

Features

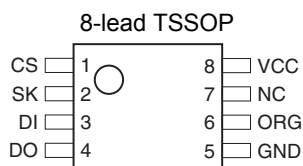
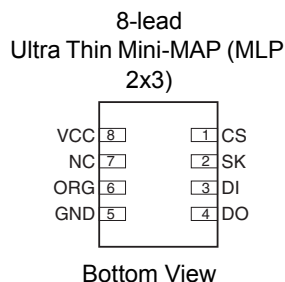
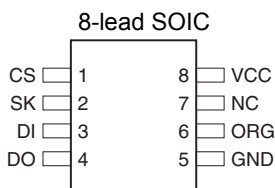
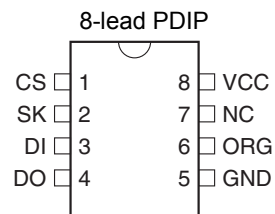
- **Low-voltage and Standard-voltage Operation**
 - 2.7 ($V_{CC} = 2.7V$ to 5.5V)
 - 1.8 ($V_{CC} = 1.8V$ to 5.5V)
- **User Selectable Internal Organization**
 - 16K: 2048 x 8 or 1024 x 16
- **Three-wire Serial Interface**
- **Sequential Read Operation**
- **Schmitt Trigger, Filtered Inputs for Noise Suppression**
- **2 MHz Clock Rate (5V) Compatibility**
- **Self-timed Write Cycle (10 ms max)**
- **High Reliability**
 - Endurance: 1 Million Write Cycles
 - Data Retention: 100 Years
- **Automotive Devices Available**
- **8-lead JEDEC PDIP, 8-lead JEDEC SOIC, 8-lead Ultra Thin Mini-MAP (MLP 2x3), and 8-lead TSSOP Packages**
- **Die Sales: Wafer Form, Waffle Pack and Bumped Wafers**

Description

The AT93C86A provides 16384 bits of serial electrically erasable programmable read only memory (EEPROM), organized as 1024 words of 16 bits each when the ORG pin is connected to V_{CC} and 2048 words of eight bits each when it is tied to ground. The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operations are essential. The AT93C86A is available in space saving 8-lead PDIP, 8-lead JEDEC SOIC, 8-lead Ultra Thin Mini-MAP (MLP 2x3), and 8-lead TSSOP packages.

Table 1. Pin Configurations

Pin Name	Function
CS	Chip Select
SK	Serial Data Clock
DI	Serial Data Input
DO	Serial Data Output
GND	Ground
VCC	Power Supply
ORG	Internal Organization
NC	No Connect



Three-wire Serial EEPROM

16K (2048 x 8 or 1024 x 16)

AT93C86A



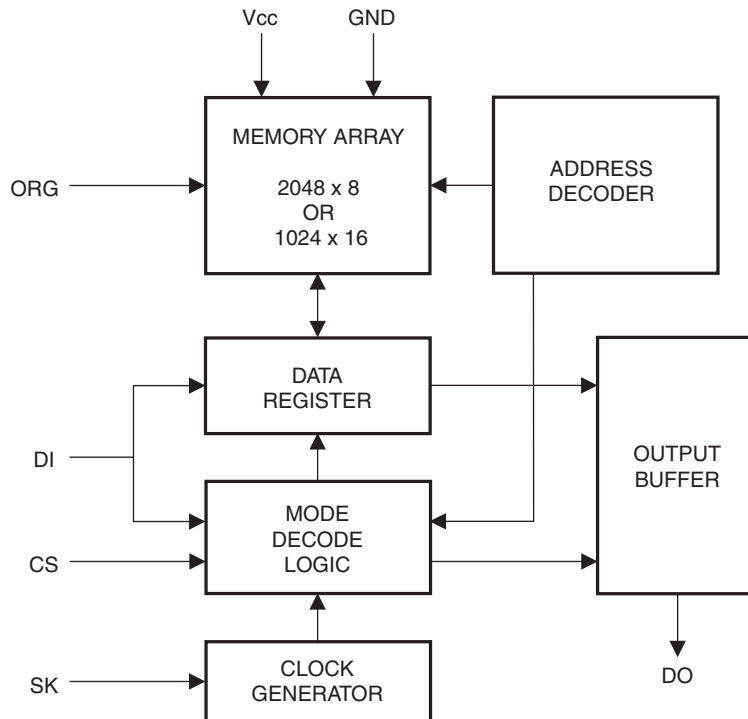
The AT93C86A is enabled through the Chip Select pin (CS), and accessed via a three-wire serial interface consisting of Data Input (DI), Data Output (DO), and Shift Clock (SK). Upon receiving a Read instruction at DI, the address is decoded and the data is clocked out serially on the data output pin DO. The Write cycle is completely self-timed and no separate Erase cycle is required before Write. The Write cycle is only enabled when the part is in the Erase/Write Enable state. When CS is brought "high" following the initiation of a Write cycle, the DO pin outputs the Ready/Busy status of the part. The AT93C86A is available in a 2.7V to 5.5V version.

