Features

- **Fast Read Access Time - 150ns**
- **5V ± 10% supply**
- **High Reliability**
- **Low Power**
  - **100mA max. Active**
  - **40mA max. Standby**
- **Fast Programming - 4ms/byte typ.**
- **JEDEC Approved Industry Standard Pinout**
- **Two-line Control**
- **TTL Compatible**
- **Integrated Product Identification Code**
- **Full Military, Commercial and Industrial Temperature Ranges**

Description

The ATMEL 27256 is a 262,144 bit Ultraviolet Erasable and Electrically Programmable Read Only Memory (EPROM) organized 32K × 8. It requires only one 5V power supply in normal read mode operation. Any byte can be accessed in less than 150ns, making this part compatible with high performance microprocessor systems by eliminating the need for performance reducing WAIT states.

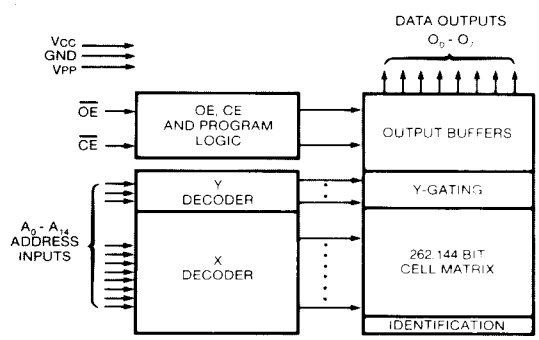
The AT27256 comes in an industry standard JEDEC-approved 28-pin package. The device features a two-line control ($\overline{CE}$,$\overline{OE}$) to give designers the flexibility to prevent bus contention.

With a high density 32K byte storage capability, the AT27256 allows firmware to be stored reliably and to be quickly accessed by the system without the delays of mass storage media.

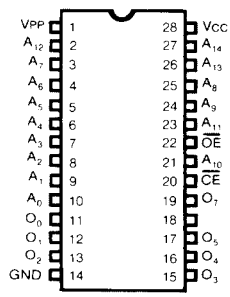
ATMEL's 27256 has additional features to ensure high quality and efficient producton use. The fast programming algorithm reduces the time required to program the chip and guarantees reliable programming. The Integrated Product Identification Code electronically identifies the device and manufacturing origin. This feature is used by industry standard programming equipment to select the proper programming algorithms and voltages.

The AT27256 is manufactured with a high quality and high performance 1.5 micron floating-poly EPROM technology.

Block Diagram



Pin Configuration



PIN NAMES

A_0 - A_{14}	ADDRESSES
$\overline{CE}$	CHIP ENABLE
$\overline{OE}$	OUTPUT ENABLE
O_0 - O_7	OUTPUTS

ATMEL CORPORATION

D.C. and A.C. Operating Conditions for Read Operation

	27256-15	27256-17	27256-20	27256-25
Operating Temperature Range	0°C - 70°C	0°C - 70°C	0°C - 70°C	0°C - 70°C
V_{CC} Power Supply [1,2]	5V±5% 5V±10%	5V±5% 5V±10%	5V±10%	5V±10%

D.C. Characteristics for Read Operation

Symbol	Parameter	Min	Max	Units	Test Conditions
I_{LI}	Input Load Current		10	µA	V_{IN}=0 to 5.5V
I_{LO}	Output Leakage Current		10	µA	V_{OUT}=0 to 5.5V
I_{PP1}[2]	V_{PP} Current Read/Standby		5	mA	V_{PP}=5.5V
I_{CC1}[2]	V_{CC} Current Standby		40	mA	$\overline{CE}$=V_{IH}
I_{CC2}[2]	V_{CC} Current Active		100	mA	$\overline{CE}$=$\overline{OE}$=V_{IL} V_{PP}=V_{CC}
V_{IL}	Input Low Voltage	-.1	+.8	V	
V_{IH}	Input High Voltage	2.0	V_{CC}+1	V	
V_{OL}	Output Low Voltage		.45	V	I_{OL}=2.1mA
V_{OH}	Output High Voltage	2.4		V	I_{OH}=-400µA
V_{PP}[2]	V_{PP} Read Voltage	3.8	V_{CC}	V	V_{CC}=5V±0.25V

Notes:
1. V_{CC} must be applied simultaneously or before V_{PP}, and removed simultaneously 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_{PP1}.

