35	
	Max	0.50	0.05	0.20	0.30	3.10	0.25	2.10	1.65		0.40	

Note:

1. Both the package length and width do not include the mold flash.
2. The exposed metal pad area on the bottom of the package is floating.
3. Coplanarity ≤0.08mm. Package edge tolerance≤0.10mm.
4. The lead shape may be of little difference according to different package factories. These lead shapes are compatible with each other.

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11. REVISION HISTORY

Version No	Description	Page	Date
1.0	Initial Released	All	2017-12-12
1.1	Modify Icc3 @40MHz from 6-8mA to 3-6mA Modify Icc3 @50MHz from 6-8mA to 3-6mA Modify tBP1 from 25~50us to 40~55us Modify tBP2 from 2.5~5us to 5~10us Modify tVSL min value from 5ms to 0.5ms Add “J” and “E” to 7th code of Ordering Information	P25 P25 P26 P26 P23 P29	2018-4-19
1.2	Modify tVSL min value from 0.5ms to 0.3ms Modify the Ordering Information	P23 P28, 29	2018-5-21
1.3	Add 4BH command Modify VWI max value from 1.5V to 1.55V Add AC/DC Parameters @-40℃~105℃ Add AC/DC Parameters @-40℃~125℃ Add package of USON8 (1.5x1.5mm)	P22 P23 P26, 29 P27, 30 P39	2018-11-8
1.4	Modify Icc3 typ. value @50MHz (x1) from 3mA to 1.3mA Modify Icc3 typ. value @40MHz (x1, x2) from 3mA to 1.6mA Modify Icc3 max. value @50MHz (x1) @-40℃-85℃ from 6mA to 2mA Modify Icc3 max. value @40MHz (x1, x2) @-40℃-85℃ from 6mA to 3mA	P25, 26, 27 P25, 26, 27 P25 P25	2019-4-24

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