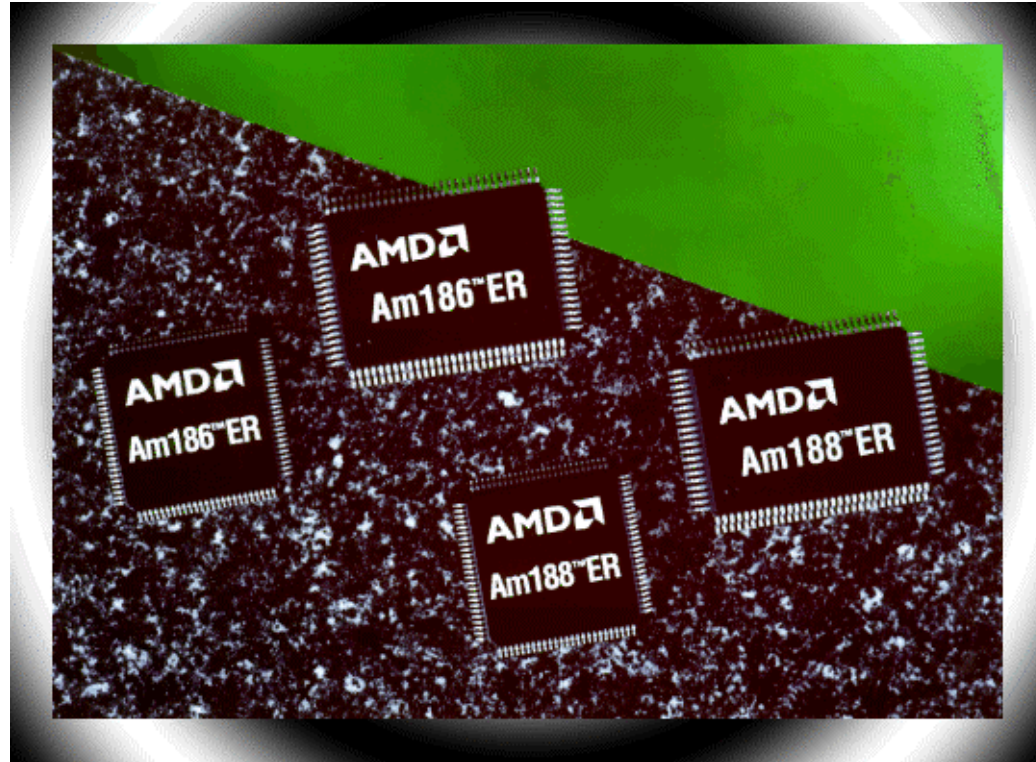




# Am186ER/Am188ER

## AMD Continues 16-bit Innovation



386-Class Performance, Enhanced System Integration, *and* Built-in SRAM





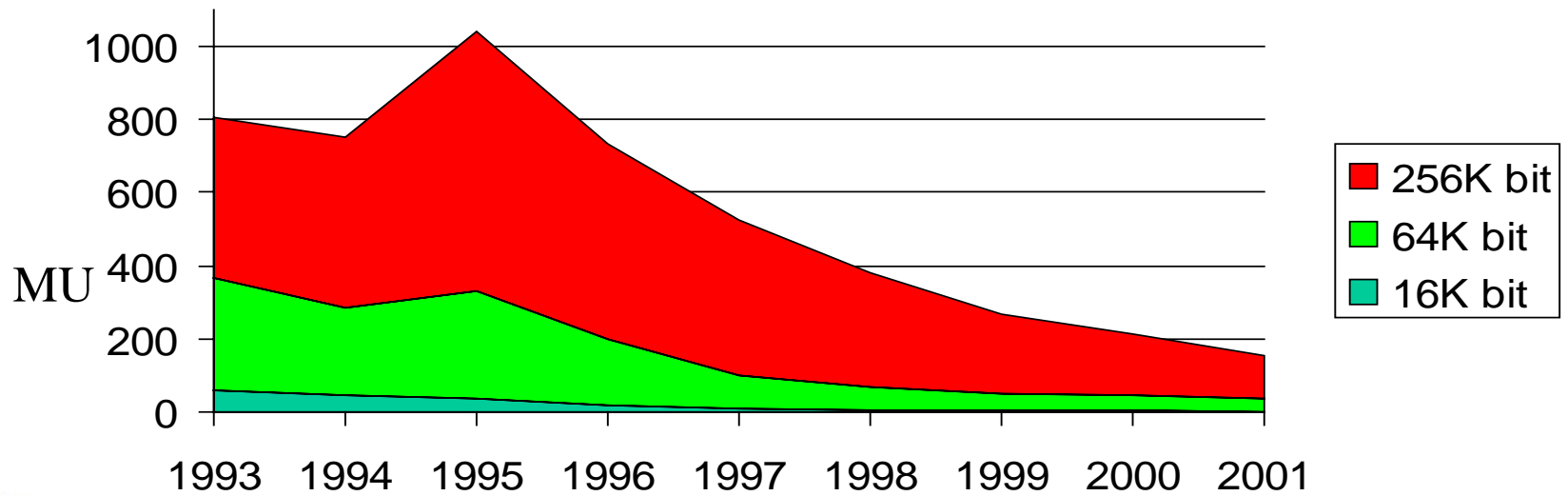
## Problem with External RAM

- All embedded systems require RAM
- Low density SRAM moving to end-of-life
  - PC cache drives SRAM market
  - PCs moving to higher densities and synchronous SRAM
- Alternatives:
  - Pay more for higher density SRAM to ensure supply
  - Integrate RAM with high performance 16-bit microcontroller





# Low Density SRAM Availability



source: Dataquest (Nov 1997)





## Benefits of 32 Kbytes Integrated RAM

- Reduces system cost
- Reduces power consumption (e.g. @ 40 MHz)
  - EM = 1.25W(max.), SRAM typical = 200-400mW (max.), ER = ~600mW (max.)
- Zero wait state performance
- Eliminating two external SRAMs saves ~1.0 square inches
- Simplifies inventory management, system qualifications, and reduces development time





## Am186ER/Am188ER Microcontrollers

- 32 Kbytes of integrated RAM
  - 16Kx16 for Am186ER, 32Kx8 for Am188ER
- 50 MHZ Max. Frequency = 6.6 MIPS
- Full Am186EM/188EM feature set compatibility
  - Same 32-bit level performance
- 3.3V +/- 0.3V using .3μ
  - 5v tolerant I/O
  - TTL compatible
- Pin and bus compatible with:
  - Am186EM/188EM/186ES/188ES
  - 100 pin PQFP and TQFP packages





## Am186/188ER Rev B Enhanced Features

- Increased performance
  - 50 MHZ Max Frequency
  - 6.6 MIPs
- DMA to/from asynchronous serial port
- Hardware Watchdog Timer





