

64K SPI Bus Serial EEPROM

Device Selection Table

Part Number	Vcc Range	Page Size	Temp. Ranges	Packages
25LC640A	2.5-5.5V	32 Byte	I,E	P, SN, ST, MS, MF, MNY
25AA640A	1.8-5.5V	32 Byte	I	P, SN, ST, MS, MF, MNY

Features:

- Max. Clock 10 MHz
- Low-Power CMOS Technology
 - Max. Write Current: 5 mA at 5.5V, 10 MHz
 - Read Current: 5 mA at 5.5V, 10 MHz
 - Standby Current: 1 μ A at 5.5V
- 8192 x 8-bit Organization
- 32 Byte Page
- Self-Timed Erase and Write Cycles (5 ms max.)
- 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

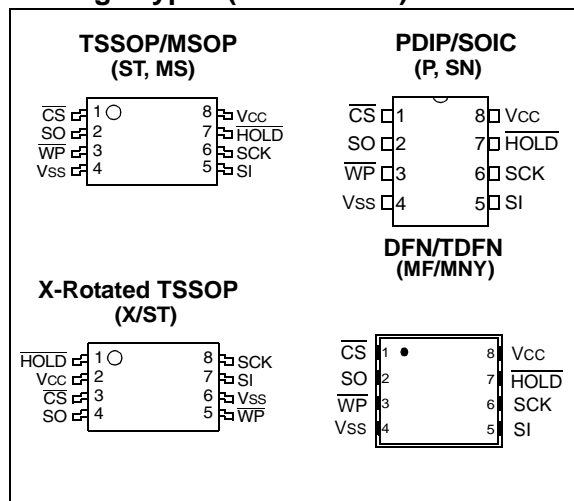
Description:

The Microchip Technology Inc. 25AA640A/25LC640A (25XX640A^{*}) are 64 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 (CS) input.

Communication to the device can be paused via the hold pin ($\overline{\text{HOLD}}$). 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 25XX640A is available in standard packages including 8-lead PDIP and SOIC, and advanced packaging including 8-lead MSOP, 8-lead TSSOP, DFN and TDFN.

Package Types (not to scale)



* 25XX640A is used in this document as a generic part number for the 25AA640A, 25LC640A devices.

25AA640A/25LC640A

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings^(†)

V _{CC}	6.5V
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): TA = -40°C to +85°C		V _{CC} = 1.8V to 5.5V	
			Automotive (E): TA = -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	.7 V _{CC}	V _{CC} +1	V	
D002	V _{IL1}	Low-level input voltage	-0.3	0.3 V _{CC}	V	V _{CC} ≥ 2.7V
D003	V _{IL2}		-0.3	0.2 V _{CC}	V	V _{CC} < 2.7V
D004	V _{OL}	Low-level output voltage	—	0.4	V	I _{OL} = 2.1 mA
D005	V _{OL}		—	0.2	V	I _{OL} = 1.0 mA, V _{CC} < 2.5V
D006	V _{OH}	High-level output voltage	V _{CC} -0.5	—	V	I _{OH} = -400 μA
D007	I _{LI}	Input leakage current	—	±1	μA	\overline{CS} = V _{CC} , V _{IN} = V _{SS} or V _{CC}
D008	I _{LO}	Output leakage current	—	±1	μA	\overline{CS} = V _{CC} , V _{OUT} = V _{SS} or V _{CC}
D009	C _{INT}	Internal Capacitance (all inputs and outputs)	—	7	pF	TA = 25°C, CLK = 1.0 MHz, V _{CC} = 5.0V (Note)
D010	I _{CC} Read	Operating Current	—	5	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
D011	I _{CC} Write		—	5	mA	V _{CC} = 5.5V
			—	3	mA	V _{CC} = 2.5V
D012	I _{CCS}	Standby Current	—	5	μA	\overline{CS} = V _{CC} = 5.5V, Inputs tied to V _{CC} or V _{SS} , 125°C
			—	1	μA	\overline{CS} = V _{CC} = 5.5V, Inputs tied to V _{CC} or V _{SS} , 85°C

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

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TABLE 1-2: AC CHARACTERISTICS

