



MICROCHIP

25AA160A/B, 25LC160A/B

16K SPI Bus Serial EEPROM

Device Selection Table

Part Number	Vcc Range	Page Size	Temp. Ranges	Packages
25LC160A	2.5-5.5V	16 Byte	I,E	P, SN, ST, MS
25AA160A	1.8-5.5V	16 Byte	I	P, SN, ST, MS
25LC160B	2.5-5.5V	32 Byte	I,E	P, SN, ST, MS
25AA160B	1.8-5.5V	32 Byte	I	P, SN, ST, MS

Features:

- Max. Clock 10 MHz
- Low-Power CMOS Technology
- 2048 x 8-bit Organization
- 16-Byte Page ('A' version devices)
- 32-Byte Page ('B' version devices)
- Write Cycle Time: 5 ms max.
- Self-Timed Erase and Write Cycles
- Block Write Protection:
 - Protect none, 1/4, 1/2 or all of array
- Built-In Write Protection:
 - Power-on/off data protection circuitry
 - Write enable latch
 - Write-protect pin
- Sequential Read
- High Reliability:
 - Endurance: 1,000,000 erase/write cycles
 - Data retention: > 200 years
 - ESD protection: > 4000V
- Temperature Ranges Supported:
 - Industrial (I): -40°C to +85°C
 - Automotive (E): -40°C to +125°C
- Pb-Free and RoHS Compliant

Description:

The Microchip Technology Inc. 25AA160A/B, 25LC160A/B (25XX160A/B) are 16 Kbit Serial Electrically Erasable PROMs. The memory is accessed via a simple Serial Peripheral Interface (SPI) compatible serial bus. The bus signals required are a clock input (SCK) plus separate data in (SI) and data out (SO) lines. Access to the device is controlled through a Chip Select (\overline{CS}) input.

Communication to the device can be paused via the hold pin (HOLD). While the device is paused, transitions on its inputs will be ignored, with the exception of Chip Select, allowing the host to service higher priority interrupts.

The 25XX160A/B is available in standard Pb-free packages including 8-lead PDIP and SOIC, and advanced packaging including 8-lead MSOP, and 8-lead TSSOP.

Package Types (not to scale)



Pin Function Table

Name	Function
\overline{CS}	Chip Select Input
SO	Serial Data Output
\overline{WP}	Write-Protect
Vss	Ground
SI	Serial Data Input
SCK	Serial Clock Input
\overline{HOLD}	Hold Input
Vcc	Supply Voltage

*25XX160A/B is used in this document as a generic part number for the 25AA160A/B, 25LC160A/B devices.

25XX160A/B

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings^(†)

V _{CC}	7.0V
All inputs and outputs w.r.t. V _{SS}	-0.6V to V _{CC} +1.0V
Storage temperature	-65°C to 150°C
Ambient temperature under bias	-40°C to 125°C
ESD protection on all pins	4 kV

† NOTICE: Stresses above 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 those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for an extended period of time may affect device reliability.

