



Am186™ CC Microcontroller

Product Presentation





Trends driving Am186CC development

- Dramatic increase in demand for higher bandwidth Internet/Intranet, esp. in Home/SOHO markets
- Convergence of computing and telephony
- Growing trend towards USB PCs and “locked box” PCs
- Communication OEMs preference for high integration and x86 for cost effective, scalable performance
- Deep submicron process technology enables cost effective, highly integrated chips





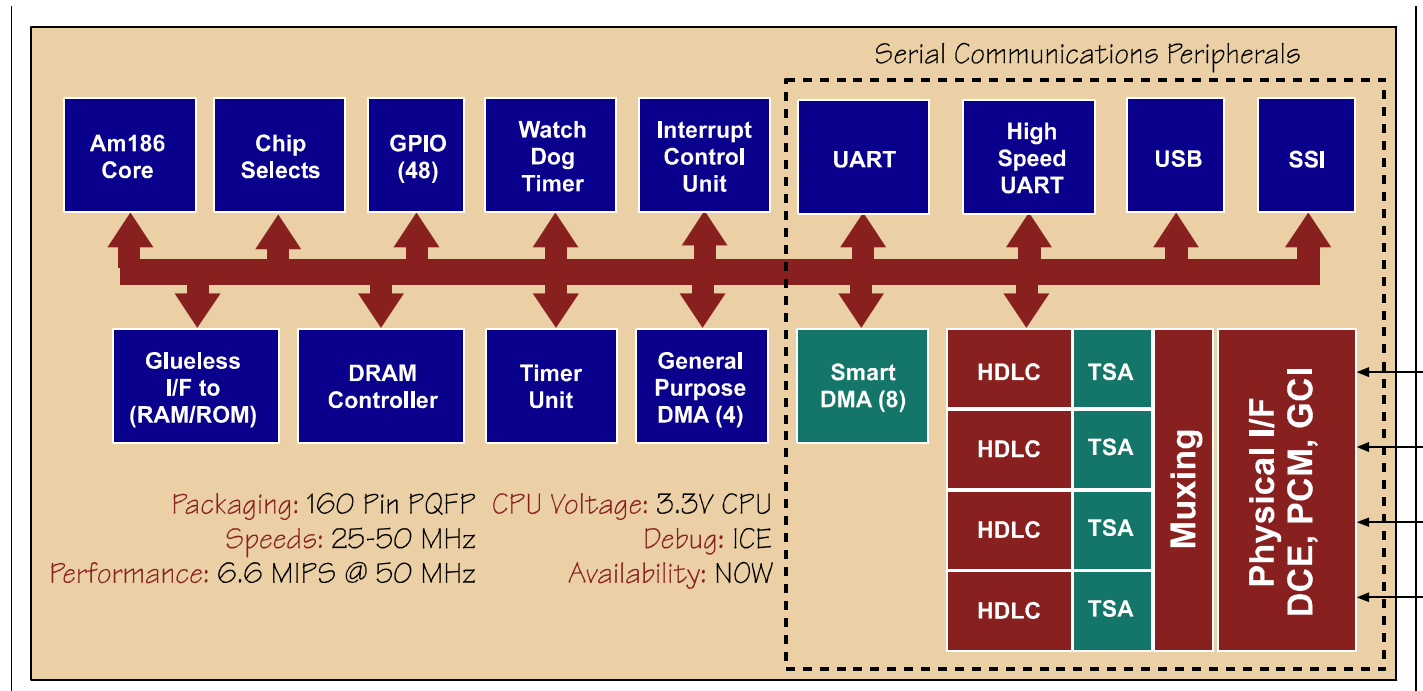
Am186CC Target Markets

- ISDN Terminal Adapters
- Low end routers
- Analog line cards (16 or 32 lines per card)
- Digital Line Cards
- xDSL applications
- PBX applications
- Digital Phones
- Key Telephone systems (KTS)
- Digital Loop Carrier Applications
- USB peripherals
- Industrial control using HDLC
- General embedded





Am186CC Embedded Communications Controller Block Diagram





Am186CC Features and Benefits

<i>Feature</i>	<i>Benefit</i>
<i>Integrated USB peripheral controller</i>	Enables USB connectivity to PC. Lowers system cost, area and power.
<i>4 High performance HDLC channels (10 Mbps)</i>	High performance serial communications. Integration lowers system cost, power, area.
<i>High Performance 50 MHz, 6.6 MPs CPU</i>	32-bit performance at a 16-bit price
<i>X86 Code Compatible</i>	Faster-time-to market with world class tools
<i>Wide range of protocols (LAPD, LAPB, HDLC, SDLC, PPP, v.110, v.120)</i>	Supports communications needs of many applications including ISDN and DSL modems, digital phones, and line cards.





