

Features

- **Low-voltage and Standard-voltage Operation**
 - 1.8 ($V_{cc} = 1.8V$ to 5.5V)
- **Internally Organized 512 x 8 (4K), or 1024 x 8 (8K)**
- **Two-wire Serial Interface**
- **Schmitt Trigger, Filtered Inputs for Noise Suppression**
- **Bidirectional Data Transfer Protocol**
- **1 MHz (5V), 400 kHz (1.8V, 2.5V, 2.7V) Compatibility**
- **Write Protect Pin for Hardware Data Protection**
- **16-byte Page (4K, 8K) Write Modes**
- **Partial Page Writes Allowed**
- **Self-timed Write Cycle (5 ms max)**
- **High-reliability**
 - **Endurance: 1 Million Write Cycles**
 - **Data Retention: 100 Years**
- **8-lead PDIP, 8-lead JEDEC SOIC, 8-lead Ultra-Thin Mini-MAP (MLP 2x3), 5-lead SOT23, 8-lead TSSOP and 8-ball dBGGA2 Packages**
- **Lead-free/Halogen-free**
- **Die Sales: Wafer Form and Tape and Reel**

Description

The AT24C04B/08B provides 4096/8192 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 512/1024 words of 8 bits each. The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operation are essential. The AT24C04B/08B is available in space-saving 8-lead PDIP, 8-lead JEDEC SOIC, 8-lead Ultra-Thin Mini-MAP (MLP 2x3), 5-lead SOT23, 8-lead TSSOP, and 8-ball dBGGA2 packages and is accessed via a Two-wire serial interface. In addition, the AT24C04B/08B is available in 1.8V (1.8V to 5.5V) version.

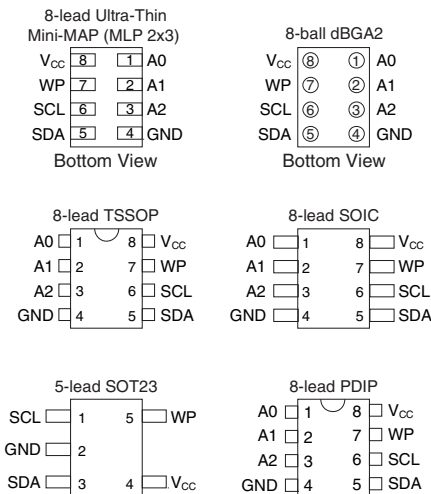
Figure 1. Pin Configurations

Pin Name	Description
A0 – A2	Address Inputs
SDA	Serial Data
SCL	Serial Clock Input
WP	Write Protect
NC	No Connect
GND	Ground
V_{cc}	Power Supply

Note: For use of 5-lead SOT23

4K: The software A2 and A1 bits in the device address word must be set to zero to properly communicate.

8K: The software A2 bit in the device address word must be set to zero to properly communicate.



