Features

- Fast read access time 90ns
- Dual voltage range operation
 - Low voltage power supply range, 3.0V to 3.6V, or
 - Standard power supply range, $5V\pm10\%$
- Compatible with JEDEC standard Atmel[®] AT27C256R
- Low-power CMOS operation
 - 20µA max standby (less than 1µA, typical) for V_{CC} = 3.6V
 - 29mW max active at 5MHz for V_{CC} = 3.6V
- JEDEC standard package
 - 32-lead PLCC
- High-reliability CMOS technology
 - 2,000V ESD protection
 - 200mA latchup immunity
- Rapid programming algorithm 100µs/byte (typical)
- CMOS- and TTL-compatible inputs and outputs

 JEDEC standard for LVTTL
- Integrated product identification code
- Industrial temperature range
- Green (Pb/halide-free) packaging option

1. Description

The Atmel AT27LV256A is a high-performance, low-power, low-voltage, 262, 144-bit, onetime programmable, read-only memory (OTP EPROM) organized as 32K by 8 bits. It requires only one supply in the range of 3.0V to 3.6V in normal read mode operation, making it ideal for fast, portable systems using battery power.

The Atmel innovative design techniques provide fast speeds that rival 5V parts, while keeping the low power consumption of a 3.3V supply. At $V_{CC} = 3.0V$, any byte can be accessed in less than 90ns. With a typical power dissipation of only 18mW at 5MHz and $V_{CC} = 3.3V$, the AT27LV256A consumes less than one-fifth the power of a standard, 5V EPROM. Standby mode supply current is typically less than 1µA at 3.3V.

The AT27LV256A is available in an industry-standard, JEDEC-approved, one-time programmable (OTP) PLCC package. All devices feature two-line control (\overline{CE} , \overline{OE}) to give designers the flexibility to prevent bus contention.

The AT27LV256A operating with V_{CC} at 3.0V produces TTL-level outputs that are compatible with standard TTL logic devices operating at V_{CC} = 5.0V. The device is also capable of standard, 5V operation, making it ideally suited for dual supply range systems or card products that are pluggable in both 3V and 5V hosts.

The AT27LV256A has additional features to ensure high quality and efficient production use. The rapid programming algorithm reduces the time required to program the part and guarantees reliable programming. Programming time is typically only 100µs/byte. The integrated product identification code electronically identifies the device and manufacturer. This feature is used by industry standard programming equipment to select the proper programming algorithms and voltages. The AT27LV256A programs in exactly the same way as a standard, 5V Atmel AT27C256R, and uses the same programming equipment.





256K (32K x 8) Low Voltage, One-time Programmable, Read-only Memory

Atmel AT27LV256A



2. Pin configurations

Pin name	Function
A0 - A14	Addresses
00 - 07	Outputs
CE	Chip Enable
ŌĒ	Output Enable
NC	No Connect
NC	No Connect



3. System considerations

Switching between active and standby conditions via the chip enable pin may produce transient voltage excursions. Unless accommodated by the system design, these transients may exceed datasheet limits, resulting in device nonconformance. At a minimum, a 0.1μ F, high-frequency, low inherent inductance, ceramic capacitor should be utilized for each device. This capacitor should be connected between the V_{CC} and ground terminals of the device, as close to the device as possible. Additionally, to stabilize the supply voltage level on printed circuit boards with large EPROM arrays, a 4.7μ F bulk electrolytic capacitor should be utilized, again connected between the V_{CC} and ground terminals. This capacitor should be positioned as close as possible to the point where the power supply is connected to the array.



2 Atmel AT27LV256A

4. Absolute maximum ratings*

Temperature under bias40°C to +85°C
Storage temperature65°C to +125°C
Voltage on any pin with respect to ground2.0V to +7.0V ⁽¹⁾
Voltage on A9 with respect to ground2.0V to +14.0V ⁽¹⁾
V_{PP} supply voltage with respect to ground2.0V to +14.0V ⁽¹⁾
Note: 1 Minimum voltage is -0.6V DC which may unde

- *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.
- Minimum voltage is -0.6V DC, which may undershoot to -2.0V for pulses of less than 20ns. Maximum output pin voltage is V_{CC} + 0.75V DC, which may be exceeded if certain precautions are observed (consult application notes), and which may overshoot to +7.0V for pulses of less than 20ns.

