# OPTiSound™ 82C933

## *Integrated Plug-and-Play 3D Audio Processor*

**Technical Brief**

## Introduction

The OPTi*Sound*™ 82C933 is a single chip Plug-and-Play ISA audio processor that provides uncompromising integrated 3-D audio that maintains compatibility with the currently installed base of legacy applications. By meeting PC 97 and WHQL specifications, providing Sound Blaster™ Pro compatibility, and offering Direct Sound™ support, the OPTi*Sound* 82C933 delivers the highest assurance of overall system and OS compatibility. The OPTi*Sound* 82C933 is an ideal ISA audio solution for desktop, mobile, and embedded applications requiring a high level of integration, and exceptional sound quality.

ECTIVA's integrated third generation 16-bit Sigma-Delta codec provides high quality analog-to-digital and digital-to-analog conversions. The Sigma-Delta codec is further integrated with a low distortion complex mixer featuring 3-D audio expansion. The OPTi*Sound* 82C933 produces a spatial or widened stereo image from ordinary left and right channel inputs, without any initial encoding of input signals.

In addition to the 22 voice OPTiFM™ synthesis, the 82C933 architecture also provides upgradeability through audio software enhancements, including wavetable and 3D expansion—ideally suited for multimedia audio and gaming applications.

The OPTi*Sound* 82C933 is an ideal building block for advanced audio solutions. The MPU-401 port supports external MIDI devices, such as hardware wavetable and keyboard interfaces. One asynchronous I/O port supports Zoom Video, hardware wavetable, speaker phone, modem interface, Digital CD-In, and DSP data.

The high level of integration of the OPTi*Sound* family eliminates the requirement for additional memory, codecs, 3D, and most discrete components; which minimizes the design effort as well as the total cost of implementation. The 82C933 is offered in two pinouts optimized for system board (MB Mode) or ISA add-in card (AD Mode) applications.

The combination of solid Sound Blaster Pro compatibility with integrated 3D makes the OPTi*Sound* 82C933 the ideal solution for desktop, mobile, and embedded applications requiring a highly integrated cost-effective audio solution.