TABLE 1-1: DC CHARACTERISTICS

DC CHARACTERISTICS			Industrial (I): T _{AMB} = -40°C to +85°C V _{CC} = 1.8V to 5.5V Automotive (E): T _{AMB} = -40°C to +125°C V _{CC} = 2.5V to 5.5V			
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
D001	V _{IH1}	High-level input voltage	2.0	V _{CC} +1	V	V _{CC} ≥ 2.7V (Note)
D002	V _{IH2}		0.7 V _{CC}	V _{CC} +1	V	V _{CC} < 2.7V (Note)
D003	V _{IL1}	Low-level input voltage	-0.3	0.8	V	V _{CC} ≥ 2.7V (Note)
D004	V _{IL2}		-0.3	0.2 V _{CC}	V	V _{CC} < 2.7V (Note)
D005	V _{OL}	Low-level output voltage	—	0.4	V	I _{OL} = 2.1 mA
D006	V _{OL}		—	0.2	V	I _{OL} = 1.0 mA, V _{CC} < 2.5V
D007	V _{OH}	High-level output voltage	V _{CC} -0.5	—	V	I _{OH} = -400 μA
D008	I _{LI}	Input leakage current	—	±1	μA	\overline{CS} = V _{CC} , V _{IN} = V _{SS} TO V _{CC}
D009	I _{LO}	Output leakage current	—	±1	μA	\overline{CS} = V _{CC} , V _{OUT} = V _{SS} TO V _{CC}
D010	C _{INT}	Internal Capacitance (all inputs and outputs)	—	7	pF	T _{AMB} = 25°C, CLK = 1.0 MHz, V _{CC} = 5.0V (Note)
D011	I _{CC} Read	Operating Current	—	6	mA	V _{CC} = 5.5V; F _{CLK} = 10.0 MHz; SO = Open
			—	2.5	mA	V _{CC} = 2.5V; F _{CLK} = 5.0 MHz; SO = Open
D012	I _{CC} Write		—	3	mA	V _{CC} = 5.5V
D013	I _{CCS}	Standby Current	—	5	μA	\overline{CS} = V _{CC} = 5.5V, Inputs tied to V _{CC} or V _{SS} , T _{AMB} = -40°C TO +125°C
			—	1	μA	\overline{CS} = V _{CC} = 2.5V, Inputs tied to V _{CC} or V _{SS} , T _{AMB} = -40°C TO +85°C

Note: This parameter is periodically sampled and not 100% tested.

TABLE 1-2: AC CHARACTERISTICS

AC CHARACTERISTICS			Industrial (I): T _{AMB} = -40°C to +85°C V _{CC} = 1.8V to 5.5V Automotive (E): T _{AMB} = -40°C to +125°C V _{CC} = 2.5V to 5.5V			
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
1	FCLK	Clock Frequency	—	10	MHz	4.5V ≤ V _{CC} ≤ 5.5V
			—	5	MHz	2.5V ≤ V _{CC} < 4.5V
			—	3	MHz	1.8V ≤ V _{CC} < 2.5V
2	T _{CSS}	$\overline{\text{CS}}$ Setup Time	50	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			100	—	ns	2.5V ≤ V _{CC} < 4.5V
			150	—	ns	1.8V ≤ V _{CC} < 2.5V
3	T _{CSH}	$\overline{\text{CS}}$ Hold Time	100	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			200	—	ns	2.5V ≤ V _{CC} < 4.5V
			250	—	ns	1.8V ≤ V _{CC} < 2.5V
4	T _{CSD}	$\overline{\text{CS}}$ Disable Time	50	—	ns	—
5	T _{SU}	Data Setup Time	10	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			20	—	ns	2.5V ≤ V _{CC} < 4.5V
			30	—	ns	1.8V ≤ V _{CC} < 2.5V
6	T _{HD}	Data Hold Time	20	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			40	—	ns	2.5V ≤ V _{CC} < 4.5V
			50	—	ns	1.8V ≤ V _{CC} < 2.5V
7	T _R	CLK Rise Time	—	500	ns	(Note 1)
8	T _F	CLK Fall Time	—	500	ns	(Note 1)
9	T _{HI}	Clock High Time	50	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			100	—	ns	2.5V ≤ V _{CC} < 4.5V
			150	—	ns	1.8V ≤ V _{CC} < 2.5V
10	T _{LO}	Clock Low Time	50	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			100	—	ns	2.5V ≤ V _{CC} < 4.5V
			150	—	ns	1.8V ≤ V _{CC} < 2.5V
11	T _{CLD}	Clock Delay Time	50	—	ns	—
12	T _{CLE}	Clock Enable Time	50	—	ns	—
13	T _V	Output Valid from Clock Low	—	50	ns	4.5V ≤ V _{CC} ≤ 5.5V
			—	100	ns	2.5V ≤ V _{CC} < 4.5V
			—	160	ns	1.8V ≤ V _{CC} < 2.5V
14	T _{HO}	Output Hold Time	0	—	ns	(Note 1)
15	T _{DIS}	Output Disable Time	—	40	ns	4.5V ≤ V _{CC} ≤ 5.5V (Note 1)
			—	80	ns	2.5V ≤ V _{CC} ≤ 4.5V (Note 1)
			—	160	ns	1.8V ≤ V _{CC} ≤ 2.5V (Note 1)
16	T _{HS}	$\overline{\text{HOLD}}$ Setup Time	20	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			40	—	ns	2.5V ≤ V _{CC} < 4.5V
			80	—	ns	1.8V ≤ V _{CC} < 2.5V

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

2: This parameter is not tested but ensured by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model which can be obtained from our web site:

3: T_{wc} begins on the rising edge of $\overline{\text{CS}}$ after a valid write sequence and ends when the internal write cycle is complete.

