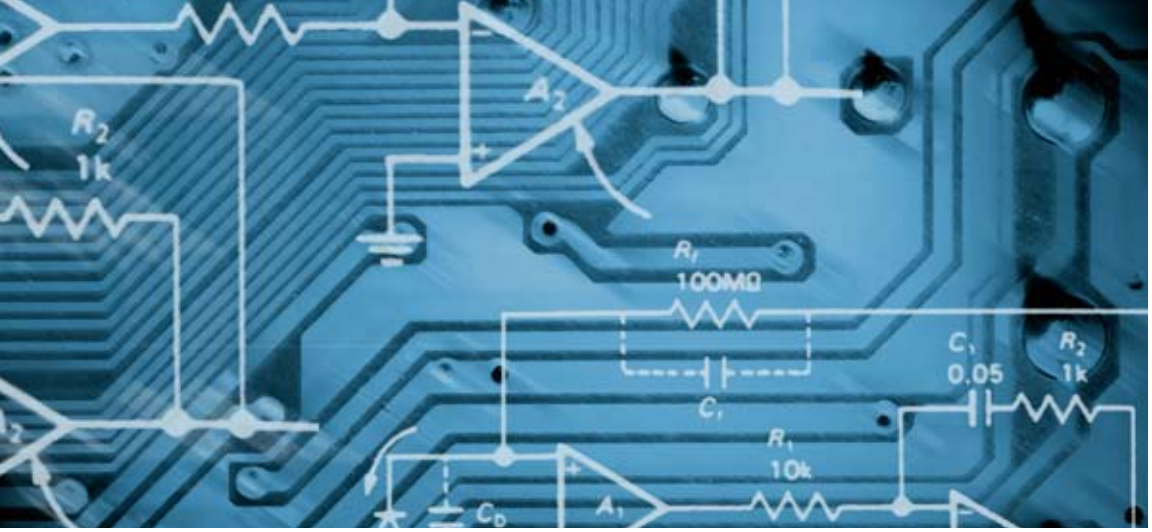


2
APPLICATION DIAGRAMS

4
FOCUS PRODUCTS

7
DESIGN RESOURCES

Blu-ray Disc® Player/Receiver Solutions

AUDIO SUBSYSTEM PRODUCT SELECTION GUIDE

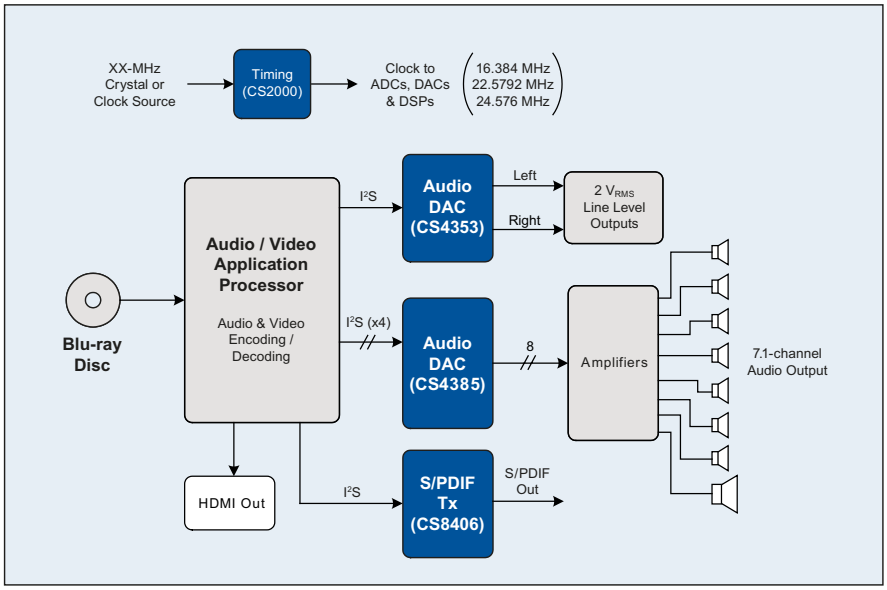
SPRING 2009

CIRRUS LOGIC®

Blu-ray Disc® Players and Disc Receivers

CONSUMER AUDIO

Cirrus Logic enjoys a long-standing reputation as a leader in innovative audio ICs. With more than 50 new mixed-signal audio and DSP products introduced over the past five years, Cirrus Logic provides designers with a comprehensive portfolio of audio products. Cirrus Logic's audio DSP and mixed signal portfolio is well aligned to provide Blu-ray Disc systems manufacturers enhanced audio capability for both Blu-ray Disc receivers or stand alone players.