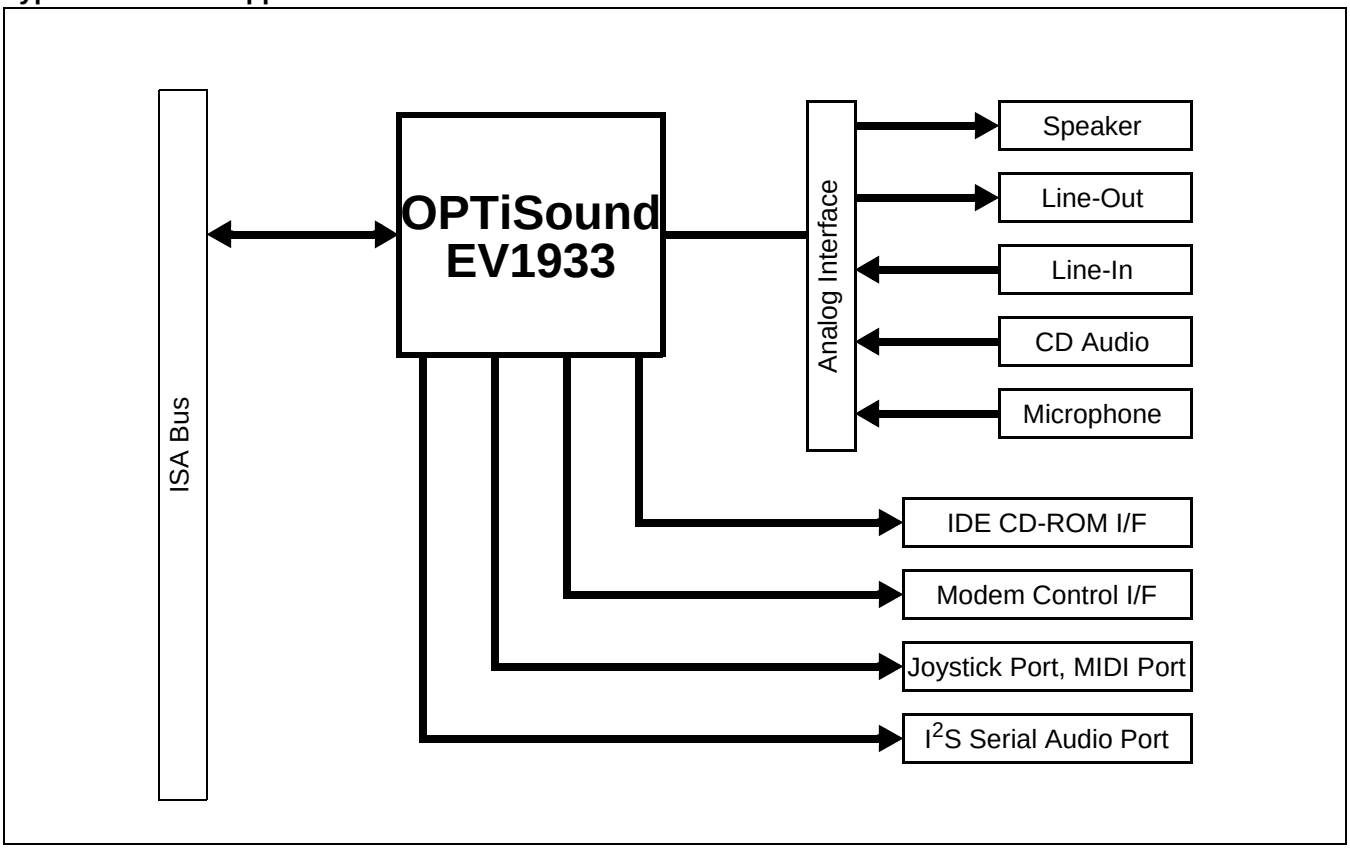
## Applications

- Desktop Multimedia Audio
- Mobile and Embedded Audio
- Stand-alone & Internet Gaming
- Music Composition & Synthesis

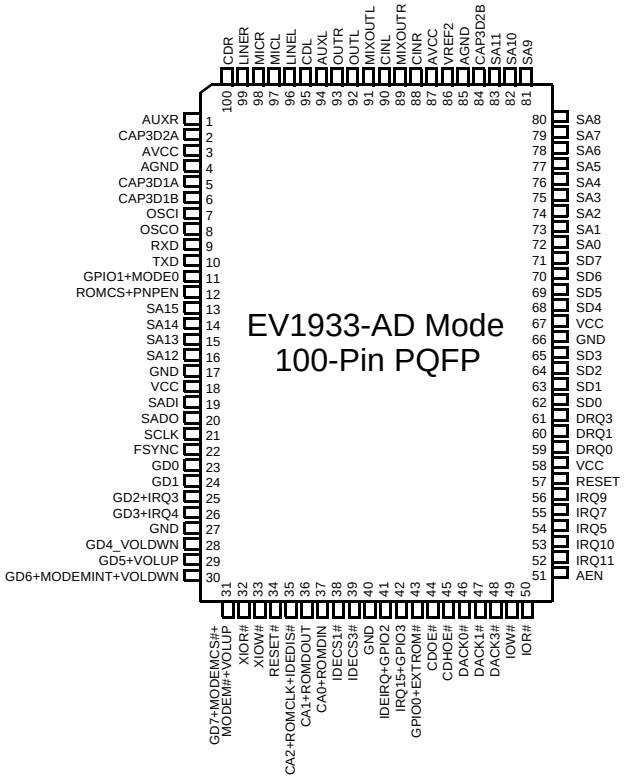
## Features

- Integrated sound controller compatible with:
  - Sound Blaster Pro™
  - Ad Lib™
  - Microsoft® Windows™ Sound System™
- Microsoft PC-97 compliant
- Built-in high-quality 22 voice, 52 operator, OPTiFM™ music synthesizer with enhanced bass
- Built-in 7-channel mixer: five stereo, two mono
- Built-in 16-bit sigma-delta stereo codec
- ISA Plug and Play Specification 1.0a compatible, supports a maximum of six logical devices:
  - Sound Blaster Pro, Windows Sound System, FM synthesis
  - MPU-401 MIDI interface
  - CD-ROM interface
  - Joystick/game port
  - Modem interface
  - 82C933 control
- Supports external serial EEPROM (optional)
- External modem chipset interface
- Full duplex operation: record and playback simultaneously using two 8- or 16-bit DMA channels
- Supports IMA ADPCM, µ-law, A-law decompression
- 8- or 16-bit stereo sound data up to 48KHz stereo
- Supports 16-bit Type F DMA playback, accelerates telephony-audio applications
- Digital joystick interface support, improves responsiveness
- $I^2S$ serial interface supports Zoom Video Port, wavetable controller and modem chipset
- Direct Sound™ interface support
- Power-down modes
- Silence mode to turn-off all audio functions
- Hardware and software volume control via push-button interface
- 100-pin PQFP (Plastic Quad Flat Pack)
- 100-pin TQFP (Thin Quad Flat Pack)