AC CHARACTERISTICS			Industrial (I): TA = -40°C to +85°C		VCC = 1.8V to 5.5V	
			Automotive (E): TA = -40°C to +125°C		VCC = 2.5V to 5.5V	
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
1	FCLK	Clock frequency	—	10	MHz	$4.5V \leq V_{CC} \leq 5.5V$
			—	5	MHz	$2.5V \leq V_{CC} < 4.5V$
			—	3	MHz	$1.8V \leq V_{CC} < 2.5V$
2	TCSS	\overline{CS} setup time	50	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			100	—	ns	$2.5V \leq V_{CC} < 4.5V$
			150	—	ns	$1.8V \leq V_{CC} < 2.5V$
3	TCSH	\overline{CS} hold time	100	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			200	—	ns	$2.5V \leq V_{CC} < 4.5V$
			250	—	ns	$1.8V \leq V_{CC} < 2.5V$
4	TCSD	\overline{CS} disable time	50	—	ns	—
5	Tsu	Data setup time	10	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			20	—	ns	$2.5V \leq V_{CC} < 4.5V$
			30	—	ns	$1.8V \leq V_{CC} < 2.5V$
6	THD	Data hold time	20	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			40	—	ns	$2.5V \leq V_{CC} < 4.5V$
			50	—	ns	$1.8V \leq V_{CC} < 2.5V$
7	TR	CLK rise time	—	100	ns	(Note 1)
8	TF	CLK fall time	—	100	ns	(Note 1)
9	THI	Clock high time	50	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			100	—	ns	$2.5V \leq V_{CC} < 4.5V$
			150	—	ns	$1.8V \leq V_{CC} < 2.5V$
10	TLO	Clock low time	50	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			100	—	ns	$2.5V \leq V_{CC} < 4.5V$
			150	—	ns	$1.8V \leq V_{CC} < 2.5V$
11	TCLD	Clock delay time	50	—	ns	—
12	TCLE	Clock enable time	50	—	ns	—
13	Tv	Output valid from clock low	—	50	ns	$4.5V \leq V_{CC} \leq 5.5V$
			—	100	ns	$2.5V \leq V_{CC} < 4.5V$
			—	160	ns	$1.8V \leq V_{CC} < 2.5V$
14	THO	Output hold time	0	—	ns	(Note 1)
15	TDis	Output disable time	—	40	ns	$4.5V \leq V_{CC} \leq 5.5V$ (Note 1)
			—	80	ns	$2.5V \leq V_{CC} \leq 4.5V$ (Note 1)
			—	160	ns	$1.8V \leq V_{CC} \leq 2.5V$ (Note 1)
16	THS	\overline{HOLD} setup time	20	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			40	—	ns	$2.5V \leq V_{CC} < 4.5V$
			80	—	ns	$1.8V \leq V_{CC} < 2.5V$

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 Microchip's web site

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

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TABLE 1-2: AC CHARACTERISTICS (CONTINUED)

AC CHARACTERISTICS			Industrial (I): TA = -40°C to +85°C VCC = 1.8V to 5.5V Automotive (E): TA = -40°C to +125°C VCC = 2.5V to 5.5V			
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
17	THH	$\overline{\text{HOLD}}$ hold time	20	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			40	—	ns	$2.5V \leq V_{CC} < 4.5V$
			80	—	ns	$1.8V \leq V_{CC} < 2.5V$
18	THZ	$\overline{\text{HOLD}}$ low to output High-Z	30	—	ns	$4.5V \leq V_{CC} \leq 5.5V$ (Note 1)
			60	—	ns	$2.5V \leq V_{CC} < 4.5V$ (Note 1)
			160	—	ns	$1.8V \leq V_{CC} < 2.5V$ (Note 1)
19	THV	$\overline{\text{HOLD}}$ high to output valid	30	—	ns	$4.5V \leq V_{CC} \leq 5.5V$
			60	—	ns	$2.5V \leq V_{CC} < 4.5V$
			160	—	ns	$1.8V \leq V_{CC} < 2.5V$
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 Microchip's web site

