



Systems in Silicon

High Performance *ÉlanTM SC400*

Am486 PC/AT-based Microcontroller Management Overview

Advanced Micro Devices, Inc.
Embedded Processor Division





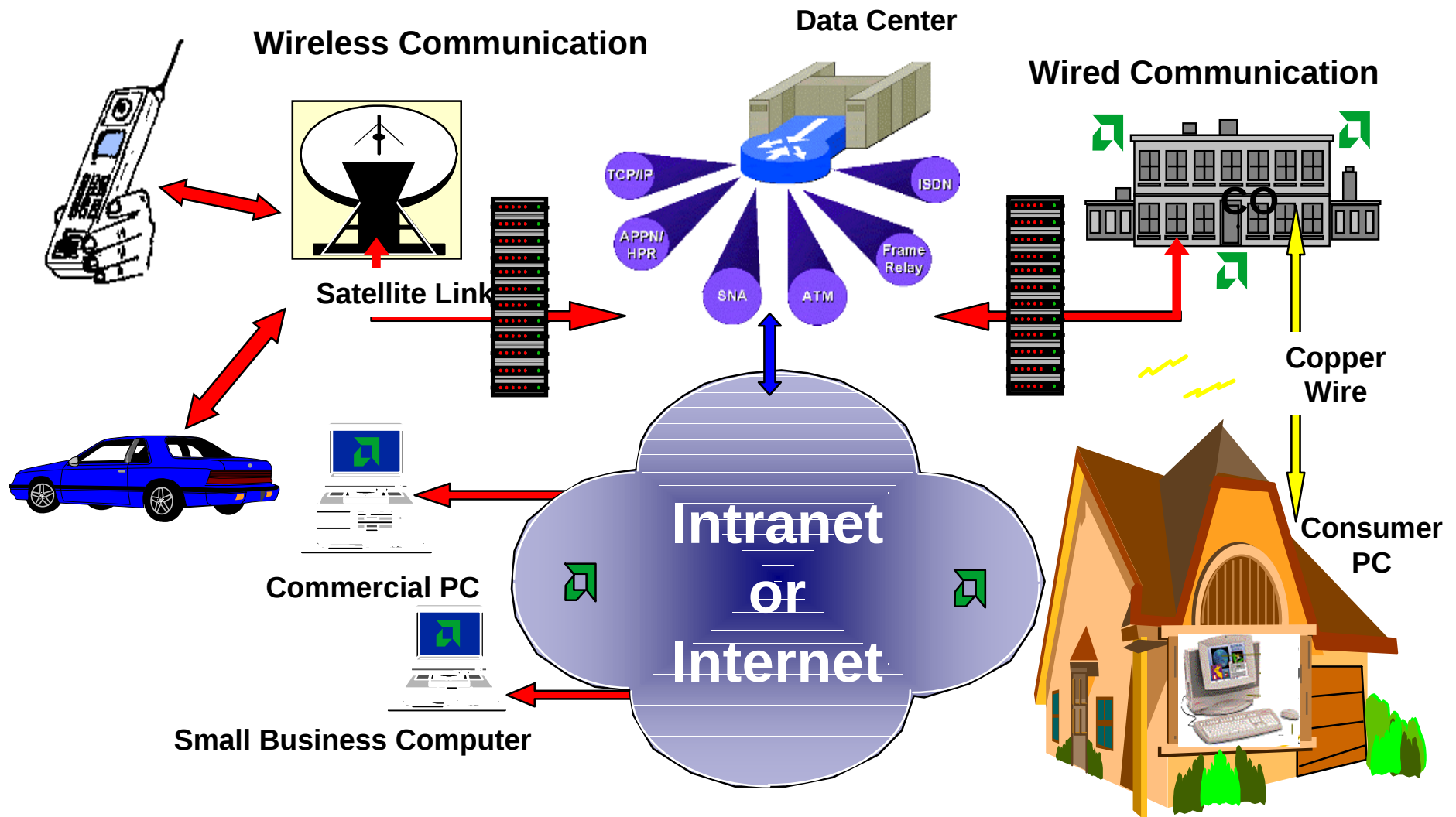
Systems in Silicon

Presentation Outline

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Emerging Computing and Connection Paradigm





Public Network Computing

- AMD is a major IC manufacturer with a proven track record in
 - Networking
 - Telecom
 - PC's
- Corporate goal:
 - Computation and Communication





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The x86 Advantage

- 110 Million units shipped in '98 (est. 125Mu '99)
- Multiple x86 vendors spawns competitive pricing
- Volume supports technology investment that subsidizes embedded processors
- High speed cores available
 - Frequencies now above 600 MHz
 - Performance superior to RISC
- Shrinking geometry
 - Lower and lower power
 - Packaging advances





The x86 Advantage - (cont'd.)