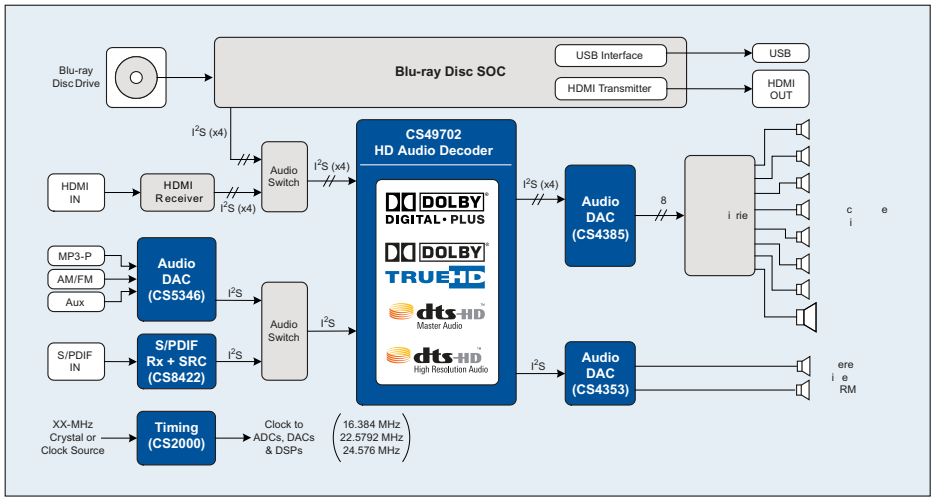


Blu-ray Disc Player

Cirrus Logic features mixed-signal audio products specifically tailored for stand alone Blu-ray Disc players, including stereo and multichannel audio converters, S/PDIF interface and timing solutions, all of which deliver ultra-low jitter and superior audio performance that designers can easily incorporate into their system.

MIXED-SIGNAL AUDIO SOLUTIONS

Part number	IC Type	Features
CS5346	ADC	103 dB dynamic range, -95 dB THD+N, 6:1 Input MUX, programmable gain amplifier
CS4353	DAC	106 dB dynamic range, -93 THD+N, 2-channels, 2-channels, ground centered 2 V_{RMS} line-level outputs
CS4385	DAC	114 dB dynamic range, -100 dB THD+N, 8-channels, volume control
CS2000	Timing	Clock multiplier/jitter reduction, clock generation, frequency synthesis
CS8422	S/PDIF Rx + SRC	EIAJ CP1201, IEC-60958 and AES3 compatible, 140 dB dynamic range, -120 dB THD+N, 4:1 Input MUX
CS8406	S/PDIF Tx	EIAJ CS1201, IEC-60958 and AES3 compatible, 192 kHz