25XX160A/B

TABLE 1-2: AC CHARACTERISTICS (CONTINUED)

AC CHARACTERISTICS			Industrial (I): T _{AMB} = -40°C to +85°C V _{CC} = 1.8V to 5.5V Automotive (E): T _{AMB} = -40°C to +125°C V _{CC} = 2.5V to 5.5V			
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
17	THH	$\overline{\text{HOLD}}$ Hold Time	20	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			40	—	ns	2.5V ≤ V _{CC} < 4.5V
			80	—	ns	1.8V ≤ V _{CC} < 2.5V
18	THZ	$\overline{\text{HOLD}}$ Low to Output High-Z	30	—	ns	4.5V ≤ V _{CC} ≤ 5.5V (Note 1)
			60	—	ns	2.5V ≤ V _{CC} < 4.5V (Note 1)
			160	—	ns	1.8V ≤ V _{CC} < 2.5V (Note 1)
19	THV	$\overline{\text{HOLD}}$ High to Output Valid	30	—	ns	4.5V ≤ V _{CC} ≤ 5.5V
			60	—	ns	2.5V ≤ V _{CC} < 4.5V
			160	—	ns	1.8V ≤ V _{CC} < 2.5V
20	TWC	Internal Write Cycle Time	—	5	ms	(NOTE 3)
21	—	Endurance	1M	—	E/W Cycles	(NOTE 2)

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

2: This parameter is not tested but ensured by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model which can be obtained from our web site: www.microchip.com.

3: TWC begins on the rising edge of $\overline{\text{CS}}$ after a valid write sequence and ends when the internal write cycle is complete.

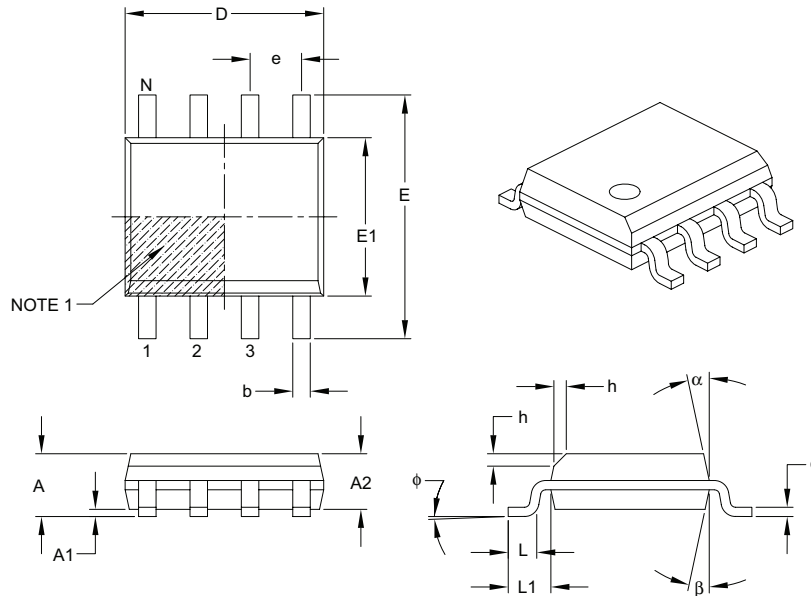
TABLE 1-3: AC TEST CONDITIONS

AC Waveform:	
V _{LO} = 0.2V	—
V _{HI} = V _{CC} - 0.2V	(Note 1)
V _{HI} = 4.0V	(Note 2)
Timing Measurement Reference Level	
Input	0.5 V _{CC}
Output	0.5 V _{CC}

