

25AA640/25LC640

64K SPI Bus Serial EEPROM

Device Selection Table

| Part Number | Vcc Range | Max Clock Frequency | Temp Ranges |
|-------------|-----------|---------------------|-------------|
| 25AA640 | 1.8-5.5V | 1 MHz | I |
| 25LC640 | 2.5-5.5V | 2 MHz | I |
| 25LC640 | 4.5-5.5V | 3/2.5 MHz | I, E |

Features:

- Low-Power CMOS Technology
 - Write current: 3 mA, typical
 - Read current: 500 μ A, typical
 - Standby current: 500 nA, typical
- 8192 x 8 Bit Organization
- 32 Byte Page
- 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
 - Data retention: > 200 years
 - ESD protection: > 4000V
- 8-pin PDIP, SOIC and TSSOP Packages
- Temperature Ranges Supported:
 - Industrial (I): -40°C to +85°C
 - Automotive (E): -40°C to +125°C

Description:

The Microchip Technology Inc. 25AA640/25LC640 (25XX640*) is a 64 Kbit Serial Electrically Erasable PROM [EEPROM]. 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.

Block Diagram



Package Types



*25XX640 is used in this document as a generic part number for the 25AA640/25LC640 devices.

25AA640/25LC640

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 | -65°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} = 4.5V to 5.5V | | | |
|--------------------|-----------------------|---|---|---------------------|-------|---|
| Param. No. | Sym | Characteristics | Min | Max | Units | Conditions |
| D1 | V _{IH1} | High-level input voltage | 2.0 | V _{CC} + 1 | V | V _{CC} ≥ 2.7V (Note 1) |
| D2 | V _{IH2} | | 0.7 V _{CC} | V _{CC} + 1 | V | V _{CC} < 2.7V (Note 1) |
| D3 | V _{IL1} | Low-level input voltage | -0.3 | 0.8 | V | V _{CC} ≥ 2.7V (Note 1) |
| D4 | V _{IL2} | | -0.3 | 0.2 V _{CC} | V | V _{CC} < 2.7V (Note 1) |
| D5 | V _{OL} | Low-level output voltage | — | 0.4 | V | I _{OL} = 2.1 mA |
| | | | — | 0.2 | V | I _{OL} = 1.0 mA, V _{CC} = < 2.5V |
| D6 | V _{OH} | High-level output voltage | V _{CC} - 0.5 | — | V | I _{OH} = -400 μA |
| D7 | I _{LI} | Input leakage current | — | ±1 | μA | \overline{CS} = V _{CC} , V _{IN} = V _{SS} TO V _{CC} |
| D8 | I _{LO} | Output leakage current | — | ±1 | μA | \overline{CS} = V _{CC} , V _{OUT} = V _{SS} TO V _{CC} |
| D9 | C _{INT} | Internal Capacitance (all inputs and outputs) | — | 7 | pF | TA = 25°C, CLK = 1.0 MHz, V _{CC} = 5.0V (Note 1) |
| D10 | I _{CC} Read | Operating Current | — | 1 | mA | V _{CC} = 5.5V; F _{CLK} = 3.0 MHz; SO = Open |
| | | | — | 500 | μA | V _{CC} = 2.5V; F _{CLK} = 2.0 MHz; SO = Open |
| D11 | I _{CC} Write | | — | 5 | mA | V _{CC} = 5.5V |
| | | | — | 3 | mA | V _{CC} = 2.5V |
| D12 | I _{CCS} | Standby Current | — | 5 | μA | \overline{CS} = V _{CC} = 5.5V, Inputs tied to V _{CC} or V _{SS} |
| | | | — | 1 | μA | \overline{CS} = V _{CC} = 2.5V, Inputs tied to V _{CC} or V _{SS} |