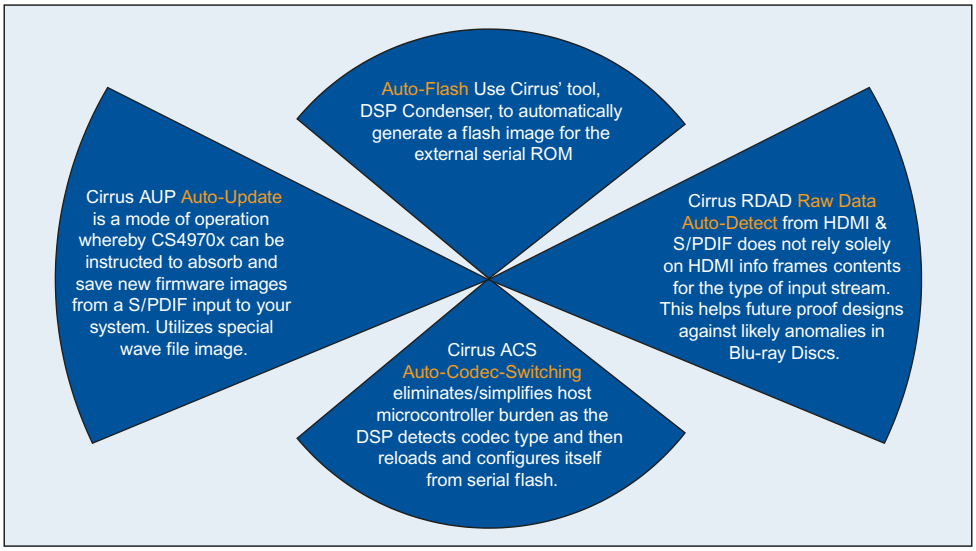


Blu-ray Disc Receiver

For Blu-ray Disc receivers, Cirrus Logic DSP solutions may offer a high-definition audio decoder and PCM processor, or in cases where the main SOC provides HD audio decoding, the DSP entails an advanced audio processor for the prior decoded high-definition audio. Cirrus Logic audio decoder DSPs support the latest high-definition and high-efficiency audio formats from Dolby and DTS.

AUDIO DSP SOLUTIONS

Part number	Processor Type	Features
CS49702	HD Dual Core DSP Processor	• High-definition audio format support: Dolby Digital® Plus, Dolby® True HD, DTS HD® Master Audio • Advanced audio processing support: Pro Logic® IIx, DTS Neo6,® bass management, parametric EQ and more! • I/O support: 12 Ch 32-bit serial audio input, 6 channel DSD® input, 16 Ch 32-bit PCM out and integrated dual 192 kHz • Two SPI™/I²C®, one parallel port • External memory interface: SDRAM and serial/parallel flash memory support
CS4953x *if HD Audio decode is not required, use in place of CS49702	Advanced Dual Core DSP Processor	• Advanced audio processing support: THX,® Pro Logic IIx, DTS Neo6, SRS,® bass management, parametric EQ and more! • I/O support: 12 Ch 32-bit serial audio input, 16 Ch 32-bit PCM out and integrated dual 192 kHz S/PDIF Tx Output • Two SPI™/I²C,® one parallel port • External memory interface: SDRAM and Serial/Parallel Flash memory support



New Features/Development Environment of CS497024 DSP

Focus Products

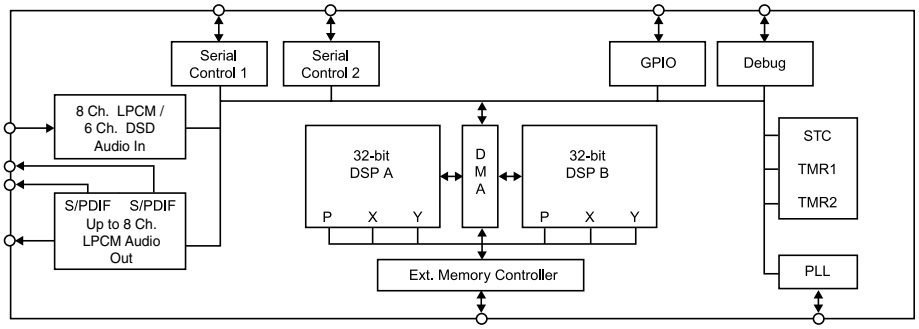
CS4970x

32-BIT HIGH DEFINITION AUDIO DECODER WITH AUDIO POST PROCESSING

FEATURES

- Multistandard 32-bit high definition audio decoding plus post processing
- Supports high-definition audio formats including: Dolby Digital® Plus, Dolby® TrueHD, DTS-HD® High Resolution Audio, DTS-HD® Master Audio and DSD®
- Additional applications library: Dolby Digital® EX, Dolby® Pro Logic® IIx, Dolby Headphone,® Dolby® Virtual Speaker,® DTS-ES 96/24,™ DTS-ES™ Discrete 6.1, DTSES™ Matrix 6.1, AAC™ Multichannel 5.1, THX® Ultra2,™ THX® ReEQ,™ Crossbar mixer, signal generator, advanced postprocessor including: 7.1 bass manager, tone control, 11- band parametric EQ, delay, 1:2 upsampler, DTS:Neo6,® DSD-to-PCM Conversion
- Up to 12 channels of 32-bit serial audio input
- 16 ch x 32-bit PCM out with dual 192 dB S/PDIF Tx
- Two SPI™/I²C,® one parallel and one UART port
- SDRAM and serial/parallel flash memory support

