

Features

- Write Protect Pin for Hardware Data Protection
 - Utilizes Different Array Protection Compared to the AT24C04B
- Low-voltage and Standard-voltage Operation
 - 1.8 ($V_{CC} = 1.8V$ to 5.5V)
- Internally Organized 512 x 8 (4K)
- Two-wire Serial Interface
- Schmitt Trigger, Filtered Inputs for Noise Suppression
- Bidirectional Data Transfer Protocol
- 1 MHz (5V) and 400 kHz (1.8V, 2.5V, 2.7V) Clock Rate
- 16-byte Page
- Partial Page Writes Allowed
- Self-timed Write Cycle (5 ms Max)
- High Reliability
 - Endurance: One Million Write Cycles
 - Data Retention: 100 Years
- 8-lead PDIP, 8-lead JEDEC SOIC and 8-lead TSSOP Packages
- Die Sales: Wafer Form, Tape and Reel, and Bumped Wafers

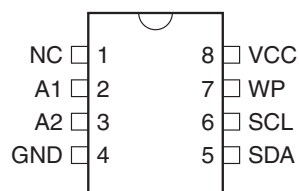
Description

The AT24HC04B provides 4096 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 512 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 AT24HC04B is available in space-saving 8-lead PDIP, 8-lead JEDEC SOIC and 8-lead TSSOP packages and is accessed via a two-wire serial interface. In addition, the entire family is available in 1.8V (1.8V to 5.5V) version.

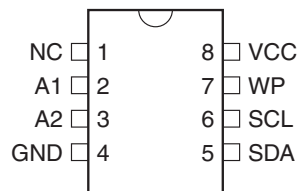
Table 0-1. Pin Configuration

Pin Name	Function
A1, A2	Address Inputs
SDA	Serial Data
SCL	Serial Clock Input
WP	Write Protect
NC	No-connect

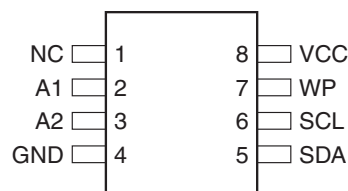
8-lead TSSOP



8-lead PDIP



8-lead SOIC



Two-wire Serial EEPROM

4K (512 x 8)

AT24HC04B

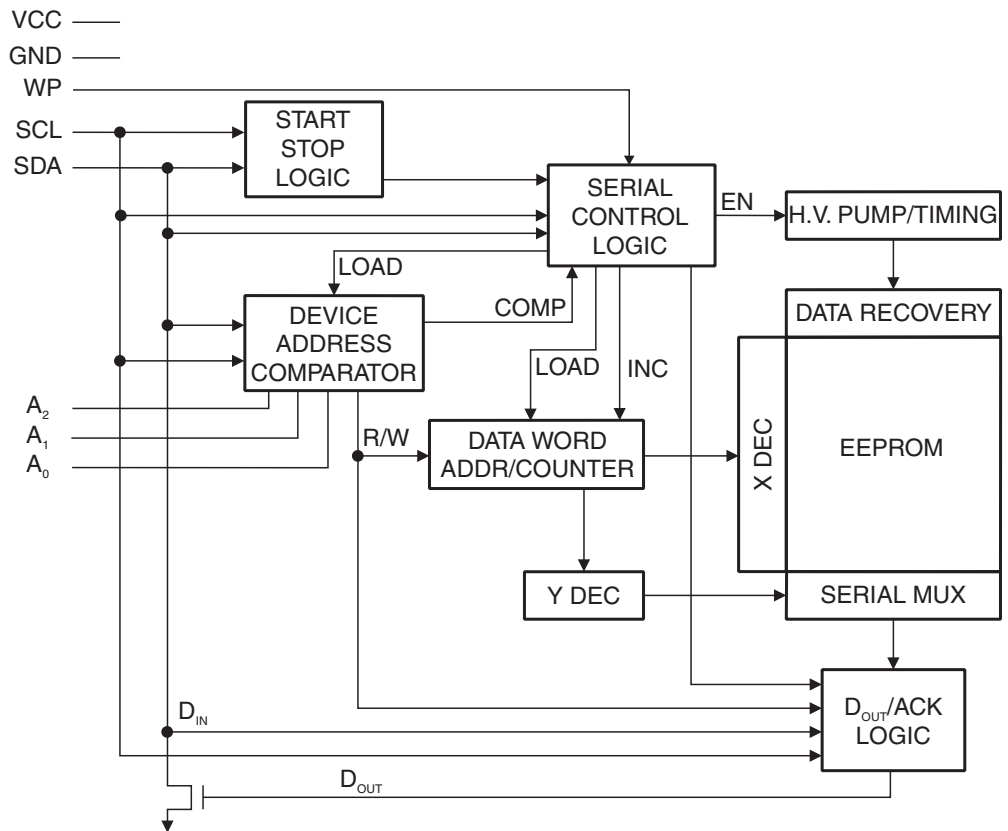


Absolute Maximum Ratings*

Operating Temperature.....	-40°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 0-1. Block Diagram





2. Memory Organization

AT24HC04B, 4K SERIAL EEPROM: The 4K is internally organized with 32 pages of 16 bytes each. Random word addressing requires an 9-bit data word address.

