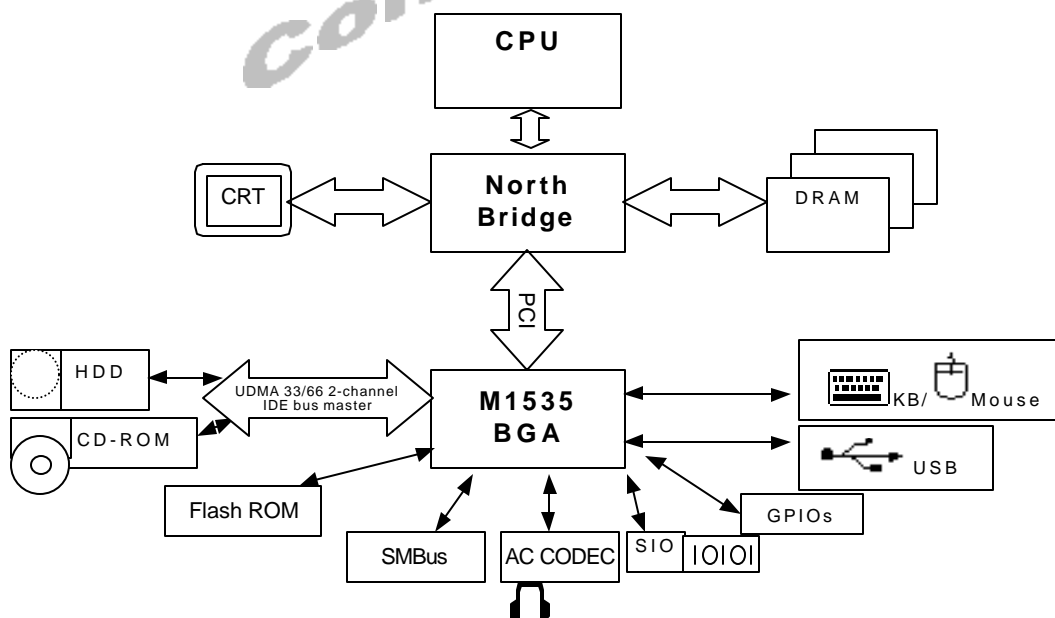*Product Brief*

Introduction

The M1535 provides the highest integration south bridge solution between PCI bus and Peripheral buses for personal computer systems. It includes audio, high-speed modem, Super I/O and Fast IR integrated into one chip to complement any one of ALi's North Bridge solutions namely M1541, M1621 and M1631.

The M1535 is PCI spec. 2.2 compliant. It provides steerable PCI Interrupts for PCI device Plug-and-Play, it has up to 8 PCI interrupts routing, it has level to edge trigger transfer. It has enhanced DMA controller. It provides 14 interrupt channels as Interrupt Controller. It provides 8254 Compatible timers for system timer, Refresh Request, Speaker Output use. It has 7 DMA channels that can be arbitrarily programmed as distributed channels. It provides 1 PC/PCI DMA channel interface. It supports serialized IRQ in quiet/continuous mode. It supports Plug-and-Play. It has built-in PS2 Keyboard and mouse controller. It provides hot plugging events detection.

The M1535 also provides the best power management solution. The M1535 integrates ACPI support, deep green function, 2-channel Ultra DMA-33/66 IDE bus master controller, 4-port USB controller, SMBus controller, Super I/O, audio system and software modem into one 27mmx27mm BGA (Ball Grid Array) chip. Please see attached pages for details.

Furthermore, the M1535 is designed to meet the requirements of desktop, mobile PCs.

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M1535 (South Bridge) Features:

- **Provides a High Integration Bridge (with Audio, HSP Modem, Super I/O & Fast IR) between PCI Bus and Peripheral Bus for Notebook or Mobile Systems**

- **PCI 3.3V/5V Tolerance Interface**
  - Supports PCI Master and Slave Interface
  - Supports PCI Master and Slave Initiated Termination
  - Concurrent PCI Architecture
  - PCI spec. 2.2 Compliant
  - PCI Power Management Interface spec. 1.1 Compliant
- **Provides Steerable PCI Interrupts for PCI Device Plug-and-Play**
  - Up to 8 PCI Interrupts Routing
  - Level to Edge Trigger Transfer
- **Enhanced DMA Controller**
  - Provides 7 Programmable Channels, 4 for 8-bit Data Size, 3 for 16-bit Data Size
  - 32-bit Addressability
- **Interrupt Controller**
  - Provides 14 Interrupt Channels
  - Independent Programmable Level/Edge Triggered Channels

