

AT27C256R

T-46-13-29

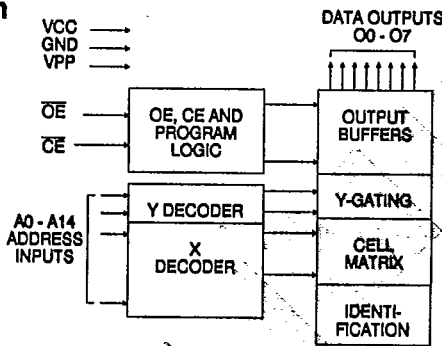
Features

- Low Power CMOS Operation
 - 100 μ A max. Standby
 - 20 mA max. Active at 5 MHz
- Fast Read Access Time - 120ns
- Wide Selection of JEDEC Standard Packages Including OTP
 - 28-Lead 600 mil Cerdip and OTP Plastic DIP or SOIC
 - 32-Pad LCC and OTP PLCC
- 5V \pm 10% Supply
- High Reliability CMOS Technology
 - 2000V ESD Protection
 - 200mA Latchup Immunity
- Rapid Programming - 100 μ s/byte (typical)
- Two-line Control
- CMOS and TTL Compatible Inputs and Outputs
- Integrated Product Identification Code
- Military, Commercial and Industrial Temperature Ranges
- Fully Compatible with AT27C256

256K (32K x 8)
UV
Erasable
CMOS
EPROM

4

Block Diagram



Preliminary

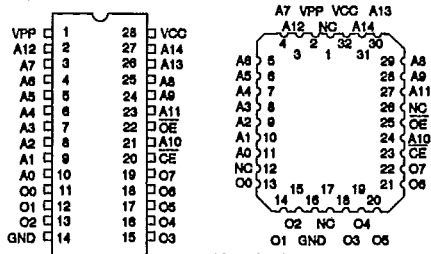
Description

The ATMEL 27C256R chip is a low-power, high performance 262,144 bit Ultraviolet Erasable and Electrically Programmable Read Only Memory (EPROM) organized 32K x 8. It requires only one 5V power supply in normal read mode operation. Any byte can be accessed in less than 120ns, eliminating the need for speed reducing WAIT states on high performance microprocessor systems.

The AT27C256R meets or exceeds all specifications for the AT27C256. ATMEL's 1.2 micron scaled CMOS technology additionally provides lower active power consumption, and significantly faster programming. Power consumption is typically only 8mA in Active Mode and less than 10 μ A in Standby.

Pin Configurations

PIN NAMES	
A0 - A14	Addresses
O0 - O7	Outputs
\overline{CE}	Chip Enable
\overline{OE}	Output Enable
NC	No Connect



Note: PLCC package Pins 1 and 17 are DONT CONNECT.





Description (Continued)

The AT27C256R comes in a choice of industry standard JEDEC-approved packages including; 28-pin DIP ceramic or one time programmable (OTP) plastic, 28-pin OTP plastic small outline (SOIC), and 32-pad ceramic leadless chip carrier (LCC), or OTP plastic J-leaded chip carrier (PLCC). All devices feature two line control (\overline{CE} , \overline{OE}) to give designers the flexibility to prevent bus contention.

With high density 32K byte storage capability, the AT27C256R allows firmware to be stored reliably and to be accessed by the system without the delays of mass storage media.

ATMEL's 27C256R 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 100 μ s/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.

Operating Modes

MODE \ PIN	\overline{CE}	\overline{OE}	Ai	Vpp	Vcc	Outputs
Read	VIL	VIL	Ai	VCC	VCC	DOUT
Output Disable	VIL	VIH	X ¹	VCC	VCC	High Z
Standby	VIH	X	X	VCC	VCC	High Z
Rapid Program ²	VIL	VIH	Ai	VPP	VCC	DIN
PGM Verify ⁴	X	VIL	Ai	VPP	VCC	DOUT
Optional PGM Verify ²	VIL	VIL	Ai	VCC	VCC	DOUT
PGM Inhibit ⁴	VIH	VIH	X	VPP	VCC	High Z
Product Identification ⁴	VIL	VIL	A9 = VH ³ A0 = VIH or VIL A1-A14 = VIL	VCC	VCC	Identification Code