- Fuels new technologies
 - PCI, USB, 1394, AGP, 3DX etc.
- Advances new memory architectures
 - RDRAM, SDRAM, EDO
 - High speed SRAM
- Large number of HW and SW engineers familiar with the x86 architecture
 - easier to hire, replace, train
- Industry's unquestioned leading tool programs
 - \$2B self-sustaining annual investment
 - unmatched quality





The x86 Advantage - (cont'd)

- High code density
 - 25-40% better than RISC
 - Less RAM/ROM so lower system cost
 - Higher cache hit rate than RISC with same cache size
- 16, 32 and 64 - bit families
 - Same software base for wide range of performance
- Capitalizes on Microsoft OS dominance
 - more O/S choices than any architecture
- Millions of lines of code validate silicon
- Faster time-to-market
- Future growth path





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AMD Advantages in Embedded x86

- Embedded market focus for over 20 years
 - strong knowledge of embedded development needs
- Continuous innovation in 16- and 32-bit families
 - lower system cost through integration
 - best 186 class price/performance
 - highest performance with commodity memories
 - best 486 price/performance
 - best Socket 7 performance
 - K6 & Athlon migration path and support for embedded



Exceeding Market Requirements

Requirements

- ◆ Time-to-market
- ◆ Price/Performance
- ◆ Product longevity
- ◆ Assured growth path
- ◆ Preserving investment

Solutions

Chip supply, range of solutions, comprehensive tools, engineering pool, integration

