



MICROCHIP

25AA320/25LC320/25C320

Not recommended for new designs –
Please use 25AA320A or 25LC320A.

32K SPI Bus Serial EEPROM

Device Selection Table

Part Number	Vcc Range	Max. Clock Frequency	Temp. Ranges
25AA320	1.8-5.5V	1 MHz	I
25LC320	2.5-5.5V	2 MHz	I,E
25C320	4.5-5.5V	3 MHz	I,E

Features:

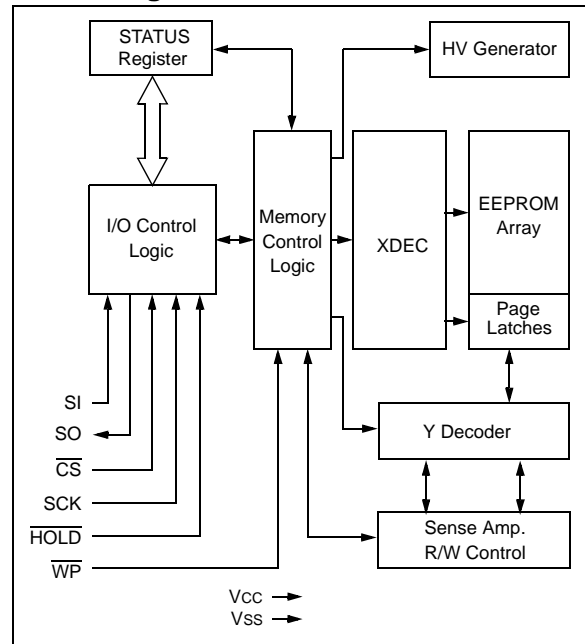
- Low-Power CMOS Technology:
 - Write current: 3 mA maximum
 - Read current: 500 µA, typical
 - Standby current: 500 nA, typical
- 4096 x 8 Bit Organization
- 32 Byte Page
- Write Cycle Time: 5 ms Maximum
- Self-Timed Erase and Write Cycles
- Block Write Protection:
 - Protect none, 1/4, 1/2 or all of array
- Built-in Write Protection:
 - Power on/off data protection circuitry
 - Write enable latch
 - Write-protect pin
- Sequential Read
- High Reliability:
 - Endurance: 1M E/W cycles
 - Data retention: > 200 years
 - ESD protection: > 4000V
- 8-Pin PDIP, SOIC and TSSOP Packages
- 14-Lead TSSOP Package
- Temperature Ranges Supported:
 - Industrial (I): -40°C to +85°C
 - Automotive (E): -40°C to +125°C

Description:

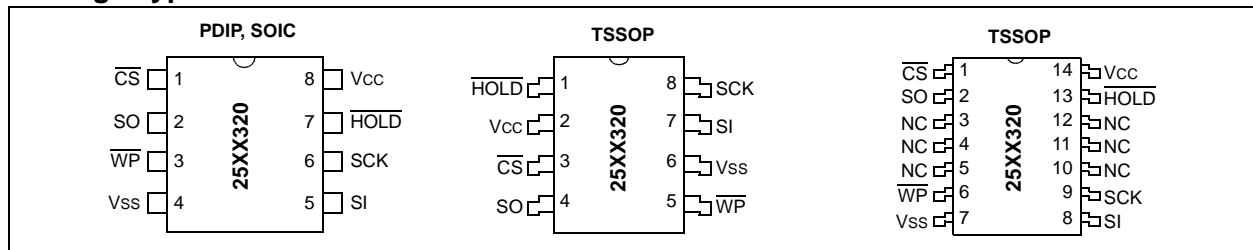
The Microchip Technology Inc. 25AA320/25LC320/25C320 (25XX320*) are 32 Kbit serial Electrically Erasable PROMs. The memory is accessed via a simple Serial Peripheral Interface (SPI) compatible serial bus. The bus signals required are a clock input (SCK) plus separate data in (SI) and data out (SO) lines. 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.

Block Diagram



Package Types



*25XX320 is used in this document as a generic part number for the 25AA320/25LC320/25C320 devices.

25AA320/25LC320/25C320

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): 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.	Characteristics	Min.	Max.	Units	Conditions
D1	V _{IH1}	High-level input voltage	2.0	V _{CC} +1	V	V _{CC} ≥ 2.7V (Note)
D2	V _{IH2}		0.7 V _{CC}	V _{CC} +1	V	V _{CC} < 2.7V (Note)
D3	V _{IL1}	Low-level input voltage	-0.3	0.8	V	V _{CC} ≥ 2.7V (Note)
D4	V _{IL2}		-0.3	0.3 V _{CC}	V	V _{CC} < 2.7V (Note)
D5	V _{OL}	Low-level output voltage	—	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	T _A = 25°C, CLK = 1.0 MHz, V _{CC} = 5.0V (Note)
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: This parameter is periodically sampled and not 100% tested.