The CS4970x4 DSP family is an enhanced version of the CS4953x DSP family with higher overall performance. In addition to all the mainstream audio processing codes in on-chip ROM that the CS4953x DSP offers, the CS4970x4 device family also supports the decoding of major high-definition audio formats. Additionally, the CS4970x4, a dual-core device, performs the high-definition audio decoding on the first core, leaving the second core available for audio postprocessing and audio enhancement. The CS4970x4 device will support the most demanding audio post processing requirements. It is also designed as an easy upgrade path to systems currently using the CS495xx or CS4953x device with minor hardware and software changes.



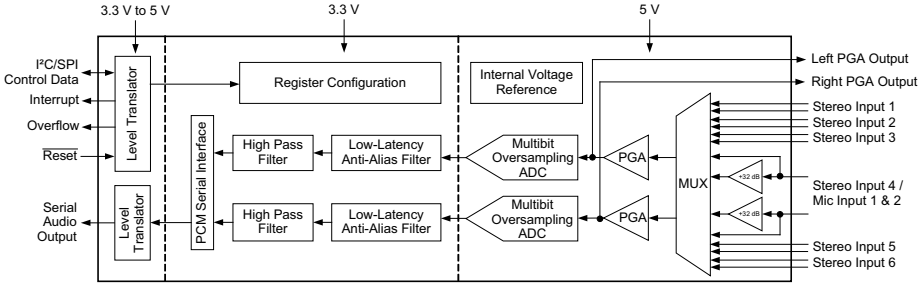
NEW CS5346

103 dB, 192 kHz STEREO D/A CONVERTER WITH MUX AND PGA

FEATURES

- Advanced multibit Delta-Sigma architecture
- Complete stereo A/D converter
- 24-bit conversion
- System sampling rates up to 192 kHz
- 103 dB dynamic range
- -95 dB THD+N
- 6:1 stereo input MUX
- Microphone pre-amp with 32 dB gain and low-noise bias supply
- Single-ended inputs
- 5 V analog; 3.3 V digital power supply
- Support for direct interface to logic levels from 3.3 V to 5 V
- Package: 48-pin LQFP, lead-free assembly

The highly integrated CS5346 stereo audio A/D converter provides designers with a solution that streamlines production development, reduces overall design complexity and cost and delivers premium audio performance.



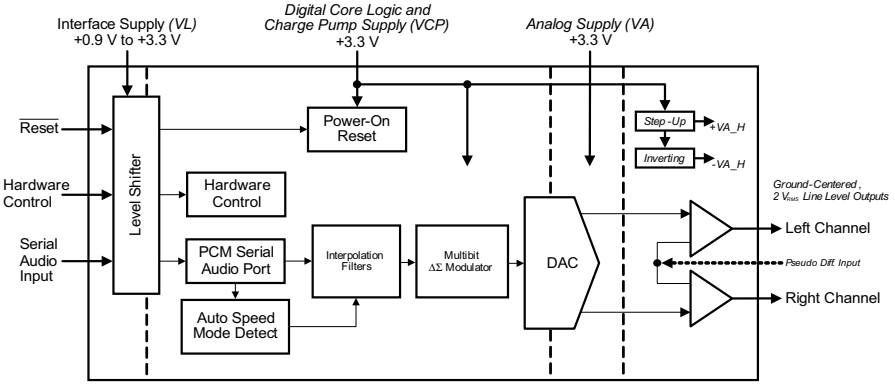
CS4353 NEW

106 dB, 192 kHz STEREO D/A CONVERTER WITH 2 V_{RMS} LINE OUTPUT

FEATURES

- Advanced multibit Delta-Sigma architecture
- 106 dB (A-wt) dynamic range
- -93 dB THD+N
- Single-ended ground centered analog architecture
  - No DC-blocking capacitors required
  - Integrated step-up/inverting charge pump
  - Filtered line-level outputs
  - Selectable 1 or 2 V_{RMS} fullscale output
- Low clock-jitter sensitivity
- Low-latency digital filtering
- Supports ample rates up to 192 kHz
- 24-bit resolution
- Power supplies
- +3.3 V charge pump and core logic
- +3.3 V analog
- +0.9 to 3.3 V interface
- 24-pin QFN, lead-free assembly
- Commercial and A