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

TABLE 1-2: AC CHARACTERISTICS

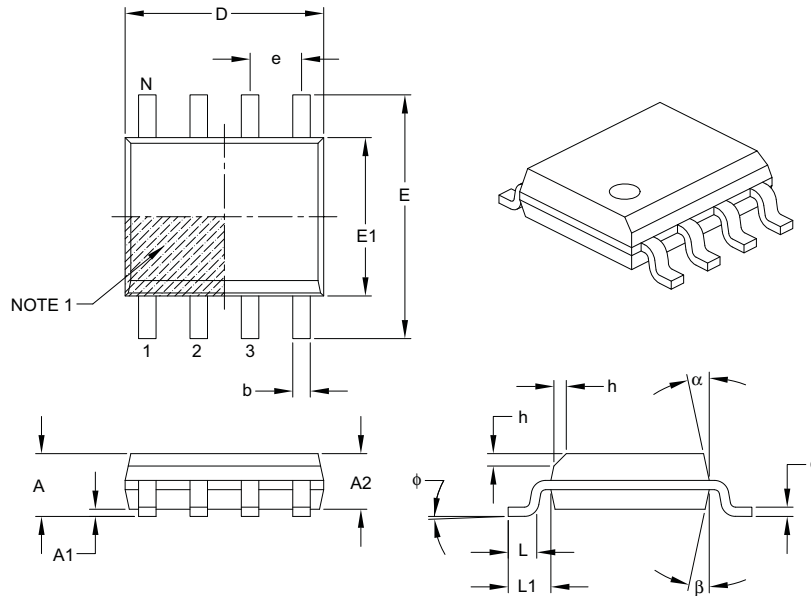
| AC CHARACTERISTICS | | | Industrial (I): Automotive (E): | TA = -40°C to +85°C TA = -40°C to +125°C | VCC = 1.8V to 5.5V VCC = 4.5V to 5.5V | |
|--------------------|------|-----------------------------|------------------------------------|---|--|--------------------------------------|
| Param. No. | Sym | Characteristic | Min | Max | Units | Conditions |
| 1 | FCLK | Clock Frequency | — | 3 | MHz | VCC = 4.5V to 5.5V (Note 2) |
| | | | — | 2 | MHz | VCC = 2.5V to 5.5V |
| | | | — | 1 | MHz | VCC = 1.8V to 5.5V |
| 2 | TCSS | CS Setup Time | 100 | — | ns | VCC = 4.5V to 5.5V |
| | | | 250 | — | ns | VCC = 2.5V to 5.5V |
| | | | 500 | — | ns | VCC = 1.8V to 5.5V |
| 3 | TCSH | CS Hold Time | 150 | — | ns | VCC = 4.5V to 5.5V |
| | | | 250 | — | ns | VCC = 2.5V to 5.5V |
| | | | 475 | — | ns | VCC = 1.8V to 5.5V |
| 4 | TCSD | CS Disable Time | 500 | — | ns | |
| 5 | TSU | Data Setup Time | 30 | — | ns | VCC = 4.5V to 5.5V |
| | | | 50 | — | ns | VCC = 2.5V to 5.5V |
| | | | 50 | — | ns | VCC = 1.8V to 5.5V |
| 6 | THD | Data Hold Time | 50 | — | ns | VCC = 4.5V to 5.5V |
| | | | 100 | — | ns | VCC = 2.5V to 5.5V |
| | | | 100 | — | ns | VCC = 1.8V to 5.5V |
| 7 | TR | CLK Rise Time | — | 2 | µs | (Note 1) |
| 8 | TF | CLK Fall Time | — | 2 | µs | (Note 1) |
| 9 | THI | Clock High Time | 150 | — | ns | VCC = 4.5V to 5.5V |
| | | | 230 | — | ns | VCC = 2.5V to 5.5V |
| | | | 475 | — | ns | VCC = 1.8V to 5.5V |
| 10 | TLO | Clock Low Time | 150 | — | ns | VCC = 4.5V to 5.5V |
| | | | 230 | — | ns | VCC = 2.5V to 5.5V |
| | | | 475 | — | ns | VCC = 1.8V to 5.5V |
| 11 | TCLD | Clock Delay Time | 50 | — | ns | |
| 12 | TCLE | Clock Enable Time | 50 | — | ns | |
| 13 | TV | Output Valid from Clock Low | — | 150 | ns | VCC = 4.5V to 5.5V |
| | | | — | 230 | ns | VCC = 2.5V to 5.5V |
| | | | — | 475 | ns | VCC = 1.8V to 5.5V |
| 14 | THO | Output Hold Time | 0 | — | ns | (Note 1) |
| 15 | TDIS | Output Disable Time | — | 200 | ns | VCC = 4.5V to 5.5V (Note 1) |
| | | | — | 250 | ns | VCC = 2.5V to 5.5V (Note 1) |
| | | | — | 500 | ns | VCC = 1.8V to 5.5V (Note 1) |
| 16 | THS | HOLD Setup Time | 100 | — | ns | VCC = 4.5V to 5.5V |
| | | | 100 | — | ns | VCC = 2.5V to 5.5V |
| | | | 200 | — | ns | VCC = 1.8V to 5.5V |
| 17 | THH | HOLD Hold Time | 100 | — | ns | VCC = 4.5V to 5.5V |
| | | | 100 | — | ns | VCC = 2.5V to 5.5V |
| | | | 200 | — | ns | VCC = 1.8V to 5.5V |
| 18 | THZ | HOLD Low to Output High-Z | 100 | — | ns | VCC = 4.5V to 5.5V (Note 1) |
| | | | 150 | — | ns | VCC = 2.5V to 5.5V (Note 1) |
| | | | 200 | — | ns | VCC = 1.8V to 5.5V (Note 1) |
| 19 | THV | HOLD High to Output Valid | 100 | — | ns | VCC = 4.5V to 5.5V |
| | | | 150 | — | ns | VCC = 2.5V to 5.5V |
| | | | 200 | — | ns | VCC = 1.8V to 5.5V |
| 20 | TWC | Internal Write Cycle Time | — | 5 | ms | |
| 21 | — | Endurance | 1M | — | E/W Cycles | (Note 3) |

