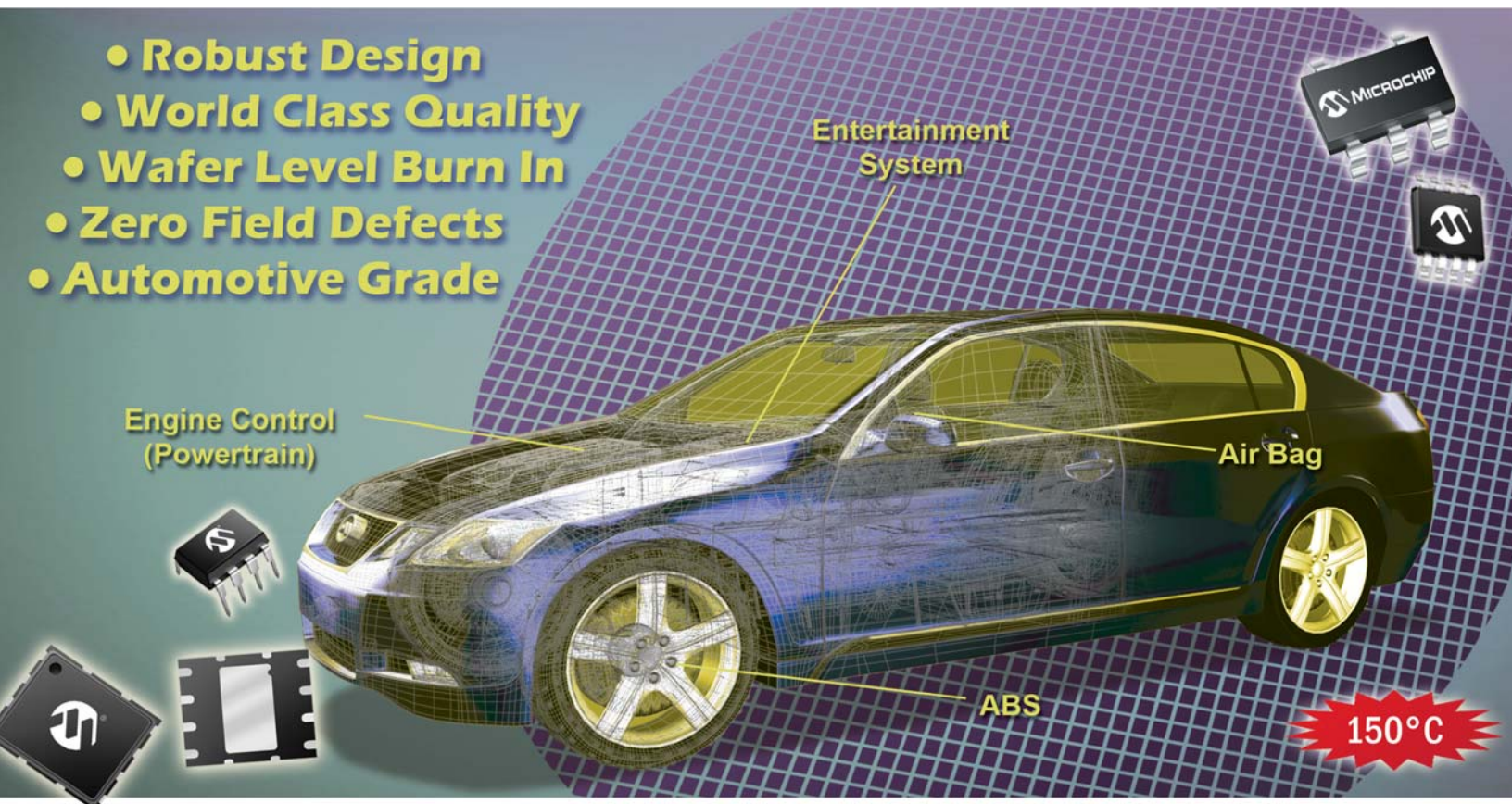




**Serial EEPROM  
Powered for Automotive**

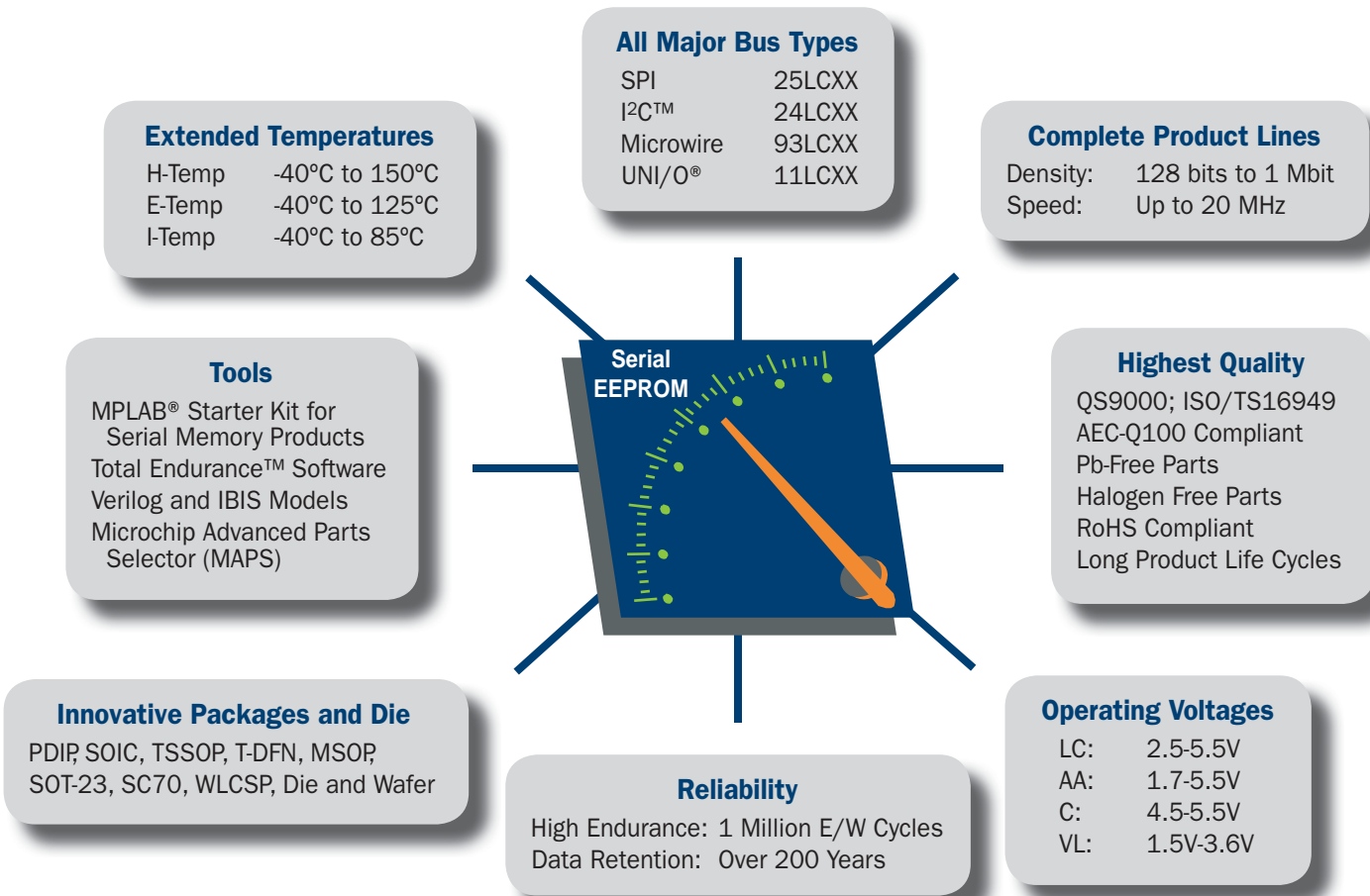
- **Robust Design**
- **World Class Quality**
- **Wafer Level Burn In**
- **Zero Field Defects**
- **Automotive Grade**



# Microchip Serial Memory Products

Microchip Technology has developed industry-leading processes for each step in the design, manufacturing and testing phases of its serial EEPROMs, and has become one of the most respected leaders in supply of these devices to the automotive industry – worldwide.