A.C. Characteristics for Read Operation

Symbol	Parameter	27256-15 Min	27256-15 Max	27256-17 Min	27256-17 Max	27256-20 Min	27256-20 Max	27256-25 Min	27256-25 Max	Units	Test Cond.
t_{ACC}	Address to Output Delay		150		170		200		250	ns	$\overline{CE}$=$\overline{OE}$=V_{IL}
t_{CE}	$\overline{CE}$ to Output Delay		150		170		200		250	ns	$\overline{CE}$=V_{IL}
t_{OE}	$\overline{OE}$ to Output Delay		70		70		75		100	ns	$\overline{CE}$=V_{IL}
t_{DF}[2,5]	$\overline{OE}$ or $\overline{CE}$ High to Output Float		50		50		55		60	ns	$\overline{CE}$=V_{IL}
t_{OH}	Output Hold from Address, $\overline{CE}$ or $\overline{OE}$, whichever occurred first	0		0		0		0		ns	$\overline{CE}$=$\overline{OE}$=V_{IL}

Absolute Maximum Ratings*

Temperature Under Bias	-10° C to +80° C
Storage Temperature	-65° C to +125° C
All Input or Output Voltages w/Respect to Ground	-0.6V to +6.25V
Voltage on Pin 24 w/Respect to Ground	-0.6V to +13.5V
V_{PP} Supply Voltage w/Respect to Ground	-0.6V to +14.0V

*NOTICE: Stresses above 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 above 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.

256K (32K × 8)
UV ERASABLE
PROM

Operating Modes

MODE	PIN (20)	(22)	A_i	V_{PP} (1)	V_{CC} (28)	Outputs (11-13,15-19)
Read	V_{IL}	V_{IL}	A_i	V_{CC}	V_{CC}	D_{OUT}
Output Disable	V_{IL}	V_{IH}	X[1]	V_{CC}	V_{CC}	High Z
Standby	V_{IH}	X	X	V_{CC}	V_{CC}	High Z
Fast PGM[2]	V_{IL}	V_{IH}	A_i	V_{PP}	V_{CC}	D_{IN}
PGM Verify	X	V_{IL}	A_i	V_{PP}	V_{CC}	D_{OUT}
PGM Inhibit	V_{IH}	V_{IH}	X	V_{PP}	V_{CC}	High Z
Product Identification	V_{IL}	V_{IL}	[3,4] $A_9 = V_H$, $A_0 = V_{IH}$ or V_{IL}, A_1–$A_{14} = V_{IL}$	V_{CC}	V_{CC}	Identification Code

Notes:
1. X can be V_{IL} or V_{IH}.
2. Refer to programming characteristics
3. $V_H = 12.0 \pm 0.5V$.
4. Two identifier bytes may be selected. All A_i inputs are held low (V_{IL}), except A_9 which is set to V_H and A_0 which is toggled low (V_{IL}) to select the Manufacturer's Identification byte and high (V_{IH}) to select the Device Code byte.

Erasure Characteristics

D.C. Programming Characteristics

T_A=25±5°C, V_{CC}=6.0±0.25V, V_{PP}=12.5±0.5V

Symbol	Parameter	Limits Min	Max	Unit	Test Conditions (see note 1)
I_{LI}	Input Current (All Inputs)		10	µA	V_{IN}=V_{IL} or V_{IH}
V_{IL}	Input Low Level (All Inputs)	-0.1	0.8	V	
V_{IH}	Input High Level	2.0	V_{CC}+1	V	
V_{OL}	Output Low Voltage During Verify		0.45	V	I_{OL}=2.1mA
V_{OH}	Output High Voltage During Verify	2.4		V	I_{OH}=-400µA
I_{CC2}	V_{CC} Supply Current (Program & Verify)		100	mA	
I_{PP2}	V_{PP} Supply Current (Program)		30	mA	$\overline{CE}$=V_{IL}
V_{ID}	A_9 Product Identification Voltage	11.5	12.5	V	