Best performance in commodity memory, efficient memory utilization

Stability of supply (chipset and microprocessor), embedded focus

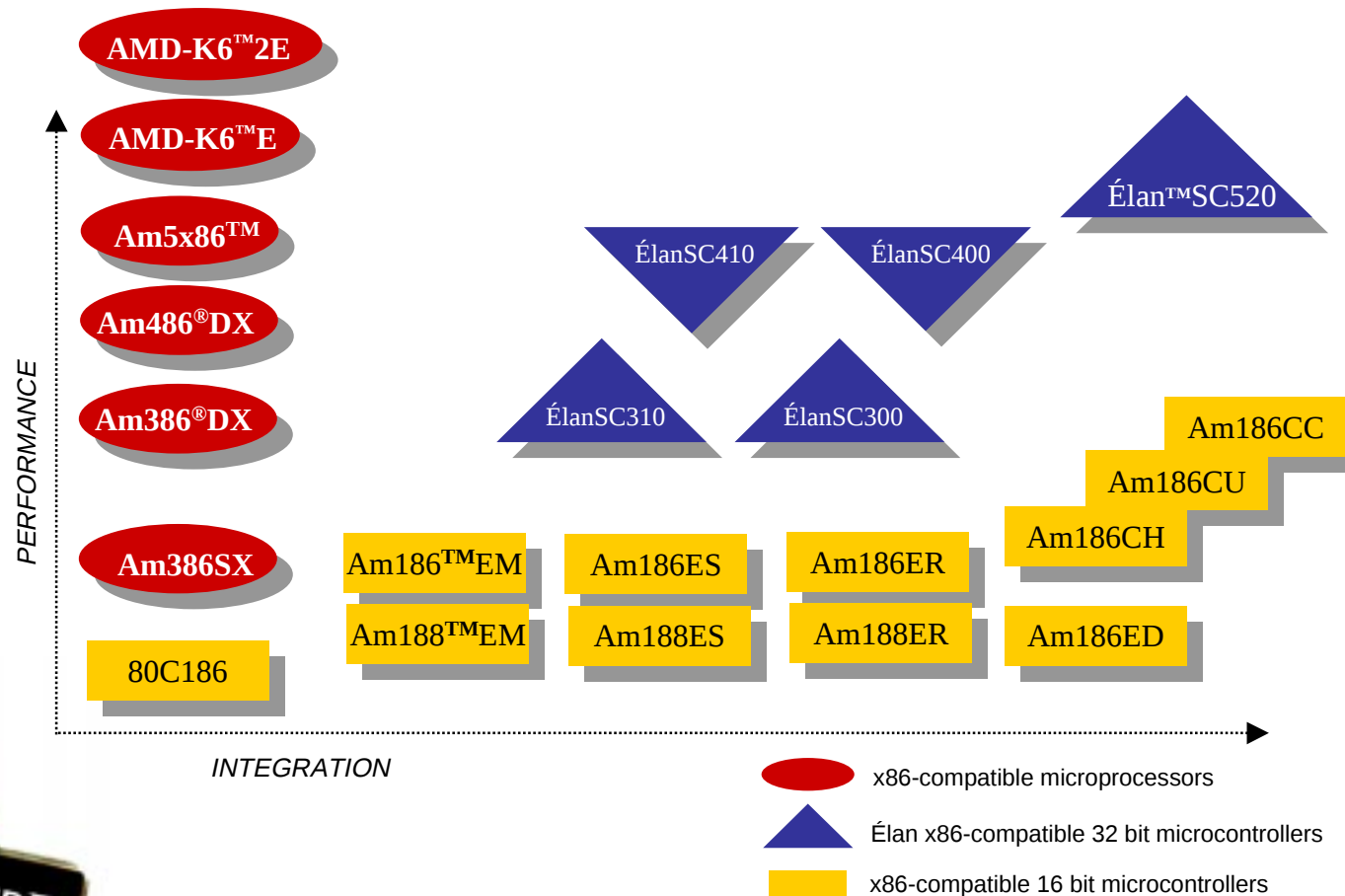
Desktop development assures new cores

Upgrade strategy based on compatible upgrade paths



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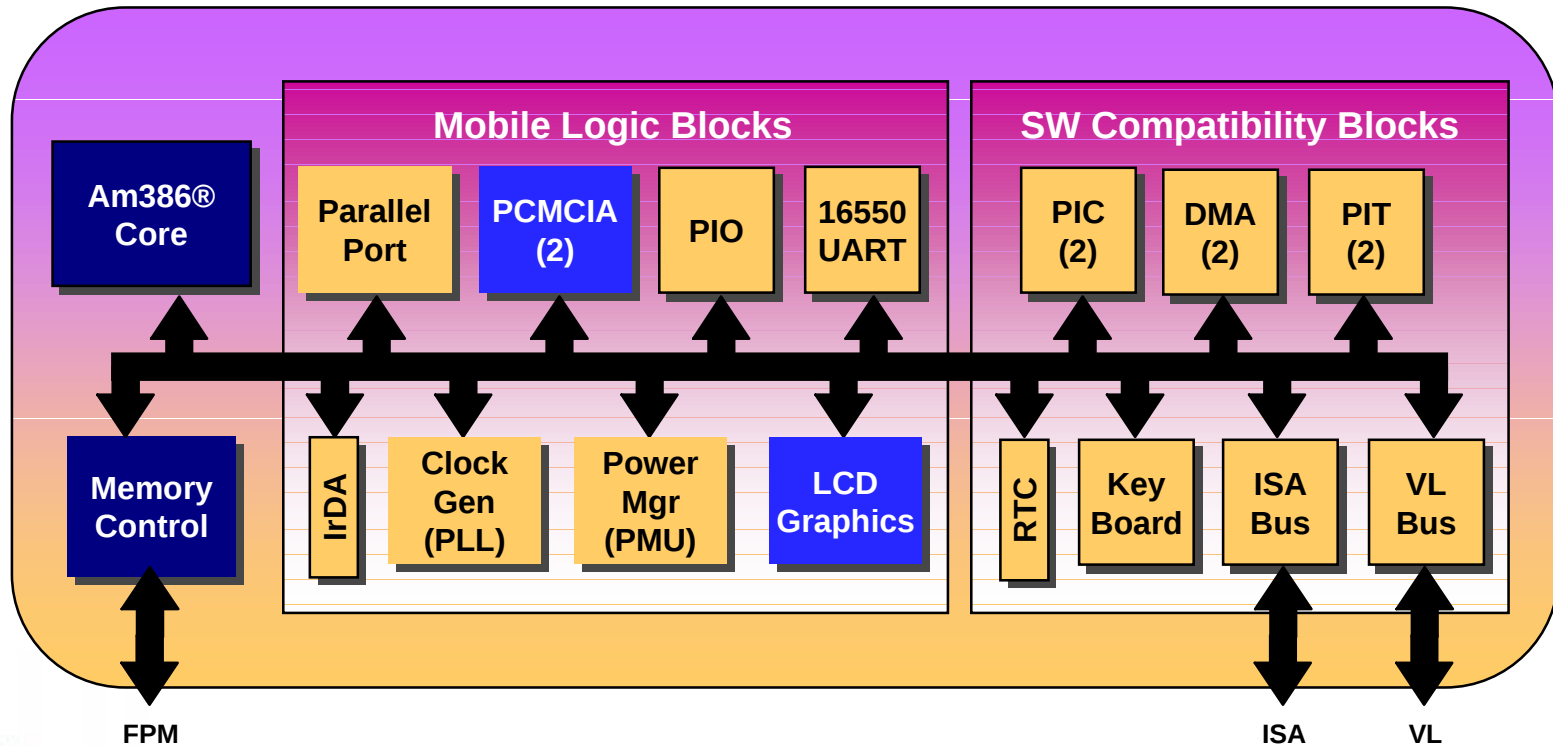
E86™ Family of Microprocessors and Microcontrollers





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Élan™ SC300/310 Block Diagram



