Features

- Single Voltage Operation Read/Write: 2.65V - 3.6V
- Access Time – 70 ns
- Sector Erase Architecture
  - One Hundred Twenty-seven 32K Word (64K Bytes) Main Sectors with Individual Write Lockout
  - Eight 4K Word (8K Bytes) Sectors with Individual Write Lockout
- Fast Word Program Time – 10 µs
- Typical Sector Erase Time: 32K Word Sectors – 700 ms; 4K Word Sectors – 100 ms
- Suspend/Resume Feature for Erase and Program
  - Supports Reading and Programming Data from Any Sector by Suspending Erase of a Different Sector
  - Supports Reading Any Word by Suspending Programming of Any Other Word
- Low-power Operation
  - 10 mA Active
  - 15 µA Standby
- VPP Pin for Write Protection and Accelerated Program Operation
- $\overline{\text{RESET}}$ Input for Device Initialization
- Softlock Sector Protection
- Secure Lock and Freeze Feature
- Top or Bottom Boot Block Configuration Available
- 128-bit Protection Register
- Minimum 100,000 Erase Cycles
- Common Flash Interface (CFI)
- CBGA Green (Pb/Halide-free/RoHS Compliant) Packaging

64-megabit (4M x 16) Secure 3-volt Only Memory

AT49BV640S
AT49BV640ST

1. Description

The AT49BV640S(T) is a 2.7-volt 32-megabit Flash memory organized as 4,194,304 words of 16 bits each. The memory is divided into 135 sectors for erase operations. The device is offered in a 64-ball CBGA package. The device has $\overline{\text{CE}}$ and $\overline{\text{OE}}$ control signals to avoid any bus contention. This device can be read or reprogrammed using a single power supply, making it ideally suited for in-system programming.

The device powers on in the read mode. Command sequences are used to place the device in other operation modes such as program and erase. The device has the capability to protect the data in any sector (see “Softlock Sector Protection” on page 6).

To increase the flexibility of the device, it contains an Erase Suspend and Program Suspend feature. This feature will put the erase or program on hold for any amount of time and let the user read data from or program data to any of the remaining sectors within the memory.

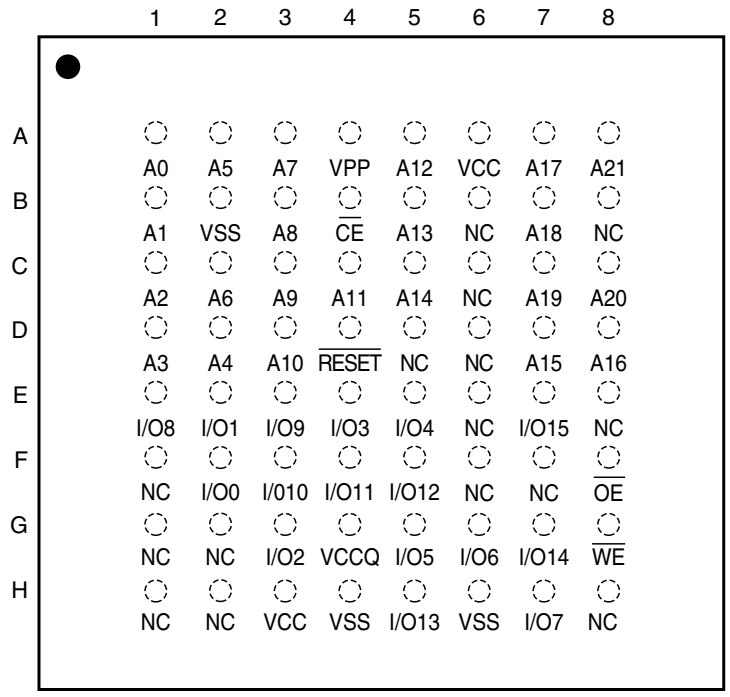
The VPP pin provides data protection. When the V_{PP} input is below 0.4V, the program and erase functions are inhibited. When V_{PP} is at 1.65V or above, normal program and erase operations can be performed. With V_{PP} at 10.0V, the program (Dual-word Program command) operation is accelerated.

3583AX–FLASH–12/8/05

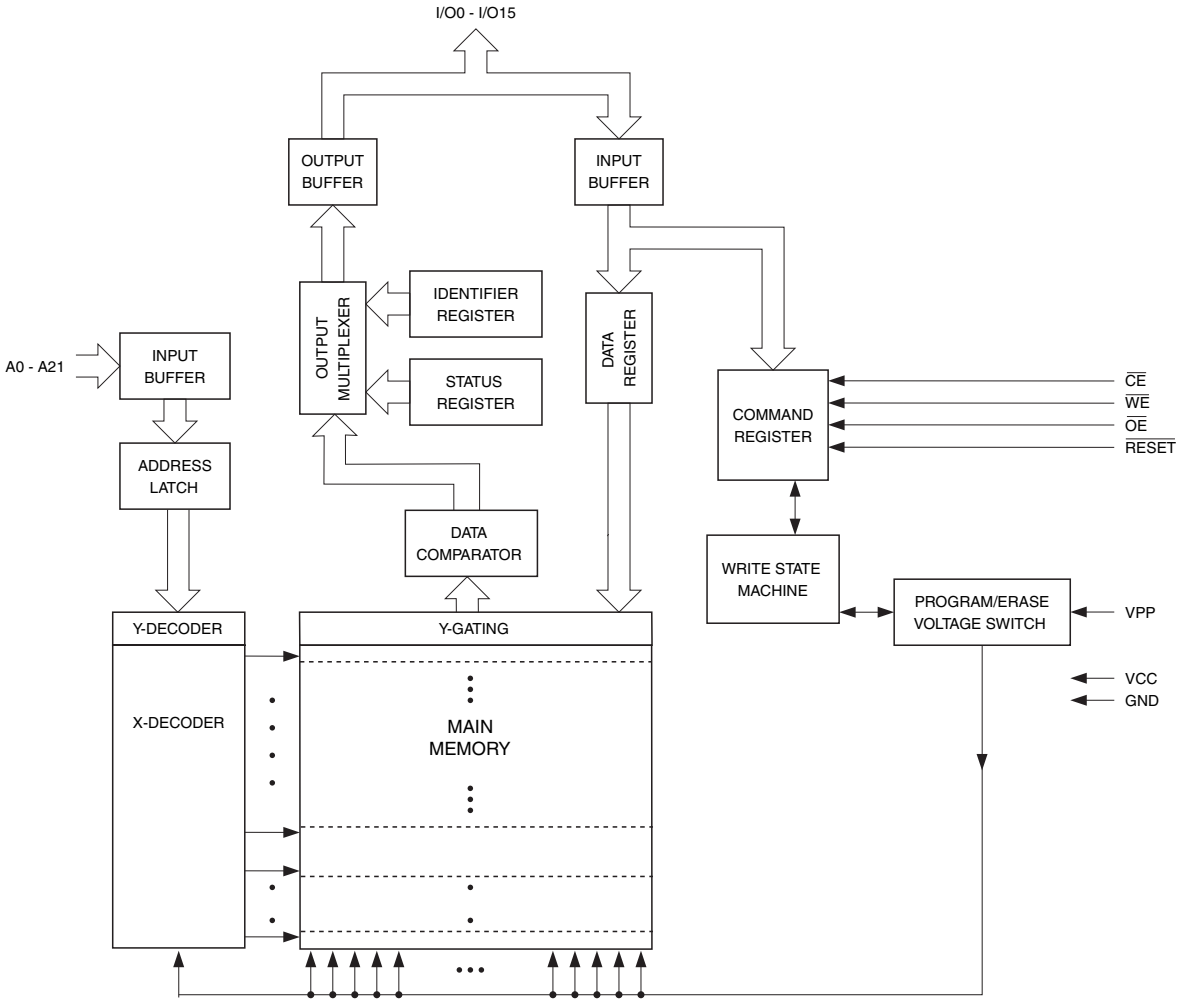
2. Pin Configurations

Pin Name	Pin Function
A0 - A21	Addresses
$\overline{CE}$	Chip Enable
$\overline{OE}$	Output Enable
$\overline{WE}$	Write Enable
$\overline{RESET}$	Reset
VPP	Write Protection and Power Supply for Accelerated Program Operations
I/O0 - I/O15	Data Inputs/Outputs
NC	No Connect
VCCQ	Output Power Supply

2.1 64-ball CBGA Top View



3. Block Diagram



4. Device Operation

4.1 Command Sequences

When the device is first powered on, it will be in the read mode. Command sequences are used to place the device in other operating modes such as program and erase. The command sequences are written by applying a low pulse on the $\overline{WE}$ input with $\overline{CE}$ low and $\overline{OE}$ high or by applying a low-going pulse on the $\overline{CE}$ input with $\overline{WE}$ low and $\overline{OE}$ high. The address is latched on the first rising edge of the $\overline{WE}$ or $\overline{CE}$. Valid data is latched on the rising edge of the $\overline{WE}$ or the $\overline{CE}$ pulse, whichever occurs first. The addresses used in the command sequences are not affected by entering the command sequences.

4.2 Read

The AT49BV640S(T) is accessed like an EPROM. When $\overline{CE}$ and $\overline{OE}$ are low and $\overline{WE}$ is high, the data stored at the memory location determined by the address pins are asserted on the outputs. The outputs are put in the high impedance state whenever $\overline{CE}$ or $\overline{OE}$ is high. This dual-line control gives designers flexibility in preventing bus contention.

