
Features

- Single 2.7V - 3.6V Supply
- Fast Read Access Time – 200 ns
- Automatic Page Write Operation
 - Internal Address and Data Latches for 64 Bytes
 - Internal Control Timer
- Fast Write Cycle Times
 - Page Write Cycle Time: 10 ms Maximum
 - 1- to 64-byte Page Write Operation
- Low Power Dissipation
 - 15 mA Active Current
 - 20 μ A CMOS Standby Current
- Hardware and Software Data Protection
- $\overline{\text{Data}}$ Polling for End of Write Detection
- High Reliability CMOS Technology
 - Endurance: 10,000 Cycles
 - Data Retention: 10 Years
- JEDEC Approved Byte-wide Pinout
- Industrial Temperature Ranges
- Green (Pb/Halide-free) Packaging Option

1. Description

The AT28BV256 is a high-performance electrically erasable and programmable read-only memory. Its 256K of memory is organized as 32,768 words by 8 bits. Manufactured with Atmel's advanced nonvolatile CMOS technology, the device offers access times to 200 ns with power dissipation of just 54 mW. When the device is deselected, the CMOS standby current is less than 200 μ A.

The AT28BV256 is accessed like a Static RAM for the read or write cycle without the need for external components. The device contains a 64-byte page register to allow writing of up to 64 bytes simultaneously. During a write cycle, the addresses and 1 to 64 bytes of data are internally latched, freeing the address and data bus for other operations. Following the initiation of a write cycle, the device will automatically write the latched data using an internal control timer. The end of a write cycle can be detected by $\overline{\text{Data}}$ polling of I/O7. Once the end of a write cycle has been detected a new access for a read or write can begin.

Atmel's AT28BV256 has additional features to ensure high quality and manufacturability. The device utilizes internal error correction for extended endurance and improved data retention characteristics. An optional software data protection mechanism is available to guard against inadvertent writes. The device also includes an extra 64 bytes of EEPROM for device identification or tracking.



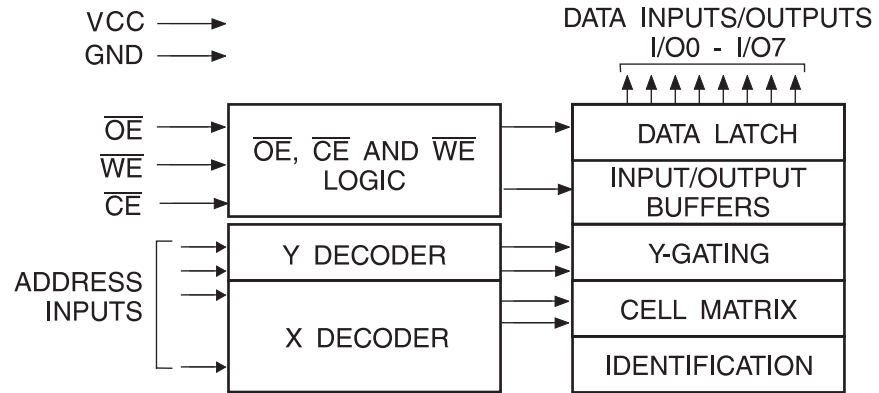
**256K (32K x 8)
Battery-Voltage
Parallel
EEPROMs**

AT28BV256

0273J-PEEPR-10/06



3. Block Diagram



4. Absolute Maximum Ratings*

Temperature under Bias	-55°C to +125°C
Storage Temperature	-65°C to +150°C
All Input Voltages (including NC Pins) with Respect to Ground	-0.6V to +6.25V
All Output Voltages with Respect to Ground	-0.6V to $V_{CC} + 0.6V$
Voltage on \overline{OE} and A9 with Respect to Ground	-0.6V to +13.5V

*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

6. DC and AC Operating Range

AT28BV256-20	
Operating Temperature (Case)	-40°C - 85°C
V _{CC} Power Supply	2.7V - 3.6V

