Networking Communications

VLSI Technology

ACTIS

Single-Chip VLSI ISDN Data Processor

OVERVIEW

The dramatic growth in the popularity of the Internet and other online services necessitates the development of new communications products which deliver increased bandwidth to the home. As such BRI-ISDN communications equipment is rapidly superseding traditional Analog modem technology due to the substantial increases in data rate it offers over the existing twisted-pair local loop infrastructure.
With the introduction of the "ACTIS" (Access Chip to The Information Super-highway) VLSI provides ISDN Communications equipment developers a single chip, high performance and functionality in a cost optimized solution targeted at the ISDN Data Communications Market.

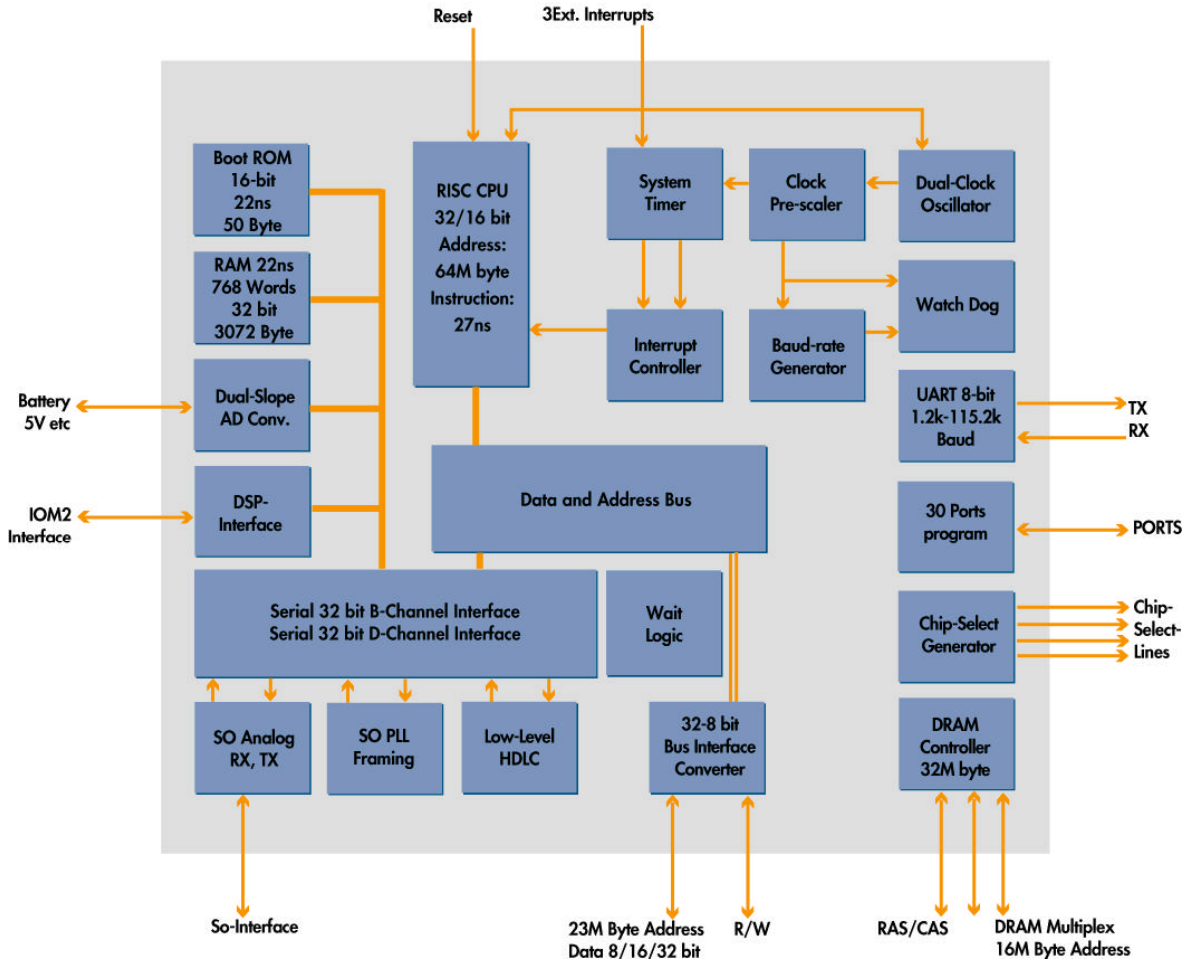
FEATURES

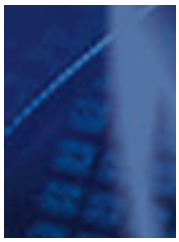
- High performance ARM RISC core with 3 Kbytes of on-chip cache RAM
- SO-Interface transceiver
- D-channel data link controller.
- Standard 64-bit serial IOM interface
- Industry standard serial interface (UART)
- Programmable clock speed
- Programmable power-down and wake-up
- Support for external RAM/ROM

APPLICATIONS

- ISDN Modems/Terminal Adapters
- ISDN Videophones
- Integrated PC communications

Block Diagram





- ISDN-to-PCMCIA communications cards
- LAN Interconnect Applications

THE SO HO ENVIRONMENT

Fig(1) shows the typical configuration of a BRI-ISDN based "Small office Home office" (SoHo), environment.

Using BRI-ISDN the huge installed base of analog local-loop lines can be upgraded quickly and cheaply to a digital format allowing an increase in throughput to 128Kbits/s. This can be further extended by the use of data compression techniques to over 1Mbit/s.