4.3 Reset

A $\overline{\text{RESET}}$ input pin is provided to ease some system applications. When $\overline{\text{RESET}}$ is at a logic high level, the device is in its standard operating mode. A low level on the $\overline{\text{RESET}}$ pin halts the present device operation and puts the outputs of the device in a high-impedance state. When a high level is reasserted on the $\overline{\text{RESET}}$ pin, the device returns to read mode.

4.4 Erase

Before a word can be reprogrammed it must be erased. The erased state of the memory bits is a logical “1”. The individual sectors can be erased by using the Sector Erase command.

4.4.1 Sector Erase

The device is organized into 135 sectors (SA0 - SA134) that can be individually erased. The Sector Erase command is a two-bus cycle operation. The sector address and the D0H Data Input command are latched on the rising edge of $\overline{\text{WE}}$. The sector erase starts after the rising edge of $\overline{\text{WE}}$ of the second cycle provided the given sector has not been protected. The erase operation is internally controlled; it will automatically time to completion. The maximum time to erase a sector is t_{SEC}. An attempt to erase a sector that has been protected will result in the operation terminating immediately.

4.5 Word Programming

Once a memory sector is erased, it is programmed (to a logical “0”) on a word-by-word basis. Programming is accomplished via the Internal Device command register and is a two-bus cycle operation. The device will automatically generate the required internal program pulses.

Any commands except Read Status Register, Program Suspend and Program Resume written to the chip during the embedded programming cycle will be ignored. If a hardware reset happens during programming, the data at the location being programmed will be corrupted. Please note that a data “0” cannot be programmed back to a “1”; only erase operations can convert “0”s to “1”s. Programming is completed after the specified t_{BP} cycle time. If the program status bit is a “1”, the device was not able to verify that the program operation was performed successfully. The status register indicates the programming status. While the program sequence executes, status bit I/O7 is “0”.

4.6 VPP Pin

The circuitry of the AT49BV640S(T) is designed so that the device cannot be programmed or erased if the V_{PP} voltage is less that 0.4V. When V_{PP} is at 1.65V or above, normal program and erase operations can be performed. The VPP pin cannot be left floating.

4.7 Read Status Register

The status register indicates the status of device operations and the success/failure of that operation. The Read Status Register command causes subsequent reads to output data from the status register until another command is issued. To return to reading from the memory, issue a Read command.

The status register bits are output on I/O7 - I/O0. The upper byte, I/O15 - I/O8, outputs 00H when a Read Status Register command is issued.

The contents of the status register [SR7:SR0] are latched on the falling edge of $\overline{OE}$ or $\overline{CE}$ (whichever occurs last), which prevents possible bus errors that might occur if status register contents change while being read. $\overline{CE}$ or $\overline{OE}$ must be toggled with each subsequent status read, or the status register will not indicate completion of a Program or Erase operation.

When the Write State Machine (WSM) is active, SR7 will indicate the status of the WSM; the remaining bits in the status register indicate whether the WSM was successful in performing the preferred operation (see Table 4-1).

Table 4-1. Status Register Bit Definition

WSMS	ESS	ES	PRS	VPPS	PSS	SLS	R
7	6	5	4	3	2	1	0
				Notes			
SR7 WRITE STATE MACHINE STATUS (WSMS) 1 = Ready 0 = Busy				Check Write State Machine bit first to determine Word Program or Sector Erase completion, before checking program or erase status bits.			
SR6 = ERASE SUSPEND STATUS (ESS) 1 = Erase Suspended 0 = Erase In Progress/Completed				When Erase Suspend is issued, WSM halts execution and sets both WSMS and ESS bits to “1” – ESS bit remains set to “1” until an Erase Resume command is issued.			
SR5 = ERASE STATUS (ES) 1 = Error in Sector Erase 0 = Successful Sector Erase				When this bit is set to “1”, WSM has applied the max number of erase pulses to the sector and is still unable to verify successful sector erasure.			
SR4 = PROGRAM STATUS (PRS) 1 = Error in Programming 0 = Successful Programming				When this bit is set to “1”, WSM has attempted but failed to program a word			
SR3 = VPP STATUS (VPPS) 1 = VPP Low Detect, Operation Abort 0 = VPP OK				The V_{PP} status bit does not provide continuous indication of VPP level. The WSM interrogates V_{PP} level only after the Program or Erase command sequences have been entered and informs the system if V_{PP} has not been switched on. The V_{PP} is also checked before the operation is verified by the WSM.			
SR2 = PROGRAM SUSPEND STATUS (PSS) 1 = Program Suspended 0 = Program in Progress/Completed				When Program Suspend is issued, WSM halts execution and sets both WSMS and PSS bits to “1”. PSS bit remains set to “1” until a Program Resume command is issued.			
SR1 = SECTOR LOCK STATUS (SLS) 1 = Prog/Erase attempted on a locked sector; Operation aborted. 0 = No operation to locked sectors				If a Program or Erase operation is attempted to one of the locked sectors, this bit is set by the WSM. The operation specified is aborted and the device is returned to read status mode.			
SR0 = Reserved for Future Enhancements (R)				This bit is reserved for future use and should be masked out when polling the status register.			

Note: 1. A Command Sequence Error is indicated when SR1, SR3, SR4 and SR5 are set.

4.8 Clear Status Register

The WSM can set status register bits 1 through 7 and can clear bits 2, 6 and 7; but, the WSM cannot clear status register bits 1, 3, 4 or 5. Because bits 1, 3, 4 and 5 indicate various error conditions, these bits can be cleared only through the Clear Status Register command. By allowing the system software to control the resetting of these bits, several operations may be performed (such as cumulatively programming several addresses or erasing multiple sectors in sequence) before reading the status register to determine if an error occurred during those operations. The status register should be cleared before beginning another operation. The Read command must be issued before data can be read from the memory array. The status register can also be cleared by resetting the device.

4.9 Softlock Sector Protection

The AT49BV640S(T) offers the Softlock Sector Protection mode. Once this mode is enabled, the contents of the selected sector is read-only and cannot be erased or programmed. At power-up and reset, all sectors have their Softlock protection mode enabled.

4.9.1 Unlock

The Softlock protection mode can be disabled by issuing a two-bus cycle Unlock command to the selected sector. Once a sector is unlocked, its contents can be erased or programmed. To enable the Softlock protection mode, a two-bus cycle Softlock command must be issued to the selected sector.

4.9.2 Sector Protection Detection

A software method is available to determine if the Softlock Sector Protection feature is enabled. When the device is in the software product identification mode a read from I/O0 at address location 00002H within a sector will show if the sector is unlocked or softlocked.

Table 4-2. Softlock Sector Protection Status

I/O0	Sector Protection Status
0	Sector Not Locked
1	Softlock Enabled

4.10 Secure Lock

In some applications, in addition to the standard softlock sector protection mechanism, a requirement exists to allow for the permanent and irreversible locking of selected regions in the memory. The AT49BV640S(T) allows the user to permanently lock thirty-eight regions, and once activated these secure regions cannot be altered or erased through Software or Hardware at any time. Once activated, no facility exists to over-ride the secure lock mechanism. The size and the location of the secure regions is determined by the Top or Bottom Boot Block designation. The location of the secure regions is shown on pages 17 - 20.

The secure regions can be locked in any sequence and at any time during normal device operation. Read operations can still be performed on any region that has the secure lock feature enabled. Full read/write operations and standard sector operations including standard Sector locking can be performed on all regions that are not secure locked.

To secure lock a region, a two-bus cycle command must be used as shown in the "Command Definition Table". The data programmed during the second bus cycle in bits D15 - D0 determines whether a corresponding region is secure locked or not. If data bit DX is "0", the corresponding region, SCRX, shown below will be secure locked. If data bit DX is "1", the corresponding region shown below will not be secure locked.

Table 4-3. Secure Lock Table

	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
D_{IN1}, data programmed during 2nd bus cycle of Lock SCR7 - SCR0 Command	X	X	X	X	X	Freeze Bit	SCR7	SCR6	SCR5	SCR4	SCR3	SCR2	SCR1	SCR0	Protection Register – Block B[1]	X
D_{IN2}, data programmed during 2nd bus cycle of Lock SCR23 - SCR8 Command	SCR23	SCR22	SCR21	SCR20	SCR19	SCR18	SCR17	SCR16	SCR15	SCR14	SCR13	SCR12	SCR11	SCR10	SCR9	SCR8
D_{IN3}, data programmed during 3rd bus cycle of Lock SCR37 - SCR24 Command	X	SCR37	SCR36	SCR35	SCR34	SCR33	SCR32	SCR31	SCR30	SCR29	SCR28	SCR27	SCR26	SCR25	SCR24	X

Note: 1. Protection Register – Block B refers to the user-programmable region of the 128-bit protection register. For details, see section "128-bit Protection Register" on page 8.

To determine whether a secure region is locked or not, the status of SCR command is given, and data bits D15 - D0 are read. If the data bit is "0", the corresponding region is secure locked, if the data bit is "1", the corresponding region can be programmed.

4.11 Erase Suspend/Erase Resume

The Erase Suspend command allows the system to interrupt a sector erase operation and then program or read data from a different sector within the memory. After the Erase Suspend command is given, the device requires a maximum time of 15 µs to suspend the erase operation. After the erase operation has been suspended, the system can then read data or program data to any other sector within the device. An address is not required during the Erase Suspend command. During a sector erase suspend, another sector cannot be erased. To resume the sector erase operation, the system must write the Erase Resume command. The Erase Resume command is a one-bus cycle command. The only valid commands while erase is suspended are Read Status Register, Product ID Entry, CFI Query, Program, Program Resume, Erase Resume, Sector Softlock and Sector Unlock.