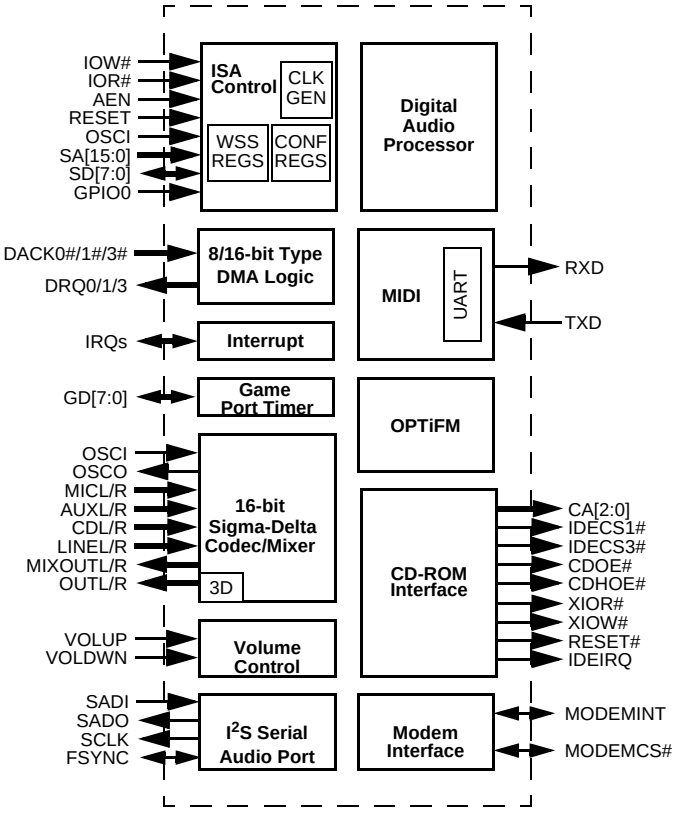
## Typical 3D Audio Application




## 100-Pin PQFP Diagram




## Block Diagram



## Signal Description

| Signal Name | Pin | Signal Description |
|---|---|---|
| **3D Signals** | | |
| CAP3D1A<br>CAP3D1B<br>CAP3D2A<br>CAP3D2B | 5<br>6<br>2<br>84 | 3D Depth Filter/Node 1A<br>3D Depth Filter/Node 1B<br>3D Depth Filter/Node 2A<br>3D Depth Filter/Node 2B |
| **ISA Bus Signals** | | |
| IOW# | 49 | I/O Write Command |
| IOR# | 50 | I/O Read Command |
| AEN | 51 | DMA Address Enable |
| RESET | 57 | System Reset Input |
| SA[15:0] | 13:16,<br>83:72 | System Address Bus Lines 15 through 0 |
| SD[7:0] | 71:68,<br>65:62 | System Data Bus Lines 7 through 0 |
| DACK0#<br>DACK1#<br>DACK3# | 46<br>47<br>48 | 8-Bit DMA Acknowledge Bits 0, 1, and 3 |
| DRQ0<br>DRQ1<br>DRQ3 | 59<br>60<br>61 | 8-Bit DMA Request Bits 0, 1, and 3 |
| GPIO0 | 43 | General Purpose I/O Bit 0 |
| EXTROM# | | External EEPROM Enable Input |
| IRQ5<br>IRQ7<br>IRQ9<br>IRQ10<br>IRQ11 | 54<br>55<br>56<br>53<br>52 | Interrupt Request Bits 5, 7, and 9 through 11: IRQ7 and IRQ9-11 are bidirectional for WSS auto interrupt determination. |
| IRQ15 | 42 | Interrupt Request Bit 15 |
| GPIO3 | | General Purpose I/O Bit 3 |
| **MIDI Interface** | | |
| RXD | 9 | Receive Data from 32KBaud MIDI UART Port |
| TXD | 10 | Transmit Data to 32KBaud MIDI UART Port |
| **External PnP EEPROM and IDE CD-ROM Interface** | | |
| ROMCS | 12 | External Serial EEPROM Chip Select |
| PNPEN | | PNP Mode Enable Jumper Bit |
| GPIO1 | 11 | General Purpose I/O Bit 1 |
| MODE0 | | 933 Mode Configuration Bit 0 |
| CA2 | 35 | IDE CA2 |
| ROMCLK | | External Serial EEPROM Clock |
| IDEDIS# | | IDE Disable |
| CA1 | 36 | IDE CA1 |
| ROMDOUT | | External Serial EEPROM Data Out |
| CA0 | 37 | IDE CA0 |
| ROMDIN | | External Serial EEPROM Data In |
| IDECS1# | 38 | IDE CD-ROM Chip Select Bit 1 |
| IDECS3# | 39 | IDE CD-ROM Chip Select Bit 3 |
| IDEIRQ | 41 | IDE CD-ROM Interrupt |
| GPIO2 | | General Purpose I/O Bit 2 |