The CS4353 is a 24-bit, 192 kHz stereo audio D/A converter with an on-chip 2 V_{RMS} line driver working from a single 3.3 V power supply. The CS4353 is ideal for any application that requires a line-level output, such as DTVs, Blu-ray Disc players, set-top boxes and video game consoles.



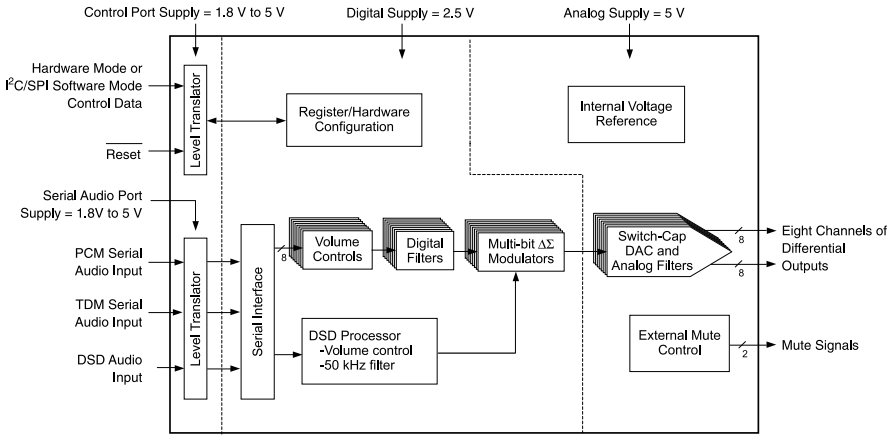
CS4365/85

114 dB, 24-BIT, 192 kHz, 6- AND 8-CHANNEL D/A CONVERTERS WITH DSD SUPPORT, LOW-LATENCY DIGITAL FILTERING AND TDM INTERFACE

FEATURES

- Advanced multibit Delta-Sigma architecture
- 24-bit conversion
- 114 dB dynamic range
- -100 dB THD+N
- Up to 192 kHz sample rates
- Direct Stream Digital® mode (SACD)
  - Non-decimating volume control
  - On-chip 50 kHz filter
  - Dedicated inputs
- Supports industry-standard TDM interface
- Selectable low-latency digital filters
- Volume control with soft ramp
  - 0.5 dB step size
  - Zero crossing click-free transitions
- Low-clock-jitter sensitivity
- µC or standalone operation
- Six mute output pins (CS4365)
- Two mute output pins (CS4385)
- Pin-compatible devices for easy upgrade path
- Consumer and automotive grades
- Available in a 48-pin LQFP, lead-free assembly

The CS4365/85 are pin-compatible 6- and 8-channel D/A converters. They feature digital de-emphasis, half-dB step-size volume control, ATAPI channel-mixing, selectable fast and slow digital interpolation filter followed by an oversampled, multibit Delta-Sigma modulator which includes mismatch shaping technology that eliminates distortion due to capacitor mismatch.