7. Operating Modes

Mode	\overline{CE}	\overline{OE}	\overline{WE}	I/O
Read	V _{IL}	V _{IL}	V _{IH}	D _{OUT}
Write ⁽²⁾	V _{IL}	V _{IH}	V _{IL}	D _{IN}
Standby/Write Inhibit	V _{IH}	X ⁽¹⁾	X	High Z
Write Inhibit	X	X	V _{IH}	
Write Inhibit	X	V _{IL}	X	
Output Disable	X	V _{IH}	X	High Z
Chip Erase	V _{IL}	V _H ⁽³⁾	V _{IL}	High Z

- Notes:
1. X can be V_{IL} or V_{IH}.
 2. Refer to AC programming waveforms.
 3. V_H = 12.0V ± 0.5V.

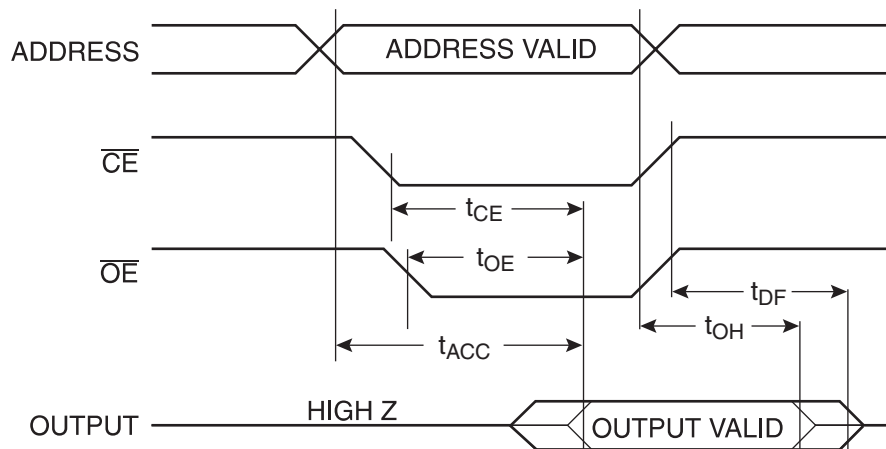
8. DC Characteristics

Symbol	Parameter	Condition	Min	Max	Units
I _{LI}	Input Load Current	V _{IN} = 0V to V _{CC} + 1V		10	μA
I _{LO}	Output Leakage Current	V _{I/O} = 0V to V _{CC}		10	μA
I _{SB}	V _{CC} Standby Current CMOS	$\overline{CE} = V_{CC} - 0.3V$ to V _{CC} + 1V		50	μA
I _{CC}	V _{CC} Active Current	f = 5 MHz; I _{OUT} = 0 mA		15	mA
V _{IL}	Input Low Voltage			0.6	V
V _{IH}	Input High Voltage		2.0		V
V _{OL}	Output Low Voltage	I _{OL} = 1.6 mA		0.3	V
V _{OH}	Output High Voltage	I _{OH} = -100 μA	2.0		V

9. AC Read Characteristics

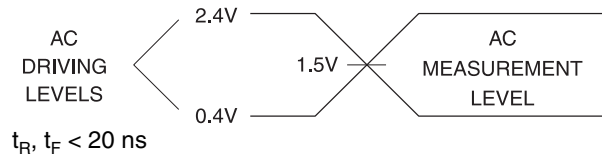
Symbol	Parameter	AT28BV256-20		Units
		Min	Max	
t_{ACC}	Address to Output Delay		200	ns
$t_{CE}^{(1)}$	\overline{CE} to Output Delay		200	ns
$t_{OE}^{(2)}$	\overline{OE} to Output Delay	0	80	ns
$t_{DF}^{(3)(4)}$	\overline{CE} or \overline{OE} to Output Float	0	55	ns
t_{OH}	Output Hold from \overline{OE} , \overline{CE} or Address, whichever occurred first	0		ns