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TABLE 1-2: AC CHARACTERISTICS

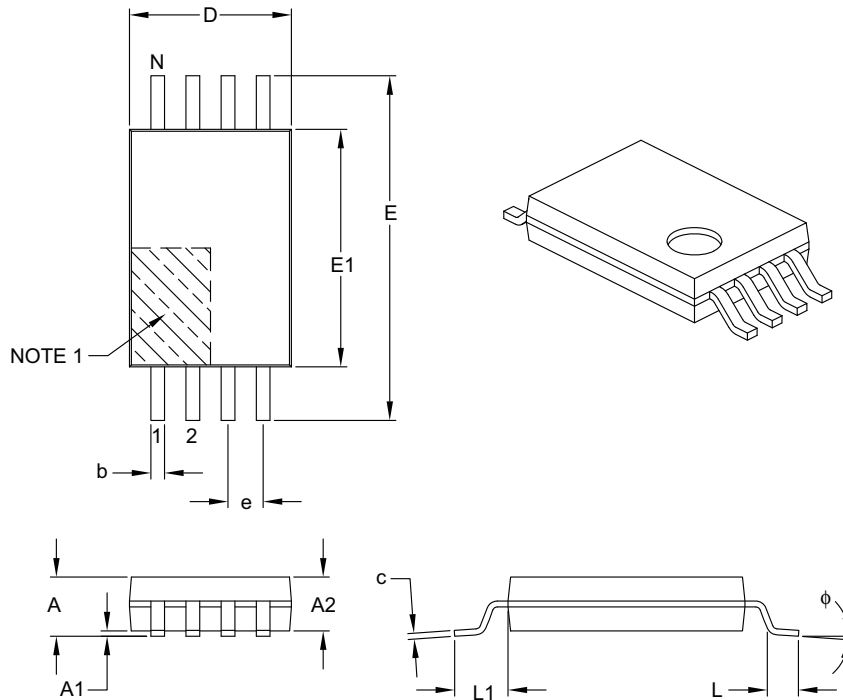
AC CHARACTERISTICS			Industrial (I): Automotive (E):	TA = -40°C to +85°C TA = -40°C to +125°C	VCC = 1.8V to 5.5V VCC = 2.5V to 5.5V	
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Conditions
1	FCLK	Clock Frequency	—	3	MHz	VCC = 4.5V to 5.5V
			—	2	MHz	VCC = 2.5V to 5.5V
			—	1	MHz	VCC = 1.8V to 5.5V
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
			—	—	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)
			—	—	ns	VCC = 1.8V to 5.5V
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
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 2)

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

Note 2: 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 at:

25AA320/25LC320/25C320

8-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm Body [TSSOP]



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	8		
Pitch	e	0.65 BSC		
Overall Height	A	–	–	1.20
Molded Package Thickness	A2	0.80	1.00	1.05
Standoff	A1	0.05	–	0.15
Overall Width	E	6.40 BSC		
Molded Package Width	E1	4.30	4.40	4.50
Molded Package Length	D	2.90	3.00	3.10
Foot Length	L	0.45	0.60	0.75
Footprint	L1	1.00 REF		
Foot Angle	ϕ	0°	–	8°
Lead Thickness	c	0.09	–	0.20
Lead Width	b	0.19	–	0.30

Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- 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 C04-086B

25AA320/25LC320/25C320

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:			
25AA320:		32 Kbit 1.8V SPI Serial EEPROM	
25AA320T:		32 Kbit 1.8V SPI Serial EEPROM (Tape and Reel)	
25AA320X		32-bit 1.8V SPI Serial EEPROM in alternate pinout (ST only)	
25AA320XT		32-bit 1.8V SPI Serial EEPROM in alternate pinout Tape and Reel (ST only)	
25LC320:		32 Kbit 2.5V SPI Serial EEPROM	
25LC320T:		32 Kbit 2.5V SPI Serial EEPROM (Tape and Reel)	
25LC320X		32-bit 2.5V SPI Serial EEPROM in alternate pinout (ST only)	
25LC320XT		32-bit 2.5V SPI Serial EEPROM in alternate pinout Tape and Reel (ST only)	
25C320:		32 Kbit 5V SPI Serial EEPROM	
25C320T:		32 Kbit 5V SPI Serial EEPROM (Tape and Reel)	
25C320X		32-bit 5V SPI Serial EEPROM in alternate pinout (ST only)	
25C320XT		32-bit 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	
	ST14 =	Plastic TSSOP (4.4 mm body), 14-lead	
Examples:			
a) 25LC320-I/SN: Industrial Temp., SOIC package			
b) 25LC320T-I/SN: Tape and Reel, Industrial Temp., SOIC package			
c) 25LC320-E/SN: Extended Temp., SOIC package			
d) 25C320-I/SN: Industrial Temp., SOIC package			
e) 25C320T-I/SN: Tape and Reel, Industrial Temp., SOIC package			
f) 25C320-I/ST: Industrial Temp., TSSOP package			
g) 25C320-E/SN: Extended Temp., SOIC package			