Benefits Overview

The Zoran® (ZR38601) is a high-performance, programmable digital audio signal processor capable of real-time, single-chip decoding of Dolby Digital 5.1-channel and MPEG-2 digital surround algorithms. It is the fourth generation decoder made by Zoran, based on the proven ZR38600 architectures. The hardware block floating-point makes it optimum for Dolby Digital and complex digital audio signal processing applications.

Due to its programmable high-performance and high level of integration, the ZR38601 is unusually flexible in meeting a wide range of system requirements at the lowest possible system cost. At the low end, it can provide standard fixed decoding functions with only a DAC and an optical interface for the S/PDIF input, in addition to the oscillator crystal. At the high end, it can provide eight channels of output, analog input, long-delay memories, custom operating features, and the ability to be upgraded with downloaded SiliconSoftware® product enhancements. Yet all of this flexibility comes without design complexity. Highly configurable standard functions with a simple command structure minimize software development, while a full set of development tools are available for the highly-custom product developer.

The ZR38601 is suitable primarily for audio applications such as Audio/Visual home theater receivers, Digital Audio Broadcast (DAB), 3-D audio, six-channel speaker systems, and Karaoke processors; video applications like SDTV and HDTV stereo television receivers and digital cable, and satellite TV set-top boxes; and multimedia PC applications such as DVD players.

Key Features

**Standard High Performance Functions in ROM**
- Dolby Digital, 5.1-channel and 2-channel decoding up to 640 Kbits per second
- Dolby Pro Logic encoding and decoding
- MPEG-1 and MPEG-2 two channel decoding with MPEG-2
- PES stream parsing, PTS decoding and SCR handling

**Downloadable SiliconSoftware Functions**
- Aureal A3D, Dolby Virtual Surround, Harman VMX
- QSOUND QSurround, Spatializer N-2-2, Home THX
- SRS TruSurround, music modes
- Bass Management and multi-channel downmix

**Flexible Input/Output**
- Serial and/or parallel data stream I/O
- Serial SPI, serial Z2C or 8-bit parallel host interface
- 3 serial input data ports and 4 serial data output ports
- Formatted S/PDIF receiver with up to 96 kHz sample rate
- Sample rates: 32 kHz, 44.1 kHz, 48 kHz or 96 kHz
- Formatted S/PDIF Dolby Digital and MPEG transmitter output

**Low System Cost**
- Host less operation without glue chips
- Separate internal PLLs for DSP core and audio I/O
- No external RAM required for 5.1 Dolby Digital/MPEG-2
- Wait-state generation for low-cost external memory
- 100-pin Plastic Quad Flat Pack (PQFP) packaging
- 3.3 V supply with 5 V compatible I/O for low power

**Software and Hardware PC Development Environment**
- Assembler/Linker/Simulator
- On-chip ICE support with direct PC connection
- ZR38600DB Demonstration Board with 6 analog outputs, microphone and line inputs, and optional PC connection

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**Figure 1. A typical Low-Parts-Count ZR38601 System**

**Encoded Data Input**
- S/PDIF Optical Interface
- S/PDIF Input

**Decoded Audio Outputs**
- Left
- Right
- Left Surround
- Right Surround
- Center
- Subwoofer
- Left Center
- Right Center

**General Purpose Control I/O**
- XTAL
- SPI or Z2C Serial Interface

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**Figure 1. A typical Low-Parts-Count ZR38601 System**

**Encoded Data Input Decoded Audio Outputs**
The Zoran ZR38601 is the latest digital audio processing member of the ZR38000 high-performance, programmable digital signal processor product line. It is especially configured with peripherals, I/O capability, and software for digital audio. Today, quality digital audio starts with a primary decoding function, adds appropriate data stream protocols, and interfaces with I/O configurations to match the application. The ZR38601 has these primary decode and protocol software functions yet has processing cycles left for additional product-distinguishing features. The ZR38601 also has the necessary flexibility in system I/O and hardware configuration.

The ZR38601 is pin and instruction-set compatible with the earlier ZR38600, but with a higher 50-MIPS processing rate and larger internal program and data RAMs and ROM. These features provide new 96-kHz sample rate S/PDIF decoding, and increased processing cycles and memories for additional functions. New hardware features are a programmable timer, a 22C serial host interface, and more support for the 24-bit I/O data formats.

### Functions

- **Dolby Digital and MPEG with variations are the primary decoding functions in use today.** The ZR38601 has these and their associated test function with the required setup, operation, and system functions to make them usable in an end-user product. In addition, an ever increasing number of SiliconSoftware functions can add special enhancing and differentiating features to products.

### Primary Decoding and Test Functions

- **Dolby Digital** Dolby Digital
- **MPEG**
- **Six- or Two-Channel PCM Input**
- **Dual S/PDIF Inputs**
- **Two-Channel PCM Output**
- **Pro Logic Output**

**PCM + Pro Logic** With two-channel PCM inputs, the choice of functions is four-channel Pro Logic decoding or two-channel stereo mixing, including upmixing from only one input channel to two.

**MPEG** The MPEG-1 decoder accepts either MPEG-1 or MPEG-2 input streams and produces either Pro Logic DAC outputs or two-channel stereo in DAC form.

**SiliconSoftware Functions**

SiliconSoftware is a group of additional functions for the ZR38601 provided by Zoran or third-party suppliers that can add special features now or provide new functions in the future.

**Pink Noise** A six-channel pink pseudo-random noise generator function is included for user testing of speaker balance in their listening space. Individual speakers can be enabled in any combination.