10. AC Read Waveforms⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

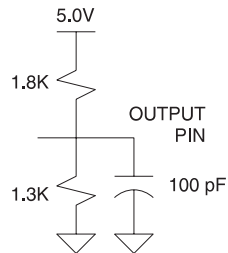


- Notes:
1. \overline{CE} may be delayed up to $t_{ACC} - t_{CE}$ after the address transition without impact on t_{ACC} .
 2. \overline{OE} may be delayed up to $t_{CE} - t_{OE}$ after the falling edge of \overline{CE} without impact on t_{CE} or by $t_{ACC} - t_{OE}$ after an address change without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

11. Input Test Waveforms and Measurement Level



12. Output Test Load



13. Pin Capacitance

$f = 1 \text{ MHz}$, $T = 25^\circ\text{C}^{(1)}$

Symbol	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.

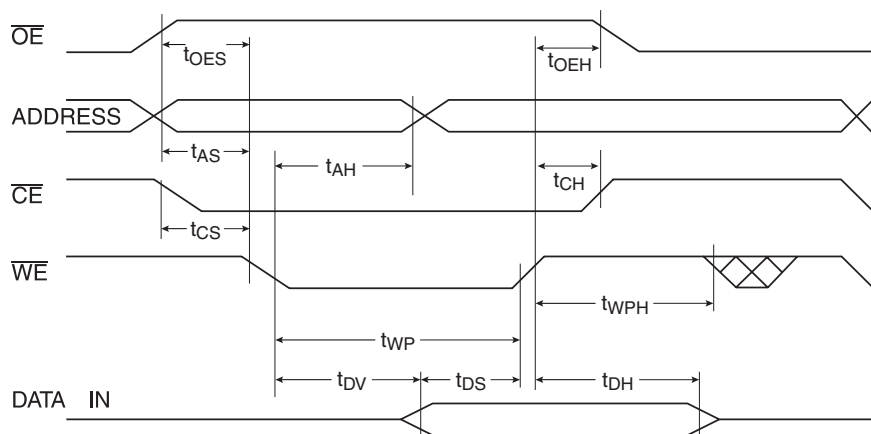
14. AC Write Characteristics

Symbol	Parameter	Min	Max	Units
t_{AS}, t_{OES}	Address, \overline{OE} Set-up Time	0		ns
t_{AH}	Address Hold Time	50		ns
t_{CS}	Chip Select Set-up Time	0		ns
t_{CH}	Chip Select Hold Time	0		ns
t_{WP}	Write Pulse Width (\overline{WE} or \overline{CE})	200		ns
t_{DS}	Data Set-up Time	50		ns
t_{DH}, t_{OEH}	Data, \overline{OE} Hold Time	0		ns
t_{DV}	Time to Data Valid	NR ⁽¹⁾		

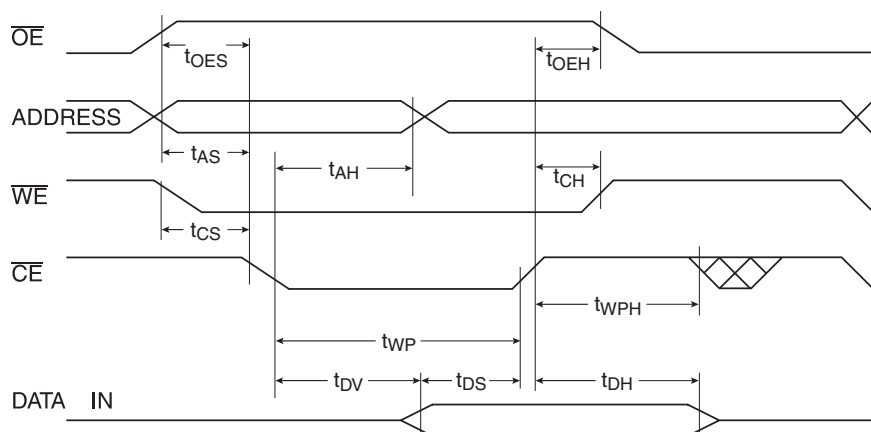
Note: 1. NR = No Restriction.