**Two-wire
Serial EEPROM**
4K (512 x 8)
8K (1024 x 8)

**AT24C04B
AT24C08B**

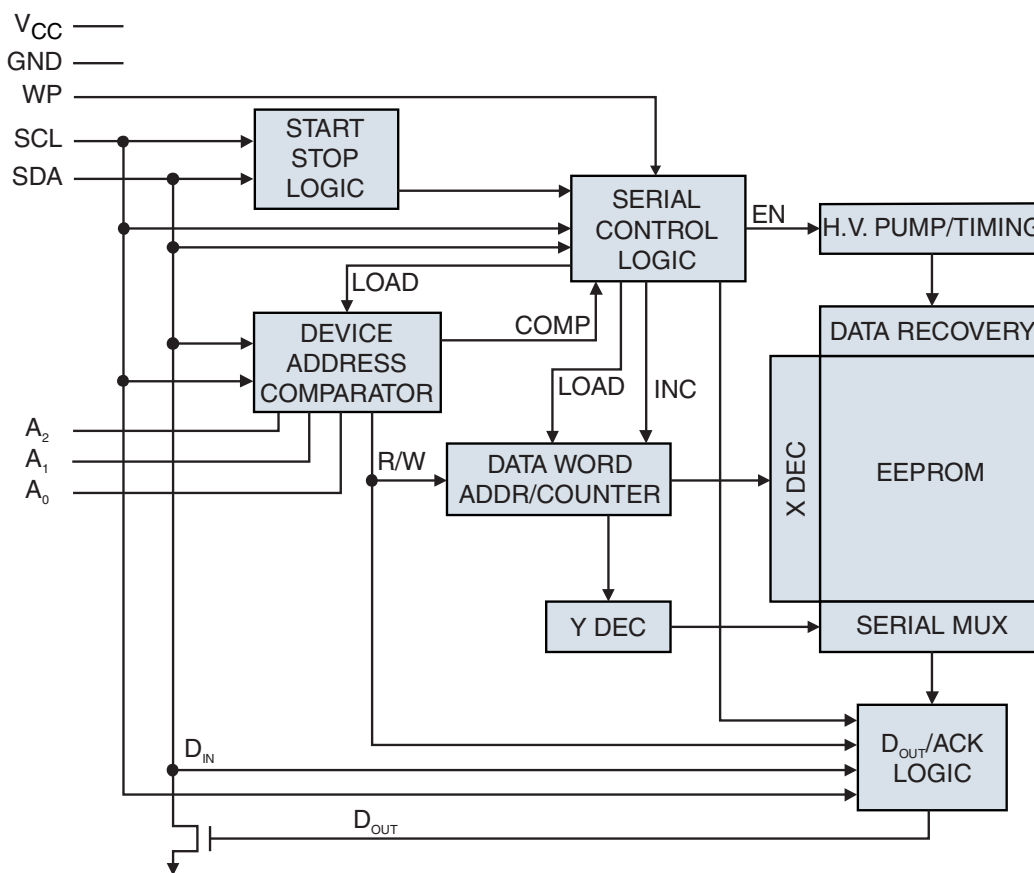


Absolute Maximum Ratings

Operating Temperature	• 55°C to +125°C
Storage Temperature	• 65°C to + 150°C
Voltage on Any Pin with Respect to Ground	• 0.1V 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 condition 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 2. Block Diagram



2. Memory Organization

AT24C04B, 4K SERIAL EEPROM: Internally organized with 32 pages of 16 bytes each, the 4K requires a 9-bit data word address for random word addressing.

AT24C08B, 8K SERIAL EEPROM: Internally organized with 64 pages of 16 bytes each, the 8K requires a 10-bit data word address for random word addressing.

Table 2. Pin Capacitance⁽¹⁾

Applicable over recommended operating range from $T_A = 25^\circ\text{C}$, $f = 1.0\text{ MHz}$, $V_{CC} = +1.8\text{V}$

Symbol	Test Condition	Max	Units	Conditions
C_{IO}	Input/Output Capacitance (SDA)	8	pF	$V_{IO} = 0\text{V}$
C_{IN}	Input Capacitance ($A_0, A_1, A_2, \text{SCL}$)	6	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:

$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = +1.8\text{V}$ to $+5.5\text{V}$ (unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
V_{CC1}	Supply Voltage		1.8		5.5	V
V_{CC2}	Supply Voltage		2.5		5.5	V
V_{CC3}	Supply Voltage		2.7		5.5	V
V_{CC4}	Supply Voltage		4.5		5.5	V
I_{CC}	Supply Current $V_{CC} = 5.0\text{V}$	READ at 100 kHz		0.4	1.0	mA
I_{CC}	Supply Current $V_{CC} = 5.0\text{V}$	WRITE at 100 kHz		2.0	3.0	mA
I_{SB1}	Supply Current $V_{CC} = 1.8\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		0.6	3.0	μA
I_{SB2}	Supply Current $V_{CC} = 2.5\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		1.4	4.0	μA
I_{SB3}	Supply Current $V_{CC} = 2.7\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		1.6	4.0	μA
I_{SB4}	Supply Current $V_{CC} = 5.0\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		8.0	18.0	μA
I_{LI}	Input Leakage Current	$V_{IN} = V_{CC}$ or V_{SS}		0.10	3.0	μA
I_{LO}	Output Leakage Current	$V_{OUT} = V_{CC}$ or V_{SS}		0.05	3.0	μA
V_{IL}	Input Low Level ⁽¹⁾		-0.6		$V_{CC} \times 0.3$	V
V_{IH}	Input High Level ⁽¹⁾		$V_{CC} \times 0.7$		$V_{CC} + 0.5$	V
V_{OL2}	Output Low Level $V_{CC} = 3.0\text{V}$	$I_{OL} = 2.1\text{ mA}$			0.4	V
V_{OL1}	Output Low Level $V_{CC} = 1.8\text{V}$	$I_{OL} = 0.15\text{ mA}$			0.2	V