Table 2-1. Pin Capacitance⁽¹⁾

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

Symbol	Test Condition	Max	Units	Conditions
$C_{I/O}$	Input/Output Capacitance (SDA)	8	pF	$V_{I/O} = 0\text{V}$
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 2-2. 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 $+5.5\text{V}$ (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}	Standby Current $V_{CC} = 1.8\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		0.6	3.0	μA
I_{SB2}	Standby Current $V_{CC} = 2.5\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		1.4	4.0	μA
I_{SB3}	Standby Current $V_{CC} = 2.7\text{V}$	$V_{IN} = V_{CC}$ or V_{SS}		1.6	4.0	μA
I_{SB4}	Standby 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.

Table 2-3. 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	0.05	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	1 Million				Write Cycles

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



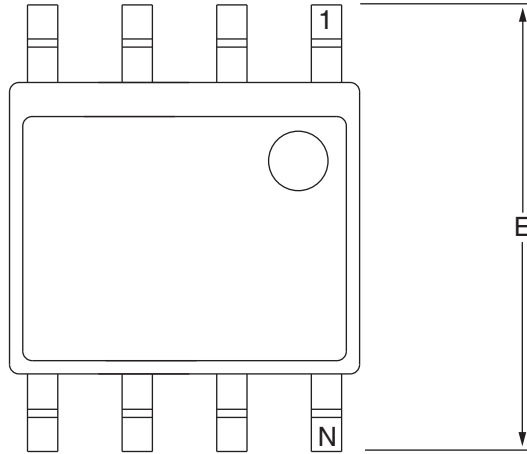
7. AT24HC04B Ordering Information

Ordering Code	Voltage	Package	Operation Range
AT24HC04B-PU (Bulk form only)	1.8	8P3	Lead-free/Halogen-free/ Industrial Temperature (-40°C to 85°C)
AT24HC04BN-SH-B ⁽¹⁾ (NiPdAu Lead Finish)	1.8	8S1	
AT24HC04BN-SH-T ⁽²⁾ (NiPdAu Lead Finish)	1.8	8S1	
AT24HC04B-TH-B ⁽¹⁾ (NiPdAu Lead Finish)	1.8	8A2	
AT24HC04B-TH-T ⁽²⁾ (NiPdAu Lead Finish)	1.8	8A2	
AT24HC04B-W-11 ⁽³⁾	1.8	Die Sale	Industrial Temperature (-40°C to 85°C)

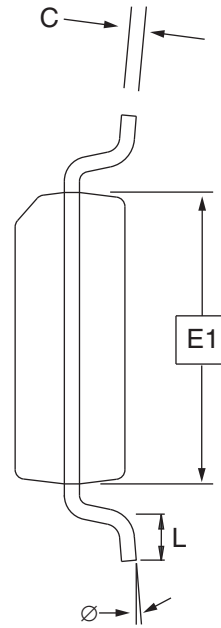
- Notes:
1. "-B" denotes bulk.
 2. "-T" denotes tape and reel. SOIC = 4K per reel. TSSOP = 5K per reel.
 3. Available in tape and reel and wafer form; order as SL788 for inkless wafer form. Bumped die available upon request. Please contact Serial Interface Marketing.

Package Type	
8P3	8-pin, 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)
Options	
-1.8	Low Voltage (1.8V to 5.5V)

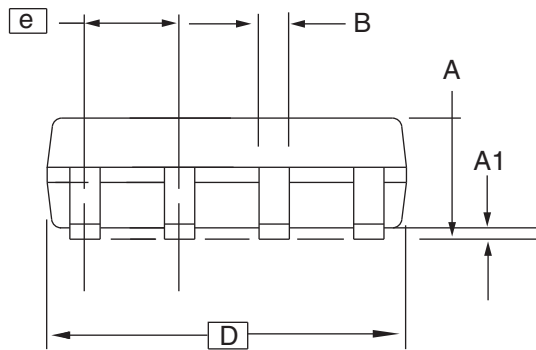
8S1 – JEDEC SOIC



Top View



End View



Side View

COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	1.35	–	1.75	
A1	0.10	–	0.25	
b	0.31	–	0.51	
C	0.17	–	0.25	
D	4.80	–	5.00	
E1	3.81	–	3.99	
E	5.79	–	6.20	
e	1.27 BSC			
L	0.40	–	1.27	
Ø	0°	–	8°	

Note: These drawings are for general information only. Refer to JEDEC Drawing MS-012, Variation AA for proper dimensions, tolerances, datums, etc.



1150 E. Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906

TITLE
8S1, 8-lead (0.150" Wide Body), Plastic Gull Wing
Small Outline (JEDEC SOIC)

DRAWING NO.
8S1

REV.
B