## Serial EEPROMs



## Serial SRAM

Looking for RAM memory also? Microchip's SPI Serial SRAM products offer:

- A quick and easy way to add external RAM
- 4-pin SPI interface
- 8 and 32 Kbyte options
- 20 MHz clock speed
- No write cycle time



### Robust Design

- ESD Protection
  - > 4000V Human Body Model (HBM)
  - > 400V Machine Model (MM)
  - > 1000V Charged Device Model
- Latch-up protection > 200 mA on all pins
- ESD Induced Latch-up > 100V (MM) on V<sub>DD</sub>; >400V on all I/O
- > 1M cycles Endurance and > 200 years data retention
- Up to 150°C Operation (reads and writes)
- Power-On Reset (POR) and Brown-Out Reset (BOR)
  - Effective protection against noisy automotive environments
  - Eliminates false writes
- Schmitt Trigger input filters for noise reduction
- Complete traceability including die location on wafer

# Wafer-level Burn-in

Microchip's Triple Test Flow is currently the most robust testing procedure for serial EEPROM devices in the industry. It tests each cell of each die three times and also performs extensive endurance and data retention tests to ensure quality and reliability.

Infant mortality of Microchip serial EEPROMs is among the lowest in the industry due to this extensive testing, excellent fabrication and highly reliable memory cell design.

## Traditional Burn-in (Old Technology)

General purpose non-specific testing procedure for random logic cells

- Non-specific and untargeted testing mechanism – Increases failure rates.
- Expensive, time consuming and inefficient.
- Introduces defect modes like bent leads and EOS that sometimes go undetected.

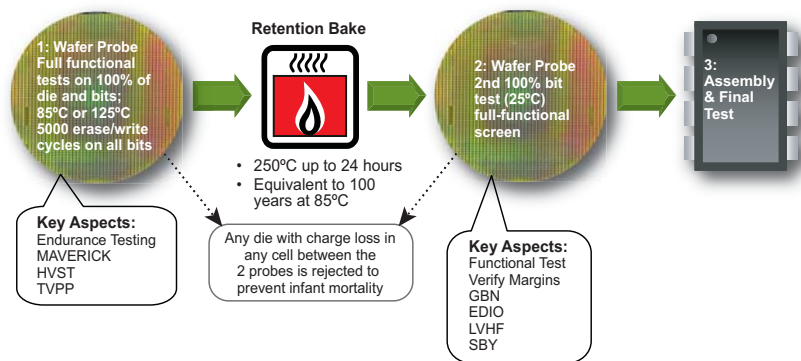
## Microchip's Triple Test and Wafer-level Burn-in Procedure

Moving beyond traditional burn-in to wafer level burn-in with the Triple Test Flow specifically targeted for memory cells has helped create the industry's most reliable memory products.

- Extensive Testing – Every cell in every die is tested three times, including specific endurance and data retention tests to ensure highest quality.
- HVST, LVHF and TVPP tests target specific defects.
- Maverick, SBY and GBN target overall failure patterns and trends.
- Insight into failure modes along with flexible test flow ensures continues improvement.

## Triple Test Flow

Microchip tests every cell in wafer form twice, then performs a final test after assembly.



## Main Goals – Zero Defects

- Full verification of data sheet parameters for functional compliance at die and package level.
- Removal of manufacturing defects to ensure highest quality and reliability.
- Screening out of functional devices that may fail in the future.

## Wafer Probe Quality Screens

Microchip performs additional in-house testing during wafer probe to ensure all parts are of the highest quality and to eliminate any devices that are outside the normal distribution or might possibly fail in the future.

### High Voltage Stress Test (HVST)

HVST targets weak devices with oxide defects in RAM and logic circuits. HVST is a targeted test that eliminates these devices by stressing the oxides at higher than normal voltages.