4.12 Program Suspend/Program Resume

The Program Suspend command allows the system to interrupt a programming operation and then read data from a different word within the memory. After the Program Suspend command is given, the device requires a maximum of 10 µs to suspend the programming operation. After the programming operation has been suspended, the system can then read from any other word within the device. An address is not required during the program suspend operation. To resume the programming operation, the system must write the Program Resume command. The program suspend and resume are one-bus cycle commands. The command sequence for the erase suspend and program suspend are the same, and the command sequence for the erase resume and program resume are the same. Read, Read Status Register, Product ID Entry, Program Resume are valid commands during a Program Suspend.

4.13 Product Identification

The product identification mode identifies the device and manufacturer as Atmel. It may be accessed by a software operation. For details, see “Operating Modes” on page 21.

4.14 128-bit Protection Register

The AT49BV640S(T) contains a 128-bit register that can be used for security purposes in system design. The protection register is divided into two 64-bit blocks. The two blocks are designated as block A and block B. The data in block A is non-changeable and is programmed at the factory with a unique number. The data in block B is programmed by the user and can be locked out such that data in the sector cannot be reprogrammed. To program block B in the protection register, the two-bus cycle Program Protection Register command must be used as shown in the “Command Definition Table” on page 15. To lock out block B, the two-bus cycle Lock Protection Register command must be used as shown in the “Command Definition Table”. Data bit D1 must be zero during the second bus cycle. To determine whether block B is locked out, use the status of block B protection command. If data bit D1 is zero, block B is locked. If data bit D1 is one, block B can be reprogrammed. Please see the “Protection Register Addressing Table” on page 16 for the address locations in the protection register. To read the protection register, the Product ID Entry command is given followed by a normal read operation from an address within the protection register. After determining whether block B is protected or not, or reading the protection register, the Read command must be given to return to the read mode.

4.15 Freeze Feature

The AT49BV640S(T) device contains a freeze feature that will freeze the lock status of the secure regions and the lock status of protection register B. The freeze feature prevents any further locking of the secure regions and also prevents any change to the lock status of protection register B. If the user requires certain regions to be locked, then these regions must be programmed and locked prior to activation of the freeze command. It is important to note that enabling the freeze feature is irreversible.

To enable the freeze feature, during the second bus cycle of the Lock Protection Register (Block B), Lock SCR7-SCR0 command, bit D10 must be a “0”, and bits D9 - D1 must be all “1s”. This bit sequence is used to prevent inadvertent activation of the freeze feature. Although enabling the freeze feature requires D9 - D1 to be all “1s”, the lock status of the secure regions and protection register B will not change to the unlocked state by enabling the freeze feature.

4.16 Common Flash Interface (CFI)

CFI is a published, standardized data structure that may be read from a flash device. CFI allows system software to query the installed device to determine the configurations, various electrical and timing parameters, and functions supported by the device. CFI is used to allow the system to learn how to interface to the flash device most optimally. The two primary benefits of using CFI are ease of upgrading and second source availability. The command to enter the CFI Query mode is a one-bus cycle command which requires writing data 98h to any address. The CFI Query command can be written when the device is ready to read data or can also be written when the part is in the product ID mode. Once in the CFI Query mode, the system can read CFI data at the addresses given in “Common Flash Interface Definition Table” on page 26. To return to the read mode, the read command should be issued.

4.17 Hardware Data Protection

Hardware features protect against inadvertent programs to the AT49BV640S(T) in the following ways: (a) V_{CC} sense: if V_{CC} is below 1.8V (typical), the device is reset and the program and erase functions are inhibited. (b) Program inhibit: holding any one of $\overline{OE}$ low, $\overline{CE}$ high or $\overline{WE}$ high inhibits program cycles. (c) Program inhibit: V_{PP} is less than V_{ILPP}.

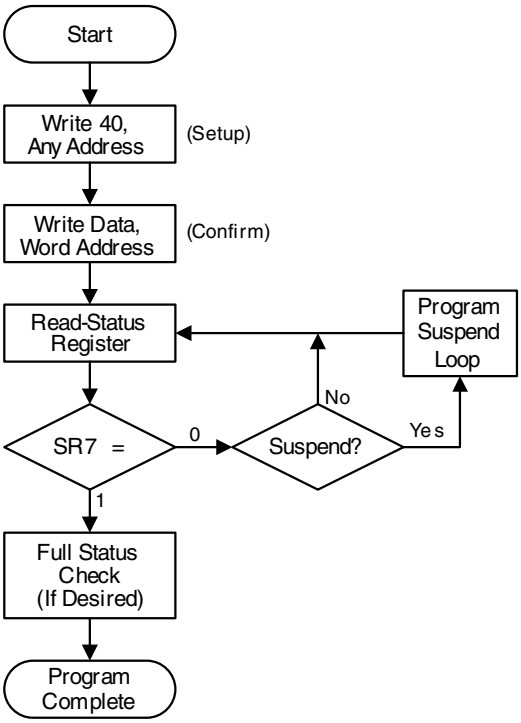
4.18 Input Levels

While operating with a 2.65V to 3.6V power supply, the address inputs and control inputs ($\overline{OE}$, $\overline{CE}$ and $\overline{WE}$) may be driven from 0 to 5.5V without adversely affecting the operation of the device. The I/O lines can be driven from 0 to V_{CCQ} + 0.6V.

4.19 Output Levels

For the AT49BV640S(T), output high levels are equal to V_{CCQ} - 0.1V (not V_{CC}). For 2.65V to 3.6V output levels, V_{CCQ} must be tied to V_{CC}.

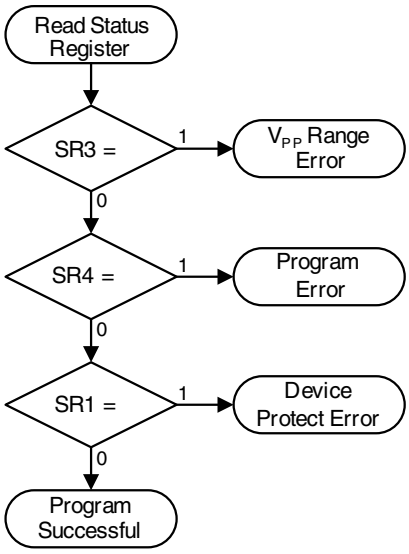
4.20 Word Program Flowchart



4.21 Word Program Procedure

Bus Operation	Command	Comments
Write	Program Setup	Data = 40 Addr = Any Address
Write	Data	Data = Data to program Addr = Location to program
Read	None	Status register data: Toggle $\overline{CE}$ or $\overline{OE}$ to update status register
Idle	None	Check SR7 1 = WSM Ready 0 = WSM Busy
Repeat for subsequent Word Program operations. Full status register check can be done after each program, or after a sequence of program operations. Write FF after the last operation to set to the Read state.		

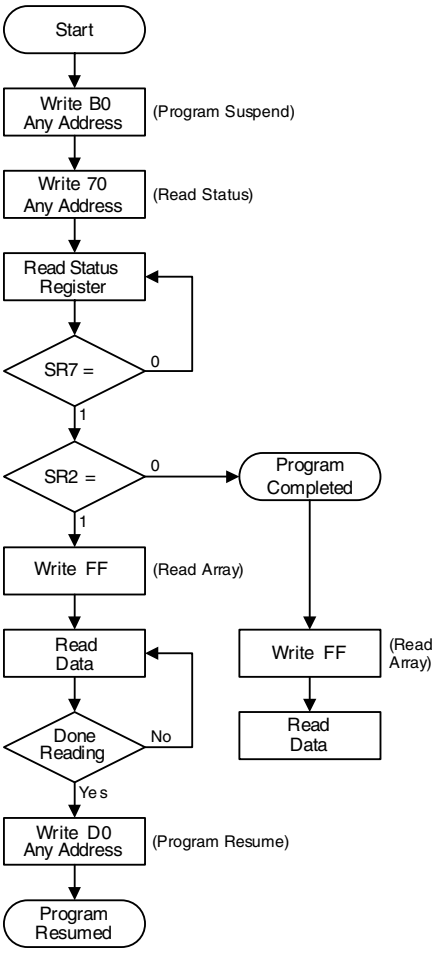
4.22 Full Status Check Flowchart



4.23 Full Status Check Procedure

Bus Operation	Command	Comments
Idle	None	Check SR3: 1 = V_{PP} Error
Idle	None	Check SR4: 1 = Data Program Error
Idle	None	Check SR1: 1 = Sector locked; operation aborted
SR3 MUST be cleared before the Write State Machine allows further program attempts. If an error is detected, clear the status register before continuing operations – only the Clear Status Register command clears the status register error bits.		