A.C. Programming Characteristics

T_A=25±5°C, V_{CC}=6.0±0.25V, V_{PP}=12.5±0.5V

Symbol	Parameter	Limits Min	Typ	Max	Unit	Test Conditions* (see note 1)
t_{AS}	Address Setup Time	2			µs	
t_{OES}	$\overline{OE}$ Setup Time	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}	$\overline{OE}$ High to Output Float Delay	0		130	ns	(see Note 2)
t_{VPS}	V_{PP} Setup Time	2			µs	
t_{VCS}	V_{CC} Setup Time	2			µs	
t_{PW}	$\overline{CE}$ Initial Program Pulse Width	0.95	1.0	1.05	ms	(see Note 3)
t_{OPW}	$\overline{CE}$ Overprogram Pulse Width	2.85		78.75	ms	(see Note 4)
t_{OE}	Data Valid from $\overline{OE}$			150	ns	

*A.C. Conditions of Test

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
Output Timing Reference Level	0.8V to 2.0V

Notes:
1. V_{CC} must be applied simultaneously or before V_{PP} and removed simultaneously 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. Initial Program Pulse width tolerance is 1 msec±5%.
4. The length of the overprogram pulse may vary from 2.85 msec to 78.75 msec as a function of the iteration counter value X.

ATMEL's 27256 Integrated Product Identification Code

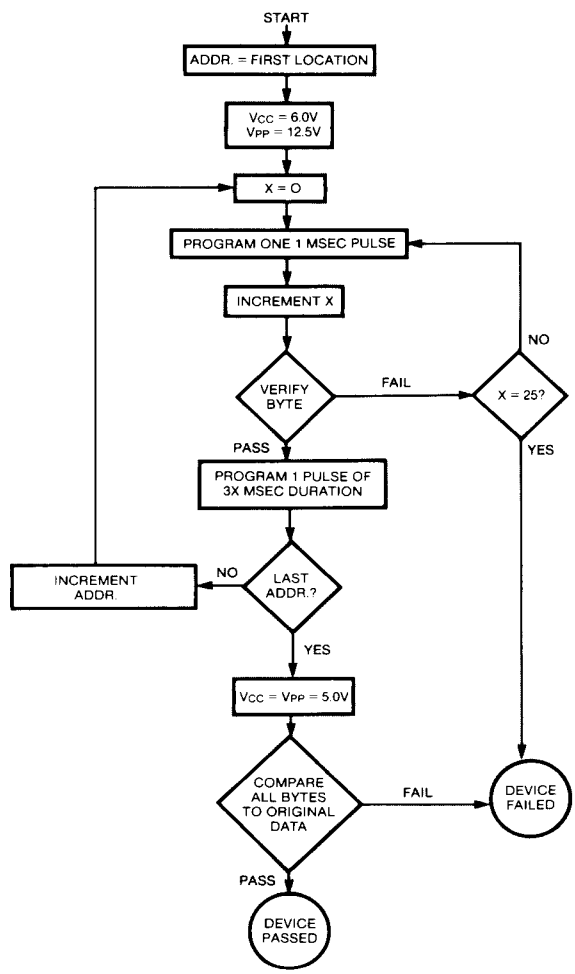
Codes	Pins	A0 (10)	07 (19)	06 (18)	05 (17)	04 (16)	03 (15)	02 (13)	01 (12)	00 (11)	Hex Data
Manufacturer		0	0	0	1	0	1	0	0	1	29
Device Type		1	0	0	0	0	0	1	0	0	04