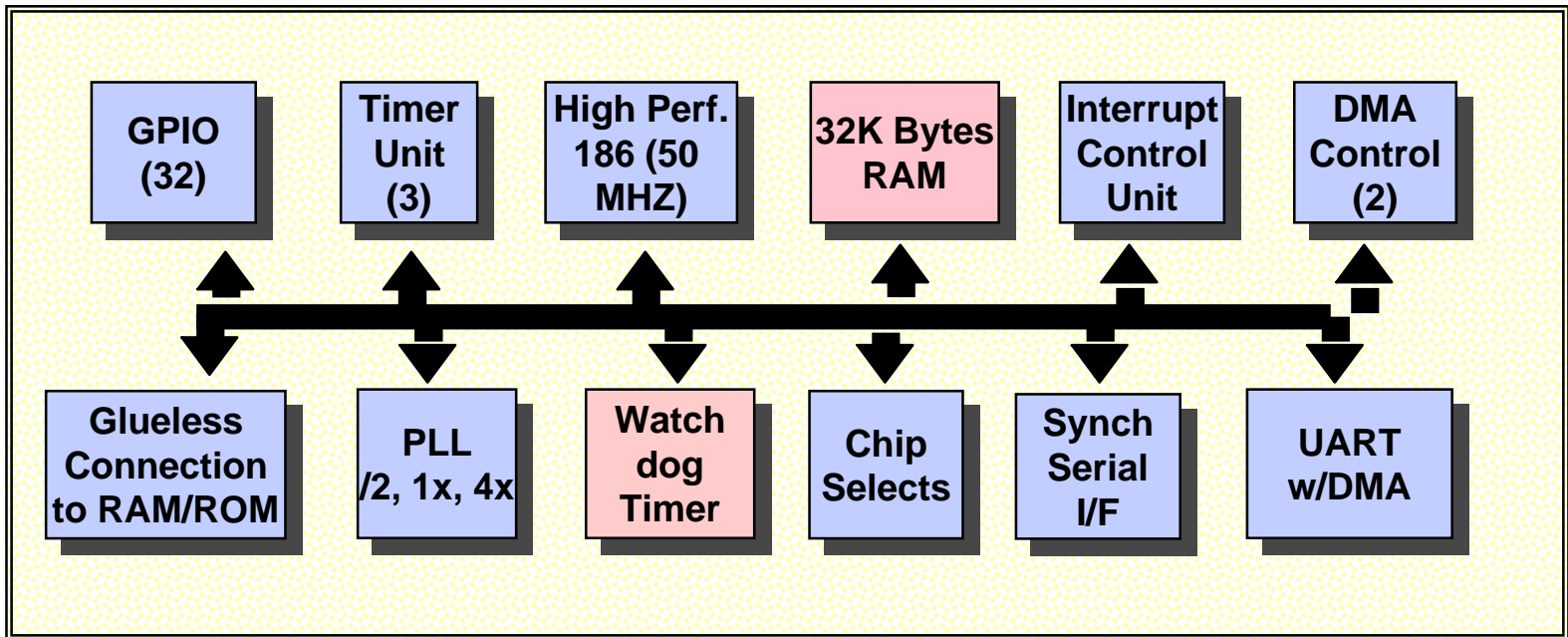
## Am186/188ER Rev B Enhanced Features Con't

- Am186/188ER 40MHz max at Industrial Temp now available in both PQFP and TQFP
  - PQFP 25, 33 & 40MHz at Industrial Temp available
  - TQFP 25, 33 & 40MHz at Industrial Temp available
- If you are currently using an EM or ES and need to upgrade to a higher frequency industrial grade device, consider the ER