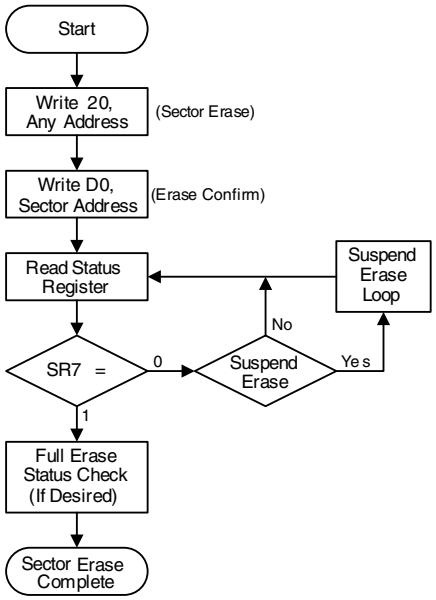
4.24 Program Suspend/Resume Flowchart



4.25 Program Suspend/Resume Procedure

Bus Operation	Command	Comments
Write	Program Suspend	Data = B0 Addr = Any address
Write	Read Status	Data = 70 Addr = Any address
Read	None	Status register data: Toggle $\overline{CE}$ or $\overline{OE}$ to update status register Addr = Any address
Idle	None	Check SR7 1 = WSM Ready 0 = WSM Busy
Idle	None	Check SR2 1 = Program suspended 0 = Program completed
Write	Read Array	Data = FF Addr = Any address
Read	None	Read data from any word in the memory
Write	Program Resume	Data = D0 Addr = Any address

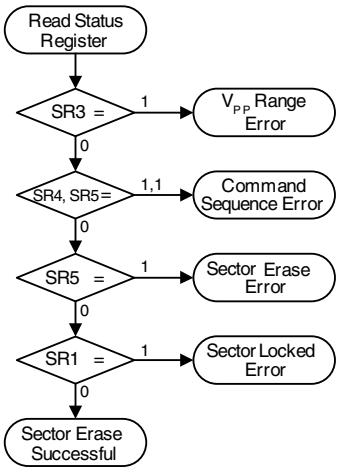
4.26 Sector Erase Flowchart



4.27 Sector Erase Procedure

Bus Operation	Command	Comments
Write	Sector Erase Setup	Data = 20 Addr = Any Address
Write	Erase Confirm	Data = D0 Addr = Sector to be erased (SA)
Read	None	Status register data: Toggle $\overline{CE}$ or $\overline{OE}$ to update status register data
Idle	None	Check SR7 1 = WSMS Ready 0 = WSMS Busy
Repeat for subsequent sector erasures. Full status register check can be done after each sector erase, or after a sequence of sector erasures. Write FF after the last operation to enter read mode.		

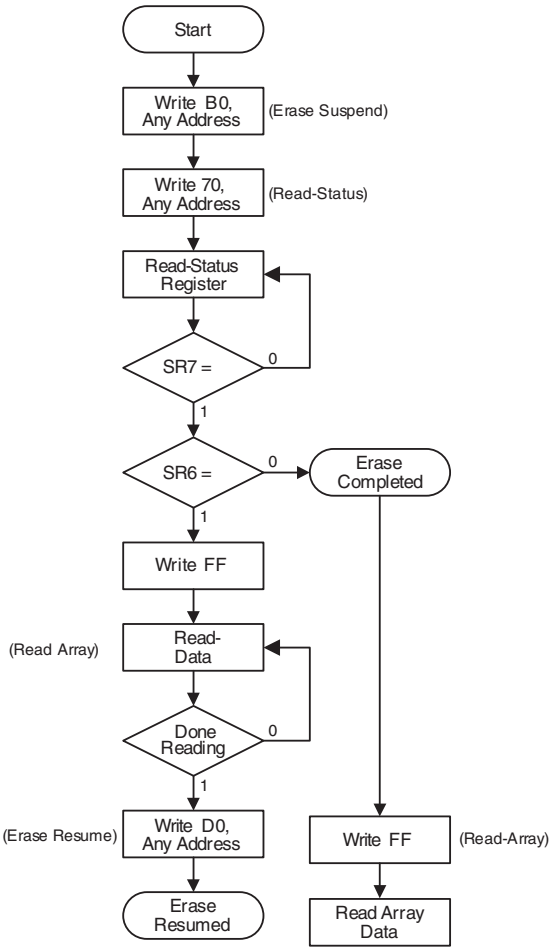
4.28 Full Erase Status Check Flowchart



4.29 Full Erase Status Check Procedure

Bus Operation	Command	Comments
Idle	None	Check SR3: 1 = V_{PP} Range Error
Idle	None	Check SR4, SR5: Both 1 = Command Sequence Error
Idle	None	Check SR5: 1 = Sector Erase Error
Idle	None	Check SR1: 1 = Attempted erase of locked sector; erase aborted.
SR1, SR3 must be cleared before the Write State Machine allows further erase attempts. Only the Clear Status Register command clears SR1, SR3, SR4, SR5. If an error is detected, clear the status register before attempting an erase retry or other error recovery.		

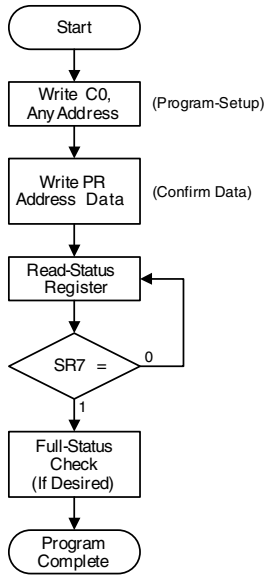
4.30 Erase Suspend/Resume Flowchart



4.31 Erase Suspend/Resume Procedure

Bus Operation	Command	Comments
Write	Erase Suspend	Data = B0 Addr = Any address
Write	Read Status	Data = 70 Addr = Any address
Read	None	Status register data: Toggle $\overline{CE}$ or $\overline{OE}$ to update status register Addr = Any address
Idle	None	Check SR7 1 = WSM Ready 0 = WSM Busy
Idle	None	Check SR6 1 = Erase suspended 0 = Erase completed
Write	Read or Program	Data = FF or 40 Addr = Any address
Read or Write	None	Read or program data from/to sector other than the one being erased
Write	Program Resume	Data = D0 Addr = Any address

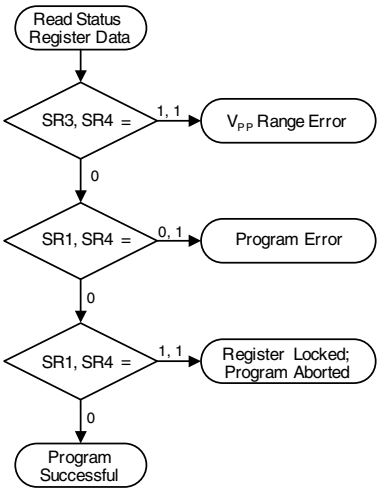
4.32 Protection Register Programming Flowchart



4.33 Protection Register Programming Procedure

Bus Operation	Command	Comments
Write	Program PR Setup	Data = C0 Addr = Any Address
Write	Protection Program	Data = Data to Program Addr = Location to Program
Read	None	Status register data: Toggle $\overline{CE}$ or $\overline{OE}$ to update status register data
Idle	None	Check SR7 1 = WSMS Ready 0 = WSMS Busy
Program Protection Register operation addresses must be within the protection register address space. Addresses outside this space will return an error. Repeat for subsequent programming operations. Full status register check can be done after each program, or after a sequence of program operations. Write FF after the last operation to return to the Read mode.		

4.34 Full Status Check Flowchart



4.35 Full Status Check Procedure

Bus Operation	Command	Comments
Idle	None	Check SR1, SR3, SR4: 0,1,1 = V_{PP} Range Error
Idle	None	Check SR1, SR3, SR4: 0,0,1 = Programming Error
Idle	None	Check SR1, SR3, SR4: 1, 0,1 = Sector locked; operation aborted
SR3 must be cleared before the Write State Machine allows further program attempts. Only the Clear Status Register command clears SR1, SR3, SR4. If an error is detected, clear the status register before attempting a program retry or other error recovery.		

5. Command Definition Table

Command Sequence	Bus Cycles	1st Bus Cycle		2nd Bus Cycle		3rd Bus Cycle	
		Addr	Data	Addr	Data	Addr	Data
Read	1	XX	FF				
Sector Erase	2	XX	20	SA[2]	D0		
Word Program	2	XX	40/10	Addr	D_{IN}		
Dual Word Program[3]	3	XX	E0	Addr0	D_{IN0}	Addr1	D_{IN1}
Erase/Program Suspend	1	XX	B0				
Erase/Program Resume	1	XX	D0				
Product ID Entry[4]	1	XX	90				
Sector Softlock	2	XX	60	SA[2]	01		
Sector Unlock	2	XX	60	SA[2]	D0		
Read Status Register	2	XX	70	XX	D_{OUT}[5]		
Clear Status Register	1	XX	50				
Program Protection Register (Block B)	2	XX	C0	Addr[6]	D_{IN}		
Lock Protection Register (Block B), Lock SCR7 - SCR0	2	XX	C0	80	D_{IN1}[7]		
Lock SCR23 - SCR8	2	XX	C0	79	D_{IN2}[8]		
Lock SCR37 - SCR24	2	XX	C0	78	D_{IN3}[9]		
Status of Protection Register (Block B), SCR7 - SCR0	2	XX	90	80	D_{OUT1}[10]		
Status of SCR23 - SCR8	2	XX	90	79	D_{OUT2}[11]		
Status of SCR37 - SCR24	2	XX	90	78	D_{OUT3}[12]		
CFI Query	1	XX	98				