Fast Programming Algorithm

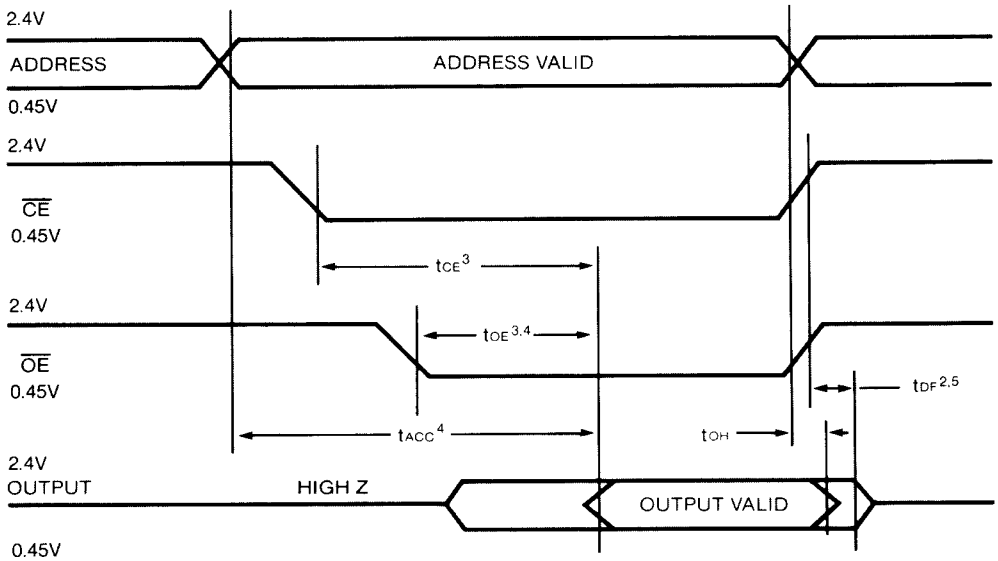
Two $\overline{CE}$ pulse widths are used to program; initial and overprogram. Ai are set to address the desired byte. V_{CC} is raised to 6.0V and V_{PP}[1] is raised to 12.5V. The first $\overline{CE}$ pulse is 1ms. The programmed byte is then verified. If the byte programmed successfully, then an overprogram $\overline{CE}$ pulse is applied for 3ms. If the byte fails to program after the first 1ms pulse, then up to 25 successive 1ms pulses are applied with a verification after each pulse. When the byte passes verification, the overprogram pulse width is 3X (times) the number of 1ms pulses required earlier (75ms max.).

If the part fails to verify after 25 1ms pulses have been applied, it is considered as failed. After the first byte is programmed, the Ai are set to the next address repeating the algorithm until all required addresses are programmed. Then V_{CC} and V_{PP}[1] are lowered to 5.0V. All bytes subsequently are read to compare with the original data to determine if the device passes or fails.

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

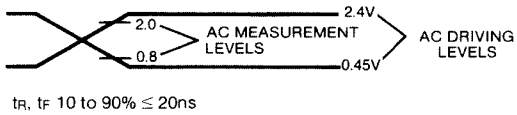


A.C. Waveforms[1]



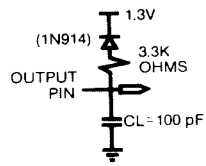
Notes:
1. Timing measurement references are 0.8V and 2.0V. Input A.C. Driving Levels are 0.45V and 2.4V, unless otherwise specified.
2. t_{DF} is specified from $\overline{OE}$ or $\overline{CE}$, whichever occurs first.
3. $\overline{OE}$ may be delayed up $t_{CE} - t_{OE}$ after the falling edge of $\overline{CE}$ without impact on t_{CE}.
4. $\overline{OE}$ may be delayed up to $t_{ACC} - t_{OE}$ after the address is valid without impact on t_{ACC}.
5. This parameter is only sampled and is not 100% tested.

Input Test Waveforms and Measurement Levels



t_R, t_F 10 to 90% ≤ 20ns

Output Test Load



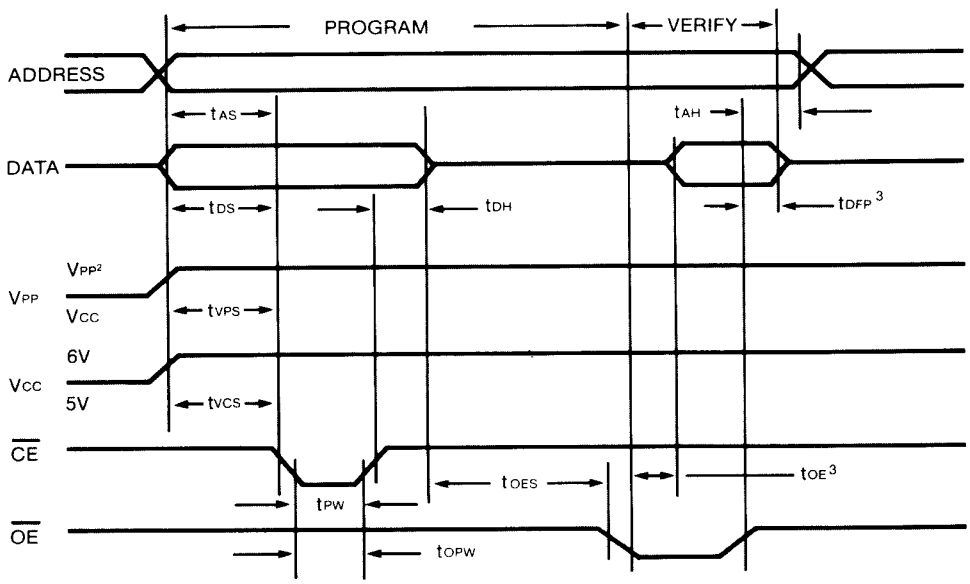
Note: C_L = 100pF including jig capacitance.