- **Counter/Timers**
  - Provides 8254 Compatible Timers for System Timer, Refresh Request, Speaker Output Use

- **Distributed DMA Supported**
  - 7 DMA Channels can be Arbitrarily Programmed as Distributed Channels
- **PC/PCI DMA Supported**
  - 1 PC/PCI DMA Channel Interface Provided
- **Serialized IRQ Supported**
  - Quiet/Continuous Mode
  - Programmable (Default 21) IRQ/DATA Frames
  - Programmable START Frame Pulse Width

- **Plug-and-Play Supported**
  - 2 Programmable Chip Select
  - 2 Steerable Interrupt Request Lines
- **Built-in Keyboard Controller**
  - Built-in PS2/AT Keyboard and PS2 Mouse Controller
- **Supports up to 512 KB ROM Size Decoding**

- **PMU Features**
  - Full Support for ACPI and OS Directed Power Management to meet system requirement of PC98/PC99

- Full Support for Instantly Available PC feature
- CPU SMM Legacy Mode and SMI Feature Supported
- Full Support for Clock Control Functions of both Pentium and Pentium II CPUs.
- Supports I/O Trap for I/O Restart Feature
- PMU Operation States :
  1. G0 State
     -- On
     -- Standby Mode
  2. G1 State (Suspend Mode 1)
     -- S1 State (Power On Suspend)
     -- S3 State (Suspend To RAM)
     -- S4 State (Suspend To DISK)
  3. G2 State (Suspend Mode 2)
     -- S5 State (Soft-Off)
  4. G3 State (Mechanical-Off)
- APM State Detection and Control Logic Supported
- Global and Local Device Power Control Logic
- 10 Monitor Timers : Standby/ APMA~D/ Global-Display/ HDD A~B/ SIO & Audio/ GPIO.
- 2 Low Battery timers supported.
- Provides System Activity and Display Activity Monitoring, including
  -- Video
  -- Audio
  -- Hard Disk
  -- Floppy Disk
  -- Serial Ports
  -- Parallel Port
  -- Keyboard
  -- 4 Programmable I/O Group
  -- 2 Programmable Memory Space
- Provides Hot Plugging Events Detection
  -- Docking Insert
- Multiple External Wakeup Events of Standby Mode (G0)
  -- Power Button
  -- Sleep Button
  -- Modem Ring
  -- RTC Alarm
  -- DRQ2
- Resume Events detected Wake Up from Suspend Mode (G1, G2)
  -- 9 resume events supported.
  -- Power Button
  -- Sleep Button
  -- RTC Alarm
  -- PCI PMEJ Signal
  -- Modem Ring
  -- USB Events
  -- AC'97
  -- Hotkey KBD & MS

-- IRQ1 & 12
- CLKRUN# Function Supported for PCI Mobile Design Guide Ver1.1
- Thermal Alarm Supported
- Clock Generator Control Logic Supported
  -- CPUCLK Stop Control
  -- PCICLK Stop Control
- L2 Cache Power Down Control Logic Supported
- Up to 25 Run Time Events Supported(included 8 Extended Run Time Events).
  - Up to 12 General Purpose Input Signals, Up to 15 General Purpose Output Signals and up to 30 General Purpose Input/Output Signals
  - 16 Extended General Purpose Input Signals, 16 Extended General Purpose Output Signals, and 8 Extended Run Time Events supported.
  - All Registers Readable/Restorable for Proper Resume from Suspend State
  - Hotkey for Power on Button Function through Keyboard or Mouse
  - Supports Power Loss Recovery
  - Watch Dog Timer for
    -- Set a Bit in Register
    -- Generate an SMI#/SCI/NMI/INIT
    -- Generate System Reset

■ **Built-in PCI IDE Controller**
- Supports Ultra DMA Mode Transfers up to Mode 4 Timing (33/66 Mbps)
- Supports PIO Modes up to Mode 4 Timings, and Multiword DMA Mode 0,1,2 with Independent Timing of up to 4 Drives
- Integrated 16 x 32-bit Read Ahead & Posted Write Buffers for each channel (Total : 32 DWords)
- Dedicated Pins of ATA Interface for each Channel
- Supports Tri-state IDE Signals for Swap Bay
- Supports Command Queue IDE enhancement

■ **USB Interface**
- One Root Hub with four USB Ports Based on OpenHCI 1.0a Specification
- Supports FS (12Mbits/sec) and LS (1.5Mbits/sec) Serial Transfer
- Supports Legacy Keyboard and Mouse Software with USB-based Keyboard and Mouse