# Am186ER Block Diagram





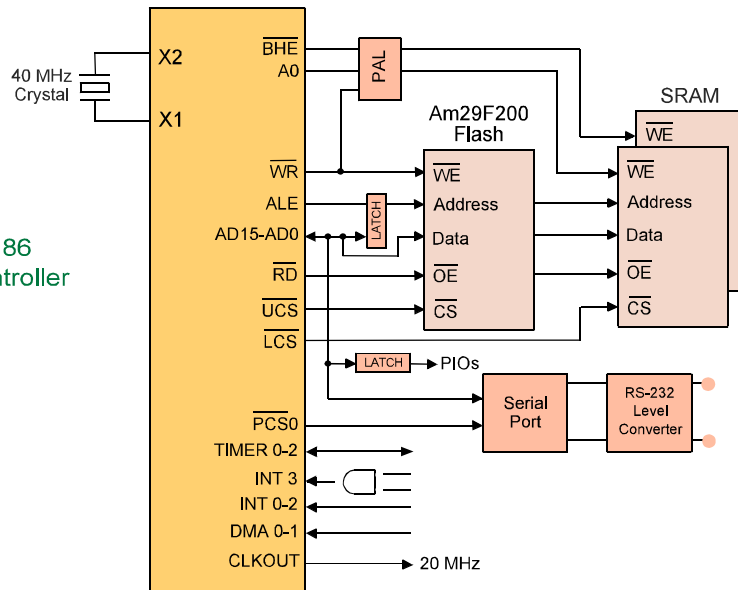


# Typical 80C186 vs. Am186ER System

## Typical 80C186 System

Many peripheral components are required to complete this system

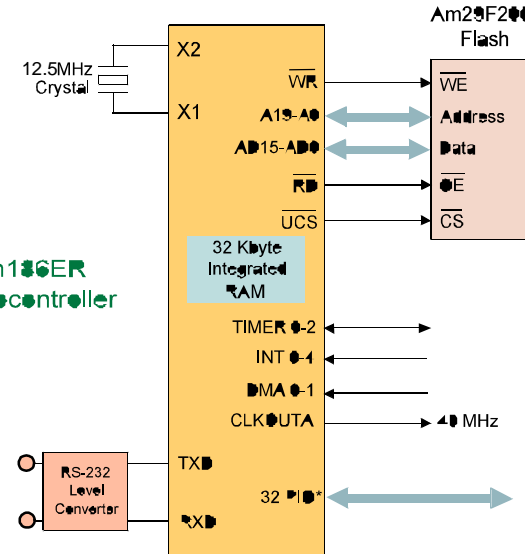
80C186  
Microcontroller



## Am186ER Microcontroller Simplified System

On-board RAM integration lowers system cost, speeds time-to-market

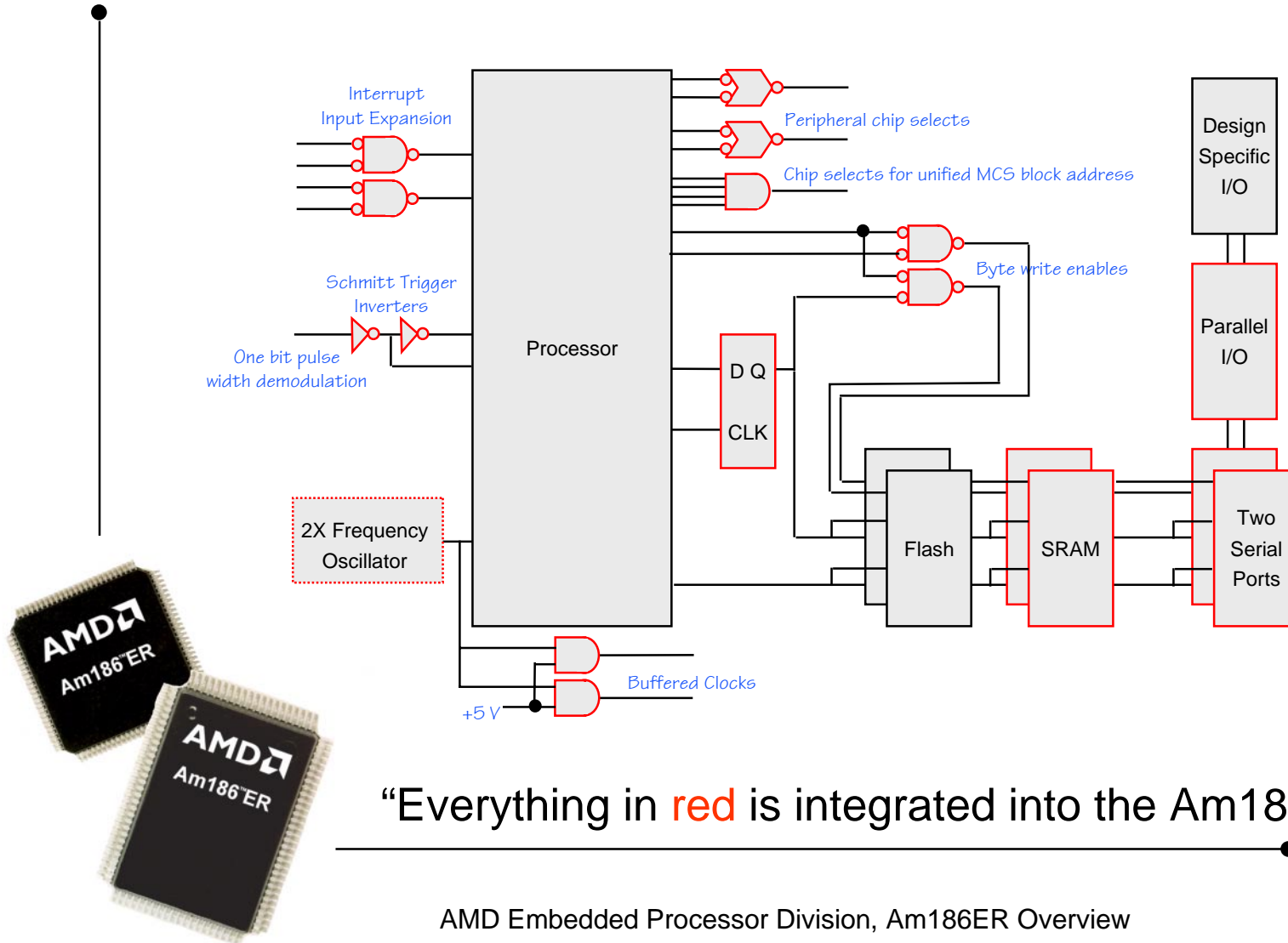
Am186ER  
Microcontroller



\* All PIO signals are shared with other physical pins.