The ACTIS was designed to meet the specific requirements of the SoHo application area by integrating all the functionality required onto a single integrated circuit. ACTIS allows the development of smart and cost effective ISDN data communication products. The device supports two 64Kbit/s and one 16Kbit/s channels, (ie. 2B+D), and interface to the ISDN network via an on-chip So-Interface.

TARGET APPLICATION AREA

Integrating all ISDN functions onto a single chip results in a number of distinct advantages to ISDN Terminal Adapter (TA) manufactures. These include enhanced performance, decreases in power consumption, smaller PCBs, and most importantly a reduction in overall system cost.

The ACTIS offers developers a unique programmable engine for ISDN subscriber communications. It includes all the circuitry required to implement a full featured ISDN TA, making it the most highly integrated and feature rich solution available today.

In addition since it is a programmable solution it offers ample opportunity to differentiate products with additional software-based options.

At the heart of both the ACTIS is an ARM™ RISC core. This platform permits today's as well as future ISDN services, features and functions to be enabled in software while maintaining the existing hardware configuration, thereby extending the range as well as the product life cycle of a given design.

The ACTIS conforms to the ITU (I.430) and the ETSI (ETS 300 012) specifications.

The ACTIS combines analog, digital and RISC technology in one device, and is a result of VLSI's "Mass Customized Silicon" strategy". The ACTIS provides customers with the capability to design cost-effective, differentiated and highly integrated ISDN Data communications solutions, while minimizing time to market.

FUNCTIONAL DESCRIPTION

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ARM RISC CORE

At the heart of ACTIS is the ARM RISC processor. This high performance, low power CPU allows many of the functions previously implemented in hardware to be performed in software, thereby reducing silicon area & cost.