Note 1: For V_{CC} ≤ 4.0V

2: For V_{CC} > 4.0V

8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm Body [SOIC]



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	8		
Pitch	e	1.27 BSC		
Overall Height	A	–	–	1.75
Molded Package Thickness	A2	1.25	–	–
Standoff §	A1	0.10	–	0.25
Overall Width	E	6.00 BSC		
Molded Package Width	E1	3.90 BSC		
Overall Length	D	4.90 BSC		
Chamfer (optional)	h	0.25	–	0.50
Foot Length	L	0.40	–	1.27
Footprint	L1	1.04 REF		
Foot Angle	φ	0°	–	8°
Lead Thickness	c	0.17	–	0.25
Lead Width	b	0.31	–	0.51
Mold Draft Angle Top	α	5°	–	15°
Mold Draft Angle Bottom	β	5°	–	15°

Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- § Significant Characteristic.
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-057B

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>X</u>	-	<u>X</u>	<u>/XX</u>																																					
Device	Tape & Reel		Temp Range	Package																																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Device:</td> <td style="width: 15%;">25AA160A</td> <td style="width: 15%;">16 Kbit, 1.8V, 16 Byte Page SPI Serial EEPROM</td> <td style="width: 15%;">25AA160B</td> <td style="width: 15%;">16 Kbit, 1.8V, 32 Byte Page SPI Serial EEPROM</td> <td style="width: 20%;"></td> </tr> <tr> <td></td> <td>25LC160A</td> <td>16 Kbit, 2.5V, 16 Byte Page SPI Serial EEPROM</td> <td>25LC160B</td> <td>16 Kbit, 2.5V, 32 Byte Page SPI Serial EEPROM</td> <td></td> </tr> <tr> <td>Tape & Reel:</td> <td>Blank</td> <td>= Standard packaging</td> <td>T</td> <td>= Tape & Reel</td> <td></td> </tr> <tr> <td>Temperature Range:</td> <td>I</td> <td>= -40°C to+85°C</td> <td>E</td> <td>= -40°C to+125°C</td> <td></td> </tr> <tr> <td>Package:</td> <td>MS</td> <td>= Plastic MSOP (Micro Small Outline), 8-lead</td> <td>P</td> <td>= Plastic DIP (300 mil body), 8-lead</td> <td></td> </tr> <tr> <td></td> <td>SN</td> <td>= Plastic SOIC (3.90 mm body), 8-lead</td> <td>ST</td> <td>= TSSOP, 8-lead</td> <td></td> </tr> </table>						Device:	25AA160A	16 Kbit, 1.8V, 16 Byte Page SPI Serial EEPROM	25AA160B	16 Kbit, 1.8V, 32 Byte Page SPI Serial EEPROM			25LC160A	16 Kbit, 2.5V, 16 Byte Page SPI Serial EEPROM	25LC160B	16 Kbit, 2.5V, 32 Byte Page SPI Serial EEPROM		Tape & Reel:	Blank	= Standard packaging	T	= Tape & Reel		Temperature Range:	I	= -40°C to+85°C	E	= -40°C to+125°C		Package:	MS	= Plastic MSOP (Micro Small Outline), 8-lead	P	= Plastic DIP (300 mil body), 8-lead			SN	= Plastic SOIC (3.90 mm body), 8-lead	ST	= TSSOP, 8-lead	
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Examples: <ul style="list-style-type: none"> a) 25AA160A-I/MS = 16 Kbit, 16-byte page, 1.8V Serial EEPROM, Industrial temp., MSOP package b) 25AA160AT-I/SN = 16 Kbit, 16-byte page, 1.8V Serial EEPROM, Industrial temp., Tape & Reel, SOIC package c) 25LC160BT-I/SN = 16 Kbit, 32-byte page, 2.5V Serial EEPROM, Industrial temp., Tape & Reel, SOIC package d) 25LC160BT-I/ST = 16 Kbit, 32-byte page, 2.5V Serial EEPROM, Industrial temp., Tape & Reel, TSSOP package 																																									