15. AC Write Waveforms

15.1 \overline{WE} Controlled



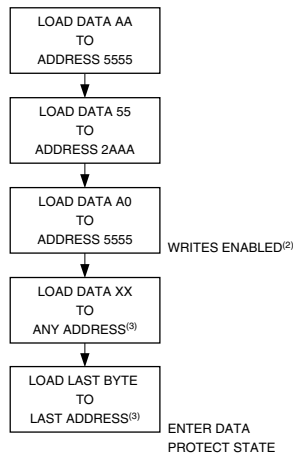
15.2 \overline{CE} Controlled



16. Page Mode Characteristics

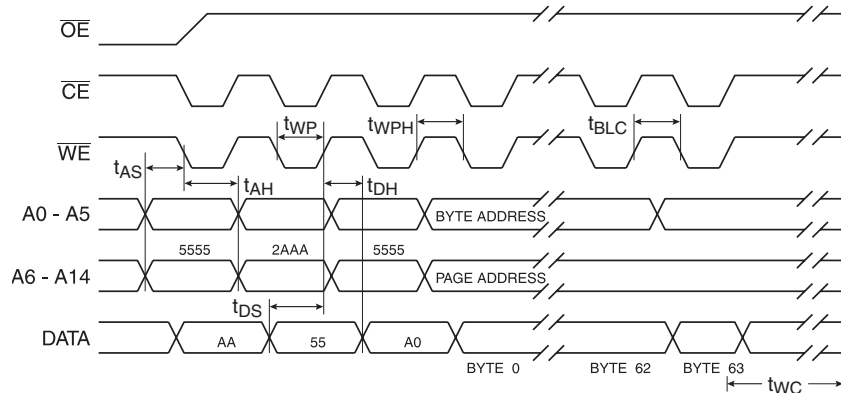
Symbol	Parameter	Min	Max	Units
t_{WC}	Write Cycle Time		10	ms
t_{AS}	Address Set-up Time	0		ns
t_{AH}	Address Hold Time	50		ns
t_{DS}	Data Set-up Time	50		ns
t_{DH}	Data Hold Time	0		ns
t_{WP}	Write Pulse Width	200		ns
t_{BLC}	Byte Load Cycle Time		150	μ s
t_{WPH}	Write Pulse Width High	100		ns

17. Programming Algorithm⁽¹⁾⁽²⁾⁽³⁾



- Notes:
1. Data Format: I/O7 - I/O0 (Hex); Address Format: A14 - A0 (Hex).
 2. Data protect state will be re-activated at the end of program cycle.
 3. 1 to 64 bytes of data are loaded.

18. Software Protected Program Cycle Waveforms⁽¹⁾⁽²⁾⁽³⁾



- Notes:
1. A0 - A14 must conform to the addressing sequence for the first three bytes as shown above.
 2. A6 through A14 must specify the same page address during each high to low transition of \overline{WE} (or \overline{CE}) after the software code has been entered.
 3. \overline{OE} must be high only when \overline{WE} and \overline{CE} are both low.

24. Ordering Information

25. Standard Package

t _{ACC} (ns)	I _{CC} (mA)		Ordering Code	Package	Operation Range
	Active	Standby			
200	15	0.02	AT28BV256-20JI AT28BV256-20PI AT28BV256-20SI AT28BV256-20TI	32J 28P6 28S 28T	Industrial (-40° to 85° C)

Note: 1. See Valid Part Numbers table below.