On-Chip Memory

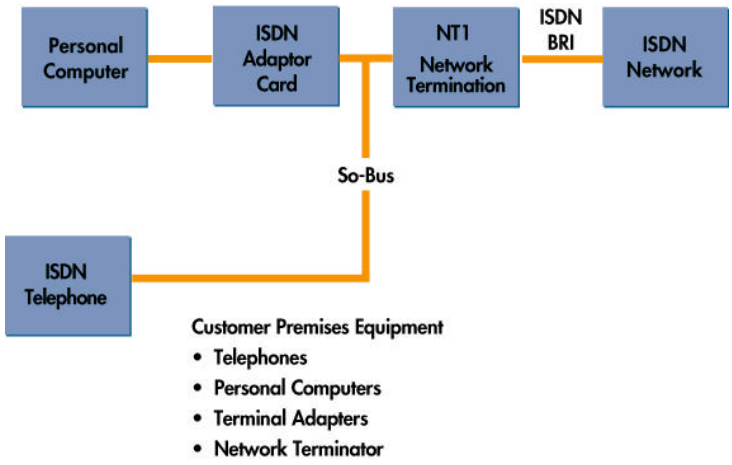
The ACTIS contains 3 Kbytes of on-chip cache memory. This allows speed critical routines to run at maximum speed.

Memory Interface

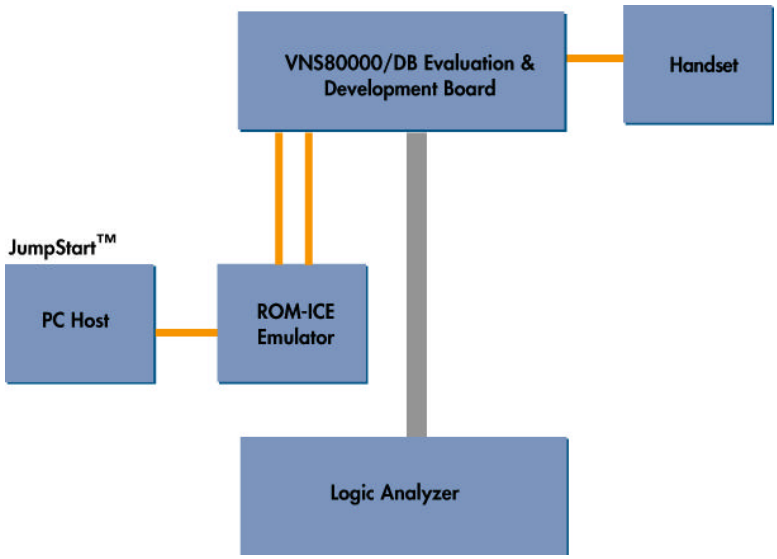
The Memory Interface allows the connection of external 8, 16 or 32 bit static RAM/ROM. An internal DRAM timing controller supports non sequential and fast page mode DRAM access.

SO-Interface

The S0-interface transceiver allows direct connection to the SO-Interface



Serial Interface



Bus. It contains all the Layer 1 functions defined in the ITU I.430 specification. The D-channel data link controller provides the Layer 1 and the basic Layer 2 frame formatting. The remaining Layer 2 functions are performed by software running on the ARM. All bits in the So-Frame are accessible to the ARM.

IOM2 Interface

For communication with other serial devices such as CODEC's, DSP's or peripherals, the ACTIS incorporates a full duplex serial port with a 64 bit serial - parallel converter to drive standard 8-bit telecom or 14-bit linear CODEC's.

UART

The ACTIS includes an on-chip UART, allowing serial communications with a personal computer etc. This simple full-duplex serial interface has a complexity equivalent to an 8251 UART. Baud rates are programmable from 1.2 kBaud up to a maximum of 115.2 kBaud.

Power Management

A flexible power management controller enables the system clock speed to programmed down to stop.

I/O Ports

All Ports are bi-directional and can be programmed to have special functions in the various configurations supported by the ACTIS.

Technology

The ACTIS has been designed using VLSI's 0.6µ CMOS, triple-layer metal mixed-signal technology, and is available in different package options.

DEVELOPMENT ENVIRONMENT

To support the integration of applications based on the ACTIS, VLSI offers a complete set of hardware development tools as well as demonstration and evaluation systems. Fig(2) shows a typical development environment. Since both ACTIS and VIP(Single-chip VLSI ISDN subscriber processor) use a compatible design methodology, the same development tool environment can be used to develop either ISDN data communications equipment or ISDN Terminals, thereby maintaining our objective of a common platform for different applications. This is mandatory to reduce time-to-market.