NEW

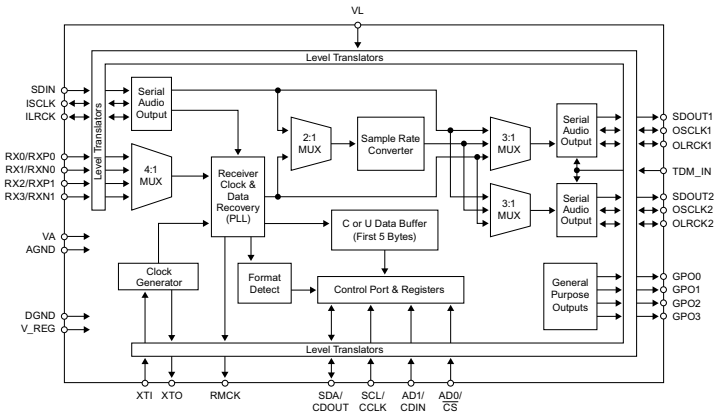
CS8422

192 kHz S/PDIF RECEIVER WITH SAMPLE-RATE CONVERTER

FEATURES

- Complete EIAJ CP1201, IEC-60958, AES3, S/PDIF compatible receiver
- Receiver supports 28 kHz to 216 kHz sample-rate range
- SRC supports sample rates up to 211 kHz
- Sample-rate ratios from 6:1 to 1:6
- 16, 18, 20, or 24-bit data I/O
- 140 dB dynamic range
- -120 dB THD+N
- 4:1 S/PDIF or 2:1 differential AES3 inputs
- High-input jitter tolerance and ultra-low jitter clock recovery
- No external PLL filter components required
- AES3 direct output and AES3 Tx pass-through
- No external master clock required
- SPI or I²C software mode and standalone hardware mode
- Flexible 3-Wire digital serial audio input port and dual serial audio output ports
- Four general-purpose output pins
- Time Division Multiplexing (TDM) mode
- 1.8 V to 5.0 V digital interface
- Space-saving 32-pin QFN package

The CS8422 is a digital audio interface receiver with a 24-bit, high performance, asynchronous sample-rate converter. This integrated feature set removes the requirement for system platforms to vary system clocking when integrating asynchronous digital interfaces such as S/PDIF. System integrators can now maintain a constant-frequency, high-quality system clock and provide a digital interface to external devices operating at various asynchronous samples rates from 32 kHz to 211 kHz.



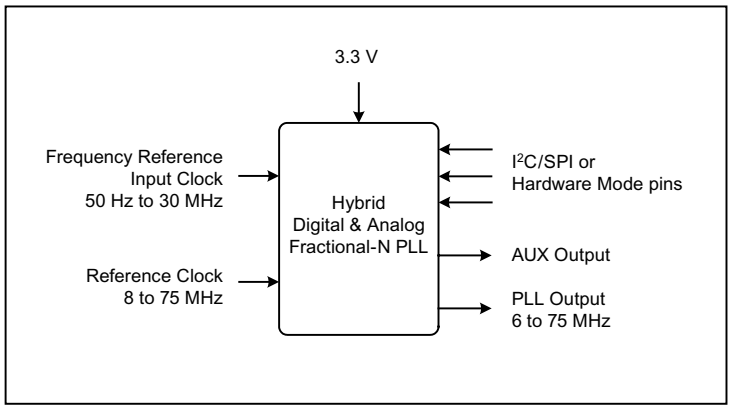
CS2xxx Family

CLOCK GENERATION AND MULTIPLICATION TIMING SOLUTIONS

FEATURES

- High-performance analog/digital phase locked loop
- Clock multiplier/jitter reduction
  - Generates a low-jitter 6–75 MHz output clock from a jittery or intermittent 50 Hz to 30 MHz clock source
- Clock generation / frequency synthesis
  - Generates a low-jitter 6–75 MHz clock relative to 8–75 MHz reference clock
- Highly accurate PLL multiplication factor
  - Less than 1 PPM error
- Flexible control options
  - One-time-programmable configuration for hardware mode
  - I²C® / SPI™ control port
- Configurable auxiliary output
  - Buffered reference clock
  - PLL Lock indication
  - Second PLL output
  - Buffered version of CLK_IN
- Flexible sourcing of reference clock
  - External oscillator or clock source
  - Supports inexpensive local crystal
- Minimal board space required
  - NO external analog loop-filter components required
  - Packaged in a 10-pin MSOP
- CS2300 has internal LCO for reference clock
- CS2200 is a subset and consists of clock generation
  - CS2100 is a subset and consists of clock multiplication

Precise clocking solutions are essential in electronics applications because they are used to synchronize the components used in professional and consumer audio equipment and directly affect audio quality. The CS2000 is unique because it offers both a clock generator feature and clock cleanup in a single IC. The IC's ability to significantly reduce jitter, or noise, makes it ideal for pro audio and mainstream consumer audio/video applications.



