

**Features**

- Wide Power Supply Range, 3.0 V to 5.5 V
- Fast Read Access Time - 200 ns
- Compatible with JEDEC Standard AT27C080
- Low Power 3.3-Volt CMOS Operation
  - 20  $\mu$ A max. Standby
  - 29 mW max. Active at 5 MHz for  $V_{CC} = 3.6$  V
  - 165 mW max. Active at 5 MHz for  $V_{CC} = 5.5$  V
- Wide Selection of JEDEC Standard Packages
  - 32-Lead 600-mil PDIP and Cerdip
  - 32-Lead 450-mil SOIC (SOP)
  - 32-Lead TSOP
- High Reliability CMOS Technology
  - 2000 V ESD Protection
  - 200 mA Latchup Immunity
- Rapid Programming - 50  $\mu$ s/byte (typical)
- Two-line Control
- CMOS and TTL Compatible Inputs and Outputs
- Integrated Product Identification Code
- Commercial and Industrial Temperature Ranges

**8 Megabit  
(1M x 8)  
Low Voltage  
UV  
Erasable  
CMOS  
EPROM**

**Description**

The AT27LV080 chip is a low power, low voltage 8,388,608 bit ultraviolet erasable and electrically programmable read only memory (EPROM) organized as 1 M x 8 bits. It requires only one supply in the range of 3.0 to 5.5 V in normal read mode operation, making it ideal for portable systems.

With a typical power draw of only 10 mW at 1 MHz and  $V_{CC}$  at 3.3 V, the AT27LV080 draws less than one-fifth the power of a standard 5-V EPROM. Standby mode supply current is typically less than 1  $\mu$ A at 3.3 V.

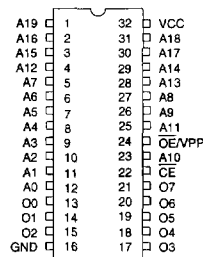
*(continued)*

**Preliminary**

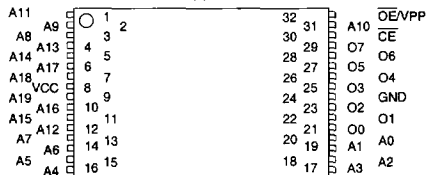
**Pin Configurations**

Pin Name	Function
A0-A19	Addresses
O0-O7	Outputs
CE	Chip Enable
OE/Vpp	Output Enable

CDIP, PDIP, SOIC Top View



TSOP Top View  
Type 1





## Description (Continued)

The AT27LV080 comes in a choice of industry standard JEDEC-approved packages, including: one-time programmable (OTP) plastic PDIP, SOIC (SOP), and TSOP, as well as windowed ceramic Cerdip. All devices feature two-line control ( $\overline{CE}$ ,  $\overline{OE}$ ) to give designers the flexibility to prevent bus contention.

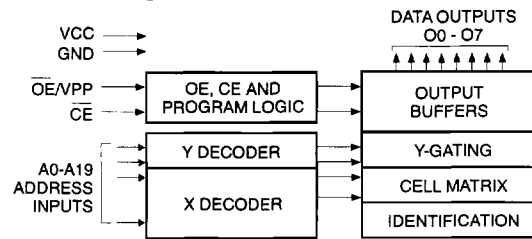
The AT27LV080 operating with  $V_{CC}$  at 3.0 V produces TTL level outputs that are compatible with standard TTL logic devices operating at  $V_{CC} = 5.0$  V.

Atmel's 27LV080 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 50  $\mu$ 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. The AT27LV080 programs identically as an AT27C080.

## Erase Characteristics

The entire memory array of the AT27LV080 is erased (all outputs read as  $V_{OH}$ ) after exposure to ultraviolet light at a wavelength of 2537  $\text{\AA}$ . Complete erasure is assured after a minimum of 20 minutes exposure using 12,000  $\mu$ W/cm<sup>2</sup> intensity lamps spaced one inch away from the chip. Minimum erase time for lamps at other intensity ratings can be calculated from the minimum integrated erasure dose of 15 W-sec/cm<sup>2</sup>. 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.