■ **SMBus Interface**
- System Management Bus Interface Meets the V1.0 Specification
- SMBALERT# Support
- I^2C protocol Support

■ Hotkey for Power on Button Function through Keyboard

■ **Super I/O Interface**
- Supports Windows Plug-and-Play
- Supports 2 Serial/ 1 Parallel/ FDC Functions
- Supports 16-bit Address Decoder
- 2.88 MB (Formatted) Floppy Disk Controller
  -- Software Compatible with 82077 and Supports 16-byte Data FIFOs
  -- High Performance Internal Data Separator
  -- Supports Standard 1 Mbps/ 500 Kbps/ 300 Kbps/ 250 Kbps Data Transfer Rate
  -- Supports 3 modes of 3.5" FDD (720KB/ 1.2MB/ 1.44MB)
  -- Swappable Drives A and B
  -- Programmable 7-bit I/O Base Address
- Various Mode Parallel Port
  -- Supports ECP/ EPP / PS/2 / SPP and 1284 Compliance
  -- Standard Mode
  -- Programmable 8-bit I/O Base Address
  -- Multiplexing of FDC Signals through Parallel Port Pins
  -- 12 IRQ Channel Options
  -- 4 8-bit DMA Channel Options
  -- IBM PC/XT, PC/AT and PS/2 Compatible Bi-directional Parallel Port
  -- Enhanced Mode
   - Enhanced Parallel Port (EPP) Compatible
   - EPP is Compatible with EPP1.9 (IEEE 1284 Compliant), also supports EPP1.7 of Xircom Specification
  -- High Speed Mode
   - Microsoft and Hewlett Packard Extended Capabilities Port (ECP) Compatible
   - IEEE 1284 Compatible ECP
   - Includes Protection Circuit against damage caused when printer is powered up, or operated at higher voltages
- Serial Ports
  -- Three High Performance 16450/16550 Compatible UARTs with Send/Receive 16-byte FIFOs
  -- Programmable Baud Rate Generator
  -- Wireless Communications
  -- Dedicated pins and COM Port for Infrared Transmission
  -- Supports IrDA 1.0 (SIR) and IrDA 1.1 (MIR and FIR)
  -- Supports Sharp-IR
  -- MIDI (Musical Instrument Digital Interface) Compatible
  -- High Performance Power Management for FDC, UART and Parallel Port
  -- Option between Programmable 7-bit I/O Base Addresses, 12 IRQs, and 4 DMA Channels for each Device

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■ **Audio System**

- Fully Plug-and-Play PCI controller and software
- PCI 2.2 compliant bus master optimized for multiple stream operation
- On-chip per voice cache minimizes PCI bandwidth
- Hardware multi-channel digital mixer
- 32 voices polyphony wavetable synthesizer supports all combinations of stereo/mono, 8-/16-bits, and signed/unsigned samples.
- Per channel for wave table synthesis with envelop, pitch shift, tremolo and vibrato
- DLS1-compliant Downloadable Samples support
- DirectMusic with unlimited downloadable samples in system memory
- Legacy game audio with SoundBlaster Pro/16 compatibility
- Legacy game FM and wave table synthesis supported
- MPU-401 compatible MIDI I/O with FIFO
- AC97 2.1 support with full duplex, independent sample rate converter for recording and playback
- On-chip sample rate converter ensures all internal operation at 48 KHz
- High precision internal 26 bit digital mixer with 20 bit digital audio output
- Microsoft WDM streaming architecture compliant and "Re-routable endpoint" support
- 32-voices DirectSound channels

- 16-voices DirectSound3D accelerator with IID, ITD and Doppler effect on 3D positional audio buffers
- DirectSound accelerator with volume, pan and pitch shift control on streaming or static buffers
- DirectInput support with digital enhanced game port enables an analog joystick to emulate digital joystick performance using DirectInput driver. This eliminates up to 12% CPU overhead wasted on joystick polling.
- DirectX timer for video/audio synchronization
- Hardware digital volume control

■ **Software Modem Interface**

- The M1535 will provide the AC'97 2.1 compliant digital controller interface for third parties (such as the AMC Codec's vendor) to enable the software modem solution.
- 4 separate telephony bus master channels. One for modem output, one for modem input, one for handset input, and one for handset output.
- AC'97 2.1 Modem variable sample rate support for "On Demand" sample transport scheme.
- AC'97 2.1 GPIO pin status and control support.
- Power Management and wake-up event support
- Caller ID string transmission via AC-link support

■ **352-pin (27mmx27mm) BGA Package**