Notes:
1. The DATA FORMAT shown for each bus cycle is as follows; I/O7 - I/O0 (Hex). I/O15 - I/O8 are don't care. The ADDRESS FORMAT shown for each bus cycle is as follows: A7 - A0 (Hex). Address A21 through A8 are don't care.
2. SA = sector address. Any word address within a sector can be used to designate the sector address (see pages 17 - 20 for details).
3. This fast programming option enables the user to program two words in parallel only when V_{PP} = 9.5V. The addresses, Addr0 and Addr1, of the two words, D_{IN0} and D_{IN1}, must only differ in address A0. This command should be used during manufacturing purposes only.
4. During the second bus cycle, the manufacturer code is read from address 000000H, the device code is read from address 000001H, and the data in the protection register is read from addresses 000081H - 000088H.
5. The status register bits are output on I/O7 - I/O0.
6. Any address within the user programmable protection register region. Address locations are shown on the "Protection Register Addressing Table" on page 16.
7. D_{IN1} represents 16 bits of data. If D1 is a "0", Protection Register (Block B) will be locked. If D9 - D2 is a "0", the corresponding region, SCR7 - SCR0, will be secure locked. If D10 is a "0" and bits D9 - D1 are all "1", the Freeze feature will be enabled. See Table 4-3 on page 7.
8. D_{IN2} represents 16 bits of data. If D15 - D0 is a "0", the corresponding region, SCR23 - SCR8 will be secure locked. See Table 4-3 on page 7.
9. D_{IN3} represents 16 bits of data. If D14 - D1 is a "0", the corresponding region SCR37 - SCR24 will be secure locked. See Table 4-3 on page 7.
10. If data bit D1 is "0", block B is locked. If data bit D1 is "1", block B can be reprogrammed. If data bit DX (X = 9 - 2) is "0", SCR (X - 2) is locked. If data bit DX is a "1", SCR (X - 2) can be reprogrammed. If bit D10 is a "0", the freeze feature is enabled.
11. If data bit DX (X = 15 - 0) is "0", SCR (X + 8) is locked. If data bit DX is a "1", SCR (X + 8) can be reprogrammed.
12. If data bit DX (X = 14 - 1) is "0", SCR (X + 23) is locked. If data bit DX is a "1" SCR (X + 23) can be reprogrammed.

6. Absolute Maximum Ratings*

Temperature under Bias	-55°C to +125°C
Storage Temperature	-65°C to +150°C
All Input Voltages Except V_{PP} (including NC Pins) with Respect to Ground	-0.6V to +6.25V
All Output Voltages with Respect to Ground	-0.6V to V_{CCQ} + 0.6V
V_{PP} Input Voltage with Respect to Ground	-0.6V to 10.0V

*NOTICE: Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

7. Protection Register Addressing Table

Address	Use	Block	A8	A7	A6	A5	A4	A3	A2	A1	A0
81	Factory	A	0	1	0	0	0	0	0	0	1
82	Factory	A	0	1	0	0	0	0	0	1	0
83	Factory	A	0	1	0	0	0	0	0	1	1
84	Factory	A	0	1	0	0	0	0	1	0	0
85	User	B	0	1	0	0	0	0	1	0	1
86	User	B	0	1	0	0	0	0	1	1	0
87	User	B	0	1	0	0	0	0	1	1	1
88	User	B	0	1	0	0	0	1	0	0	0

Note: All address lines not specified in the above table must be "0" when accessing the protection register, i.e., A21 - A8 = 0.

8. Memory Organization – AT49BV640S

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
0	SA0	4K	00000 - 00FFF
	SA1	4K	01000 - 01FFF
	SA2	4K	02000 - 02FFF
	SA3	4K	03000 - 03FFF
	SA4	4K	04000 - 04FFF
	SA5	4K	05000 - 05FFF
	SA6	4K	06000 - 06FFF
	SA7	4K	07000 - 07FFF
1	SA8	32K	08000 - 0FFFF
2	SA9	32K	10000 - 17FFF
3	SA10	32K	18000 - 1FFFF
4	SA11	32K	20000 - 27FFF
5	SA12	32K	28000 - 2FFFF
6	SA13	32K	30000 - 37FFF
7	SA14	32K	38000 - 3FFFF
8	SA15	32K	40000 - 47FFF
	SA16	32K	48000 - 4FFFF
	SA17	32K	50000 - 57FFF
	SA18	32K	58000 - 5FFFF
9	SA19	32K	60000 - 67FFF
	SA20	32K	68000 - 6FFFF
	SA21	32K	70000 - 77FFF
	SA22	32K	78000 - 7FFFF
10	SA23	32K	80000 - 87FFF
	SA24	32K	88000 - 8FFFF
	SA25	32K	90000 - 97FFF
	SA26	32K	98000 - 9FFFF
11	SA27	32K	A0000 - A7FFF
	SA28	32K	A8000 - AFFFF
	SA29	32K	B0000 - B7FFF
	SA30	32K	B8000 - BFFFF
12	SA31	32K	C0000 - C7FFF
	SA32	32K	C8000 - CFFFF
	SA33	32K	D0000 - D7FFF
	SA34	32K	D8000 - DFFFF

8. Memory Organization – AT49BV640S (Continued)

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
13	SA35	32K	E0000 - E7FFF
	SA36	32K	E8000 - EFFFF
	SA37	32K	F0000 - F7FFF
	SA38	32K	F8000 - FFFFF
14	SA39	32K	100000 - 107FFF
	SA40	32K	108000 - 10FFFF
	SA41	32K	110000 - 117FFF
	SA42	32K	118000 - 11FFFF
15	SA43	32K	120000 - 127FFF
	SA44	32K	128000 - 12FFFF
	SA45	32K	130000 - 137FFF
	SA46	32K	138000 - 13FFFF
16	SA47	32K	140000 - 147FFF
	SA48	32K	148000 - 14FFFF
	SA49	32K	150000 - 157FFF
	SA50	32K	158000 - 15FFFF
17	SA51	32K	160000 - 167FFF
	SA52	32K	168000 - 16FFFF
	SA53	32K	170000 - 177FFF
	SA54	32K	178000 - 17FFFF
18	SA55	32K	180000 - 187FFF
	SA56	32K	188000 - 18FFFF
	SA57	32K	190000 - 197FFF
	SA58	32K	198000 - 19FFFF
19	SA59	32K	1A0000 - 1A7FFF
	SA60	32K	1A8000 - 1AFFFF
	SA61	32K	1B0000 - 1B7FFF
	SA62	32K	1B8000 - 1BFFFF
20	SA63	32K	1C0000 - 1C7FFF
	SA64	32K	1C8000 - 1CFFFF
	SA65	32K	1D0000 - 1D7FFF
	SA66	32K	1D8000 - 1DFFFF
21	SA67	32K	1E0000 - 1E7FFF
	SA68	32K	1E8000 - 1EFFFF
	SA69	32K	1F0000 - 1F7FFF
	SA70	32K	1F8000 - 1FFFFF

8. Memory Organization – AT49BV640S (Continued)

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
22	SA71	32K	200000 - 207FFF
	SA72	32K	208000 - 20FFFF
	SA73	32K	210000 - 217FFF
	SA74	32K	218000 - 21FFFF
23	SA75	32K	220000 - 227FFF
	SA76	32K	228000 - 22FFFF
	SA77	32K	230000 - 237FFF
	SA78	32K	238000 - 23FFFF
24	SA79	32K	240000 - 247FFF
	SA80	32K	248000 - 24FFFF
	SA81	32K	250000 - 257FFF
	SA82	32K	258000 - 25FFFF
25	SA83	32K	260000 - 267FFF
	SA84	32K	268000 - 26FFFF
	SA85	32K	270000 - 277FFF
	SA86	32K	278000 - 27FFFF
26	SA87	32K	280000 - 287FFF
	SA88	32K	288000 - 28FFFF
	SA89	32K	290000 - 297FFF
	SA90	32K	298000 - 29FFFF
27	SA91	32K	2A0000 - 2A7FFF
	SA92	32K	2A8000 - 2AFFFF
	SA93	32K	2B0000 - 2B7FFF
	SA94	32K	2B8000 - 2BFFFF
28	SA95	32K	2C0000 - 2C7FFF
	SA96	32K	2C8000 - 2CFFFF
	SA97	32K	2D0000 - 2D7FFF
	SA98	32K	2D8000 - 2DFFFF
29	SA99	32K	2E0000 - 2E7FFF
	SA100	32K	2E8000 - 2EFFFF
	SA101	32K	2F0000 - 2F7FFF
	SA102	32K	2F8000 - 2FFFFF

8. Memory Organization – AT49BV640S (Continued)

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
30	SA103	32K	300000 - 307FFF
	SA104	32K	308000 - 30FFFF
	SA105	32K	310000 - 317FFF
	SA106	32K	318000 - 31FFFF
31	SA107	32K	320000 - 327FFF
	SA108	32K	328000 - 32FFFF
	SA109	32K	330000 - 337FFF
	SA110	32K	338000 - 33FFFF
32	SA111	32K	340000 - 347FFF
	SA112	32K	348000 - 34FFFF
	SA113	32K	350000 - 357FFF
	SA114	32K	358000 - 35FFFF
33	SA115	32K	360000 - 367FFF
	SA116	32K	368000 - 36FFFF
	SA117	32K	370000 - 377FFF
	SA118	32K	378000 - 37FFFF
34	SA119	32K	380000 - 387FFF
	SA120	32K	388000 - 38FFFF
	SA121	32K	390000 - 397FFF
	SA122	32K	398000 - 39FFFF
35	SA123	32K	3A0000 - 3A7FFF
	SA124	32K	3A8000 - 3AFFFF
	SA125	32K	3B0000 - 3B7FFF
	SA126	32K	3B8000 - 3BFFFF
36	SA127	32K	3C0000 - 3C7FFF
	SA128	32K	3C8000 - 3CFFFF
	SA129	32K	3D0000 - 3D7FFF
	SA130	32K	3D8000 - 3DFFFF
37	SA131	32K	3E0000 - 3E7FFF
	SA132	32K	3E8000 - 3EFFFF
	SA133	32K	3F0000 - 3F7FFF
	SA134	32K	3F8000 - 3FFFFF

