

## Features

- Single Voltage Read/Write Operation: 2.65V to 3.6V
- Access Time – 70 ns
- Sector Erase Architecture
  - Thirty-one 32K Word (64K Bytes) Sectors with Individual Write Lockout
  - Eight 4K Word (8K Bytes) Sectors with Individual Write Lockout
- Fast Word Program Time – 10  $\mu$ s
- 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 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  $\mu$ A Standby
- VPP Pin for Write Protection and Accelerated Program Operations
- $\overline{\text{RESET}}$  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

## 1. Description

The AT49BV160S(T) is a 2.7-volt 16-megabit Flash memory organized as 1,048,576 words of 16 bits each. The memory is divided into 39 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.

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 AT49BV160S(T) allows the user to permanently lock thirty-nine 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 of each secure region is the same as the sector size, and the location of these regions is determined by the Top or Bottom Boot Block designation. The location of the secure regions is shown on [page 3](#).

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 and write operations, standard sector operations including standard Sector locking operations can be performed on all regions that are not secure locked.



**16-megabit  
(1M x 16)  
Secure  
3-volt Only  
Memory**

**AT49BV160S  
AT49BV160ST**

**Summary  
(Complete  
Datasheet  
under NDA)**

**NOTE:** This is a summary document. The complete document is available under NDA. For more information, please contact your local Atmel sales office.

3560AS-FLASH-9/06



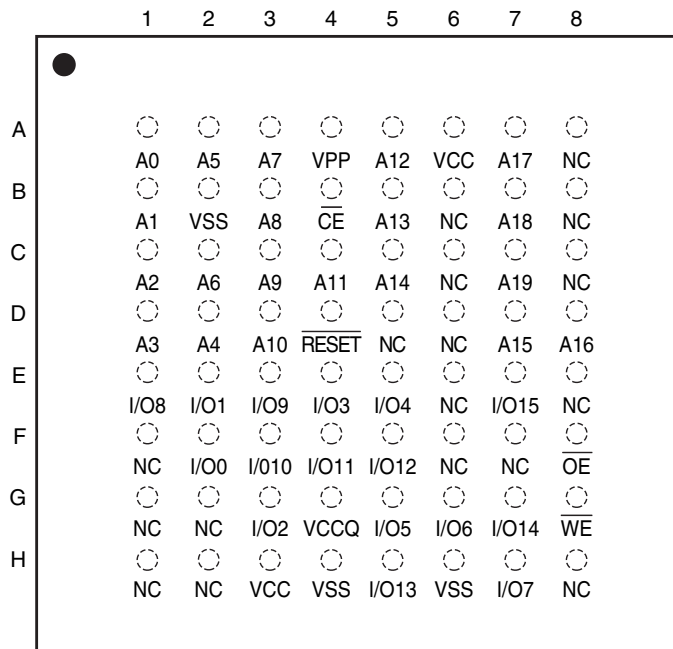


The AT49BV160S(T) device also contains a freeze feature that will freeze the lock status of the secure regions. The freeze feature prevents any further locking of the secure regions. If the user requires certain regions to be locked, then these regions must be programmed and locked prior to activation of the freeze command. It is important to note that enabling the freeze feature is irreversible.

## 2. Pin Configurations

Pin Name	Function
A0 - A19	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-lead CBGA Top View