Design Resources

Cirrus Logic offers a wide selection of free tools and resources to help system designers implement audio products quickly and efficiently. Please visit **http://www.cirrus.com/en/support/** for more information on the following:

- Product Data Sheets
- Reference Designs and Evaluation Boards
- User Manuals
- Tools and Software
- Application Notes
- Product Bulletins

AUDIO CONVERSION SYSTEMS NOISE CALCULATIONS AND REQUIREMENTS

The skills required to predict the dynamic range of a combined A/D converter and D/A converter system, as well as to determine the noise requirements for the analog input and output stages, should be considered essential for an audio systems designer. This application note discusses in detail the steps required to apply these techniques and determine the critical system performance parameters.

http://www.cirrus.com/en/pubs/appNote/AN263REV1.pdf

THE 2-CHANNEL SERIAL AUDIO INTERFACE: A TUTORIAL

This application note describes the Serial Audio Interface and its various industry standard formats. The Serial Audio Interface is the most common mechanism used to transfer two channels of audio data between devices within a system – for instance, from the ADC to the DSP and then the DAC.

http://www.cirrus.com/en/pubs/appNote/AN282REV1.pdf

TIME DIVISION MULTIPLEXED (TDM) AUDIO INTERFACE – SIMPLIFIES DESIGN, REDUCES SYSTEM COST

The TDM interface allows typically 4, 6, or 8 channels of 24-bit (up to 192 kHz) audio data to be transferred on a single data stream between devices within a system and provides an easy interface to the DSP. Many of Cirrus Logic's audio converters and DSP solutions integrate this feature. Please see our Application Note (AN301) Time Division Multiplexed Audio Interface: A Tutorial.

http://www.cirrus.com/en/pubs/appNote/AN301REV1.pdf

AUDIO DSP DESIGN RESOURCES

Designing a system with DSP audio processing is no easy task. At Cirrus Logic we structure our offerings to allow system designers the easiest path to getting their designs into production with access to the following resources:

- Reference schematics and layout
- Free schematics, layout and BOM review
- On-site field applications engineering support in all major cities/countries
- DSP Composer: graphical tool that allows user to graphically develop and tweak audio applications (EQ, etc.)
- DSP Condenser: DSP will absorb many of the system controller tasks, making system software easier.
- DSP Controller: reference system controller source code
- Evaluation kits
- System Designer's Guide
- Extensive application notes libraries
- SDK tools training – C-compiler, assembler

CONTACT US

For technical assistance in North America, please call:
1-800-625-4084.

For International technical assistance, please contact the Cirrus Logic office in your region.

For a complete list of Cirrus Logic's sales representatives and distributors, please visit the Contacts area at www.cirrus.com.

NORTH AMERICA

CORPORATE HEADQUARTERS

2901 Via Fortuna
Austin, Texas 78746
United States
T +1-512-851-4000
F +1-512-851-4977
Toll-Free +1-800-888-5016

CIRRUS LOGIC TUCSON

5980 N. Shannon Road
Tucson, Arizona 85741
United States
T +1-520-690-8600
F +1-520-888-3329
Toll-Free +1-800-888-5016

ASIA PACIFIC

CIRRUS LOGIC INTERNATIONAL LTD.

Suite 1427
Ocean Centre
Harbour City
5 Canton Road
Tsimshatsui
Kowloon, Hong Kong
China
T +852-2376-0801
F +852-2412-5178

JAPAN

CIRRUS LOGIC K.K.

Aioi Sonpo, Building 6F
5-6 Niban-cho
Chiyoda-ku
Tokyo, Japan 102-0084
T +81-3-5226-7757
F +81-3-5226-7677

EUROPE

CIRRUS LOGIC (U.K.) LTD.

1st Floor Offices
Park House, Mere Park
Dedmere Road
Marlow, Buckinghamshire SL71FJ
United Kingdom
T +44-0-1628-891-300
F +44-0-1628-891-988

LEARN MORE AT
www.cirrus.com