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

Two-wire Serial EEPROM

Table 4. AC 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 $+5.5\text{V}$, $CL = 1$ TTL Gate and 100 pF (unless otherwise noted)

Symbol	Parameter	1.8, 2.5, 2.7		5.0-volt		Units
		Min	Max	Min	Max	
f_{SCL}	Clock Frequency, SCL		400		1000	kHz
t_{LOW}	Clock Pulse Width Low	1.2		0.4		μs
t_{HIGH}	Clock Pulse Width High	0.6		0.4		μs
t_I	Noise Suppression Time		50		40	ns
t_{AA}	Clock Low to Data Out Valid	0.1	0.9	0.55	0.55	μs
t_{BUF}	Time the bus must be free before a new transmission can start	1.2		0.5		μs
$t_{HD,STA}$	Start Hold Time	0.6		0.25		μs
$t_{SU,STA}$	Start Setup Time	0.6		0.25		μs
$t_{HD,DAT}$	Data in Hold Time	0		0		μs
$t_{SU,DAT}$	Data In Setup Time	100		100		ns
t_R	Inputs Rise Time ⁽¹⁾		0.3		0.3	μs
t_F	Inputs Fall Time ⁽¹⁾		300		100	ns
$T_{SU,STO}$	Stop Setup Time	0.6		.25		μs
t_{DH}	Data Out Hold Time	50		50		ns
t_{WR}	Write Cycle Time		5		5	ms
Endurance ⁽¹⁾	5.0V, 25°C, Byte Mode	1M		1M		Write cycles

Note: 1. This parameter is ensured by characterization only.



9. AT24C04B Ordering Information

Table 5. Ordering Information

Ordering Code	Voltage	Package	Operational range
AT24C04B-PU (Bulk form only)	1.8	8P3	Lead-free/Halogen-free/ Industrial Temperature (-40°C to 85°C)
AT24C04BN-SH-B ⁽¹⁾ (NiPdAu Lead Finish)	1.8	8S1	
AT24C04BN-SH-T ⁽²⁾ (NiPdAu Lead Finish)	1.8	8S1	
AT24C04B-TH-B ⁽¹⁾ (NiPdAu Lead Finish)	1.8	8A2	
AT24C04B-TH-T ⁽²⁾ (NiPdAu Lead Finish)	1.8	8A2	
AT24C04BY6-YH-T ⁽²⁾ (NiPdAu Lead Finish)	1.8	8Y6	
AT24C04B-TSU-T ⁽²⁾	1.8	5TS1	
AT24C04BU3-UU-T ⁽²⁾	1.8	8U3-1	
AT24C04B-W-11 ⁽³⁾	1.8	Die Sale	Industrial Temperature (-40°C to 85°C)

- Note:**
1. "-B" denotes bulk.
 2. "-T" denotes tape and reel. SOIC = 4K per reel. TSSOP, Ultra Thin Mini-MAP, SOT23, and dBGA2 = 5K per reel.
 3. Available in tape and reel and wafer form; order as SL788 for inkless wafer form. Please contact Serial Interface 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, 4.4 mm Body, Plastic Thin Shrink Small Outline Package (TSSOP)
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)
5TS1	5-lead, 2.90 mm x 1.60 mm Body, Plastic Thin Shrink Small Outline Package (SOT23)
8U3-1	8-ball, die Ball Grid Array Package (dBGA2)
Options	
-1.8	Low-voltage (1.8V to 5.5V)



8S1 – JEDEC SOIC

Figure 16. 8S1 – JEDEC SOIC