Absolute Maximum Ratings*

Operating Temperature.....	-55°C to +125°C
Storage Temperature	-65°C to +150°C
Voltage on any Pin with Respect to Ground.....	-1.0V to +7.0V
Maximum Operating Voltage	6.25V
DC Output Current.....	5.0 mA

*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

Figure 1. Block Diagram



Note: When the ORG pin is connected to Vcc, the x 16 organization is selected. When it is connected to ground, the x 8 organization is selected. If the ORG pin is left unconnected and the application does not load the input beyond the capability of the internal 1 Meg ohm pullup, then the x 16 organization is selected.

Table 2. Pin Capacitance⁽¹⁾

Applicable over recommended operating range from $T_A = 25^\circ\text{C}$, $f = 1.0\text{ MHz}$, $V_{CC} = +5.0\text{V}$ (unless otherwise noted)

Symbol	Test Conditions	Max	Units	Conditions
C_{OUT}	Output Capacitance (DO)	5	pF	$V_{OUT} = 0\text{V}$
C_{IN}	Input Capacitance (CS, SK, DI)	5	pF	$V_{IN} = 0\text{V}$

Note: 1. This parameter is characterized and is not 100% tested.

Table 3. DC Characteristics

Applicable over recommended operating range from: $T_{AI} = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = +1.8\text{V}$ to $+5.5\text{V}$, $T_{AE} = -40^\circ\text{C}$ to $+125^\circ\text{C}$, $V_{CC} = +1.8\text{V}$ to $+5.5\text{V}$ (unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit	
V_{CC1}	Supply Voltage		1.8		5.5	V	
V_{CC2}	Supply Voltage		2.7		5.5	V	
V_{CC3}	Supply Voltage		4.5		5.5	V	
I_{CC}	Supply Current	$V_{CC} = 5.0\text{V}$	READ at 1.0 MHz		0.5	2.0	mA
			WRITE at 1.0 MHz		0.5	2.0	mA
I_{SB1}	Standby Current	$V_{CC} = 1.8\text{V}$	CS = 0V		0.4	1.0	μA
I_{SB2}	Standby Current	$V_{CC} = 2.7\text{V}$	CS = 0V		6.0	10.0	μA
I_{SB3}	Standby Current	$V_{CC} = 5.0\text{V}$	CS = 0V		10.0	15.0	μA
I_{IL}	Input Leakage	$V_{IN} = 0\text{V}$ to V_{CC}			0.1	3.0	μA
I_{OL}	Output Leakage	$V_{IN} = 0\text{V}$ to V_{CC}			0.1	3.0	μA
$V_{IL1}^{(1)}$ $V_{IH1}^{(1)}$	Input Low Voltage Input High Voltage	$2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$		---0.6 2.0		0.8 $V_{CC} + 1$	V
$V_{IL2}^{(1)}$ $V_{IH2}^{(1)}$	Input Low Voltage Input High Voltage	$1.8\text{V} \leq V_{CC} \leq 2.7\text{V}$		-0.6 $V_{CC} \times 0.7$		$V_{CC} \times 0.3$ $V_{CC} + 1$	V
V_{OL1} V_{OH1}	Output Low Voltage Output High Voltage	$2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$	$I_{OL} = 2.1\text{ mA}$			0.4	V
			$I_{OH} = -0.4\text{ mA}$	2.4			V
V_{OL2} V_{OH2}	Output Low Voltage Output High Voltage	$1.8\text{V} \leq V_{CC} \leq 2.7\text{V}$	$I_{OL} = 0.15\text{ mA}$			0.2	V
			$I_{OH} = -100\ \mu\text{A}$	$V_{CC} - 0.2$			V

Note: 1. V_{IL} min and V_{IH} max are reference only and are not tested.

Table 4. AC Characteristics

Applicable over recommended operating range from $T_{AI} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $T_{AE} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{CC} = \text{As Specified}$, $CL = 1$ TTL Gate and 100 pF (unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
f_{SK}	SK Clock Frequency	$4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$ $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	0 0 0		2 1 0.25	MHz
t_{SKH}	SK High Time	$2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	250 1000			ns
t_{SKL}	SK Low Time	$2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	250 1000			ns
t_{CS}	Minimum CS Low Time	$2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	250 1000			ns
t_{CSS}	CS Setup Time	Relative to SK $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	50 200			ns
t_{DIS}	DI Setup Time	Relative to SK $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	100 400			ns
t_{CSH}	CS Hold Time	Relative to SK	0			ns
t_{DIH}	DI Hold Time	Relative to SK $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	100 400			ns
t_{PD1}	Output Delay to "1"	AC Test $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$			250 1000	ns
t_{PD0}	Output Delay to "0"	AC Test $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$			250 1000	ns
t_{SV}	CS to Status Valid	AC Test $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$			250 1000	ns
t_{DF}	CS to DO in High Impedance	AC Test CS = V_{IL} $2.7\text{V} \leq V_{CC} \leq 5.5\text{V}$ $1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$			150 400	ns
t_{WP}	Write Cycle Time	$1.8\text{V} \leq V_{CC} \leq 5.5\text{V}$	0.1	3	10	ms
						ms
Endurance ⁽¹⁾	5.0V, 25°C		1M			Write Cycles

Note: 1. This parameter is ensured by characterization.