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

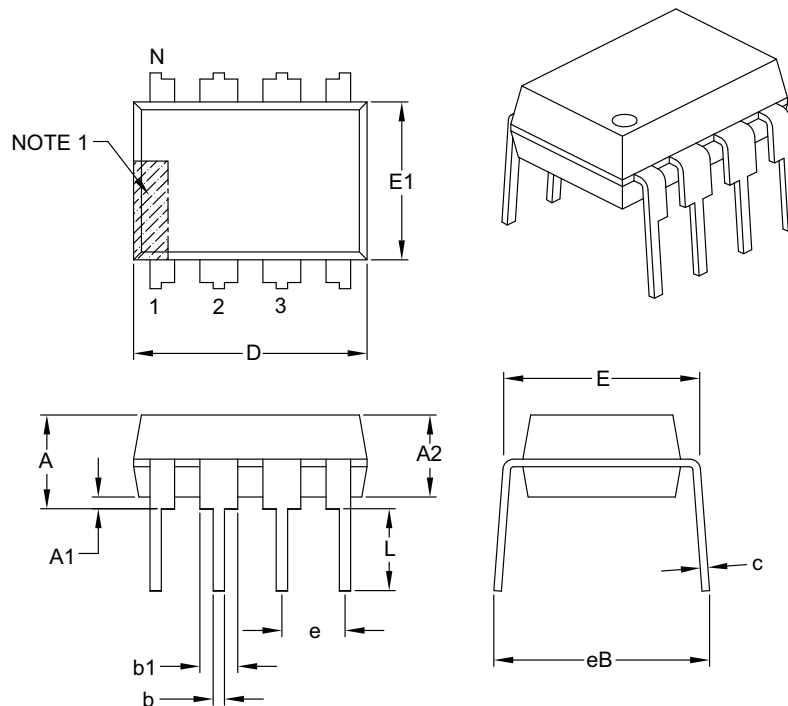
AC Waveform:	
VLO = 0.2V	—
VHI = VCC - 0.2V	(Note 1)
VHI = 4.0V	(Note 2)
CL = 100 pF	—
Timing Measurement Reference Level	
Input	0.5 VCC
Output	0.5 VCC

Note 1: For $V_{CC} \leq 4.0V$

2: For $V_{CC} > 4.0V$

25AA640A/25LC640A

8-Lead Plastic Dual In-Line (P) – 300 mil Body [PDIP]



Dimension Limits	Units	INCHES		
		MIN	NOM	MAX
Number of Pins	N	8		
Pitch	e	.100 BSC		
Top to Seating Plane	A	–	–	.210
Molded Package Thickness	A2	.115	.130	.195
Base to Seating Plane	A1	.015	–	–
Shoulder to Shoulder Width	E	.290	.310	.325
Molded Package Width	E1	.240	.250	.280
Overall Length	D	.348	.365	.400
Tip to Seating Plane	L	.115	.130	.150
Lead Thickness	c	.008	.010	.015
Upper Lead Width	b1	.040	.060	.070
Lower Lead Width	b	.014	.018	.022
Overall Row Spacing §	eB	–	–	.430

Notes:

- Pin 1 visual index feature may vary, but must be located with the hatched area.
- § Significant Characteristic.
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
- Dimensioning and tolerancing per ASME Y14.5M.

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

Microchip Technology Drawing C04-018B

25AA640A/25LC640A

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	
<p>Device:</p> <p>25AA640A = 64k-bit, 1.8V, SPI Serial EEPROM 25LC640A = 64k-bit, 2.5V, SPI Serial EEPROM 25AA640AX = 64k-bit, 1.8V, SPI Serial EEPROM in alternate pinout (ST only) 25LC640AX = 64k-bit, 2.5V, SPI Serial EEPROM in alternate pinout (ST only)</p> <p>Tape & Reel:</p> <p>Blank = Standard packaging T = Tape & Reel</p> <p>Temperature Range:</p> <p>I = -40°C to+85°C E = -40°C to+125°C</p> <p>Package:</p> <p>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 (4.4 mm body), 8-lead MF = DFN (5x6), 8-lead MNY⁽¹⁾ = TDFN (2x3), 8-lead</p> <p>Note 1: "Y" indicates a Nickel Palladium Gold (NiPdAu) finish.</p>					
<p>Examples:</p> <p>a) 25AA640A-I/MS = 64 kbit, 1.8V Serial EEPROM, Industrial temp., MSOP package</p> <p>b) 25AA640AT-I/SN = 64 kbit, 1.8V Serial EEPROM, Industrial temp., Tape & Reel, SOIC package</p> <p>c) 25LC640AT-E/SN = 64 kbit, 2.5V Serial EEPROM, Extended temp., Tape & Reel, SOIC package</p> <p>d) 25LC640AT-I/ST = 64 kbit, 2.5V Serial EEPROM, Industrial temp., Tape & Reel, TSSOP package</p> <p>e) 25LC640AXT-I/ST = 64 kbit, 2.5V Serial EEPROM, Industrial temp., Tape & Reel, Rotated pinout, TSSOP package</p>					