| RESET# | 34 | Buffered Reset (active low) |
| CDOE# | 44 | CD Output Enable |
| CDHOE# | 45 | CD High Output Enable |

## Signal Description (cont.)

| Signal Name | Pin | Signal Description |
|---|---|---|
| XIOR# | 32 | IDE Buffered IOR# |
| XIOW# | 33 | IDE Buffered IOW# |
| **Game Port and Serial Audio Interface** | | |
| GD7 | 31 | Game Port 2 Data Line 7 |
| MODEMCS# | | Modem Chip Select |
| MODEM# | | Modem Interface Enable Input |
| VOLUP | | Volume Up |
| GD6 | 30 | Game Port 2 Data Line 6 |
| MODEMINT | | Modem Interrupt |
| VOLDWN | | Volume Down |
| GD5 | 29 | Game Port 1 Data Line 5 |
| VOLUP | | Volume Up |
| GD4 | 28 | Game Port 1 Data Line 4 |
| VOLDWN | | Volume Down |
| GD3 | 26 | Game Port 2 Data Line 3 |
| IRQ4 | | Interrupt Request Bit 4 |
| GD2 | 25 | Game Port 2 Data Line 2 |
| IRQ3 | | Interrupt Request Bit 2 |
| GD1 | 24 | Game Port 1 Data Line 1 |
| GD0 | 23 | Game Port 1 Data Line 0 |
| **Codec/Mixer Interface** | | |
| MICL | 97 | Microphone Input Left |
| MICR | 98 | Microphone Input Right |
| LINEL | 96 | Line Input Left |
| LINER | 99 | Line Input Right |
| CDL | 95 | CD Input Left |
| CDR | 100 | CD Input Right |
| AUXL | 94 | Auxiliary Input Left |
| AUXR | 1 | Auxiliary Input Right |
| OUTL | 92 | Output Left |
| OUTR | 93 | Output Right |
| MIXOUTL | 91 | Mixer Output Left |
| MIXOUTR | 89 | Mixer Output Right |
| CINL | 90 | ADC Filter Pin Left |
| CINR | 88 | ADC Filter Pin Right |
| VREF | 86 | Voltage Reference |
| OSCI | 7 | Oscillator Input: 14.318MHz |
| OSCO | 8 | Oscillator Output |
| **Serial Audio Interface Signals** | | |
| SADI | 19 | Serial Audio Data Input |
| SADO | 20 | Serial Audio Data Output |
| SCLK | 21 | Serial Audio Clock |
| FSYNC | 22 | Serial Audio Synchronization |
| **Power and Ground** | | |
| VCC | 18, 58,<br>67 | Power Connection |
| GND | 17, 27,<br>40, 66 | Ground Connection |
| AVCC | 3, 87 | Analog Power Connection |
| AGND | 4, 85 | Analog Ground Connection |

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