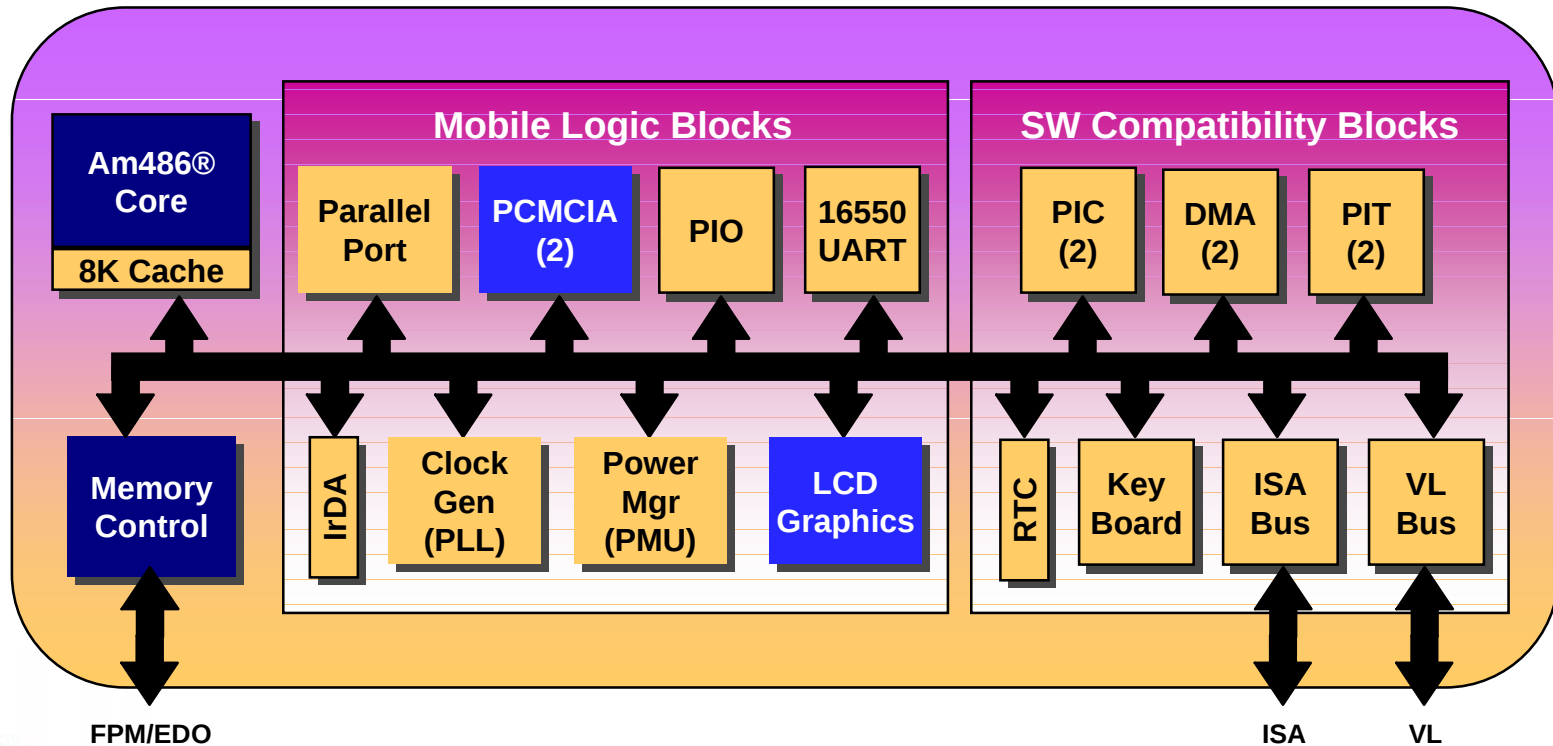
Not featured
in the
ÉlanSC310





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Élan™ SC400/410 Block Diagram



Not featured
in the
ÉlanSC410





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Élan Target Markets

Connected

Stand Alone

Line power

Battery power

INFO APPLIANCES

Thin client
Web browser
Windows terminal
Network computer
POS
Consumer PC
Automotive PC
Web Phone
Set Top Box

EMBEDDED PC

Industrial control
DVD player
Game machine

MOBILE COMM

Smart Phone
LEO handset
Web/Client Pad

MOBILE

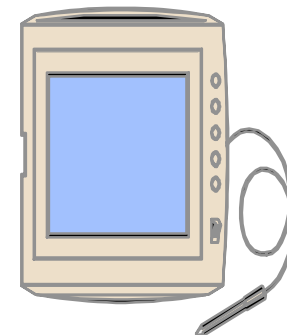
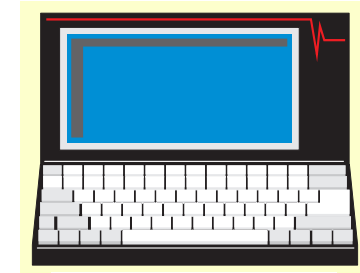
Laptop computer
Tablet computer
Dictionary / Translator
Handheld PC
PDA
GPS navigation





Key Target Applications

- ◆ Web browsers (internet)
- ◆ Network computers (intranet)
- ◆ Thin Client / WBT
- ◆ Mobile terminals
- ◆ Smart Phones
- ◆ Point of sale (POS) terminals
- ◆ Miniature notebook PC
- ◆ Bar code scanners

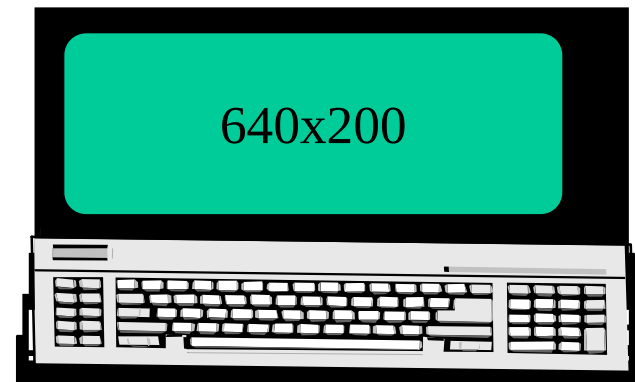




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Design Example: Hand Held PC

- ❑ *ROM DOS or Windows CE*
- ❑ *33MHz Am486 performance*
- ❑ *640x200 LCD 16 gray*
- ❑ *1 PCMCIA slot*
- ❑ *IrDA*
- ❑ *Serial Port*
- ❑ *80 key keyboard*
- ❑ *Printer port*
- ❑ *1MB DRAM*
- ❑ *2MB ROM*

