

# CXD3772GG

Sony has now developed the CXD3772GG audio signal processor LSI. This device is based on professional audio technologies and includes A/D converter, D/A converter, and PLL circuits on chip. This LSI allows dedicated programs to be downloaded and parameters to be adjusted and provides audio fidelity improvement effects comparable to the functions in professional audio equipment. The CXD3772GG makes it possible to achieve significant improvements in audio quality in accordance with the physical characteristics of the equipment. For example it can improve the insufficient bass response in equipment that uses miniature speakers, such as cellular phones, portable audio equipment, and miniature headphones.

- Miniature dedicated audio processor:  
Bass enhancement,  
Stereo spatial enhancement function,  
Dynamic range control,  
Equalization, and other functions.
- Stereo signal processing
- Built-in A/D and D/A converters, PLL, and digital interface
- Power saving standby mode
- Miniature 44-pin VFBGA package

## ■ Miniature Dedicated Audio Processor

Sony developed the CXD3772GG as a new dedicated audio product. It provides the following functions for audio quality adjustment that are used in professional audio.

- Bass enhancement (low band enhancement effect that is based on the characteristics of human hearing and operates without increasing the low-band gain)
- Stereo spatial enhancement function
- Dynamic range control
- Equalization (correction of the frequency characteristics to match the speaker system)

These functions are implemented in a programmable manner. (Note, however, that program development and audio quality tuning require an experienced specialist.) Programs and adjustment parameter values are loaded over an I<sup>2</sup>C bus (that supports fast mode). Parameter values are changed dynamically.

## ■ Stereo Signal Processing

The CXD3772GG provides two 1-bit  $\Delta\Sigma$  A/D converters and two D/A converters on chip. After the input analog signals are converted to digital, they are processed by the internal processor and then converted back to analog signals for output. Since the CXD3772GG also includes a digital audio interface, it supports the following signal conversions.

- Analog input → digital output
- Digital input → analog output

The CXD3772GG generates an internal 1024fs clock from an externally input clock using a built-in PLL circuit. It supports fs = 44.1 kHz.

## ■ Power Saving Standby Mode

Since the RAM and core power supplies are separate, it is possible to leave only the power supply for the RAM, which holds downloaded programs and parameters, operating and shut off all other power supply systems.

At the same time as reducing power consumption in standby mode, this makes it possible to return to normal operation without having to re-download the program.

Also, since the CXD3772GG includes an analog bypass signal path, power can be reduced even further by using that signal path when signal processing is not required.

## ■ Audio Characteristics

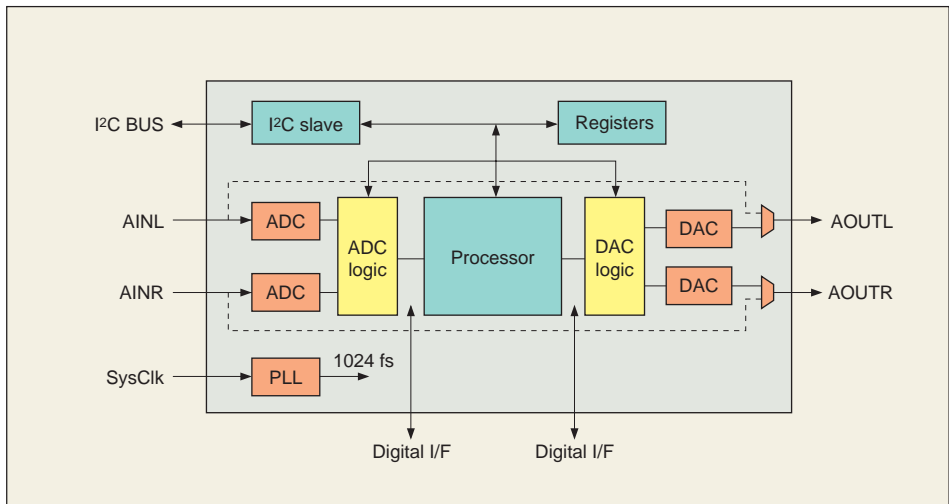
- Total harmonic distortion + noise: 70 dB or better
- Signal-to-noise ratio: 82 dB or better
- Channel separation: 80 dB or better