AT93C86A Ordering Information⁽¹⁾

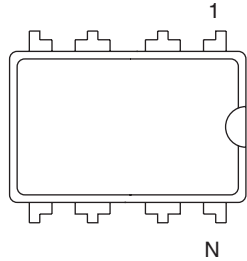
Ordering Code	Package	Operation Range
AT93C86A-10PU-2.7 ⁽²⁾	8P3	Lead-Free/Halogen-Free/ Industrial Temperature (-40°C to 85°C)
AT93C86A-10PU-1.8 ⁽²⁾	8P3	
AT93C86A-10SU-2.7 ⁽²⁾	8S1	
AT93C86A-10SU-1.8 ⁽²⁾	8S1	
AT93C86A-10TU-2.7 ⁽²⁾	8A2	
AT93C86A-10TU-1.8 ⁽²⁾	8A2	
AT93C86AY1-10YU-1.8 ⁽²⁾ (Not recommended for new design)	8Y1	
AT93C86AY6-10YH-1.8 ⁽³⁾	8Y6	
AT93C86A-W1.8-11 ⁽⁴⁾	Die Sale	Industrial Temperature (-40°C to 85°C)

- Notes:
1. For 2.7V devices used in a 4.5V to 5.5V range, please refer to performance values in the AC and DC characteristics tables.
 2. "U" designates Green package + RoHS compliant.
 3. "H" designates Green Package + RoHS compliant, with NiPdAu Lead Finish.
 4. Available in Waffle pack and Wafer form; order as SL788 for inkless Wafer form. Bumped die available upon request. Please contact Serial EEPROM marketing.

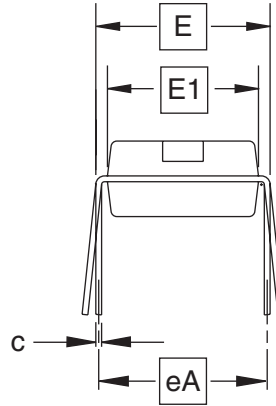
Package Type	
8P3	8-lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)
8S1	8-lead, 0.150" Wide, Plastic Gull Wing Small Outline (JEDEC SOIC)
8A2	8-lead, 0.170" Wide, Thin Shrink Small Outline Package (TSSOP)
8Y1	8-lead, 4.90 mm x 3.00 mm Body, Dual Footprint, Non-leaded, Miniature Array Package (MAP)
8Y6	8-lead, 2.00 mm x 3.00 mm Body, 0.50 mm Pitch, Ultra Thin Mini-MAP, Dual No Lead Package (DFN), (MLP 2x3 mm)
Options	
-2.7	Low Voltage (2.7V to 5.5V)
-1.8	Low Voltage (1.8V to 5.5V)

Packaging Information

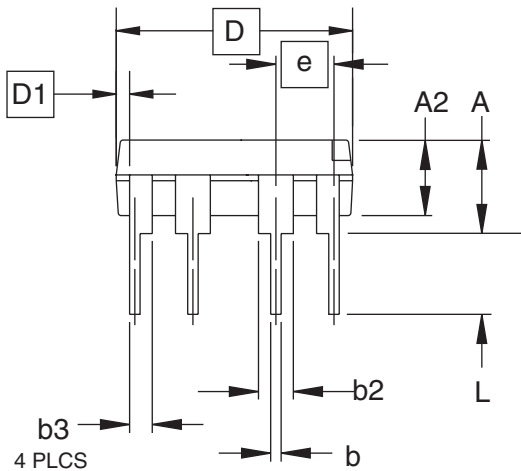
8P3 – PDIP



Top View



End View



Side View

COMMON DIMENSIONS
(Unit of Measure = inches)

SYMBOL	MIN	NOM	MAX	NOTE
A			0.210	2
A2	0.115	0.130	0.195	
b	0.014	0.018	0.022	5
b2	0.045	0.060	0.070	6
b3	0.030	0.039	0.045	6
c	0.008	0.010	0.014	
D	0.355	0.365	0.400	3
D1	0.005			3
E	0.300	0.310	0.325	4
E1	0.240	0.250	0.280	3
e	0.100 BSC			
eA	0.300 BSC			4
L	0.115	0.130	0.150	2

- Notes:
1. This drawing is for general information only; refer to JEDEC Drawing MS-001, Variation BA for additional information.
 2. Dimensions A and L are measured with the package seated in JEDEC seating plane Gauge GS-3.
 3. D, D1 and E1 dimensions do not include mold Flash or protrusions. Mold Flash or protrusions shall not exceed 0.010 inch.
 4. E and eA measured with the leads constrained to be perpendicular to datum.
 5. Pointed or rounded lead tips are preferred to ease insertion.
 6. b2 and b3 maximum dimensions do not include Dambar protrusions. Dambar protrusions shall not exceed 0.010 (0.25 mm).



2325 Orchard Parkway
San Jose, CA 95131

TITLE

8P3, 8-lead, 0.300" Wide Body, Plastic Dual
In-line Package (PDIP)

DRAWING NO.

8P3

REV.

B