Am186CC Features and Benefits

<i>Feature</i>	<i>Benefit</i>
<i>High level of system peripheral integration</i>	Lowers system cost, area, and power. Simplifies dev.
<i>Standard product</i>	Lower development time and cost
<i>3.3v with 5v tolerant I/Os</i>	Lower system power but retain ability to I/F with 5v parts
<i>Programmable bus sizing + 8 bit boot option</i>	Minimize system memory cost
<i>Integrated DRAM controller</i>	Lowers system cost and development time
<i>Part of AMD's Comm86 Family</i>	Range of price/performance, comm focused devices, all SW compatible
<i>Reference Designs</i>	Complete HW and SW solutions for fast time to market





Am186CC Serial Interfaces and System Peripherals





Am186CC Serial Interfaces

- The Am186CC has **8 serial interfaces**
 - **4 Channels of HDLC**
 - Each HDLC Channel has an independent TSA
 - Each HDLC Channel is supported by 2 SmartDMA channels
 - Physical interface can be either GCI, PCM Highway, or DCE
 - **USB peripheral controller**
 - USB 1.0, 1.1 and 2.0 Full speed (12Mbit/s) device compliant with built in transceiver
 - Very flexible USB controller with 6 endpoints
 - DMA and SmartDMA support
 - **2 UARTs**
 - High speed UART with Autobaud
 - Lower speed UART usually used for low baud rates or debug
 - **Synchronous Serial Interface (SSI)**
 - Serial interface used to configure and control peripherals





HDLC - What is it ?

- Layer 2 protocol (OSI)
- Been around since the 60s
- Many Layer 3 and 4 protocols build off it
- X.25, PPP, Frame Relay, V.110, V.120, LAPD, LAPB
- Used for robust serial communications in a variety of systems
- HDLC is usually point-to-point and synchronous



OSI Model

Layer 7 - Application
Layer 6 - Presentation
Layer 5 - Session
Layer 4 - Transport
Layer 3 - Network
Layer 2 - Data Link
Layer 1 - Physical





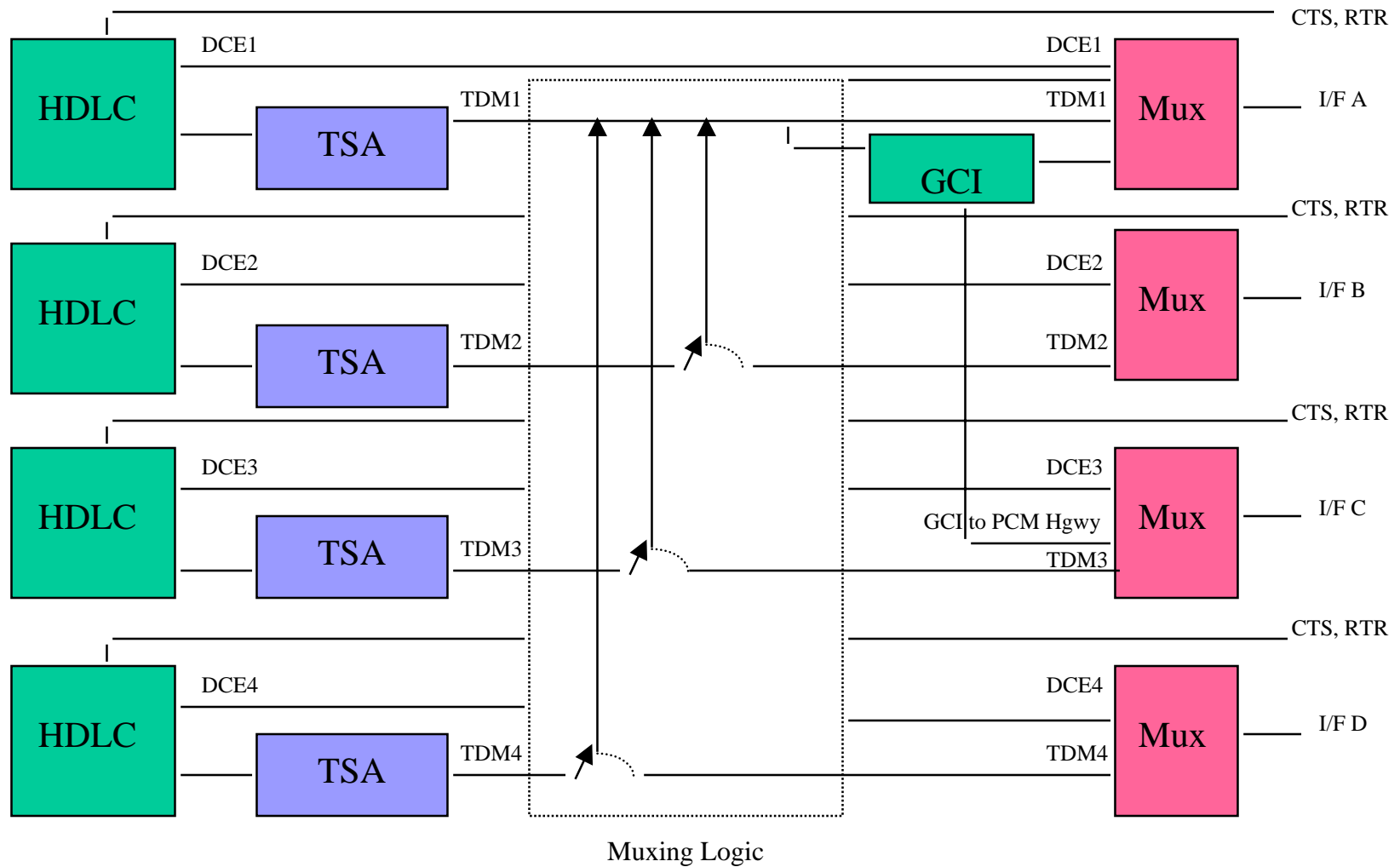
USB - What is it ?

