ZR38600

PRODUCT BRIEF **PROGRAMMABLE DOLBY AC-3 AND MPEG2 AUDIO PROCESSOR**

FEATURES

- Hardware Features
  - High performance 40 MIPS DSP core
  - Large on chip RAM/ROM
  - S/PDIF Transmitter and Receiver
  - Parallel input port with FIFO
  - Separate programmable PLLs for DSP and Audio
  - 3 serial input ports and 4 serial output ports
  - 16 bit External memory interface
  - Glueless interface with the ZR36120 PCI controller
  - 3.3 V supply with 5 V compatible I/Os
- Low System Cost
  - No external RAM required for 5.1 Dolby AC-3/MPEG2
  - Wait-state generation for low-cost external memory
  - 100-pin Plastic Quad Flat Pack (PQFP) packaging
- Decoding software included in on-chip ROM
  - Dolby AC-3 5.1 Channels and 2 Channels
  - Dolby Pro Logic Encoding and Decoding
  - MPEG1 and MPEG2 2 Channels
  - Bass crossover and multi-channel downmix
- Dedicated Functions(*)
  - MPEG2 PES Stream parsing
  - MPEG2 PTS decoding and SCR handling
  - 8-channel PCM downmixing to two channels
  - Sample rate conversion 96 kHz to 48 kHz
  - AC-3 and MPEG S/PDIF output conforming to IEC-958
- Flexible Input/Output
  - Parallel and/or serial input stream handling
  - Support for 24 bit PCM input /output
  - Master or slave I/O with programmable internal clocks
  - Formatted S/PDIF (IEC-958) input and output
  - AC-3 Input data rates up to 640 Kbits per second
  - Sample rates: 32 kHz, 44.1 kHz, 48 kHz or 96 kHz
- Software and Hardware Development Environment
  - Assembler/Linker/Simulator
  - On-chip ICE support with direct PC connection
  - ZR38600DB - Demonstration Board with 6 analog outputs and optional PC connection

APPLICATIONS:

- Home theater A/V Receivers and decoders
- DVD (Digital Video Disk)
- Digital Cable TV set-top boxes
- Multimedia PC
- DAB (Digital Audio Broadcast)
- Karaoke

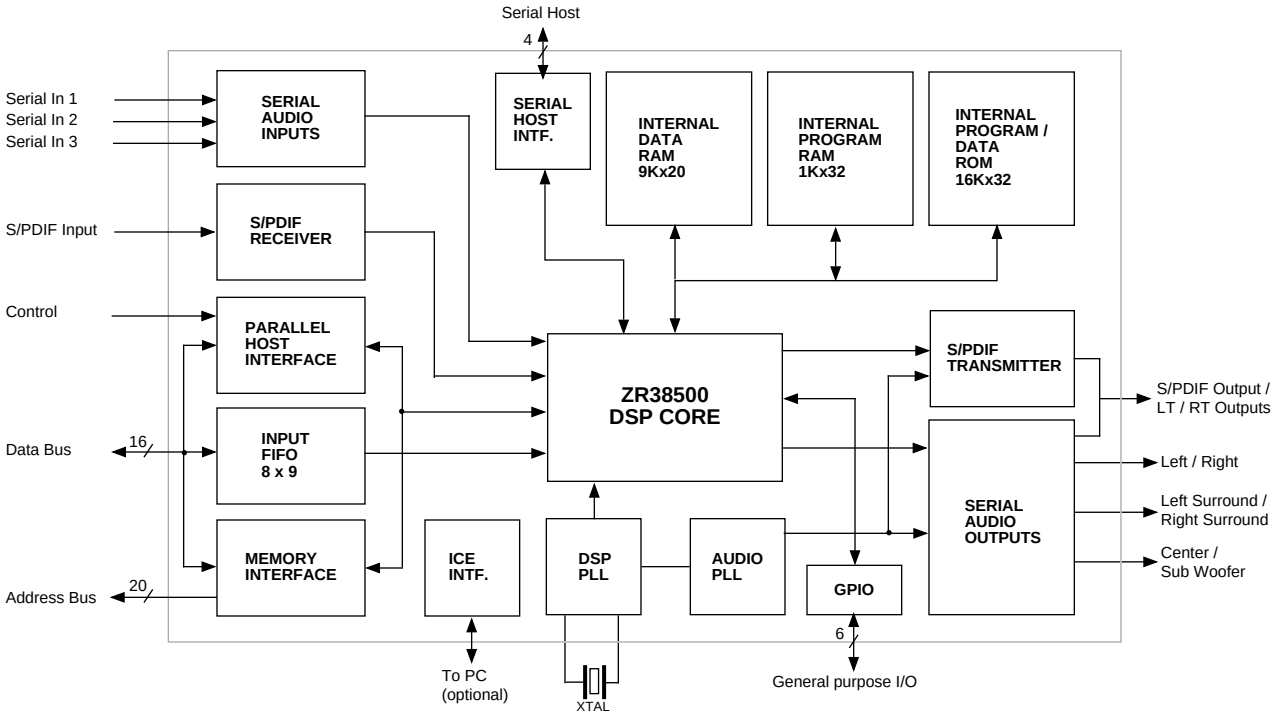

Figure 1. ZR38600 - Functional Block Diagram

GENERAL DESCRIPTION

The Zoran ZR38600 is a high performance programmable digital signal processor capable of real-time single-chip decoding of Dolby AC-3 5.1-channel digital surround and MPEG2 2-channel algorithms. The ZR38600 is the third generation AC-3 decoder made by Zoran. It is based on the proven ZR38000 and ZR38500 architectures, optimized for Dolby AC-3 and other complex audio signal processing applications.

