



**CIRRUS LOGIC<sup>®</sup>**

**CS4391**

# **24-Bit, 192 kHz Stereo DAC with Volume Control**

The following information is based on the technical data sheet:

*CS4391 DS335PP2 SEP '99*

Please contact Cirrus Logic for further information.

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**PRODUCT INFORMATION**

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PI335PP1 OCT '99

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***24-Bit, 192 kHz Stereo DAC with Volume Control***

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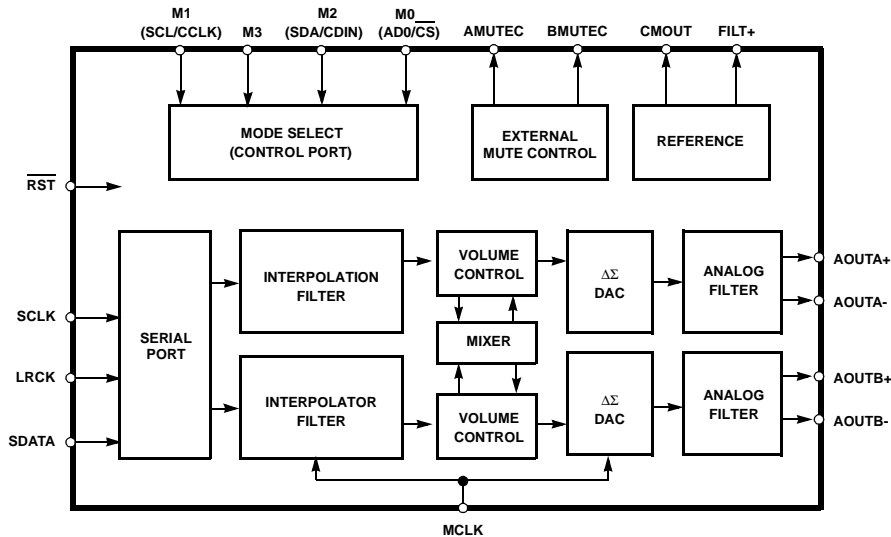
**Features**

- Complete Stereo DAC System: Interpolation, D/A, Output Analog Filtering
- 108 dB Dynamic Range
- 94 dB THD+N
- Direct Stream Digital Mode
- Low Clock Jitter Sensitivity
- +5 V to +3 V Power Supply
- ATAPI Mixing
- On-Chip Digital De-emphasis for 32, 44.1, and 48 kHz
- Volume Control with Soft Ramp
  - 119 dB Attenuation
  - 1 dB Step Size
  - Zero Crossing Click-Free Transitions
- 36 mW with 3 V supply
- Direct Interface with 5 V to 1.8 V Logic

**Description**

The CS4391 is a complete stereo digital-to-analog system including digital interpolation, fourth-order delta-sigma digital-to-analog conversion, digital de-emphasis, volume control, channel mixing and analog filtering. The advantages of this architecture include: ideal differential linearity, no distortion mechanisms due to resistor matching errors, no linearity drift over time and temperature and a high tolerance to clock jitter.

The CS4391 accepts PCM data at sample rates from 2 kHz to 192 kHz, DSD audio data, consumes very little power and operates over a wide power supply range. These features are ideal for DVD, A/V receivers, CD and set-top box systems.



## Overview

The CS4391 is a complete stereo digital-to-analog system including digital interpolation, fourth-order delta sigma digital-to-analog conversion, digital de-emphasis, volume control, channel mixing and analog filtering. The advantages of this architecture include: ideal differential linearity, no distortion mechanisms due to resistor matching errors, no linearity drift over time and temperature and a high tolerance to clock jitter.

The CS4391 supports master clock frequencies up to 1024x, depending on the sample rate, therefore supporting various audio environments. In addition, the CS4391 supports a Direct Stream Digital interface for use with Sony's Super Audio CD format. All in all, the CS4391 is a superior D/A for the mid to high performance consumer space.

## FAQs

1) What is the difference between the CS4390 and CS4391

A: The CS4391 is a 24-bit, 192kHz D/A converter with 108dB of dynamic range. The CS4390 is a 20-bit, 48kHz D/A converter with 106dB of dynamic range. The CS4391 is a newer D/A converter and is recommended for all new consumer audio design opportunities.

2) Are the CS4390 and CS4391 pin compatible?

A: No. The CS4390 and CS4391 are not pin compatible as they are different architectures and different products altogether. The CS4391 offers improved performance at a lower price point. In addition, future derivatives of the CS4391 will be pin compatible to the CS4391.

3) What is the benefit of switched capacitor analog filter architecture?

A: Clock jitter is common in audio systems and it degrades D/A converter performance. Switched capacitor filters are less sensitive to clock jitter than continuous time filters; therefore it is easier for a designer to use the CS4391 and achieve the target specifications of the D/A converter and the total audio system.

4) Many converters have built in volume control, why is the CS4391s so superior?

A: The CS4391 uses a logarithmic volume control that is programmed via the control port on the D/A converter. Unlike our competitors' parts, the CS4391 does not require an external lookup table to calculate how many steps correspond to dBs of attenuation or amplification. Therefore, the CS4391s volume control is easier to design with and easier to use than our competitors' offerings.

5) What are the major differences between the CS4391, CS4340/41, and CS4334?

A: Refer to the following table:

	<b>CS4334</b>	<b>CS4340/41</b>	<b>CS4391</b>
Resolution (bits)	24	24	24
Dynamic Range (A-weighted) (dB)	96	102	108
THD+N (dB)	-88	-90	-96
Power Supply (V)	+5	+3V to +5V	+3V to +5V
Power Consumption (mW)	75	75	76
Sample Rate (kHz)	96	96	192/DSD
Package	8SOIC	16SOIC	20TSSOP
Volume Control	No	No/Yes	Yes
Soft Mute	No	No/Yes	Yes
Sensitive to jitter?	No	No/Yes	No

**Ordering Information**

CS4391-KZ	20-pin TSSOP, -10 to 70 °C
CDB4391	Evaluation Board



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