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

Note 2: FCLK max. = 2.5 MHz for TA > 85°C.

Note 3: This parameter is not tested but established by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model which can be obtained from Microchip's web site

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.

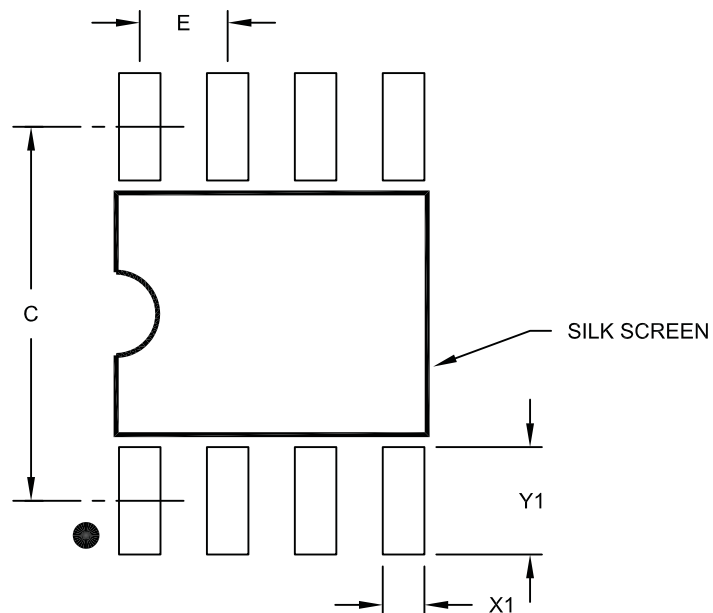
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-057B

25AA640/25LC640

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



RECOMMENDED LAND PATTERN

| Dimension Limits | Units | MILLIMETERS | | |
|-------------------------|-------|-------------|----------|------|
| | | MIN | NOM | MAX |
| Contact Pitch | E | | 1.27 BSC | |
| Contact Pad Spacing | C | | 5.40 | |
| Contact Pad Width (X8) | X1 | | | 0.60 |
| Contact Pad Length (X8) | Y1 | | | 1.55 |

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2057A

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>/XX</u> | <u>XXX</u> |
|-------------------|-------------------|--|------------|
| Device | Temperature Range | Package | Pattern |
| Device | 25AA640: | 64K bit 1.8V SPI Serial EEPROM | |
| | 25AA640T: | 64K bit 1.8V SPI Serial EEPROM (Tape and Reel) | |
| | 25AA640X: | 64K bit 1.8V SPI Serial EEPROM in alternate pinout (ST only) | |
| | 25AA640XT: | 64K bit 1.8V SPI Serial EEPROM in alternate pinout Tape and Reel (ST only) | |
| | 25LC640: | 64K bit 2.5V SPI Serial EEPROM | |
| | 25LC640T: | 64K bit 2.5V SPI Serial EEPROM (Tape and Reel) | |
| | 25LC640X: | 64K bit 2.5V SPI Serial EEPROM in alternate pinout (ST only) | |
| | 25LC640XT: | 64K bit 2.5V SPI Serial EEPROM in alternate pinout Tape and Reel (ST only) | |
| Temperature Range | I = | -40°C to +85°C | |
| | E = | -40°C to +125°C | |
| Package | P = | Plastic DIP (300 mil Body), 8-lead | |
| | SN = | Plastic SOIC (150 mil Body), 8-lead | |
| | ST = | Plastic TSSOP (4.4 mm Body), 8-lead | |

Examples:

- a) 25AA640-I/SN: Industrial Temp., SOIC package
- b) 25AA640T-I/SN: Tape and Reel, Industrial Temp., SOIC package
- c) 25AA640X-I/ST: Alternate Pinout Industrial Temp., TSSOP package
- d) 25LC640-I/SN: Industrial Temp., SOIC package
- e) 25LC640T-I/SN: Tape and Reel, Industrial Temp., SOIC package
- f) 25LC640X-I/ST: Alternate Pinout, Industrial Temp., TSSOP package