## Block Diagram



## Absolute Maximum Ratings\*

Temperature Under Bias .....	-40°C to +85°C
Storage Temperature.....	-65°C to +125°C
Voltage on Any Pin with Respect to Ground.....	-2.0 V to +7.0 V <sup>(1)</sup>
Voltage on A9 with Respect to Ground .....	-2.0 V to +14.0 V <sup>(1)</sup>
V <sub>PP</sub> Supply Voltage with Respect to Ground.....	-2.0 V to +14.0 V <sup>(1)</sup>
Integrated UV Erase Dose.....	7258 W*sec/cm <sup>2</sup>

\*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.

### Notes:

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

## Operating Modes


Mode \ Pin	CE	$\overline{OE}/V_{PP}$	Ai	V <sub>CC</sub>	Outputs
Read	V <sub>IL</sub>	V <sub>IL</sub>	Ai	V <sub>CC</sub>	D <sub>OUT</sub>
Output Disable	X	V <sub>IH</sub>	X <sup>(1)</sup>	V <sub>CC</sub>	High Z
Standby	V <sub>IH</sub>	X	X	V <sub>CC</sub>	High Z
Rapid Program <sup>(2)</sup>	V <sub>IL</sub>	V <sub>PP</sub>	Ai	V <sub>CC</sub> <sup>(2)</sup>	D <sub>IN</sub>
PGM Verify <sup>(2)</sup>	V <sub>IL</sub>	V <sub>IL</sub>	Ai	V <sub>CC</sub> <sup>(2)</sup>	D <sub>OUT</sub>
PGM Inhibit <sup>(2)</sup>	V <sub>IH</sub>	V <sub>PP</sub>	X	V <sub>CC</sub> <sup>(2)</sup>	High Z
Product Identification <sup>(2,4)</sup>	V <sub>IL</sub>	V <sub>IL</sub>	A9=V <sub>H</sub> <sup>(3)</sup> A0=V <sub>IH</sub> or V <sub>IL</sub> A1-A19=V <sub>IL</sub>	V <sub>CC</sub> <sup>(2)</sup>	Identification Code

- Notes:
1. X can be V<sub>IL</sub> or V<sub>IH</sub>.
  2. Refer to Programming characteristics. Programming modes require  $V_{CC} \geq 4.5$  V.
  3. V<sub>H</sub> = 12.0  $\pm$  0.5 V.

4. Two identifier bytes may be selected. All Ai inputs are held low (V<sub>IL</sub>), except A9 which is set to V<sub>H</sub> and A0 which is toggled low (V<sub>IL</sub>) to select the Manufacturer's Identification byte and high (V<sub>IH</sub>) to select the Device Code byte.

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

		AT27LV080		
		-20	-25	-30
Operating Temperature (Case)	Com.	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
V <sub>CC</sub> Power Supply		3.0 V to 5.5 V	3.0 V to 5.5 V	3.0 V to 5.5 V

 = Advance Information

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D.C. and Operating Characteristics for Read Operation

(V<sub>CC</sub> = 3.0 V to 5.5 V unless otherwise specified)


Symbol	Parameter	Condition	Min	Max	Units
I <sub>LI</sub>	Input Load Current	V <sub>IN</sub> = 0 V to V <sub>CC</sub>		±1	μA
I <sub>LO</sub>	Output Leakage Current	V <sub>OUT</sub> = 0 V to V <sub>CC</sub>		±5	μA
I <sub>SB</sub>	V <sub>CC</sub> <sup>(1)</sup> Standby Current	I <sub>SB1</sub> (CMOS), $\overline{CE} = V_{CC} \pm 0.3 V$	V <sub>CC</sub> = 3.6 V	20	μA
			V <sub>CC</sub> = 5.5 V	100	μA
		I <sub>SB2</sub> (TTL), $\overline{CE} = 2.0 \text{ to } V_{CC} + 0.5 V$	V <sub>CC</sub> = 3.6 V	100	μA
			V <sub>CC</sub> = 5.5 V	1	mA
I <sub>CC</sub>	V <sub>CC</sub> Active Current	I <sub>CC1</sub> f = 5 MHz, I <sub>OUT</sub> = 0 mA, $\overline{CE} = V_{IL}$ , V <sub>CC</sub> = 3.6 V	Com.	8	mA
			Ind.	10	mA
		I <sub>CC2</sub> f = 5 MHz, I <sub>OUT</sub> = 0 mA, $\overline{CE} = V_{IL}$ , V <sub>CC</sub> = 5.5 V	Com.	30	mA
			Ind.	40	mA
V <sub>IL</sub>	Input Low Voltage		-0.6	0.8	V
V <sub>IH</sub>	Input High Voltage		2.0	V <sub>CC</sub> +0.5	V
V <sub>OL</sub>	Output Low Voltage	I <sub>OL</sub> = 2.0 mA		.4	V
		I <sub>OL</sub> = 100 μA		.2	V
V <sub>OH</sub>	Output High Voltage	I <sub>OH</sub> = -2.0 mA	2.4		V
		I <sub>OH</sub> = -100 μA	V <sub>CC</sub> -0.2		V