### Time at Vpp (TVPP)

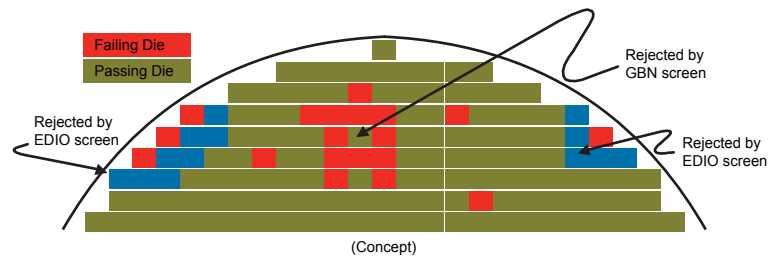
TVPP targets oxide defects in EEPROM cells, charge pumps and other high-voltage circuits. Programming voltages (Vpp) are applied to the memory array for an extended period of time in order to highlight any weak devices.

### Low Voltage High Frequency (LVHF)

LVHF targets signal paths that are partially blocked and therefore more resistive than normal. LVHF eliminates these devices by requiring them to operate faster than specified and at voltages lower than specified.

## Good Die in a Bad Neighborhood (GBN) and Edge Die Ink Out (EDIO)

Special algorithms target devices that function, but are suspect because of their proximity to clusters of failing devices or edge die.



### Maverick Test

Maverick test targets wafer lots with unusual parametric performance and/or yields. Separate from device data sheet parameters, intrinsic parameters such as transistor thresholds or thin film resistances are measured. Maverick testing rejects wafer lots with values outside the normal range.

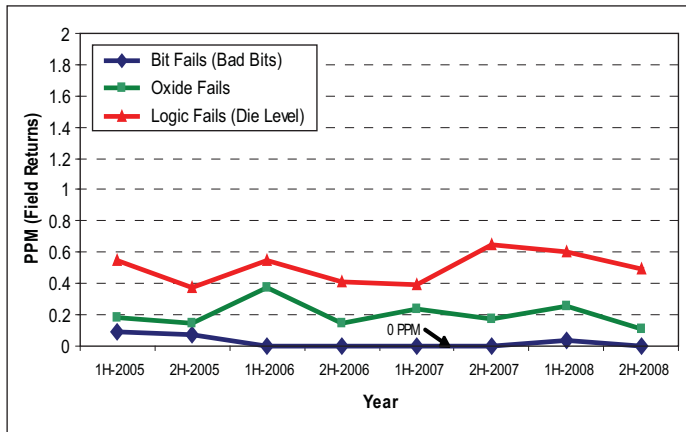
### Statistical Bin Yield (SBY)

SBY targets individual wafers with yields outside the normal range. Within a wafer lot, occasionally an individual wafer will differ significantly from the yield of all the other wafers. SBY rejects that entire wafer.

# Automotive Grade Quality and Tools

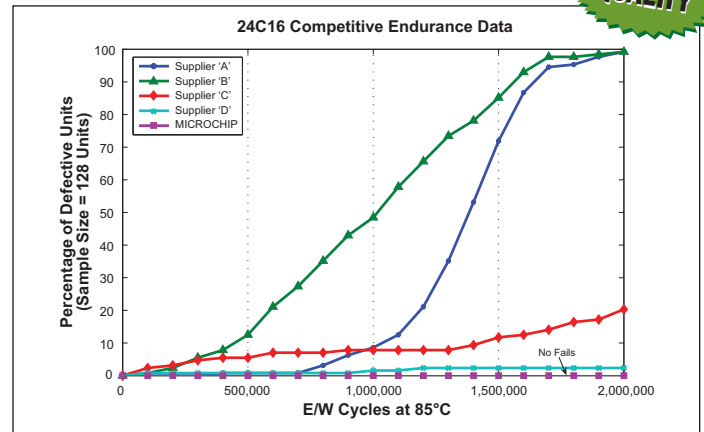
Microchip's best-in-class field performance is the combined result of Wafer Level Burn-In and Wafer Probe Quality Screens.