9. Memory Organization – AT49BV640ST

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
37	SA0	32K	00000 - 07FFF
	SA1	32K	08000 - 0FFFF
	SA2	32K	10000 - 17FFF
	SA3	32K	18000 - 1FFFF
36	SA4	32K	20000 - 27FFF
	SA5	32K	28000 - 2FFFF
	SA6	32K	30000 - 37FFF
	SA7	32K	38000 - 3FFFF
35	SA8	32K	40000 - 47FFF
	SA9	32K	48000 - 4FFFF
	SA10	32K	50000 - 57FFF
	SA11	32K	58000 - 5FFFF
34	SA12	32K	60000 - 67FFF
	SA13	32K	68000 - 6FFFF
	SA14	32K	70000 - 77FFF
	SA15	32K	78000 - 7FFFF
33	SA16	32K	80000 - 87FFF
	SA17	32K	88000 - 8FFFF
	SA18	32K	90000 - 97FFF
	SA19	32K	98000 - 9FFFF
32	SA20	32K	A0000 - A7FFF
	SA21	32K	A8000 - AFFFF
	SA22	32K	B0000 - B7FFF
	SA23	32K	B8000 - BFFFF
31	SA24	32K	C0000 - C7FFF
	SA25	32K	C8000 - CFFFF
	SA26	32K	D0000 - D7FFF
	SA27	32K	D8000 - DFFFF
30	SA28	32K	E0000 - E7FFF
	SA29	32K	E8000 - EFFFF
	SA30	32K	F0000 - F7FFF
	SA31	32K	F8000 - FFFFF
29	SA32	32K	100000 - 107FFF
	SA33	32K	108000 - 10FFFF
	SA34	32K	110000 - 117FFF
	SA35	32K	118000 - 11FFFF

9. Memory Organization – AT49BV640ST (Continued)

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
28	SA36	32K	120000 - 127FFF
	SA37	32K	128000 - 12FFFF
	SA38	32K	130000 - 137FFF
	SA39	32K	138000 - 13FFFF
27	SA40	32K	140000 - 147FFF
	SA41	32K	148000 - 14FFFF
	SA42	32K	150000 - 157FFF
	SA43	32K	158000 - 15FFFF
26	SA44	32K	160000 - 167FFF
	SA45	32K	168000 - 16FFFF
	SA46	32K	170000 - 177FFF
	SA47	32K	178000 - 17FFFF
25	SA48	32K	180000 - 187FFF
	SA49	32K	188000 - 18FFFF
	SA50	32K	190000 - 197FFF
	SA51	32K	198000 - 19FFFF
24	SA52	32K	1A0000 - 1A7FFF
	SA53	32K	1A8000 - 1AFFFF
	SA54	32K	1B0000 - 1B7FFF
	SA55	32K	1B8000 - 1BFFFF
23	SA56	32K	1C0000 - 1C7FFF
	SA57	32K	1C8000 - 1CFFFF
	SA58	32K	1D0000 - 1D7FFF
	SA59	32K	1D8000 - 1DFFFF
22	SA60	32K	1E0000 - 1E7FFF
	SA61	32K	1E8000 - 1EFFFF
	SA62	32K	1F0000 - 1F7FFF
	SA63	32K	1F8000 - 1FFFFF
21	SA64	32K	200000 - 207FFF
	SA65	32K	208000 - 20FFFF
	SA66	32K	210000 - 217FFF
	SA67	32K	218000 - 21FFFF
20	SA68	32K	220000 - 227FFF
	SA69	32K	228000 - 22FFFF
	SA70	32K	230000 - 237FFF
	SA71	32K	238000 - 23FFFF

9. Memory Organization – AT49BV640ST (Continued)

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
19	SA72	32K	240000 - 247FFF
	SA73	32K	248000 - 24FFFF
	SA74	32K	250000 - 257FFF
	SA75	32K	258000 - 25FFFF
18	SA76	32K	260000 - 267FFF
	SA77	32K	268000 - 26FFFF
	SA78	32K	270000 - 277FFF
	SA79	32K	278000 - 27FFFF
17	SA80	32K	280000 - 287FFF
	SA81	32K	288000 - 28FFFF
	SA82	32K	290000 - 297FFF
	SA83	32K	298000 -29FFFF
16	SA84	32K	2A0000 - 2A7FFF
	SA85	32K	2A8000 - 2AFFFF
	SA86	32K	2B0000 - 2B7FFF
	SA87	32K	2B8000 - 2BFFFF
15	SA88	32K	2C0000 - 2C7FFF
	SA89	32K	2C8000 - 2CFFFF
	SA90	32K	2D0000 - 2D7FFF
	SA91	32K	2D8000 - 2DFFFF
14	SA92	32K	2E0000 - 2E7FFF
	SA93	32K	2E8000 - 2EFFFF
	SA94	32K	2F0000 - 2F7FFF
	SA95	32K	2F8000 - 2FFFFF
13	SA96	32K	300000 - 307FFF
	SA97	32K	308000 - 30FFFF
	SA98	32K	310000 - 317FFF
	SA99	32K	318000 - 31FFFF
12	SA100	32K	320000 - 327FFF
	SA101	32K	328000 - 32FFFF
	SA102	32K	330000 - 337FFF
	SA103	32K	338000 - 33FFFF

9. Memory Organization – AT49BV640ST (Continued)

Secure Region (SCR)	Sector	Size (Words)	x16 Address Range (A21 - A0)
11	SA104	32K	340000 - 347FFF
	SA105	32K	348000 - 34FFFF
	SA106	32K	350000 - 357FFF
	SA107	32K	358000 - 35FFFF
10	SA108	32K	360000 - 367FFF
	SA109	32K	368000 - 36FFFF
	SA110	32K	370000 - 377FFF
	SA111	32K	378000 - 37FFFF
9	SA112	32K	380000 - 387FFF
	SA113	32K	388000 - 38FFFF
	SA114	32K	390000 - 397FFF
	SA115	32K	398000 - 39FFFF
8	SA116	32K	3A0000 - 3A7FFF
	SA117	32K	3A8000 - 3AFFFF
	SA118	32K	3B0000 - 3B7FFF
	SA119	32K	3B8000 - 3BFFFF
7	SA120	32K	3C0000 - 3C7FFF
6	SA121	32K	3C8000 - 3CFFFF
5	SA122	32K	3D0000 - 3D7FFF
4	SA123	32K	3D8000 - 3DFFFF
3	SA124	32K	3E0000 - 3E7FFF
2	SA125	32K	3E8000 - 3EFFFF
1	SA126	32K	3F0000 - 3F7FFF
0	SA127	4K	3F8000 - 3F8FFF
	SA128	4K	3F9000 - 3F9FFF
	SA129	4K	3FA000 - 3FAFFF
	SA130	4K	3FB000 - 3FBFFF
	SA131	4K	3FC000 - 3FCFFF
	SA132	4K	3FD000 - 3FDFFF
	SA133	4K	3FE000 - 3FEFFF
	SA134	4K	3FF000 - 3FFFFF

10. DC and AC Operating Range

		AT49BV640S(T)-70
Operating Temperature (Case)	Industrial	-40°C - 85°C
V_{CC} Power Supply		2.65V - 3.6V

11. Operating Modes

Mode	$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	$\overline{RESET}$	V_{PP}[1]	Ai	I/O
Read	V_{IL}	V_{IL}	V_{IH}	V_{IH}	X[2]	Ai	D_{OUT}
Program/Erase[3]	V_{IL}	V_{IH}	V_{IL}	V_{IH}	V_{IHPP}[4]	Ai	D_{IN}
Standby/Program Inhibit	V_{IH}	X[2]	X	V_{IH}	X	X	High Z
Program Inhibit	X	X	V_{IH}	V_{IH}	X		
	X	V_{IL}	X	V_{IH}	X		
	X	X	X	X	V_{ILPP}[5]		
Output Disable	X	V_{IH}	X	V_{IH}	X		High Z
Reset	X	X	X	V_{IL}	X	X	High Z
Product Identification Software				V_{IH}		A0 = V_{IL}, A1 - A21 = V_{IL}	Manufacturer Code[6]
						A0 = V_{IH}, A1 - A21 = V_{IL}	Device Code[6]

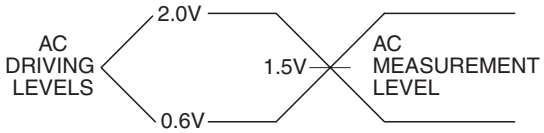
Notes:
1. The VPP pin can be tied to V_{CC}. For faster program operation, V_{PP} can be set to 9.5V ± 0.5V.
2. X can be VIL or VIH.
3. Refer to AC programming waveforms on page 25.
4. V_{IHPP} (min) = 1.65V.
5. V_{ILPP} (max) = 0.4V.
6. Manufacturer Code: 001FH; Device Code: 02DEH – AT49BV640S; 02DBH – AT49BV640ST

12. DC Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Units
I_{LI}	Input Load Current	V_{IN} = 0V to V_{CC}			2	µA
I_{LO}	Output Leakage Current	$V_{I/O}$ = 0V to V_{CC}			2	µA
I_{SB}	V_{CC} Standby Current CMOS	$\overline{CE}$ = V_{CCQ} - 0.3V to V_{CC}		15	25	µA
I_{CC}[1]	V_{CC} Active Read Current	f = 5 MHz; I_{OUT} = 0 mA		10	15	mA
I_{CC1}	V_{CC} Programming Current				25	mA
I_{PP1}	V_{PP} Input Load Current				10	µA
V_{IL}	Input Low Voltage				0.6	V
V_{IH}	Input High Voltage		V_{CCQ} - 0.6			V
V_{OL}	Output Low Voltage	I_{OL} = 2.1 mA			0.45	V
V_{OH}	Output High Voltage	I_{OH} = -100 µA	V_{CCQ} - 0.1			V

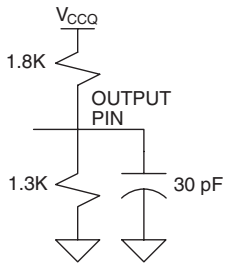
Note: 1. In the erase mode, I_{CC} is 25 mA.