Note: 1. V<sub>CC</sub> must be applied simultaneously or before V<sub>pp</sub>, and removed simultaneously or after V<sub>pp</sub>.

A.C. Characteristics for Read Operation

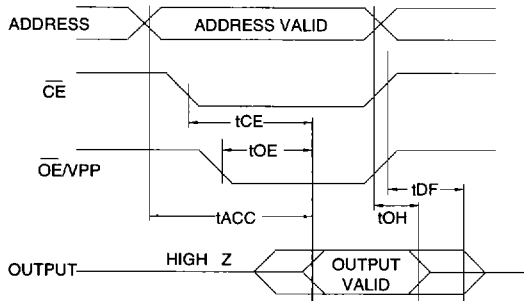
			AT27LV080							
			-20		-25		-30		Units	
Symbol	Parameter	Condition	Min	Max	Min	Max	Min	Max		
t <sub>ACC</sub> <sup>(4)</sup>	Address to Output Delay	$\overline{CE} = \overline{OE}/V_{PP}$ $= V_{IL}$	Com.	200		250		300		ns
			Ind., Mil.	200		250		300		ns
t <sub>CE</sub> <sup>(3)</sup>	$\overline{CE}$ to Output Delay	$\overline{OE}/V_{PP} = V_{IL}$	200		250		300		ns	
t <sub>OE</sub> <sup>(3,4)</sup>	$\overline{OE}/V_{PP}$ to Output Delay	$\overline{CE} = V_{IL}$	70		100		150		ns	
t <sub>DF</sub> <sup>(2,5)</sup>	$\overline{OE}/V_{PP}$ or $\overline{CE}$ High to Output Float		50		50		50		ns	
t <sub>OH</sub>	Output Hold from Address, $\overline{CE}$ or $\overline{OE}/V_{PP}$ , whichever occurred first		0		0		0		ns	

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

 = Advance Information



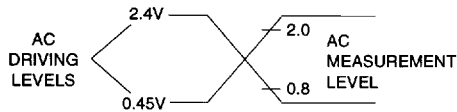
## A.C. Waveforms for Read Operation <sup>(1)</sup>



### Notes:

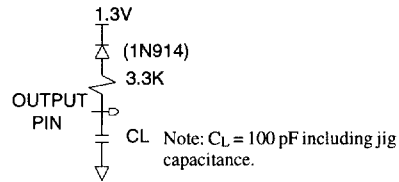
1. Timing measurement references are 0.8 V and 2.0 V. Input AC driving levels are 0.45 V and 2.4 V, unless otherwise specified.
2.  $t_{DF}$  is specified from  $\overline{OE}/V_{PP}$  or  $\overline{CE}$ , whichever occurs first. Output float is defined as the point when data is no longer driven.
3.  $\overline{OE}/V_{PP}$  may be delayed up to  $t_{CE-tOE}$  after the falling edge of  $\overline{CE}$  without impact on  $t_{CE}$ .
4.  $\overline{OE}/V_{PP}$  may be delayed up to  $t_{ACC-tOE}$  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



$t_R, t_F < 20\text{ns}$  (10% to 90%)