5. DC and AC characteristics

Mode/Pin	CE	ŌĒ	Ai	V _{PP}	V _{cc}	Outputs
Read ⁽²⁾	V _{IL}	V _{IL}	Ai	V _{CC}	V _{CC}	D _{OUT}
Output disable ⁽²⁾	V _{IL}	V _{IH}	X ⁽¹⁾	V _{CC}	V _{CC}	High Z
Standby ⁽²⁾	V _{IH}	X ⁽¹⁾	X ⁽¹⁾	V _{cc}	V _{CC}	High Z
Rapid program ⁽³⁾	V _{IL}	V _{IH}	Ai	V _{PP}	V _{CC}	D _{IN}
PGM verify ⁽³⁾	X ⁽¹⁾	V _{IL}	Ai	V _{PP}	V _{CC}	D _{OUT}
Optional PGM verify ⁽³⁾	V _{IL}	V _{IL}	Ai	V _{cc}	V _{CC}	D _{OUT}
PGM inhibit ⁽³⁾	V _{IH}	V _{IH}	X ⁽¹⁾	V _{PP}	V _{CC}	High Z
Product identification ⁽³⁾⁽⁵⁾	V _{IL}	V _{IL}	$A9 = V_{H}^{(4)}$ $A0 = V_{IH} \text{ or } V_{IL}$ $A1 - A14 = V_{IL}$	V _{cc}	V _{cc}	Identification code

Table 5-1.Operating modes

Notes: 1. X can be V_{IL} or V_{IH} .

- 2. Read, output disable, and standby modes require $3.0V \le V_{CC} \le 3.6V$ or $4.5V \le V_{CC} \le 5.5V$.
- 3. Refer to programming characteristics. Programming modes require $V_{CC} = 6.5V$.
- 4. $V_{\rm H} = 12.0 \pm 0.5 V_{\odot}$
- 5. Two identifier bytes may be selected. All Ai inputs are held low $(V_{||})$ except A9, which is set to V_{H} , and A0, which is toggled low $(V_{||})$ to select the manufacturer's identification byte and high $(V_{||})$ to select the device code byte.

	Atmel AT27LV256A
	-90
Industrial operating temperature (case)	-40°C - 85°C
	3.0V to 3.6V
V _{CC} power supply	5V ± 10%





Symbol	Parameter	Condition	Min	Max	Units
V _{CC} = 3.0V	to 3.6V				
ILI	Input load current	$V_{IN} = 0V$ to V_{CC}		±1	μΑ
I _{LO}	Output leakage current	$V_{OUT} = 0V$ to V_{CC}		±5	μA
(2)	V _{PP} ⁽¹⁾ read/standby current	$V_{PP} = V_{CC}$		10	μΑ
) ((1) store allow a summark	I_{SB1} (CMOS), $\overline{CE} = V_{CC \pm} 0.3V$		20	μA
I _{SB}	V _{CC} ⁽¹⁾ standby current	I_{SB2} (TTL), $\overline{CE} = 2.0$ to $V_{CC} + 0.5V$		100	μA
I _{CC}	V _{CC} active current	f = 5MHz, I_{OUT} = 0mA, \overline{CE} = V_{IL}		8	mA
V _{IL}	Input low voltage		-0.6	0.8	V
V _{IH}	Input high voltage		2.0	V _{CC} + 0.5	V
V _{OL}	Output low voltage	$I_{OL} = 2.0 \text{mA}$		0.4	V
V _{OH}	Output high voltage	I _{OH} = -2.0mA	2.4		V
V _{CC} = 4.5V	to 5.5V				
ILI	Input load current	$V_{IN} = 0V$ to V_{CC}		±1	μΑ
I _{LO}	Output leakage current	$V_{OUT} = 0V$ to V_{CC}		±5	μA
(2)	V _{PP} ⁽¹⁾ read/standby current	$V_{PP} = V_{CC}$		10	μA
1		I_{SB1} (CMOS), $\overline{CE} = V_{CC} \pm 0.3V$		100	μA
I _{SB}	V _{CC} ⁽¹⁾ standby current	I_{SB2} (TTL), \overline{CE} = 2.0 to V_{CC} + 0.5V		1	mA
I _{CC}	V _{CC} active current	$f = 5MHz$, $I_{OUT} = 0mA$, $\overline{CE} = V_{IL}$		20	mA
V _{IL}	Input low voltage		-0.6	0.8	V
V _{IH}	Input high voltage		2.0	V _{CC} + 0.5	V
V _{OL}	Output low voltage	I _{OL} = 2.1mA		0.4	V
V _{OH}	Output high voltage	I _{OH} = -400μA	2.4		V