## Microchip Serial EEPROM Field Return Data



- Industry lowest field return numbers – best suited for automotive applications

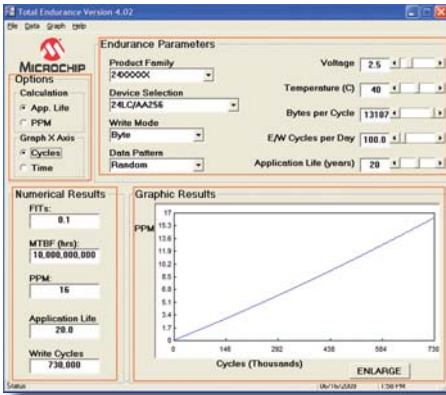
## Microchip Serial EEPROM Endurance



- All devices from supplier A and B failed
- Testing shows zero Microchip EEPROM fails even at 2 million E/W cycles at 85°C

## FREE Total Endurance™ Software

Total Endurance Software provides a comprehensive model that helps estimate the endurance and reliability of Microchip Serial EEPROM devices. By providing operating conditions based on your application, all design trade-offs affecting reliability can be accurately estimated both graphically and numerically in PPM, FIT and MTBF modes, saving time and ensuring a truly robust design.



## Automotive Grade\*



- ISO TS-16949 (inc. VDA6.1) compliant quality manufacturing systems
- Restricted site assembly
- Production Parts Approval Process (PPAP)
- Exceeds AEC Q-100 product qualification requirements
- Special screening and test methods including Maverick lot testing
- Long product life cycle in support of automotive industry 15 year supply requirement

\*Automotive grade criteria will evolve as market requirements change.



## Now Offering I<sup>2</sup>C™ and SPI Serial EEPROMs with Optional Range from -55°C to +150°C

- Automotive Turbo Chargers and Exhaust Gas Recirculation
- Automotive fan motors, air valves, flaps and spark plugs
- Areas under the vehicle hood

## Additional Resources

Verilog and IBIS Models

Microchip Advanced Part Selector (MAPS): [www.microchip.com/maps](http://www.microchip.com/maps)

Memory Products Webinars: <http://techtrain.microchip.com/webseminars>

Over 50 different application notes, many with source code options can be found at: [www.microchip.com/apnotes](http://www.microchip.com/apnotes)

Get started with Microchip's Serial EEPROMs in four easy steps: [www.microchip.com/EEPROM](http://www.microchip.com/EEPROM)

MPLAB Starter Kit for Serial Memory Products (Part Number DV243003) and PIM Packs (AC243003)

# Product Specifications

## I<sup>2</sup>C™ Memory Products

Device	Density (Organization)	Max Clock Frequency	Operating Voltage (AA, LC, C)	Temperature (I, E, H)	Endurance (E/W Cycles)	Data Retention	Write Protect (Hardware)	Packages
24XX00	128 bits (x8)	400 kHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	No	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN
24XX01/014	1 Kbit (x8)	400 kHz	1.7V-5.5V	-40°C to +150°C	1M	200 years	W, ½	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP, SC70
24XX02/024	2 Kbits (x8)	400 kHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	W, ½	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP, SC70
24XX04	4 Kbits (x8)	400 kHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	W, ½	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP, WLCSP
24XX08	8 Kbits (x8)	400 kHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	W, ½	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
24XX16	16 Kbits (x8)	400 kHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	W, ½	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP, WLCSP
24XX32	32 Kbits (x8)	400 kHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	W, ¼	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP, WLCSP
24XX64/65	64 Kbits (x8)	1 MHz	1.7V-5.5V	-40°C to +125°C	1M/10M	200 years	W, ¼	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP, WLCSP
24XX128	128 Kbits (x8)	1 MHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	Yes	PDIP, SOIC, TSSOP, 2x3 T-DFN, 6x5 DFN, MSOP, WLCSP
24XX256	256 Kbits (x8)	1 MHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	Yes	PDIP, SOIC, TSSOP, 6x5 DFN, MSOP, WLCSP
24XX512	512 Kbits (x8)	1 MHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	Yes	PDIP, SOIC, TSSOP, 6x5 DFN, WLCSP
24XX1025	1 Mbit (x8)	1 MHz	1.7V-5.5V	-40°C to +125°C	1M	200 years	Yes	PDIP, SOIC, SOIJ, 6x5 DFN