- Notes: 1. X can be VIL or VIH. 2. Refer to Programming characteristics. 3. VH = 12.0 \pm 0.5V.
 4. Two identifier bytes may be selected. All Ai inputs are held low (VIL), except A9 which is set to VH and A0 which is toggled low (VIL) to select the Manufacturer's Identification byte and high (VIH) to select the Device Code byte.

Absolute Maximum Ratings*

Temperature Under Bias.....	-55°C to +125°C
Storage Temperature.....	-65°C to +150°C
Voltage on Any Pin with Respect to Ground.....	-2.0V to +7.0V ¹
Voltage on A9 with Respect to Ground.....	-2.0V to +14.0V ¹
Vpp Supply Voltage with Respect to Ground.....	-2.0V to +14.0V ¹
Integrated UV Erase Dose.....	7258 W \cdot sec/cm ²

Notes: 1. Minimum voltage is -0.6V dc which may undershoot to -2.0V for pulses of less than 20ns. Maximum output pin voltage is VCC+0.75V dc which may overshoot to +7.0V for pulses of less than 20ns.

*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.

Erase Characteristics

The entire memory array of the AT27C256R is erased (all outputs read as VOH) after exposure to ultraviolet light at a wavelength of 2537Å. Complete erasure is assured after a minimum of 20 minutes exposure using 12,000 μ W/cm² intensity lamps spaced one inch away from the chip. Minimum erase time for lamps at other intensity ratings can be calcu-

lated from the minimum integrated erasure dose of 15W \cdot sec/cm². To prevent unintentional erasure, an opaque label is recommended to cover the clear window on any UV erasable EPROM which will be subjected to continuous fluorescent indoor lighting or sunlight.

AT27C256R

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

		AT27C256R			
		-12	-15	-20	-25
Operating Temperature (case)	Com.	0°C - 70°C	0°C - 70°C	0°C - 70°C	0°C - 70°C
	Ind.	-40°C - 85°C	-40°C - 85°C	-40°C - 85°C	-40°C - 85°C
	Mil.	-55°C - 125°C	-55°C - 125°C	-55°C - 125°C	-55°C - 125°C
VCC Power Supply		5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%

D.C. and Operating Characteristics for Read Operation

Symbol	Parameter	Condition	Min	Max	Units
I _{LI}	Input Load Current	V _{IN} = -0.1V to V _{CC} + 1V		10	μA
I _{LO}	Output Leakage Current	V _{OUT} = -0.1V to V _{CC} + 0.1V		10	μA
I _{PP1}	V _{PP1} Read/Standby Current	V _{PP} = 3.8 to V _{CC} + 0.3V		10	μA
I _{SB}	V _{CC1} Standby Current	I _{SB1} (CMOS)	Com.	100	μA
		CE = V _{CC} - 0.3 to V _{CC} + 1.0V	Ind., Mil.	200	μA
		I _{SB2} (TTL)	Com.	2	mA
		CE = 2.0 to V _{CC} + 1.0V	Ind., Mil.	3	mA
I _{CC}	V _{CC} Active Current	f = 5MHz, I _{OUT} = 0mA, CE = V _{IL}	Com.	20	mA
			Ind., Mil.	25	mA
V _{IL}	Input Low Voltage		-0.6	0.8	V
V _{IH}	Input High Voltage		2.0	V _{CC} + 1	V
V _{OL}	Output Low Voltage	I _{OL} = 2.1mA		.45	V
		I _{OH} = -100μA	V _{CC} - 0.3		V
V _{OH}	Output High Voltage	I _{OH} = -2.5mA		3.5	V
		I _{OH} = -400μA		2.4	V
		V _{CC} = 5 ± 0.25V	3.8	V _{CC} + .3	V

4

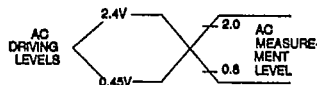
- Note: 1. V_{CC} must be applied simultaneously or before V_{PP}, and removed simultaneously or after V_{PP}.
 2. V_{PP} may be connected directly to V_{CC}, except during programming. The supply current would then be the sum of I_{CC} and I_{PP}.