## Output Test Load

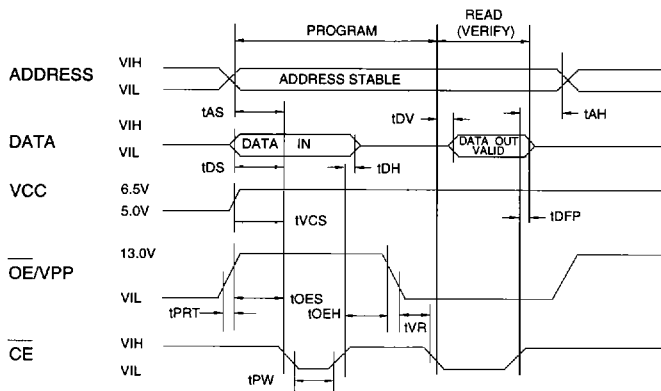


## Pin Capacitance ( $f = 1\text{ MHz}$ $T = 25^\circ\text{C}$ ) <sup>(1)</sup>

	Typ	Max	Units	Conditions
$C_{IN}$	4	8	pF	$V_{IN} = 0\text{ V}$
$C_{OUT}$	8	12	pF	$V_{OUT} = 0\text{ V}$

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

## Programming Waveforms <sup>(1)</sup>



### Notes:

1. The Input Timing Reference is 0.8 V for  $V_{IL}$  and 2.0 V for  $V_{IH}$ .
2.  $t_{OE}$  and  $t_{DFP}$  are characteristics of the device but must be accommodated by the programmer.

### D.C. Programming Characteristics

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

Sym- bol	Parameter	Test Conditions	Limits		Units
			Min	Max	
I <sub>LI</sub>	Input Load Current	$V_{IN}=V_{IL}, V_{IH}$		10	$\mu\text{A}$
V <sub>IL</sub>	Input Low Level	(All Inputs)	-0.6	0.8	V
V <sub>IH</sub>	Input High Level		2.0	$V_{CC}+1$	V
V <sub>OL</sub>	Output Low Volt.	$I_{OL}=2.1\text{ mA}$		.45	V
V <sub>OH</sub>	Output High Volt.	$I_{OH}=-400\ \mu\text{A}$	2.4		V
I <sub>CC2</sub>	V <sub>CC</sub> Supply Current (Program and Verify)			40	mA
I <sub>PP2</sub>	$\overline{\text{OE}}/V_{PP}$ Current	$\overline{\text{CE}}=V_{IL}$		25	mA
V <sub>ID</sub>	A9 Product Identification Voltage		11.5	12.5	V

### A.C. Programming Characteristics

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

Sym- bol	Parameter	Test Conditions* (see Note 1)	Limits		Units
			Min	Max	
t <sub>AS</sub>	Address Setup Time		2		$\mu\text{s}$
t <sub>OES</sub>	$\overline{\text{OE}}/V_{PP}$ Setup Time		2		$\mu\text{s}$
t <sub>OEH</sub>	$\overline{\text{OE}}/V_{PP}$ Hold Time		2		$\mu\text{s}$
t <sub>DS</sub>	Data Setup Time		2		$\mu\text{s}$
t <sub>AH</sub>			-		$\mu\text{s}$
t <sub>DH</sub>	Data Hold Time		2		$\mu\text{s}$
t <sub>DFP</sub>	$\overline{\text{CE}}$ High to Out- put Float Delay	(Note 2)	0	130	ns
t <sub>VCS</sub>	V <sub>CC</sub> Setup Time		2		$\mu\text{s}$
t <sub>PW</sub>	$\overline{\text{CE}}$ Program Pulse Width	(Note 3)	47	53	$\mu\text{s}$
t <sub>DV</sub>	Data Valid from CE	(Note 2)		1	$\mu\text{s}$
t <sub>VR</sub>	$\overline{\text{OE}}/V_{PP}$ Recovery Time		2		$\mu\text{s}$
t <sub>PRT</sub>	$\overline{\text{OE}}/V_{PP}$ Pulse Rise Time During Programming		50		ns

\*A.C. Conditions of Test:

- Input Rise and Fall Times (10% to 90%) ..... 20 ns
- Input Pulse Levels ..... 0.45 V to 2.4 V
- Input Timing Reference Level ..... 0.8 V to 2.0 V
- Output Timing Reference Level ..... 0.8 V to 2.0 V

Notes:

1. V<sub>CC</sub> must be applied simultaneously or before  $\overline{\text{OE}}/V_{PP}$  and removed simultaneously or after  $\overline{\text{OE}}/V_{PP}$ .
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 50  $\mu\text{sec} \pm 5\%$ .