Pin Capacitance (f = 1MHz T = 25°C)

	TYP[1]	MAX	UNITS	CONDITIONS
C_{IN}	4	6	pF	V_{IN} = 0V
C_{OUT}	8	12	pF	V_{OUT} = 0V

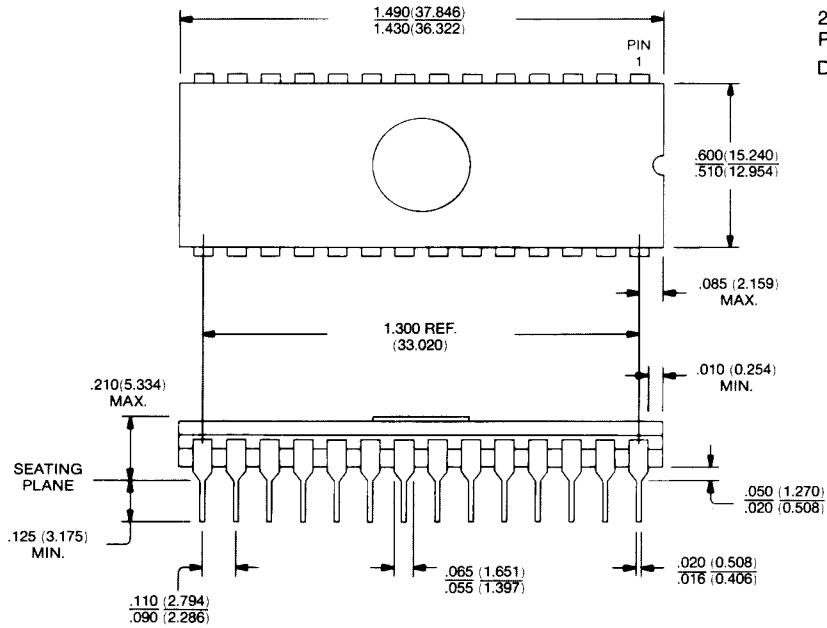
Notes: 1. Typical values for nominal supply voltages.

Programming Waveforms[1]



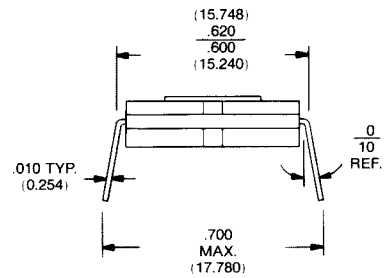
Notes:
1. The Input Timing Reference Level is 0.8V for V_{IL} and 2V for V_{IH}.
2. When programming the 27256, a 0.1uF capacitor is required across V_{PP} and ground to supress spurious voltage transients which can damage the device.
3. t_{OE} and t_{DFP} are characteristics of the device but must be accommodated by the programmer.

Packaging Information



28-Lead Hermetic Dual In-Line CERDIP
Package Type D

DIMENSIONS IN INCHES AND (MILLIMETERS)



Ordering Information

EPROMs + EEPROMs — EXAMPLE: AT27256-15 DM1B

PREFIX	DEVICE	SUFFIX				
AT	27256	25	P	C	1	B
		20	D	I	2	
		17	L	M		
		15				

PROCESSING
B = HI REL
POWER SUPPLY — 2=5V±5%
1=5V±10%

TEMPERATURE RANGE
C = COMMERCIAL (0° C TO 70° C)
I = INDUSTRIAL (−40° C TO +85° C)
M = MILITARY (−55° C TO +125° C)

PACKAGE
P = PLASTIC
D = CERDIP
L = LEADLESS CHIP CARRIER

SPEED

August 1985
ORDER NO. 27256-0001

ATMEL CORPORATION 2095 Ringwood Ave., San Jose. CA 95131 **(408) 434-9201**

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