A.C. Characteristics for Read Operation

		AT27C256R								
		-12		-15		-20		-25		
Symbol	Parameter	Condition		Min	Max	Min	Max	Min	Max	Units
t _{ACC} ⁴	Address to Output Delay	CE = OE		Com.	120	150	200	250		ns
		= V _{IL}		Ind., Mil.	120	150	200	250		ns
t _{CE} ³	CE to Output Delay	OE = V _{IL}		120	150	200	250		ns	
t _{OE} ^{3,4}	OE to Output Delay	CE = V _{IL}		50	60	75	100		ns	
t _{DF} ^{2,5}	OE or CE High to Output Float	CE = V _{IL}		45	50	55	60		ns	
t _{OH}	Output Hold from Address, CE or OE, whichever occurred first	CE = OE = V _{IL}		0	0	0	0		ns	

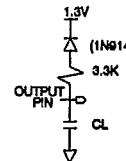
Notes: 2,3,4, and 5 - see AC Waveforms for Read Operation.

Input Test Waveforms and Measurement Levels



t_R, t_F < 20ns (10% to 90%)

Output Test Load

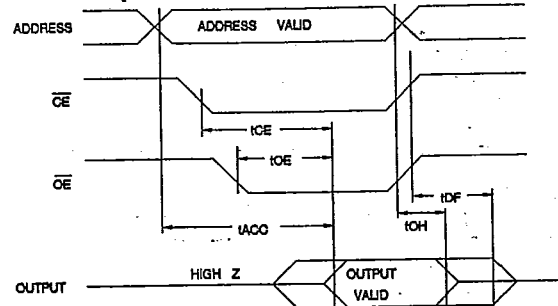


Note: C_L = 100pF including jig capacitance.





A.C. Waveforms for Read Operation¹



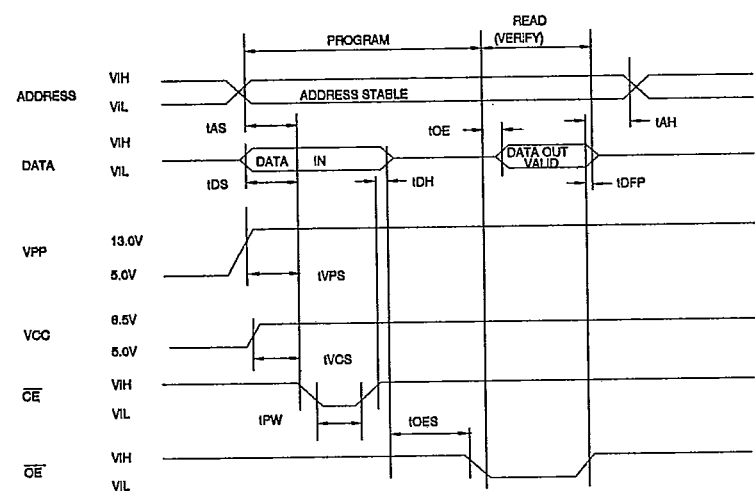
- Notes:
1. Timing measurement references are 0.8V and 2.0V. Input AC driving levels are 0.45V and 2.4V, unless otherwise specified.
 2. t_{DF} is specified from \overline{OE} or \overline{CE} , whichever occurs first.
 3. \overline{OE} may be delayed up to t_{CE-tOE} after the falling edge of \overline{CE}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

Pin Capacitance(f = 1MHz T = 25°C)

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

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

Programming Waveforms¹



- Notes:
1. The Input Timing Reference is 0.8V for V_{IL} and 2.0V for V_{IH}.
 2. t_{OE} and t_{DFP} are characteristics of the device but must be accommodated by the programmer.
 3. When programming the AT27C256R a 0.1μF capacitor is required across V_{pp} and GND to suppress spurious voltage transients.