## UNI/O® Bus Memory Products

Device	Density (Organization)	Max Clock Frequency	Operating Voltage (AA, LC)	Temperature (I, E)	Endurance (E/W Cycles)	Data Retention	Write Protect (Software)	Max Standby Current	Packages
11XX010	1 Kbit (x8)	100 kHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	1 µA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
11XX020	2 Kbits (x8)	100 kHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	1 µA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
11XX040	4 Kbits (x8)	100 kHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	1 µA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
11XX080	8 Kbits (x8)	100 kHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	1 µA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
11XX160	16 Kbits (x8)	100 kHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	1 µA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP

## Microwire Memory Products

Device	Density (x8 or x16)	Max Clock Frequency	Operating Voltage (AA, LC, C)	Temperature (I, E)	Endurance (E/W Cycles)	Data Retention	Write Protect (Hardware)	Read Current	Packages
93XX46A/B/C	1 Kbit	3 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	No	1 mA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
93XX56A/B/C	2 Kbits	3 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	No	1 mA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
93XX66A/B/C	4 Kbits	3 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	No	1 mA	PDIP, SOIC, TSSOP, SOT-23, 2x3 T-DFN, MSOP
93XX76A/B/C	8 Kbits	3 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	Yes	1 mA	PDIP, SOIC, TSSOP, 2x3 T-DFN, MSOP
93XX86A/B/C	16 Kbits	3 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	Yes	1 mA	PDIP, SOIC, TSSOP, 2x3 T-DFN, MSOP

A: x8 Organization, B: x16 Organization, C: Selectable x8 or x16 Organization

## SPI Memory Products

Device	Density (Organization)	Max Clock Frequency	Operating Voltage (AA, LC)	Temperature (I, E, H)	Endurance (E/W Cycles)	Data Retention	Write Protect (Software)	Packages
25XX010A	1 Kbit (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, 2x3 T-DFN, MSOP, SOT-23
25XX020A	2 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, 2x3 T-DFN, MSOP, SOT-23
25XX040A	4 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, 2x3 T-DFN, MSOP, SOT-23
25XX080C/D	8 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, MSOP, 2x3 T-DFN
25XX160C/D	16 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, MSOP, 2x3 T-DFN
25XX320A	32 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, MSOP, 2x3 T-DFN
25XX640A	64 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, MSOP, 2x3 T-DFN
25XX128	128 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, 6x5 DFN
25XX256	256 Kbits (x8)	10 MHz	1.8V-5.5V	-40°C to +150°C	1M	200 years	W, ½, ¼	PDIP, SOIC, TSSOP, 6x5 DFN
25XX512	512 Kbits (x8)	20 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	PDIP, SOIC, 6x5 DFN
25XX1024	1 Mbit (x8)	20 MHz	1.8V-5.5V	-40°C to +125°C	1M	200 years	W, ½, ¼	PDIP, SOIJ, 6x5 DFN

1. Voltage Range: AA = 1.7-5.5V; LC = 2.5-5.5V; C = 4.5-5.5V

2. I = -40°C to 85°C; E = -40°C to 125°C; H = -40°C to 150°C

3. Pb-Free, Halogen Free and RoHS Compliant

4. Write Protect: W = Whole Array, ½ = Half Array, ¼ = Quarter Array

5. ESD protection > 4 kV (HBM); > 400V (MM) on all pins

6. H Temp is SOIC only

## SRAM Memory Products

Device	Density (Organization)	Max Clock Frequency	Operating Voltage (A, K)	Temperature (I, E)	Read Current (mA)	Max Standby Current	Packages
23X640	8KB (64 Kbits)	20 MHz	1.8V, 3V	-40°C to +125°C	3 mA	4 µA	PDIP, SOIC, TSSOP
23X256	32 KB (256 Kbits)	20 MHz	1.8V, 3V	-40°C to +125°C	3 mA	4 µA	PDIP, SOIC, TSSOP

1. Voltage Range: A = 1.5-1.95V; K = 2.7V-3.6V

2. All Devices are Pb-Free, RoHS Compliant and Halogen Free

For up to date product information visit: [www.microchip.com/memory](http://www.microchip.com/memory)

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