13. Input Test Waveforms and Measurement Level



t_R, t_F < 5 ns

14. Output Test Load



15. Pin Capacitance

f = 1 MHz, T = 25°C[1]

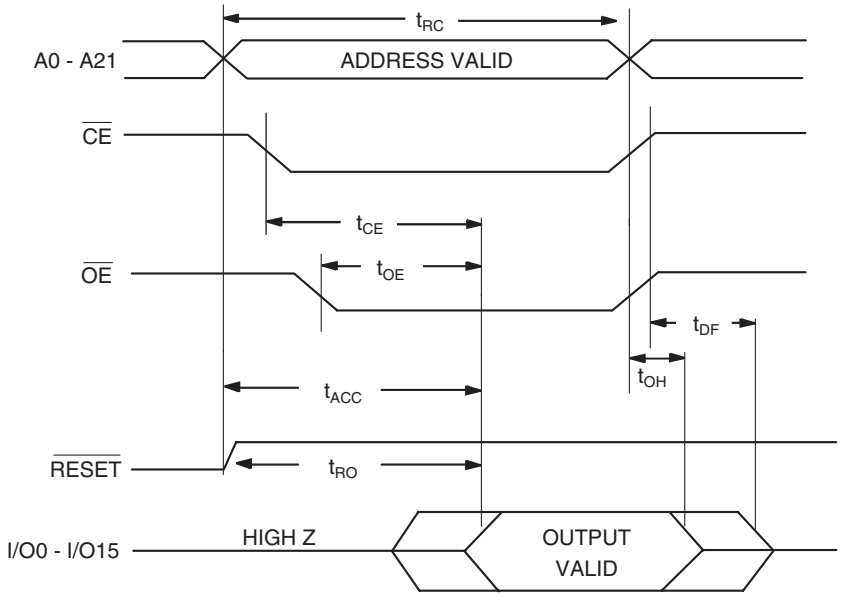
	Typ	Max	Units	Conditions
C_{IN}	4	6	pF	V_{IN} = 0V
C_{OUT}	8	12	pF	V_{OUT} = 0V

Note: 1. This parameter is characterized and is not 100% tested.

16. AC Read Characteristics

Symbol	Parameter	AT49BV640S(T)-70		Units
		Min	Max	
t_{RC}	Read Cycle Time	70		ns
t_{ACC}	Access, Address to Data Valid		70	ns
t_{CE}[1]	Access, $\overline{CE}$ to Data Valid		70	ns
t_{OE}[2]	$\overline{OE}$ to Data Valid		20	ns
t_{DF}[3][4]	$\overline{CE}$, $\overline{OE}$ High to Data Float		25	ns
t_{OH}	Output Hold from $\overline{OE}$, $\overline{CE}$ or Address, whichever Occurs First	0		ns
t_{RO}	$\overline{RESET}$ to Output Delay		100	ns

17. Asynchronous Read Cycle Waveform[1][2][3][4]



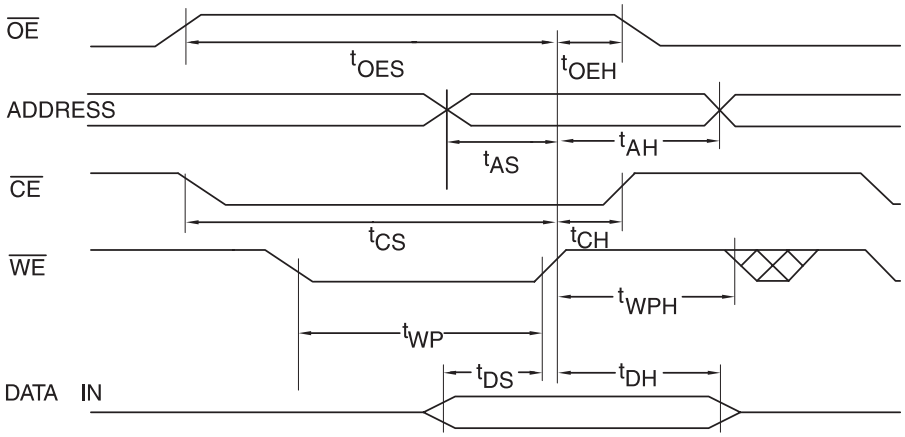
Notes:
1. $\overline{CE}$ may be delayed up to $t_{ACC} - t_{CE}$ after the address transition without impact on t_{ACC}.
2. $\overline{OE}$ may be delayed up to $t_{CE} - t_{OE}$ after the falling edge of $\overline{CE}$ without impact on t_{CE} or by $t_{ACC} - t_{OE}$ after an address change without impact on t_{ACC}.
3. t_{DF} is specified from $\overline{OE}$ or $\overline{CE}$, whichever occurs first (CL = 5 pF).
4. This parameter is characterized and is not 100% tested.

18. AC Word Load Characteristics

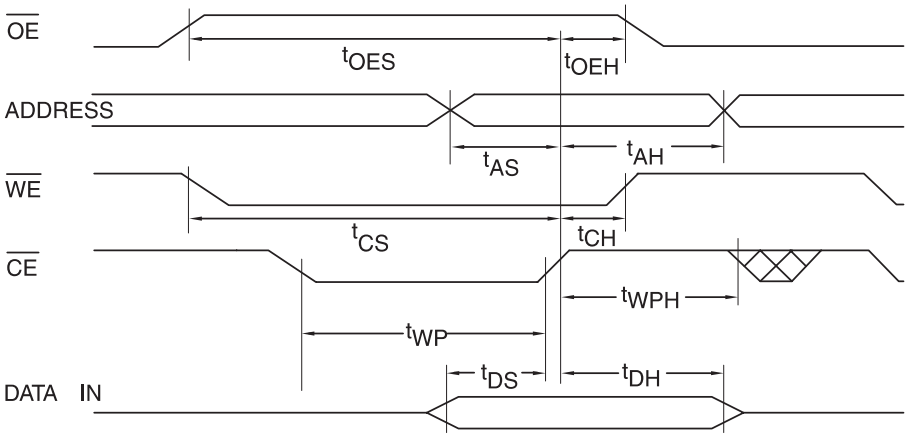
Symbol	Parameter	Min	Max	Units
t_{AS}, t_{OES}	Address, $\overline{OE}$ Setup Time	20		ns
t_{AH}	Address Hold Time	0		ns
t_{CS}	Chip Select Setup Time	0		ns
t_{CH}	Chip Select Hold Time	0		ns
t_{WP}	Write Pulse Width ($\overline{WE}$ or $\overline{CE}$)	25		ns
t_{WPH}	Write Pulse Width High	15		ns
t_{DS}	Data Setup Time	25		ns
t_{DH}, t_{OEH}	Data, $\overline{OE}$ Hold Time	0		ns

19. AC Word Load Waveforms

19.1 $\overline{WE}$ Controlled



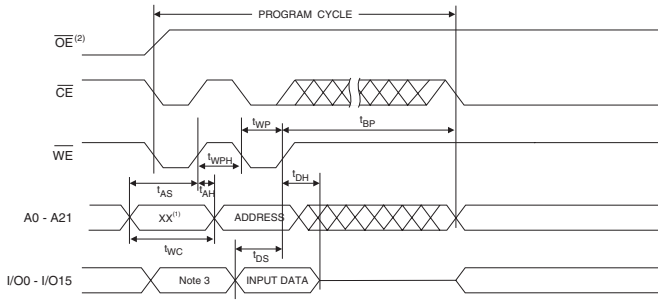
19.2 $\overline{CE}$ Controlled



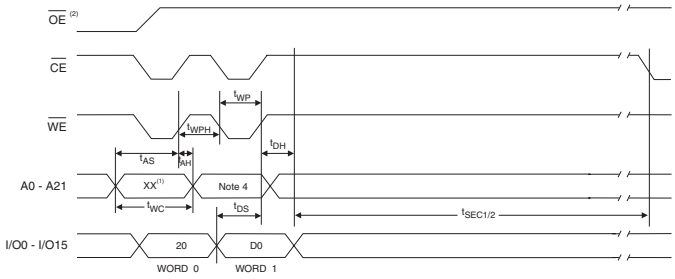
20. Program Cycle Characteristics

Symbol	Parameter	Min	Typ	Max	Units
t_{BP}	Word Programming Time		10	120	µs
t_{BPD}	Word Programming Time in Dual Programming Mode		5	60	µs
t_{AS}	Address Setup Time	20			ns
t_{AH}	Address Hold Time	0			ns
t_{DS}	Data Setup Time	25			ns
t_{DH}	Data Hold Time	0			ns
t_{WP}	Write Pulse Width	25			ns
t_{WPH}	Write Pulse Width High	15			ns
t_{WC}	Write Cycle Time	70			ns
t_{RP}	$\overline{\text{Reset}}$ Pulse Width	500			ns
t_{SEC1}	Sector Erase Cycle Time (4K Word Sectors)		0.1	2.0	seconds
t_{SEC2}	Sector Erase Cycle Time (32K Word Sectors)		0.5	6.0	seconds
t_{ES}	Erase Suspend Time			15	µs
t_{PS}	Program Suspend Time			10	µs
t_{ERES}	Delay between Erase Resume and Erase Suspend	500			µs