The ZR38600 incorporates large on-chip ROM (16Kx32) and RAM (9Kx20) for single chip, multi-channel AC-3 decoding without the need for external memories. In addition, the ZR38600 includes several important peripheral functions that simplify system design and achieve lower system costs. A minimal system requires only a DAC and an optical interface for the S/PDIF input in addition to the ZR38600 and oscillator.

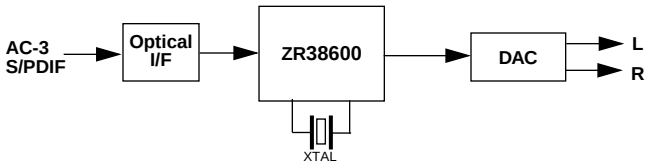

Figure 3. ZR38600 Minimal System

The high performance of the ZR38600, in conjunction with 1Kwords of on-chip program RAM allow the use of customer specific, downloadable software without the need for a costly and time consuming ROM mask change. Currently, all the required software for AC3 and MPEG2 is implemented in ROM. as well as a some additional functions such as Bass Crossover and special handling for DVD. A complete and flexible user interface program is also included, it permits operation of the ZR38600 in multiple environments and full control of decoding functions and configurations. Other multi-channel decoding algorithms will be provided in upcoming versions of the device.

The compressed bit stream may be fed to the ZR38600 through several means: An S/PDIF input, a 3 wire serial interface carrying a raw or packetized bitstream or an 8 bit parallel port. All S/PDIF rates are supported. The serial interface can support bit rates of up to 20 Mbits/sec and the parallel interface can accommodate rates of up to 7 MBytes/sec. The system designer may select any of the above input schemes or even a combination of input schemes that suit his particular application. The software in ROM can handle both request driven input or constant rate input.

The S/PDIF receiver and associated software conforms to IEC-958. Dolby AC-3, MPEG and PCM bitstreams are supported. The ZR38600 extracts the data and clock information from the bi-phase mark encoding of the S/PDIF streams, the data is fed to the audio decoder and the clock is used to drive the serial output ports and the DACs. While receiving coded information from the S/PDIF input, the ZR38600 can also receive other information from any serial input port i.e. a microphone or line input. The S/PDIF transmitter also conforms to IEC-958 and is used mainly to convey coded bitstreams to an external decoder.

Four serial output ports are provided on the ZR38600. Three of them carry the normal 5.1 channels of AC-3 and the fourth port may be used to output Dolby Pro Logic to a recording device while playing 5.1 channels. A full 8 channel output configuration is also possible with the ZR38600.

The ZR38600 has an external memory interface for applications that require additional memory. This interface shares pins with the parallel port. The parallel port may be used by an external host to communicate with the ZR38600 for commands/status or to input coded bitstreams. For those systems that do not have a parallel host, an SPI compatible serial host interface is provided . All functions are available through both host interfaces.

Two fully programmable PLLs (Phase Locked Loops) are provided on-chip. One generates the DSP clock and the second one is dedicated to generating the audio clocks for the DACs and ADCs. The two PLLs simplify system design and permit lower external component count, especially if multiple bit-rates and different audio sample rates are switched on-the-fly.

The ZR38600 is available in a 100 pin PQFP package.

(*) Functions will be provided in loadable software modules

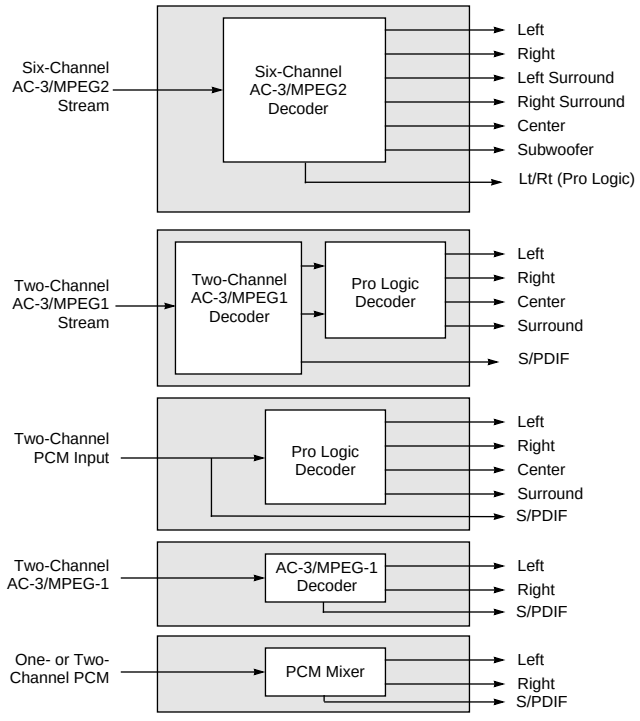

Figure 4. ZR38600 Decoding Functions