AT27C256R

D.C. Programming Characteristics

TA = 25 ± 5°C, VCC = 6.5 ± 0.25V, VPP = 13.0 ± 0.25V

Symbol	Parameter	Test Conditions	Limits		Units
			Min	Max	
ILI	Input Load Current	VIN = VIL, VIH		10	μA
VIL	Input Low Level	(All Inputs)	-0.6	0.8	V
VIH	Input High Level		2.0	VCC+1	V
VOL	Output Low Volt.	IOL = 2.1mA	.45		V
VOH	Output High Volt.	IOH = -400μA	2.4		V
ICC2	VCC Supply Current (Program and Verify)			25	mA
Ipp2	Vpp Current	CE = VIL		25	mA
VID	A9 Product Identification Voltage		11.5	12.5	V

A.C. Programming Characteristics

TA = 25 ± 5°C, VCC = 6.5 ± 0.25V, VPP = 13.0 ± 0.25V

Symbol	Parameter	Test Conditions* (see Note 1)	Limits		Units
			Min	Max	
tAS	Address Setup Time		2		μs
tOES	OE Setup Time		2		μs
tDS	Data Setup Time		2		μs
tAH	Address Hold Time		0		μs
tDH	Data Hold Time		2		μs
tDFP	OE High to Output Float Delay (Note 2)		0	130	ns
tVPS	Vpp Setup Time		2		μs
tVCS	Vcc Setup Time		2		μs
tpw	CE Program Pulse Width (Note 3)		95	105	μs
tOE	Data Valid from OE (Note 2)			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:

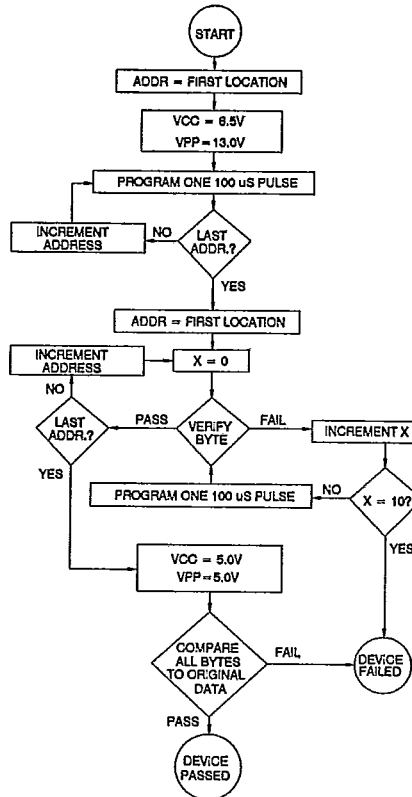
- VCC must be applied simultaneously or before VPP and removed simultaneously or after VPP.
- This parameter is only sampled and is not 100% tested. Output Float is defined as the point where data is no longer driven - see timing diagram.
- Program Pulse width tolerance is 100μs ± 5%.

ATMEL's 27C256R Integrated Product Identification Code:

Pins	A0	O7	O6	O5	O4	O3	O2	O1	O0	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

Rapid Programming Algorithm

A 100μs CE pulse width is used to program. The address is set to the first location. VCC is raised to 6.5V and Vpp is raised to 13.0V. Each address is first programmed with one 100μs 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 100μs 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. Vpp is then lowered to 5.0V and VCC to 5.0V. All bytes are read again and compared to the original data to determine if the device passes or fails.