# Am186ER Microcontrollers Lowers System Cost

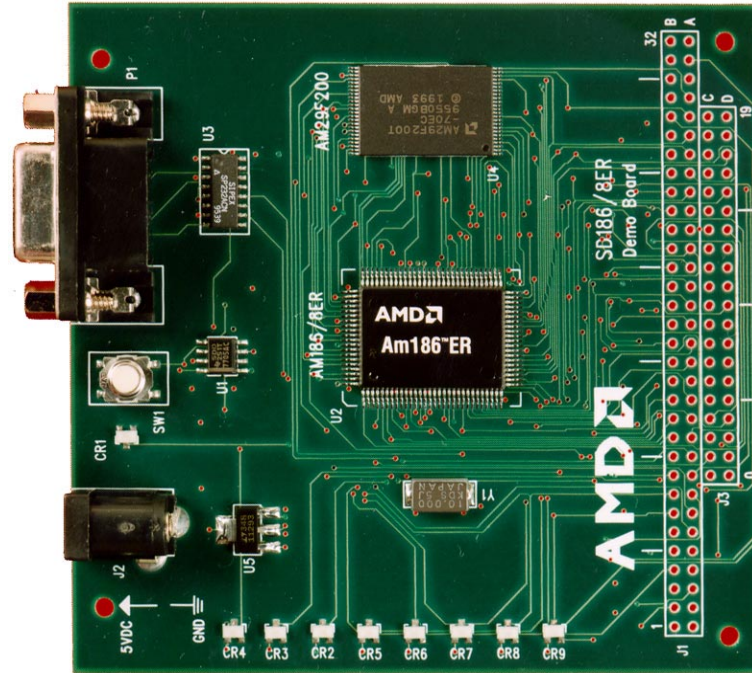


“Everything in red is integrated into the Am186.”