ACTIS/VIP Development Board

The Development Board, (VNS80000/DB) s e rves the dual function of product evaluation and development. From a hardware point of view it functions as and ISDN telephone and can be used as a hardware & software development platform connecting to the ISDN S0-bus as defined by the ITU I.430 and ETSI, ETS 300 012 specifications.

JUMPSTART™ SOFTWARE TOOLS

For those customers planning to develop their own software, VLSI offers the integrated ARM development tool, JumpStart™. This software and hardware platform runs on both UNIX workstations as well as PCs and in combination with the VNS80000/DB development board and a ROM-ICE system offers a complete software/hardware development platform. Given this development environment, software

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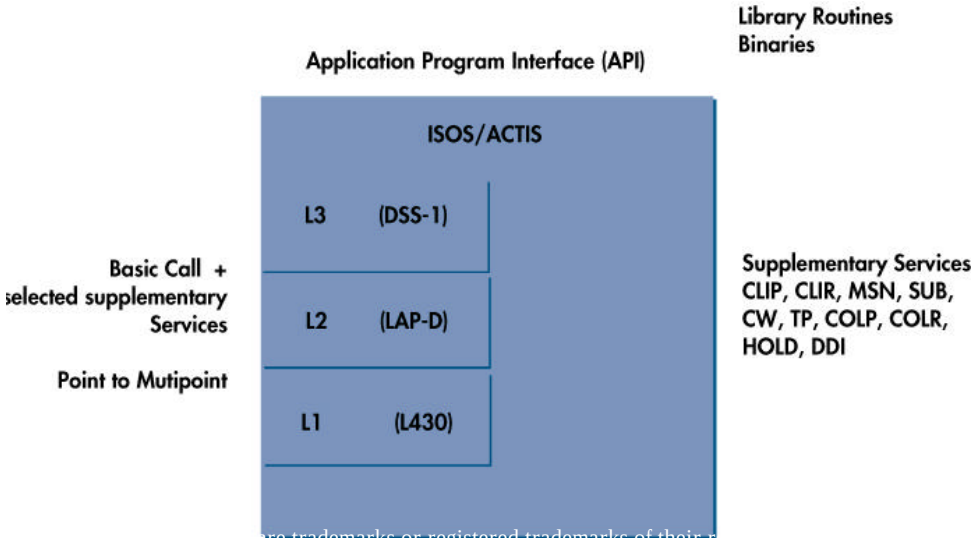

developers can port their existing code as well as develop new features for the VLSI's ISDN solutions with minimal effort.

ISDN LAYER 1 2 AND 3 SOFTWARE

For those customers that do not want to develop their own layer 1, 2 and 3 software VLSI will license these modules as re-distributable binary objects. This software has been specifically designed to run on the ACTIS and VIP ASSPs and consists of Library routines for E-DSS1 version: Layer 1, layer 2, layer 3 (basic calls) device drivers / OS routines.

It is currently planned that this software supports the following supplementary services: CLIP, CLIR, MSN, SUB, CW, TP, COLP, COLR, Call Hold, DDI. If additional supplementary services are required, (national ISDN variants for Europe, as well as US versions 5-ESS and NI-1) VLSI is able to provide these on request.

ISDN Software Configuration

Fig(3) shows the partitioning of the various ISDN functions within a typical ACTIS based application. All layer 1 functions are performed in hardware by the ACTIS. Layer 2 and 3 functions functions are performed in software and are part of the ISDN D-Channel Software.

This module in turn interface with the higher level user software and operating system. This interface is referred to as the Application Interface Specification (API).

ISDN Software Description

The following specifications are supported:

- Layer 1
  - ETS 300 012 and Related Specifications
- Layer 2
  - ETS 300 125 and Related Specifications
- Layer 3
  - ETS 300 102 + Related Specifications

For update information, please visit our Web site:
http://www.vlsi.com

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