## ■ IC Specifications

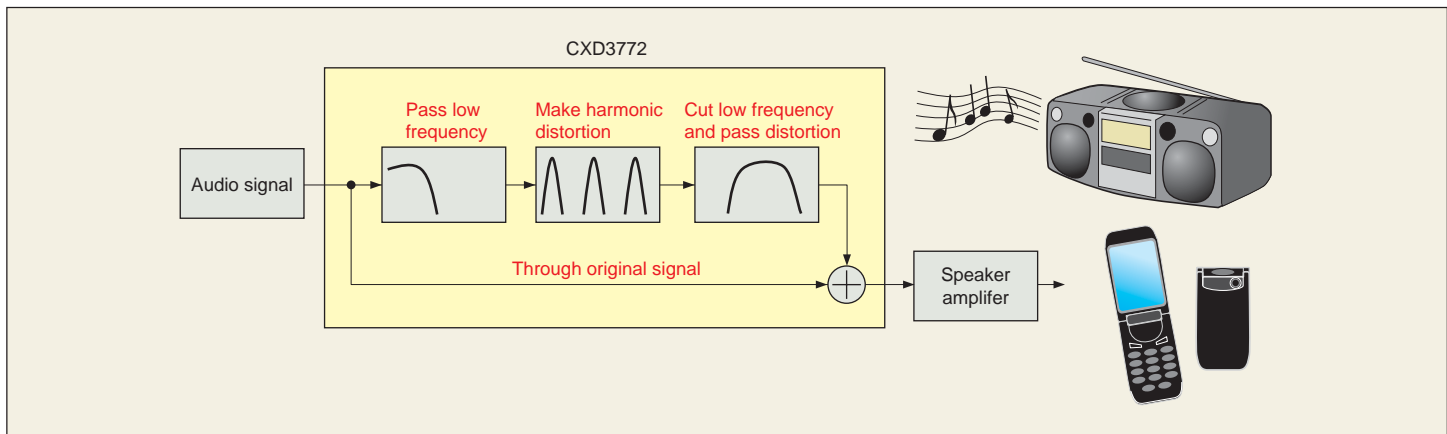
- Supply voltages:  
Digital and PLL system supply voltage: 1.8 V, A/D and D/A converters: 2.85 V (3.3 V max.)
- Operating temperature: -30 to +85°C
- Package: 44-pin VFBGA (0.5 mm pitch)
- Package dimensions: 4.0 mm × 4.0 mm

## V O I C E

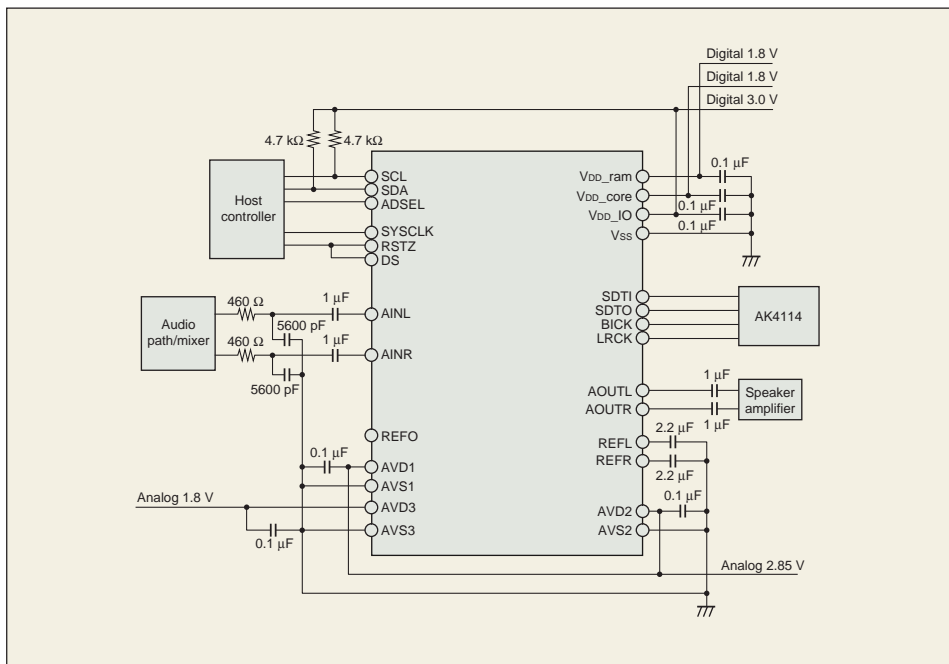
Although the CXD3772GG is not an extremely large-scale LSI, it was still difficult to create an evaluation environment, since it is a mixed-signal analog/digital device. Nevertheless, the development team worked together as a unit to see the device through to mass production. I think you will find that including this LSI in your products will provide a previously unknown level of audio quality improvement in portable equipment.



■ Figure 1 Block Diagram



■ Figure 2 System Overview



■ Figure 3 Application Circuit Example