### Atmel's 27LV080 Integrated Product Identification Code

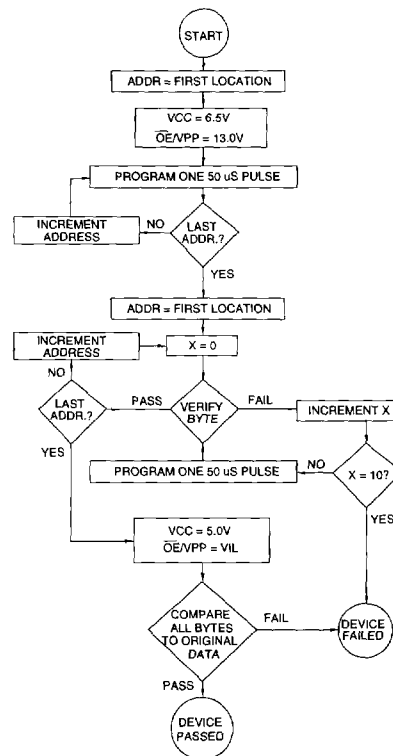
Codes	Pins									Hex Data
	A0	O7	O6	O5	O4	O3	O2	O1	O0	
Manufacturer	0	0	0	0	1	1	1	1	0	1E
Device Type	1	1	0	0	0	1	0	1	0	8A

Note: 1. The AT27LV080 has the same Product Identification Code as the AT27C080. Both are programming compatible.

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### Rapid Programming Algorithm

A 50  $\mu\text{s}$   $\overline{\text{CE}}$  pulse width is used to program. The address is set to the first location. V<sub>CC</sub> is raised to 6.5V and  $\overline{\text{OE}}/V_{PP}$  is raised to 13.0 V. Each address is first programmed with one 50  $\mu\text{s}$   $\overline{\text{CE}}$  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 50  $\mu\text{s}$  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.  $\overline{\text{OE}}/V_{PP}$  is then lowered to V<sub>IL</sub> and V<sub>CC</sub> to 5.0 V. All bytes are read again and compared with the original data to determine if the device passes or fails.





## Ordering Information

 = Advance Information

t <sub>ACC</sub> (ns)	I <sub>CC</sub> (mA)		Ordering Code	Package	Operation Range
	V <sub>CC</sub> = 3.6 V				
	Active	Standby			
200	8	0.02	AT27LV080-20DC AT27LV080-20PC AT27LV080-20TC AT27LV080-20RC	32DW6 32P6 32T 32R	Commercial (0°C to 70°C)
200	10	0.02	AT27LV080-20DI AT27LV080-20PI AT27LV080-20TI AT27LV080-20RI	32DW6 32P6 32T 32R	Industrial (-40°C to 85°C)
250	8	0.02	AT27LV080-25DC AT27LV080-25PC AT27LV080-25TC AT27LV080-25RC	32DW6 32P6 32T 32R	Commercial (0°C to 70°C)
250	10	0.02	AT27LV080-25DI AT27LV080-25PI AT27LV080-25TI AT27LV080-25RI	32DW6 32P6 32T 32R	Industrial (-40°C to 85°C)
300	8	0.02	AT27LV080-30DC AT27LV080-30PC AT27LV080-30TC AT27LV080-30RC	32DW6 32P6 32T 32R	Commercial (0°C to 70°C)
300	10	0.02	AT27LV080-30DI AT27LV080-30PI AT27LV080-30TI AT27LV080-30RI	32DW6 32P6 32T 32R	Industrial (-40°C to 85°C)

Package Type	
<b>32DW6</b>	32 Lead, 0.600" Wide, Windowed, Ceramic Dual Inline Package (Cerdip)
<b>32P6</b>	32 Lead, 0.600" Wide, Plastic Dual Inline Package OTP (PDIP)
<b>32T</b>	32 Lead, Plastic Thin Small Outline Package OTP (TSOP)
<b>32R</b>	32 Lead, 0.450" Wide, Plastic Gull Wing Small Outline Package OTP (SOIC)