- Three types of USB silicon solutions
 - USB Host controller
 - Master, built in to all PC chipsets
 - USB Hub
 - Expansion ports for downstream devices
 - USB peripheral controller
 - Am186CC !
 - Slave device
 - Three speeds
 - 1.5 Mbps, 12 Mbps, and 240Mbps (low, full & High speed)
 - Am186CC is a full speed (12 Mbps) suitable for scanners, printers, modems, etc.





Am186CC External Interfaces for HDLC channels





Am186CC System Peripherals

- Timers
 - Three 16-bit flexible timer/counters
- General purpose DMA
 - 4 Channels, 2 external DMA request lines
- Chip selects
 - 14 chip selects for DRAM, ROM, I/O devices
- DRAM controller
 - EDO or Fast Page mode, 2 banks, symmetric 256Kx16 DRAMs supported
- General Purpose Programmable I/Os
 - 48 GPIOs, SET and CLEAR registers, 8 PIOs are interrupt sources
- Interrupt Controller
 - 17 external interrupt sources (36 total maskable interrupts)
- Hardware Watchdog Timer
 - Generates either Am186CC reset, system reset or NMI



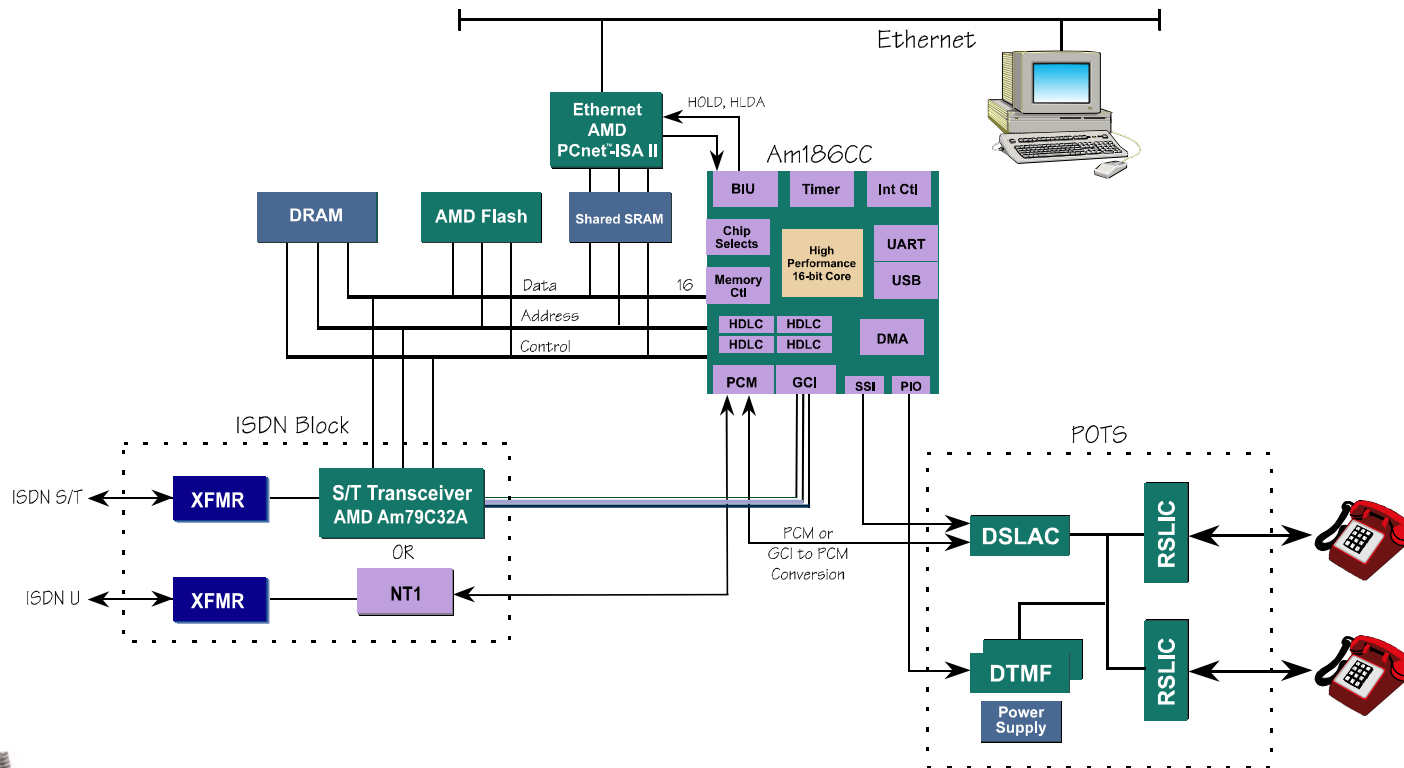


Am186CC Reference Designs and Customer Development Platform



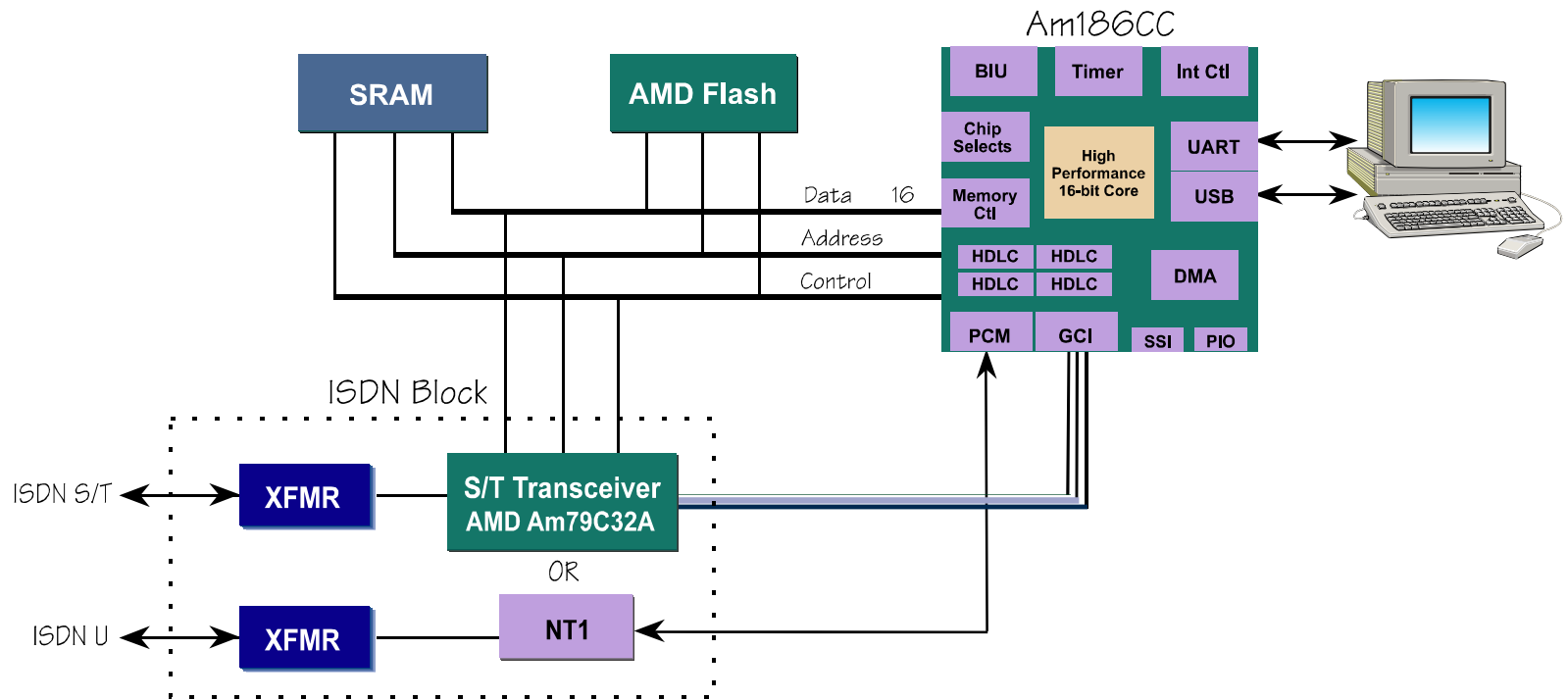


Am186CC-Based Low-End Router Reference Design



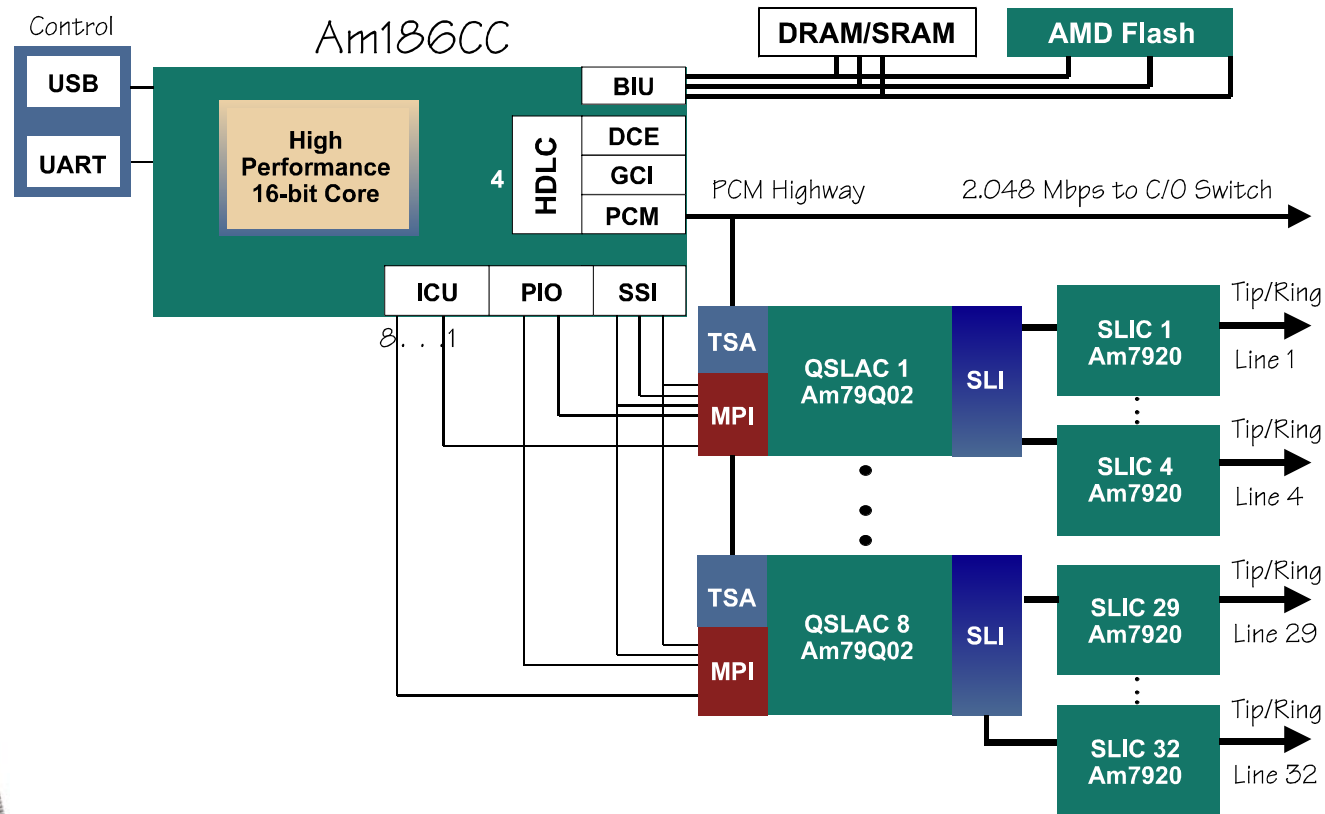