# Am186ER Microcontroller Evaluation Board



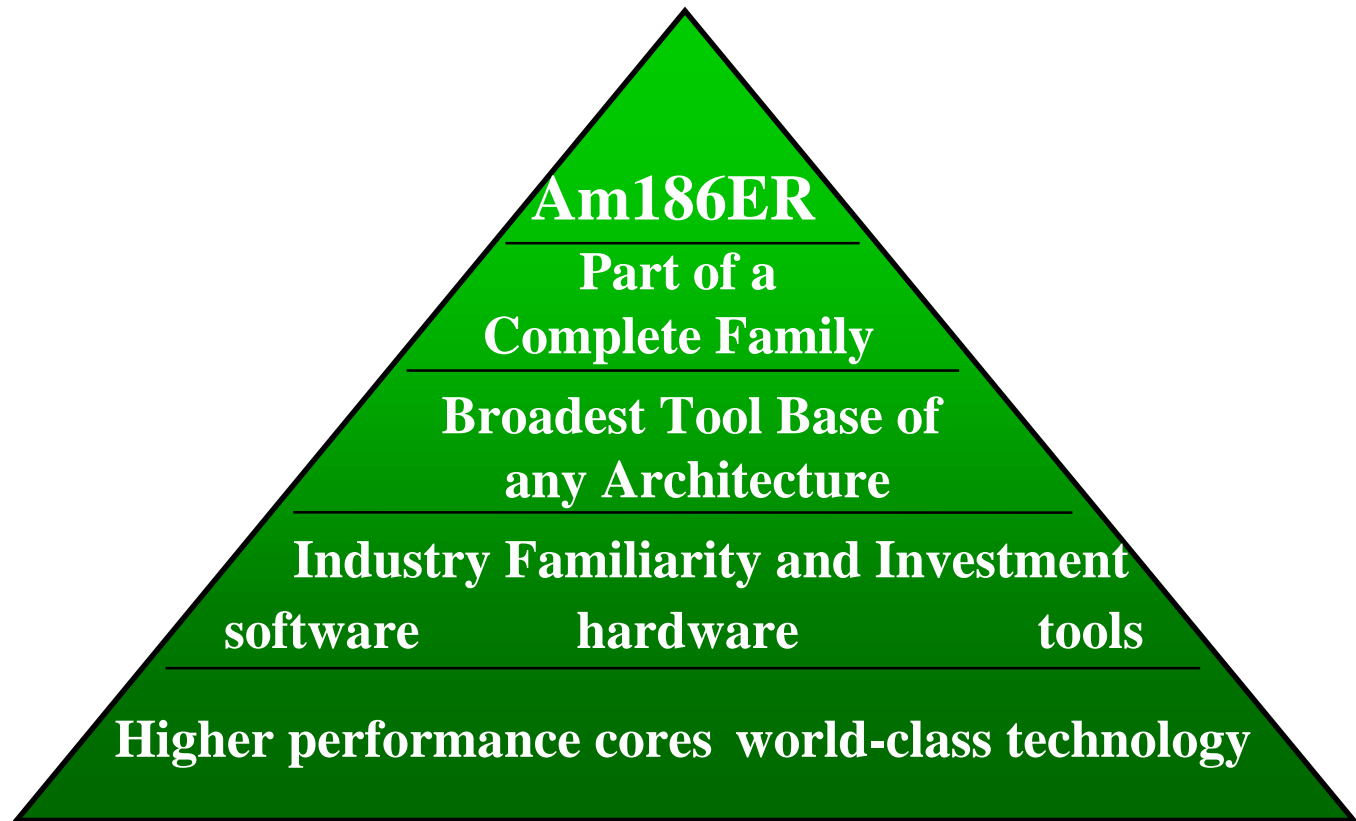
The Am186ER Evaluation Board

“1 Am186ER + 1 Flash = An easy high performance solution.”





# x86 Compatibility Leverage



***x86 is the worlds most successful architecture!***





## Faster Time-To-Market

- Leverage 186 compatibility
  - Previous software
  - Existing tools
  - Industry Experience
- Leverage system integration
  - Glueless memory interface
  - General system logic
  - 32-bit performance
- Results: **Faster time-to-market**





## Upgrading from 186/188 to Am186ER/188ER

- Am186ER/188ER is software compatible with 186/188
- Higher performance
  - 25 to 50 MHz
  - Zero wait states using commodity memories
- Lower system cost
  - Integrated RAM and peripherals
  - Glueless connection to memory with demultiplexed address bus
- 25 MHz Am188ER delivers 12 MHz 80C186 performance
  - Save on routing and space while using cheaper x8 components





## Upgrading from Am186/188EM to Am186ER/188ER

- No wait state internal RAM
  - 16Kx16 for Am186ER, and 32Kx8 for Am188ER
  - Visible for debugging
- Low Power
  - 3.3v Vcc
  - 5V tolerant TTL compatible
  - Integration of RAM reduces system power
- Multiple clocking modes
  - 1/2x, 1x, and 4x system frequency vs. input
  - Use a 12.5 MHz crystal for 50MHz system
- Same 100 pin TQFP and PQFP package/pinout





# Am186/188ER Features/Benefits

- On-Chip Integration including 32 KBytes of On-Chip RAM
- 386 Performance at a 16-bit Price
- Am186 compatibility
- Lowers system costs, faster time-to-market, eases inventory management and reduces board space
- 6.6 MIPs at 50 MHZ
- Zero Wait state performance
  - 55 ns Flash/SRAM
- Fast time-to-market because of the existing knowledge and tool base







## Schedule (Rev B)

- Announcement: March 31, 1998
- Data Sheet (printed) : March 31, 1998
- User's manual (printed): March 31, 1998
- General Samples Available: May 1998
- Demo Boards Available: May 1998
- Production Starts: 3Q98





## Am186/Am188ER Notes

- The Am186/188ER Rev B is in full production.
- Rev B yields higher performance and more features.
- New design-ins should occur with Rev B silicon.
- Rev B is backward compatible with Rev A with only 1 exception.
  - When using an external oscillator, X2 pin should float instead of being grounded as in Rev A. For a crystal configuration with internal oscillator, no changes are required.
  - This change was required to improve the oscillator.