Table 5-3. DC and operating characteristics for read operation

Notes: 1. V_{CC} must be applied simultaneously with or before V_{PP} , and removed simultaneously with or after V_{PP} .

2. V_{PP} may be connected directly to V_{CC} , except during programming. The supply current would then be the sum of I_{CC} and I_{PP} .

Table 5-4. AC characteristics for read operation

 V_{CC} = 3.0V to 3.6V and 4.5V to 5.5V

			Atmel AT2	27LV256A	
			-9	90	
Symbol	Parameter	Condition	Min	Max	Units
t _{ACC} ⁽³⁾	Address to output delay	$\overline{CE} = \overline{OE} = V_{IL}$		90	ns
t _{CE} ⁽²⁾	CE to output delay	$\overline{OE} = V_{IL}$		90	ns
t _{OE} ⁽²⁾⁽³⁾	OE to output delay	$\overline{CE} = V_{IL}$		50	ns
t _{DF} ⁽⁴⁾⁽⁵⁾	\overline{OE} or \overline{CE} high to output float, whichever occurred first			40	ns
t _{OH}	Output hold from address, \overline{CE} or \overline{OE} , whichever occurred first		0		ns

Figure 5-1. AC waveforms for read operation⁽¹⁾



- Notes: 1. Timing measurement references are 0.8V and 2.0V. Input AC drive levels are 0.45V and 2.4V, unless otherwise specified.
 - 2. $\overline{\text{OE}}$ may be delayed up to t_{CE} t_{OE} after the falling edge of $\overline{\text{CE}}$ without impact on t_{CE} .
 - 3. \overline{OE} may be delayed up to t_{ACC} t_{OE} after the address is valid without impact on t_{ACC} .
 - 4. This parameter is only sampled, and is not 100% tested.
 - 5. Output float is defined as the point when data is no longer driven.







Table 5-5.Pin capacitance

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

Symbol	Тур	Max	Units	Conditions
C _{IN}	4	8	pF	$V_{IN} = OV$
C _{OUT}	8	12	pF	$V_{OUT} = OV$

Note: 1. Typical values for nominal supply voltage. This parameter is only sampled and is not 100% tested.



Figure 5-4. Programming waveforms⁽¹⁾

Notes: 1. The input timing reference is 0.8V for $V_{\rm IL}$ and 2.0V for $V_{\rm IH}.$

- 2. t_{OE} and t_{DFP} are characteristics of the device, but must be accommodated by the programmer.
- 3. When programming the Atmel AT27LV256A, a 0.1 μ F capacitor is required across V_{PP} and ground to suppress spurious voltage transients.