Am186CC-Based ISDN Terminal Adapter Reference Design



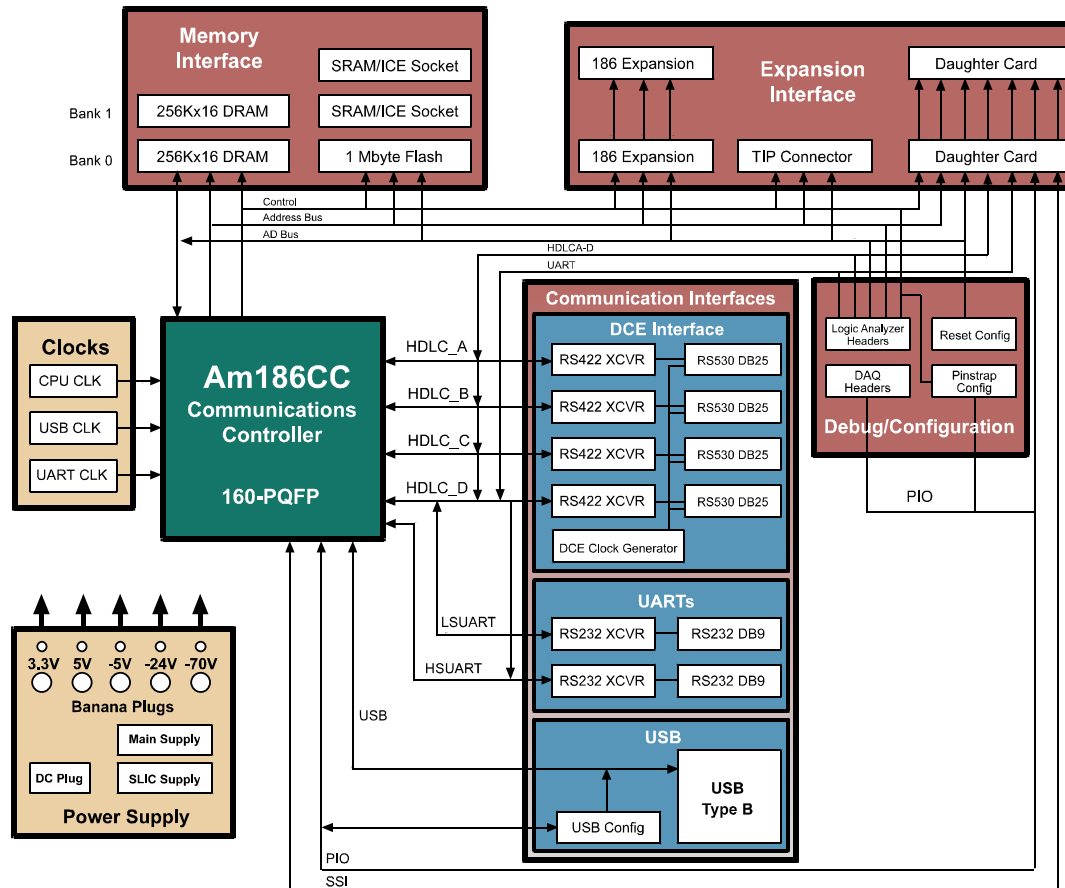


Am186CC-Based 32-Channel Linecard Reference Design



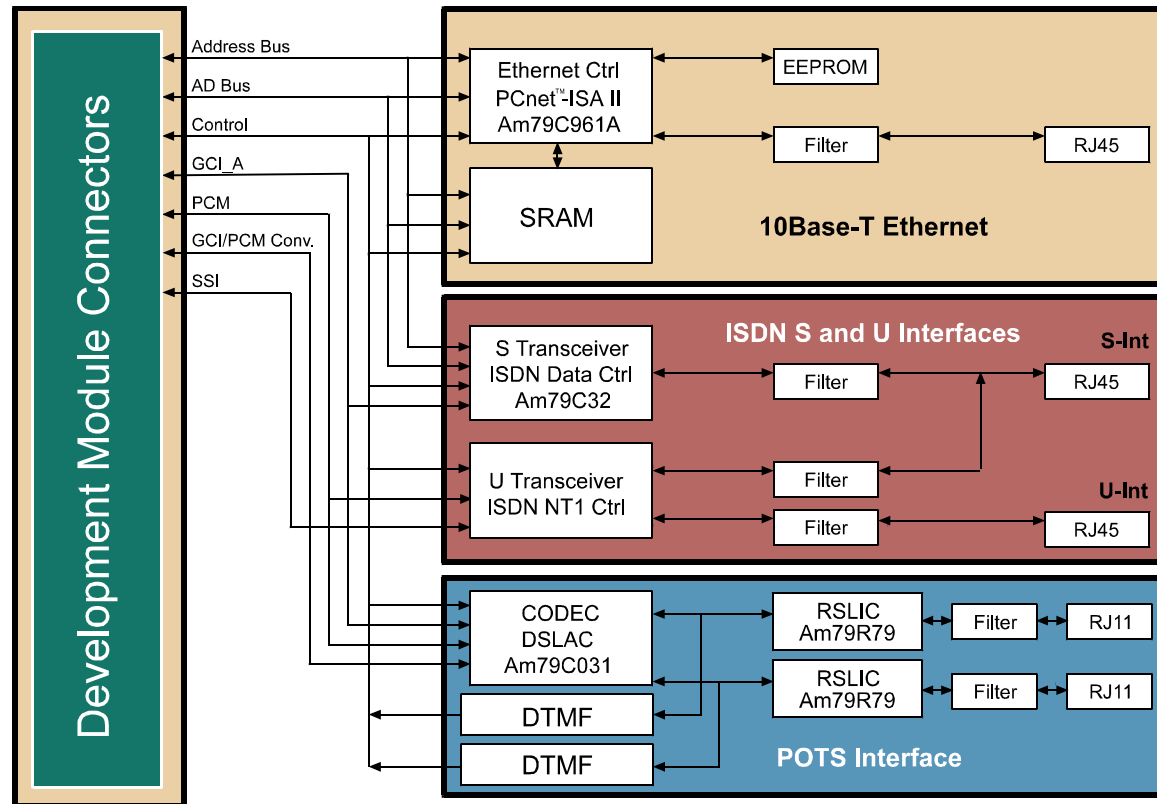


Am186CC Customer Development Platform Main Board





Am186CC Customer Development Platform Development Module





Am186CC AMD-provided Software

- Drivers: HDLC, UARTs, USB, GCI, SSI, Ethernet, SLAC (codec) and others
- Monitor: E86Mon
- Protocols: v.110 and v.120
- Other: Simple AT command PAD, simple TCP/IP stack, board level diagnostics and POST, flash programming code, DMA-based examples