21. Program Cycle Waveforms



22. Sector Erase Cycle Waveforms



Notes:
1. Any address can be used to load data.
2. $\overline{\text{OE}}$ must be high only when $\overline{\text{WE}}$ and $\overline{\text{CE}}$ are both low.
3. The data can be 40H or 10H.
4. The address depends on what sector is to be erased.

23. Common Flash Interface Definition Table

Address	AT49BV640ST	AT49BV640S	Comments
10h	0051h	0051h	“Q”
11h	0052h	0052h	“R”
12h	0059h	0059h	“Y”
13h	0003h	0003h	
14h	0000h	0000h	
15h	0041h	0041h	
16h	0000h	0000h	
17h	0000h	0000h	
18h	0000h	0000h	
19h	0000h	0000h	
1Ah	0000h	0000h	
1Bh	0027h	0027h	VCC min write/erase
1Ch	0036h	0036h	VCC max write/erase
1Dh	0090h	0090h	VPP min voltage
1Eh	00A0h	00A0h	VPP max voltage
1Fh	0004h	0004h	Typ word write – 10 µs
20h	0002h	0002h	Typ dual word program time – 5 µs
21h	0009h	0009h	Typ sector erase – 700 ms
22h	0000h	0000h	Typ chip erase – N/A
23h	0004h	0004h	Max word write/typ time
24h	0004h	0004h	Max dual word program time/typical time
25h	0003h	0003h	Max sector erase/typ sector erase
26h	0000h	0000h	Max chip erase/ typ chip erase – N/A
27h	0017h	0017h	Device size
28h	0001h	0001h	x16 device
29h	0000h	0000h	x16 device
2Ah	0002h	0002h	Maximum number of bytes in multiple byte write = 4
2Bh	0000h	0000h	Maximum number of bytes in multiple byte write = 4
2Ch	0002h	0002h	2 regions, x = 2
2Dh	007Eh	0007h	64K bytes, Y = 126 (Top); 8K bytes, Y = 7 (Bottom)
2Eh	0000h	0000h	64K bytes, Y = 126 (Top); 8K bytes, Y = 7 (Bottom)
2Fh	0000h	0020h	64K bytes, Z = 256 (Top); 8K bytes, Z = 32 (Bottom)
30h	0001h	0000h	64K bytes, Z = 256 (Top); 8K bytes, Z = 32 (Bottom)
31h	0007h	007Eh	8K bytes, Y = 7 (Top); 64K bytes, Y = 126 (Bottom)
32h	0000h	0000h	8K bytes, Y = 7 (Top); 64K bytes, Y = 126 (Bottom)
33h	0020h	0000h	8K bytes, Z = 32 (Top);64K bytes, Z = 256 (Bottom)
34h	0000h	0001h	8K bytes, Z = 32 (Top);64K bytes, Z = 256 (Bottom)

23. Common Flash Interface Definition Table (Continued)

Address	AT49BV640ST	AT49BV640S	Comments
VENDOR SPECIFIC EXTENDED QUERY			
41h	0050h	0050h	“P”
42h	0052h	0052h	“R”
43h	0049h	0049h	“I”
44h	0031h	0031h	Major version number, ASCII
45h	0030h	0030h	Minor version number, ASCII
46h	0086h	0086h	Bit 0 – chip erase supported, 0 – no, 1 – yes Bit 1 – erase suspend supported, 0 – no, 1 – yes Bit 2 – program suspend supported, 0 – no, 1 – yes Bit 3 – simultaneous operations supported, 0 – no, 1 – yes Bit 4 – burst mode read supported, 0 – no, 1 – yes Bit 5 – page mode read supported, 0 – no, 1 – yes Bit 6 – queued erase supported, 0 – no, 1 – yes Bit 7 – protection bits supported, 0 – no, 1 – yes
47h	0000h	0001h	Bit 0 – top (“0”) or bottom (“1”) boot block device Undefined bits are “0”
48h	0000h	0000h	Bit 0 – 4 word linear burst with wrap around, 0 – no, 1 – yes Bit 1 – 8 word linear burst with wrap around, 0 – no, 1 – yes Bit 2 – 16 word linear burst with wrap around, 0 – no, 1 – yes Bit 3 – continuous burst, 0 – no, 1 – yes Undefined bits are “0”
49h	0000h	0000h	Bit 0 – 4 word page, 0 – no, 1 – yes Bit 1 – 8 word page, 0 – no, 1 – yes Undefined bits are “0”
4Ah	0080h	0080h	Location of protection register lock byte, the section’s first byte
4Bh	0003h	0003h	# of bytes in the factory prog section of prot register – 2*n
4Ch	0003h	0003h	# of bytes in the user prog section of prot register – 2*n

24. Ordering Information

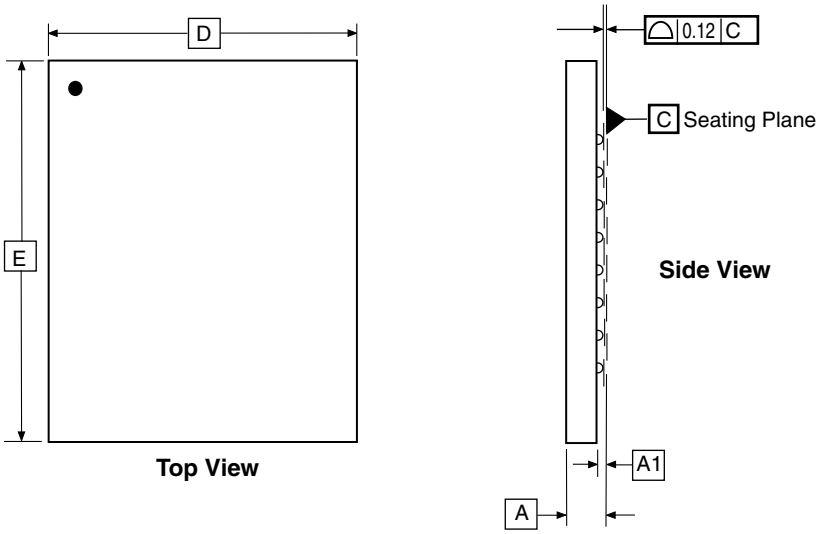
24.1 Green Package (Pb/Halide-free/RoHS Compliant)

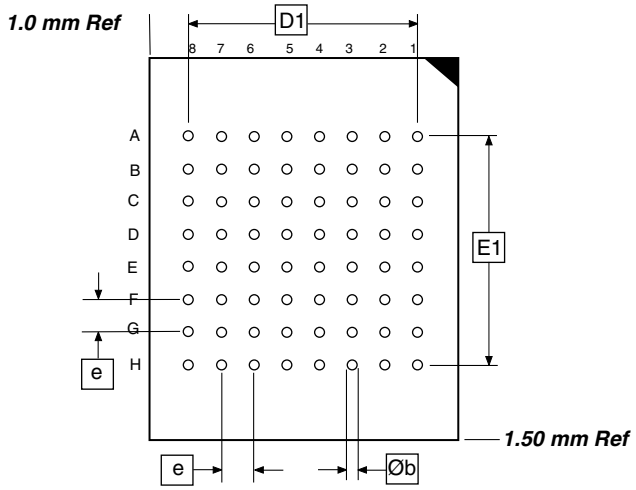
t_{ACC} (ns)	I_{CC} (mA)		Ordering Code	Package	Operation Range
	Active	Standby			
70	10	0.025	AT49BV640S-70CU	64C1	Industrial (-40° to 85° C)
			AT49BV640ST-70CU		

Package Type	
64C1	64-ball, Plastic Chip-size Ball Grid Array Package (CBGA)

25. Packaging Information

25.1 64C1 – CBGA





COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.00	
A1	0.23	–	–	
D	8.90	9.00	9.10	
D1		7.0 TYP		
E	9.90	10.00	10.10	
E1		7.0 TYP		
e		1.0 TYP		
Øb		0.35 TYP		

1/25/05

	TITLE	DRAWING NO.	REV.
2325 Orchard Parkway San Jose, CA 95131	**64C1**, 64-ball (8 x 8 Array), 9 x 10 x 1.0 mm Body, 1.0 mm Ball Pitch Chip-scale Ball Grid Array Package (CBGA)	64C1	B

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