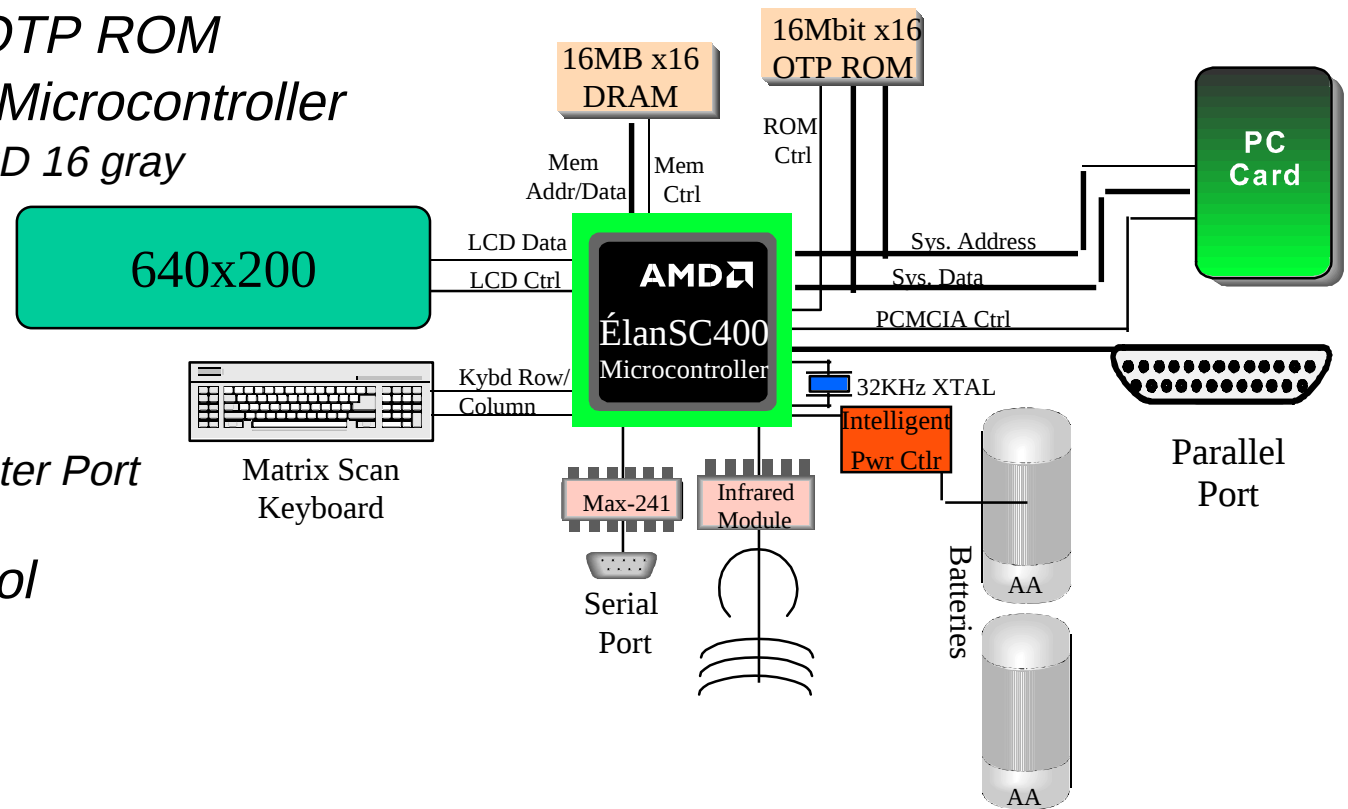




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Hand Held PC Block Diagram

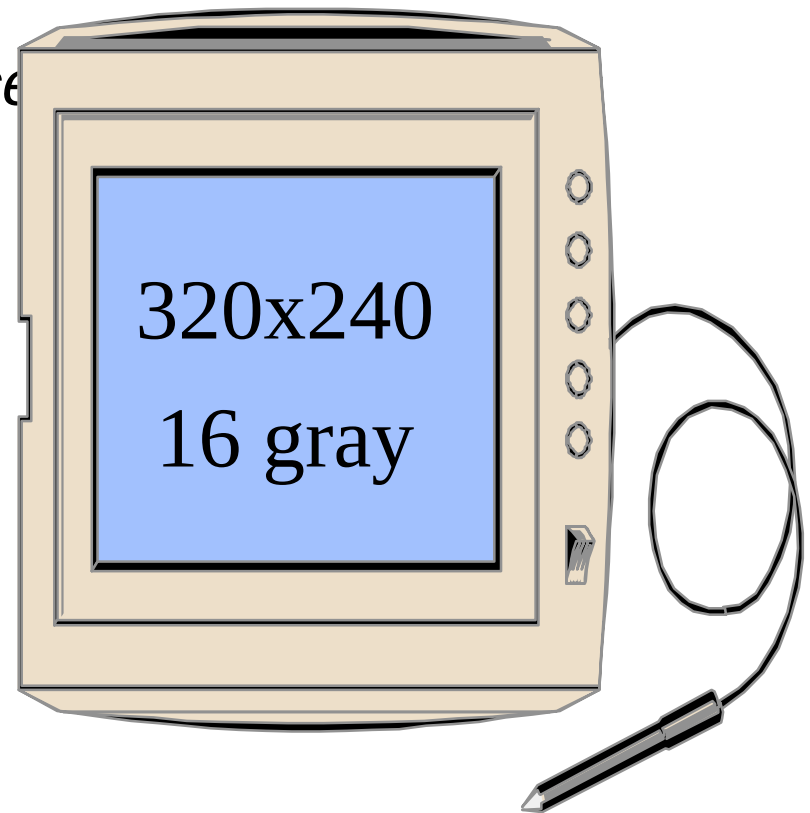
- ❑ ROM DOS or Windows CE
- ❑ 1MBx16 Fast Page DRAM
- ❑ 16mbitx16 OTP ROM
- ❑ ÉlanSC400 Microcontroller
 - ❑ 640x200 LCD 16 gray
 - ❑ 1 PCMCIA
 - ❑ IrDA
 - ❑ Serial Port
 - ❑ 80 key keyboard
 - ❑ Parallel Printer Port
- ❑ Buffers, Power control Etc...