Ordering Information

t _{ACC} (ns)	I _{CC} (mA)		Ordering Code	Package	Operation Range
	Active	Standby			
120	20	0.1	AT27C256R-12DC AT27C256R-12LC	28DW6 32LW	Commercial (0°C to 70°C)
			AT27C256R-12DI AT27C256R-12LI	28DW6 32LW	Industrial (-40°C to 85°C)
120	25	0.2	AT27C256R-12DM AT27C256R-12LM	28DW6 32LW	Military
			AT27C256R-12DM/883 AT27C256R-12LM/883	28DW6 32LW	Military/883C Class B, Fully Compliant (-55°C to 125°C)
			AT27C256R-15DC AT27C256R-15LC AT27C256R-15PC AT27C256R-15JC AT27C256R-15TC	28DW6 32LW 28P6 32J 28T	Commercial (0°C to 70°C)
150	25	0.2	AT27C256R-15DI AT27C256R-15LI AT27C256R-15PI AT27C256R-15JI AT27C256R-15TI	28DW6 32LW 28P6 32J 28T	Industrial (-40°C to 85°C)
			AT27C256R-15DM AT27C256R-15LM	28DW6 32LW	Military (-55°C to 125°C)
			AT27C256R-15DM/883 AT27C256R-15LM/883	28DW6 32LW	Military/883C Class B, Fully Compliant (-55°C to 125°C)
170	20	0.1	AT27C256R-17DC AT27C256R-17LC AT27C256R-17PC AT27C256R-17JC AT27C256R-17TC	28DW6 32LW 28P6 32J 28T	Commercial (0°C to 70°C)
			AT27C256R-17DI AT27C256R-17LI AT27C256R-17PI AT27C256R-17JI AT27C256R-17TI	28DW6 32LW 28P6 32J 28T	Industrial (-40°C to 85°C)
170	25	0.2	AT27C256R-17DM AT27C256R-17LM	28DW6 32LW	Military (-55°C to 125°C)
			AT27C256R-17DM/883 AT27C256R-17LM/883	28DW6 32LW	Military/883C Class B, Fully Compliant (-55°C to 125°C)
			AT27C256R-20DC AT27C256R-20LC AT27C256R-20PC AT27C256R-20JC AT27C256R-20TC	28DW6 32LW 28P6 32J 28T	Commercial (0°C to 70°C)
200	20	0.1	AT27C256R-20DC AT27C256R-20LC AT27C256R-20PC AT27C256R-20JC AT27C256R-20TC	28DW6 32LW 28P6 32J 28T	Commercial (0°C to 70°C)

AT27C256R

Ordering Information

t _{ACC} (ns)	I _{CC} (mA)		Ordering Code	Package	Operation Range
	Active	Standby			
200	25	0.2 -	AT27C256R-20DI AT27C256R-20LI AT27C256R-20PI AT27C256R-20JI AT27C256R-20TI	28DW6 32LW 28P6 32J 28T	Industrial (-40°C to 85°C)
			AT27C256R-20DM AT27C256R-20LM	28DW6 32LW	Military (-55°C to 125°C)
			AT27C256R-20DM/883 AT27C256R-20LM/883	28DW6 32LW	Military/883C Class B, Fully Compliant (-55°C to 125°C)
250	20	0.1	AT27C256R-25DC AT27C256R-25LC AT27C256R-25PC AT27C256R-25JC AT27C256R-25TC	28DW6 32LW 28P6 32J 28T	Commercial (0°C to 70°C)
250	25	0.2	AT27C256R-25DI AT27C256R-25LI AT27C256R-25PI AT27C256R-25JI AT27C256R-25TI	28DW6 32LW 28P6 32J 28T	Industrial (-40°C to 85°C)
			AT27C256R-25DM AT27C256R-25LM	28DW6 32LW	Military (-55°C to 125°C)
			AT27C256R-25DM/883 AT27C256R-25LM/883	28DW6 32LW	Military/883C Class B, Fully Compliant (-55°C to 125°C)

4

Package Type

28DW6	28 Lead, 0.6", Windowed Cerdip
32J	32 Lead, Plastic J-Lead Chip Carrier
32LW	32 Pad, Windowed, Ceramic Leadless Chip Carrier
28P6	28 Lead, 0.6" Wide, Plastic Dual-In-Line
28T	28 Lead, Wide Footprint, Plastic Gull Wing SOIC