## 3. AT49BV160S – Sector Address Table

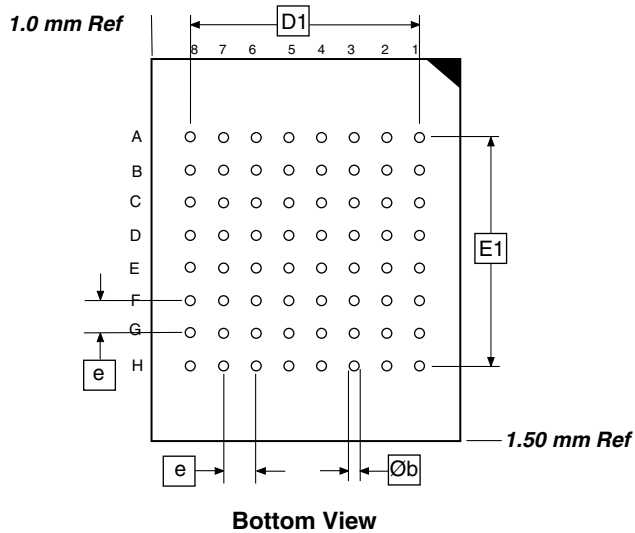
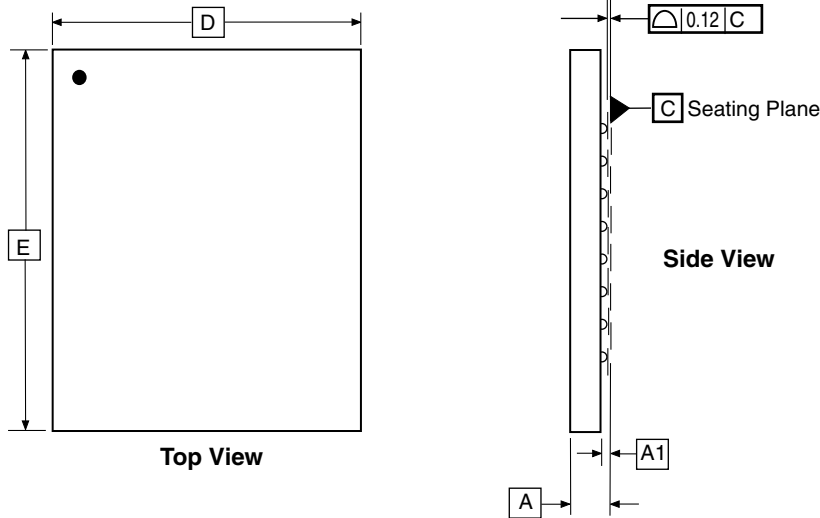
Secure Region (SCR)	Sector	Size (Bytes/Words)	Address Range (A20 - A0)
0	SA0	8K/4K	00000 - 00FFF
1	SA1	8K/4K	01000 - 01FFF
2	SA2	8K/4K	02000 - 02FFF
3	SA3	8K/4K	03000 - 03FFF
4	SA4	8K/4K	04000 - 04FFF
5	SA5	8K/4K	05000 - 05FFF
6	SA6	8K/4K	06000 - 06FFF
7	SA7	8K/4K	07000 - 07FFF
8	SA8	64K/32K	08000 - 0FFFF
9	SA9	64K/32K	10000 - 17FFF
10	SA10	64K/32K	18000 - 1FFFF
11	SA11	64K/32K	20000 - 27FFF
12	SA12	64K/32K	28000 - 2FFFF
13	SA13	64K/32K	30000 - 37FFF
14	SA14	64K/32K	38000 - 3FFFF
15	SA15	64K/32K	40000 - 47FFF
16	SA16	64K/32K	48000 - 4FFFF
17	SA17	64K/32K	50000 - 57FFF
18	SA18	64K/32K	58000 - 5FFFF
19	SA19	64K/32K	60000 - 67FFF
20	SA20	64K/32K	68000 - 6FFFF
21	SA21	64K/32K	70000 - 77FFF
22	SA22	64K/32K	78000 - 7FFFF
23	SA23	64K/32K	80000 - 87FFF
24	SA24	64K/32K	88000 - 8FFFF
25	SA25	64K/32K	90000 - 97FFF
26	SA26	64K/32K	98000 - 9FFFF
27	SA27	64K/32K	A0000 - A7FFF
28	SA28	64K/32K	A8000 - AFFFF
29	SA29	64K/32K	B0000 - B7FFF
30	SA30	64K/32K	B8000 - BFFFF
31	SA31	64K/32K	C0000 - C7FFF
32	SA32	64K/32K	C8000 - CFFFF
33	SA33	64K/32K	D0000 - D7FFF
34	SA34	64K/32K	D8000 - DFFFF
35	SA35	64K/32K	E0000 - E7FFF
36	SA36	64K/32K	E8000 - EFFFF
37	SA37	64K/32K	F0000 - F7FFF
38	SA38	64K/32K	F8000 - FFFFF

## 4. AT49BV160ST – Sector Address Table

Secure Region (SCR)	Sector	Size (Bytes/Words)	Address Range (A20 - A0)
38	SA0	64K/32K	00000 - 07FFF
37	SA1	64K/32K	08000 - 0FFFF
36	SA2	64K/32K	10000 - 17FFF
35	SA3	64K/32K	18000 - 1FFFF
34	SA4	64K/32K	20000 - 27FFF
33	SA5	64K/32K	28000 - 2FFFF
32	SA6	64K/32K	30000 - 37FFF
31	SA7	64K/32K	38000 - 3FFFF
30	SA8	64K/32K	40000 - 47FFF
29	SA9	64K/32K	48000 - 4FFFF
28	SA10	64K/32K	50000 - 57FFF
27	SA11	64K/32K	58000 - 5FFFF
26	SA12	64K/32K	60000 - 67FFF
25	SA13	64K/32K	68000 - 6FFFF
24	SA14	64K/32K	70000 - 77FFF
23	SA15	64K/32K	78000 - 7FFFF
22	SA16	64K/32K	80000 - 87FFF
21	SA17	64K/32K	88000 - 8FFFF
20	SA18	64K/32K	90000 - 97FFF
19	SA19	64K/32K	98000 - 9FFFF
18	SA20	64K/32K	A0000 - A7FFF
17	SA21	64K/32K	A8000 - AFFFF
16	SA22	64K/32K	B0000 - B7FFF
15	SA23	64K/32K	B8000 - BFFFF
14	SA24	64K/32K	C0000 - C7FFF
13	SA25	64K/32K	C8000 - CFFFF
12	SA26	64K/32K	D0000 - D7FFF
11	SA27	64K/32K	D8000 - DFFFF
10	SA28	64K/32K	E0000 - E7FFF
9	SA29	64K/32K	E8000 - EFFFF
8	SA30	64K/32K	F0000 - F7FFF
7	SA31	8K/4K	F8000 - F8FFF
6	SA32	8K/4K	F9000 - F9FFF
5	SA33	8K/4K	FA000 - FAFFF
4	SA34	8K/4K	FB000 - FBFFF
3	SA35	8K/4K	FC000 - FCFFF
2	SA36	8K/4K	FD000 - FDFFF
1	SA37	8K/4K	FE000 - FEFFF
0	SA38	8K/4K	FF000 - FFFFF

## 5. Packaging Information

### 5.1 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



2325 Orchard Parkway  
San Jose, CA 95131

**TITLE**

**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)

**DRAWING NO.**

64C1

**REV.**

B



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