Design Example: Personal Digital Assistant

- ❑ *Windows CE*
- ❑ *66MHz Am486 performance*
- ❑ *320x240 LCD 16 gray*
- ❑ *2 PCMCIA slots*
- ❑ *IrDA*
- ❑ *Serial Port*
- ❑ *Pen input*
- ❑ *4MB DRAM*
- ❑ *8MB FLASH*

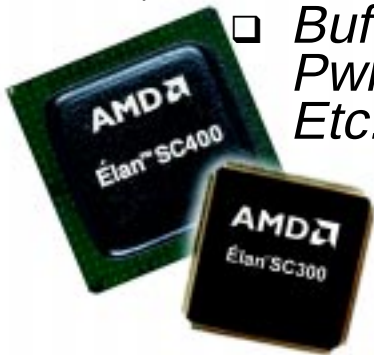
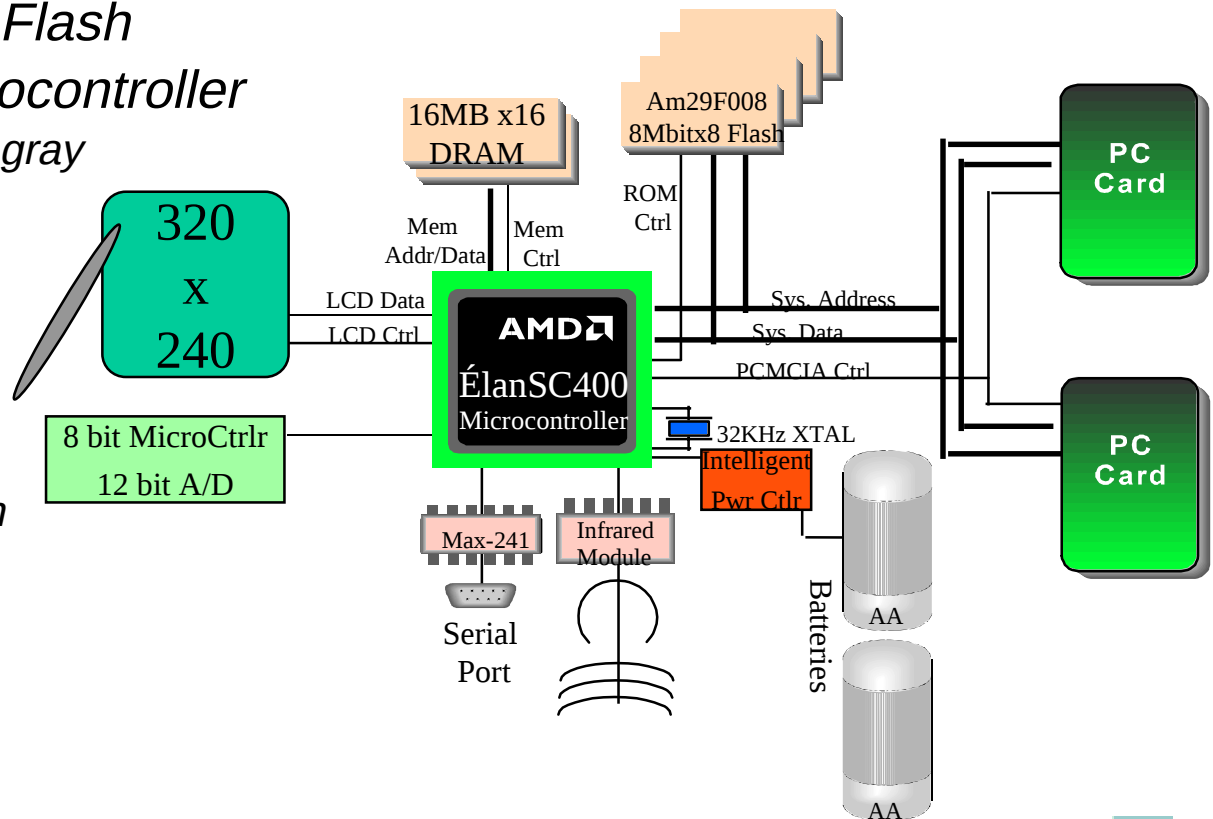




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Personal Digital Assistant Block Diagram