Table 5-6. DC programming characteristics $T_{A}=25\pm5^{\circ}\text{C},\,V_{CC}=6.5\pm0.25\text{V},\,V_{PP}=13.0\pm0.25\text{V}$

			Limits		
Symbol	Parameter	Test conditions	Min	Max	Units
I _{LI}	Input load current	$V_{\rm IN} = V_{\rm IL'} V_{\rm IH}$		±10	μA
V _{IL}	Input low level		-0.6	0.8	V
V _{IH}	Input high level		2.0	V _{cc} + 0.5	V
V _{OL}	Output low voltage	$I_{OL} = 2.1 \text{mA}$		0.4	V
V _{OH}	Output high voltage	I _{OH} = -400μA	2.4		V
I _{CC2}	V _{CC} supply current (program and verify)			25	mA
I _{PP2}	V _{PP} current	$\overline{CE} = V_{IL}$		25	mA
V _{ID}	A9 product identification voltage		11.5	12.5	V

Table 5-7. AC programming characteristics

$T_A = 25 \pm 5^{\circ}$ C, $V_{CC} = 6.5 \pm 0.25$ V, $V_{PP} = 13.0 \pm 0.25$ V

			Limits		
Symbol	Parameter	Test conditions ⁽¹⁾	Min	Max	Units
t _{AS}	Address setup time		2		μs
t _{OES}	OE setup time	Input rise and fall times (10% to 90%) 20ns Input pulse levels 0.45V to 2.4V Input timing reference level 0.8V to 2.0V	2		μs
t _{DS}	Data setup time		2		μs
t _{AH}	Address hold time		0		μs
t _{DH}	Data hold time		2		μs
t _{DFP}	$\overline{\text{OE}}$ high to output float delay ⁽²⁾		0	130	ns
t _{VPS}	V _{PP} setup time		2		μs
t _{VCS}	V _{CC} setup time		2		μs
t _{PW}	CE program pulse width ⁽³⁾	Output timing reference level	95	105	μs
t _{OE}	Data valid from $\overline{OE}^{(2)}$	0.8V to 2.0V		150	ns
t _{PRT}	V_{PP} pulse rise time during programming		50		ns

Notes: 1. V_{CC} must be applied simultaneously with or before V_{PP} and removed simultaneously with or after V_{PP} .

2. This parameter is only sampled, and is not 100% tested. Output float is defined as the point where data is no longer driven. See timing diagram.

3. Program pulse width tolerance is 100 $\mu sec \pm 5\%$.

Table 5-8.	The Atmel AT27LV256A integrated product identification code ⁽¹⁾
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		Pins								
Codes	A0	07	O6	O5	04	O3	02	01	00	Hex data
Manufacturer	0	0	0	0	1	1	1	1	0	1E
Device type	1	1	0	0	0	1	1	0	0	8C

Note: 1. The Atmel AT27LV256A has the same product identification code as the Atmel AT27C256R. Both are programming compatible.



Π	EL

6. Rapid programming algorithm

A 100 μ s \overline{CE} pulse width is used to program. The address is set to the first location. V_{CC} is raised to 6.5V and V_{PP} is raised to 13.0V. Each address is first programmed with one 100 μ s \overline{CE} pulse without verification. Then a verification/reprogramming loop is executed for each address. In the event a byte fails to pass verification, up to 10 successive 100 μ s pulses are applied with a verification after each pulse. If the byte fails to verify after 10 pulses have been applied, the part is considered failed. After the byte verifies properly, the next address is selected until all have been checked. V_{PP} is then lowered to 5.0V and V_{CC} to 5.0V. All bytes are read again and compared with the original data to determine if the device passes or fails.

Figure 6-1. Rapid programming algorithm



7. Ordering information

Green package option (Pb/halide-free)

t _{ACC}	ACC I _{CC} (mA)						
(ns)	Active	Standby	Atmel ordering code	Package	Lead finish	Operation range	
90	8	0.02	AT27LV256A-90JU	32J	Matte tin	Industrial (-40°C to 85°C)	

Package type					
32J 32-lead, plastic, J-leaded chip carrier (PLCC)					





8. Packaging information

32J – PLCC



9. Revision history

Doc. rev.	Date	Comments
0547E	04/2011	Remove SOIC and TSOP packages Add lead finish to ordering information
0547D	12/2007	





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