Am186CC Development Fusion partner support

- The Am186CC is supported by AMD's Fusion partners providing third party development environments and protocol stacks.
- **Protocol Stacks:** Telesoft (ISDN), Agranat Software & USSW (embedded web servers), Interniche (TCP/IP and routing software)
- **Development Tools:** CAD-UL, Microsoft, Borland, Paradigm.
- **RTOS:** Kadak (AMX), Embedded Systems Products (RTXC), EBS (OS & TCP/IP)
- **ICE:** Beacon
- Additional Fusion partners will be added





Am186CC Value

The Am186CC integrates:

80C186 Microcontroller	\$5
4 Channels of HDLC	\$10 - \$12
USB peripheral controller	\$3 - \$5
DRAMcontroller	\$2
<u>System Peripherals</u>	<u>\$3 - \$4</u>
Total Discrete costs	\$23 - \$28



All pricing assumes 10,000 units through distributors





Summary - AMD's commitment to x86 and communications

- AMD has 15 years of experience with x86 in embedded
- History of highly integrated microcontrollers lowering system cost and power
 - Best in class 186 price/performance
 - Best in class 386 and 486 price/performance and infrastructure support
 - Best in class Socket 7 price/performance based on AMD-K6© microprocessor
- Strong focus on communications with Comm86™ family