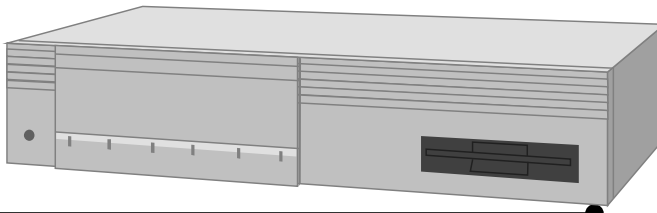
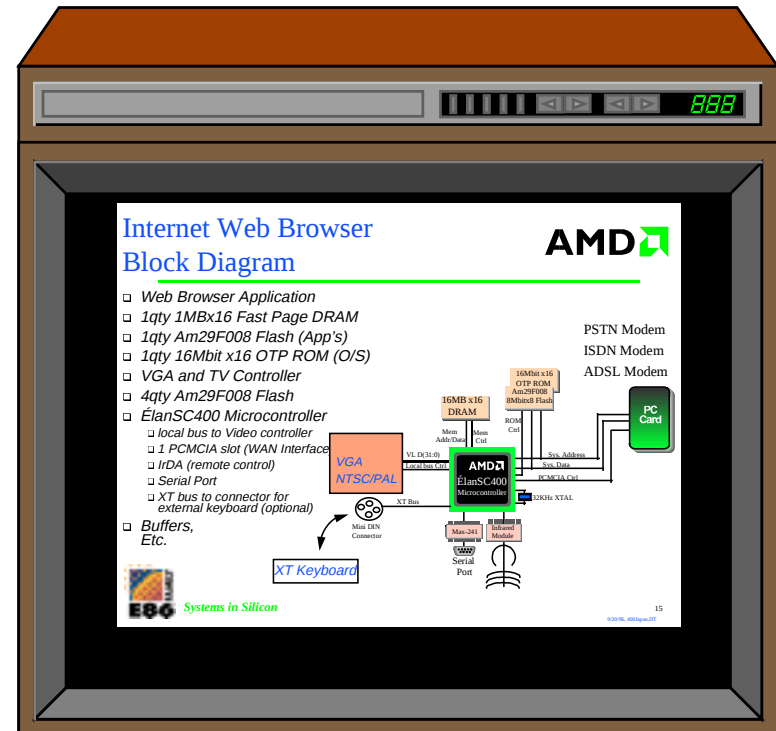
- ❑ Windows CE
- ❑ 2qty 1MBx16 Fast Page DRAM
- ❑ 4qty Am29F008 Flash
- ❑ ÉlanSC400 Microcontroller
 - ❑ 320x240 LCD 16 gray
 - ❑ 2 PCMCIA slot
 - ❑ IrDA
 - ❑ Serial Port
 - ❑ 80 key keyboard
- ❑ 8 bit Microcontroller
 - ❑ 12 bit A/D for Pen
- ❑ Buffers, Pwr control Etc.





Design Example: Web Television

- ❑ TV output
- ❑ Internet
 - ❑ Consumer
 - ❑ Primarily a Browser
 - ❑ 2MB DRAM
 - ❑ 4MB ROM
 - ❑ Modem via PCMCIA
- ❑ Intranet
 - ❑ Business
 - ❑ Server apps and browser
 - ❑ 4MB DRAM
 - ❑ 8MB ROM
 - ❑ Ethernet

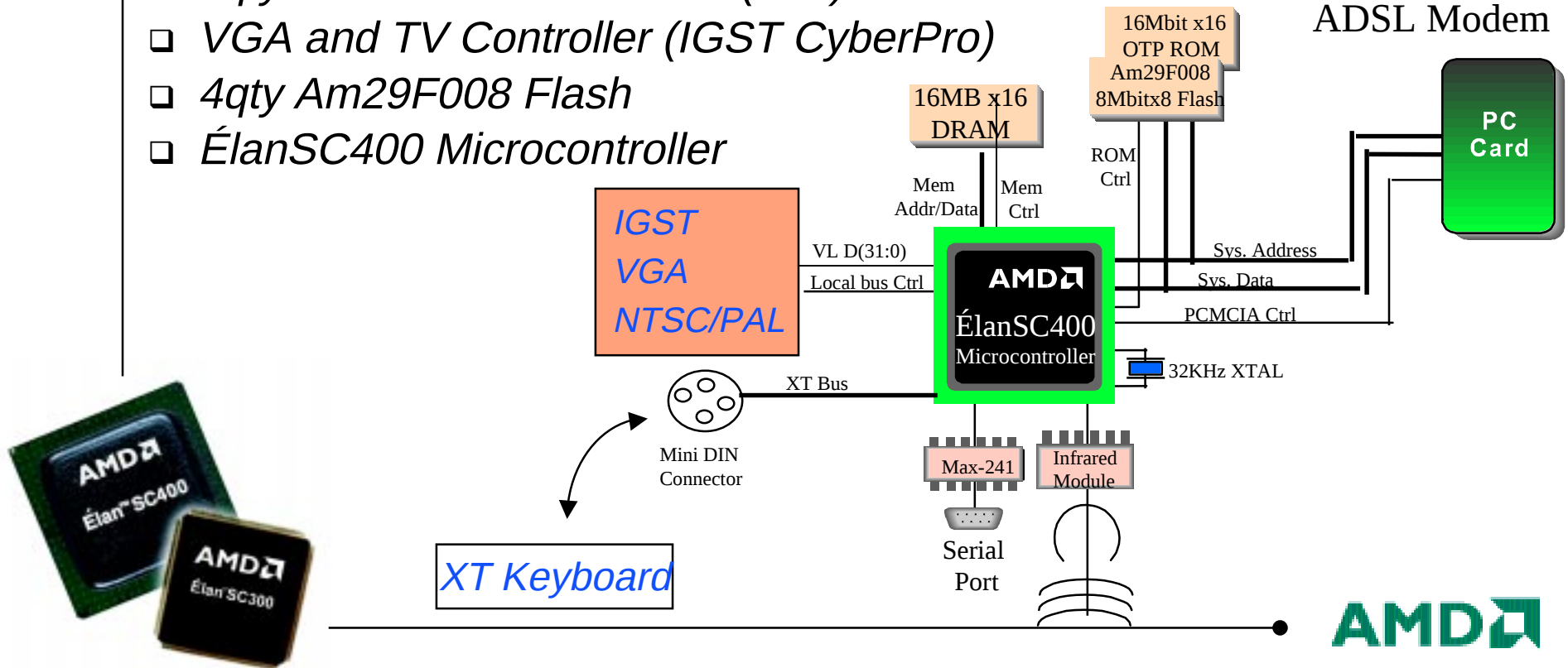




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Web Television Block Diagram