26. Green Package Option (Pb/Halide-free)

t _{ACC} (ns)	I _{CC} (mA)		Ordering Code	Package	Operation Range
	Active	Standby			
200	15	0.02	AT28BV256-20JU AT28BV256-20TU AT28BV256-20SU AT28BV256-20PU	32J 28T 27S 28T	Industrial (-40° to 85° C)

27. Valid Part Numbers

The following table lists standard Atmel products that can be ordered.

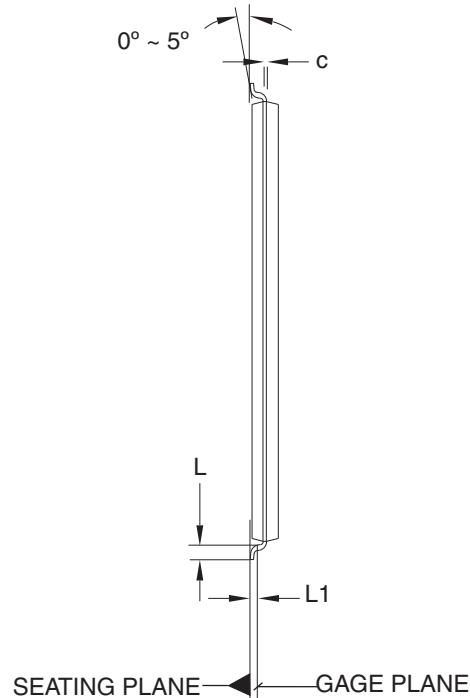
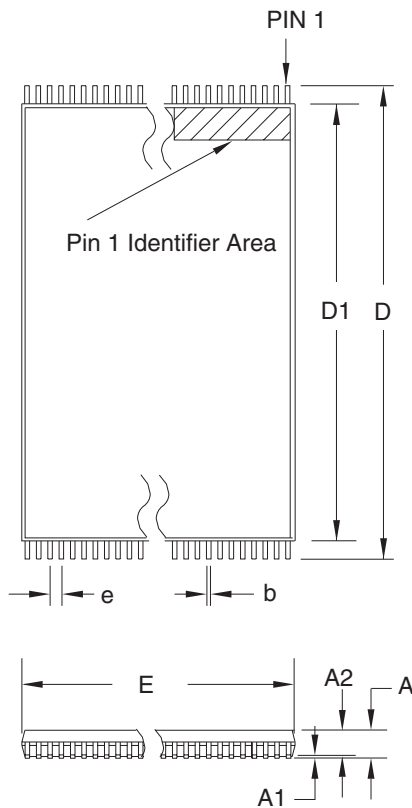
Device Numbers	Speed	Package and Temperature Combinations
AT28BV256	20	JI, PI, SI, TI, TU, JU, SU, PU

28. Die Products

Reference Section: Parallel EEPROM Die Products

Package Type	
32J	32-lead, Plastic J-leaded Chip Carrier (PLCC)
28P6	28-lead, 0.600" Wide, Plastic Dual Inline Package (PDIP)
28S	28-lead, 0.300" Wide, Plastic Gull Wing Small Outline (SOIC)
28T	28-lead, Plastic Thin Small Outline Package (TSOP)

29.4 28T – TSOP



COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.20	
A1	0.05	–	0.15	
A2	0.90	1.00	1.05	
D	13.20	13.40	13.60	
D1	11.70	11.80	11.90	Note 2
E	7.90	8.00	8.10	Note 2
L	0.50	0.60	0.70	
L1	0.25 BASIC			
b	0.17	0.22	0.27	
c	0.10	–	0.21	
e	0.55 BASIC			

- Notes:
1. This package conforms to JEDEC reference MO-183.
 2. Dimensions D1 and E do not include mold protrusion. Allowable protrusion on E is 0.15 mm per side and on D1 is 0.25 mm per side.
 3. Lead coplanarity is 0.10 mm maximum.



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TITLE

28T, 28-lead (8 x 13.4 mm) Plastic Thin Small Outline
Package, Type I (TSOP)

DRAWING NO.

28T

REV.

C