- ❑ Web Browser Application
- ❑ 1qty 1MBx16 Fast Page DRAM
- ❑ 1qty Am29F008 Flash (App's)
- ❑ 1qty 16Mbit x16 OTP ROM (O/S)
- ❑ VGA and TV Controller (IGST CyberPro)
- ❑ 4qty Am29F008 Flash
- ❑ ÉlanSC400 Microcontroller





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Info Appliance Solution

Market Requirement

- ◆ High performance processor
- ◆ Software compatibility
 - Windows CE
 - DOS
 - QNX
- ◆ Video VGA/NTSC/PAL
- ◆ 33.6K and 56K modem

AMD Solution

- ◆ 32-bit Am486 CPU core (33/66/100 with 8Kb cache)
- ◆ PC/AT Compatibility
 - DMA, RTC, PIC, GPIO
- ◆ IGST CyberPro 5000
- ◆ Conexant controllerless





Mobile Computing Solution

Market Requirement

- ◆ High performance processor
- ◆ Software compatibility
 - Windows CE is OS of choice
- ◆ Less power consumption
 - 10 hour day operation
- ◆ Smaller form factors

AMD Solution

- ◆ 32-bit Am486 CPU core (33/66/100 with 8Kb cache)
- ◆ PC/AT Compatibility
 - DMA, RTC, PIC, GPIO
- ◆ Low power consumption
 - PMU, PLLs, 0.35 process
- ◆ High Integration
 - Single chip solution
 - BGA package





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Embedded PC Solution

Market Requirement

- ◆ High performance processor
- ◆ Software compatibility
 - Windows 3.01, 95, CE
 - DOS
 - QNX
- ◆ Cost effective

Tools and engineers

AMD Solution

- ◆ 32-bit Am486 CPU core (33/66/100 with 8Kb cache)
- ◆ PC/AT compatibility
 - DMA, RTC, PIC, GPIO
- ◆ High integration
 - Single chip solution
 - BGA package
- ◆ FusionE86 partner program





Systems in Silicon

Evaluation Board Development Tools

- Evaluation board allows software and hardware development
- Accelerates driver and BIOS Development
- Test out LCD, local bus and ISA peripherals
- Performance Analysis
- Power Measurements
- Busses for expansion

<http://www.amd.com/products/lpd/elan400/21027b.html>





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DOS/Windows Operating System Vendors

- Microsoft
 - MS-DOS® (ROM version and disk version)
 - Windows® 3.1 (ROM version and disk version)
 - Windows 95
 - Windows NT
 - Windows CE
 - MS-DOS, Windows and Windows NT are registered trademarks of Microsoft Corporation.
- Datalight
 - ROM DOS
 - PC-Card services
- IBM - Embedded O/S group
 - PC DOS 7
 - Windows
- Any other x86 O/S





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Windows CE Partners

- bsquare Incorporated
CE Express Kit
- Phoenix Technologies Ltd.
Phoenix PicoPAL™ for Microsoft Windows CE
- Annasoft Systems
JumpStart for Windows CE





Mobile and Real Time O/S

- Geoworks
 - Geos 3.0 - mobile operating system
- QNX
 - Real time embedded operating Systems
 - Internet application suite
- Microtec Research Inc.. (MRI)
 - VRTX(R) x86 application development kit





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VGA/TV Expansion Chips

- IGST - VGA/NTSC/PAL Controllers
 - CyberPro2000, 3000, 5000 Multimedia

<http://www.igst.com>
- Trident
 - TVG9470 VGA/NTSC/PAL Controllers

<http://www.tridentmicro.com/trident/html/linecard/legacy.htm>
- Epson - VGA/NTSC Controllers
 - SED 1374 with embedded SRAM
 - SED 1356 LCD/CRT/TV

<http://www.eea.epson.com/products/graphics/graphics.htm>





Flash Memory

- AMD 29LVxxx family of Flash memory
 - 3.3v
 - Many size options: 1Mb, 4Mb, 8Mb, etc..
 - Many package options: TSOP, SSOP, etc..

<http://www.amd.com/products/nvd/overview/21531.pdf>

- AmMCxxx family of MiniCard Flash

- 3V and 5V
- 2MB, 4MB, 8MB, 16MB

<http://www.amd.com/products/nvd/overview/20610.html>





AMD E86™ Family Strategy for Embedded

- Embedded market focus for PC CPU core and technology investment
 - Ensure long term support and availability for CPUs
 - Leverage PC standards for embedded market
- Create 16- and 32-bit platforms using x86 cores
 - Integrate market specific peripherals
 - Use latest process and design technology
- Enable quick time-to-market
 - Tool environment, robust debugging
 - Evaluation boards, design examples

