A DIVISION OF CIRRUS LOGIC®

CS7615
CS7665

10-Bit, CCD Camera Electronics Chip-Set

The following information is based on the technical datasheets:

CS7615 DS231PP4 MAY'97

CS7665 DS232PP5 MAY'97

Please contact Cirrus Logic : Crystal Semiconductor Products Division for further information.

CRYSTAL SEMICONDUCTOR PRODUCTS DIVISION PRODUCT INFORMATION

PI231PP1/PI232PP1 OCT '97

CS7615: CCD Imager Analog Processor

CS7615

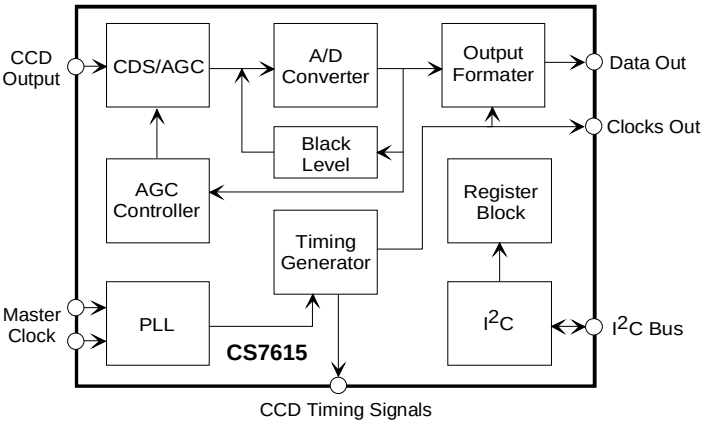
Features

- 10-Bit A/D Converter
- Multi-Sync CCD Timing Generator, handles imagers up to 1000 pixels wide
- Integrated Correlated Double Sampler
- 38dB Automatic Analog Gain Control
- Up to 90dB Total Gain Adjust Range
- Closed-Loop “Fuzzy” AGC/Exposure
- Code 16 Black Level Clamp
- I^2C Control Bus
- 4-Phase Vertical CCD Timing Signals
- No CCD Buffer Amplifier Required
- Master Clock or Crystal Controlled

Description

The CS7615 is a low-power Analog front-end processor for standard four-color interline transfer CCD imagers. The architecture includes a correlated double sampler, AGC amplifier, black-level clamp, 10-Bit A/D converter, and a complete multi-sync CCD timing generator. The analog CCD imager output can be directly connected to the CS7615 input, which does not require an external buffer amplifier. The pixel data is double sampled for improved noise performance, and gain adjusted prior to being digitized by the A/D converter. Feedback from the A/D converter holds the image black level at code-16

(assumes 8-bit data path), easing ITU-601 compliance issues. The multi-sync CCD timing generator is programmed via the I^2C bus, and can be used with a wide range of interline transfer CCD imagers up to 1000 pixels wide. The CS7615 supports full ITU-601 compliance for images up to 720 pixels wide, and is compatible with both NTSC and PAL timing. The CS7615 is designed to be used along with the CS7665 Digital Color-Space Processor for CCD Cameras, which generates a 4:2:2 component digital video output.



Overview

The CS7615 performs the analog functions in a four chip digital CCD Camera. The four main chips include the CCD imager, the CS7615 CCD digitizer, the CS7665 color space processor, and a vertical drive interface-chip for the CCD imager. Several CCD imagers (and their associated vertical drivers) can be used with the CS7615 digitizer and the CS7665 processor to form a simple and cost-effective YCrCb output format digital camera.

CS7665: Digital Color-Space Processor for CCD Cameras

CS7665

Features

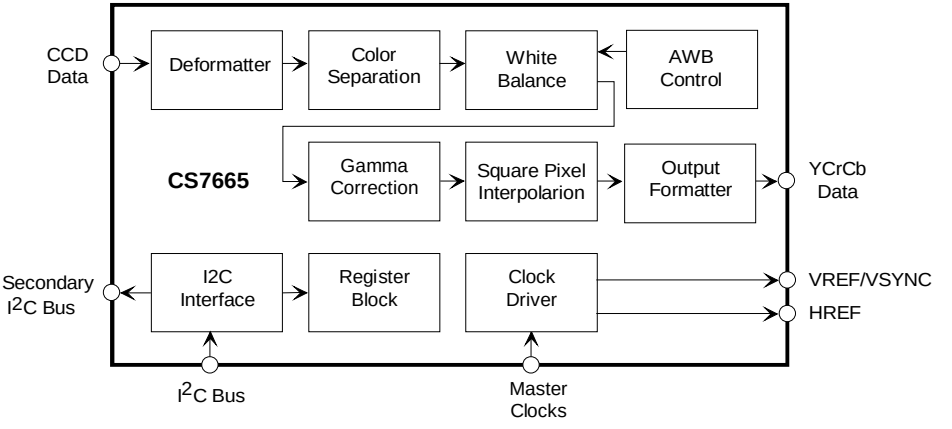
- ITU-601 Compliant Image Formatting
- ITU-656 and SMPTE-125/M Transport
- Provides Separate HREF and VREF (or alternately VSYNC) Signals
- I^2C Control Interface
- Limited Secondary I^2C Bus Master
- Automatic White Balance
- Programmable Gamma Correction
- 4:5 Square-Pixel Interpolation
- Advanced Color Anti-Aliasing Filter
- Programmable Luma Gain and Saturation Control
- Fully Programmable Color Separation Matrix Coefficients
- Supports Images up to 1024 pixels wide, with no limitation on Vertical Size

Description

The CS7665 is a low-power Digital Color-Space Processor for CCD cameras. It provides all necessary digital image processing for standard four-color interline transfer CCD imagers. The CS7665 processes the MYCG CCD imager data into YCrCb formatted component digital video. Internal processing

includes color separation, automatic white balance, user programmable gamma correction curves, square pixel interpolation, and output formatting. The CS7665 employes an advanced color anti-aliasing filter which prevents both incorrect color and “color noise” that can undermine compression based systems. The CS7665 digital output is ITU-601 compliant and supports both ITU-656 and SMPTE-125/M transport. Additionally, HREF and VREF (or VSYNC) output pins are provided to support older analog video encoders and the current ZV-Port definition. The CS7665 can support horizontal line widths of up to 1024 pixels. It has no limitations on the number of lines it can support in the vertical direction.

The CS7665 is designed to work directly with the CS7615 CCD Imager Analog Processor.



Overview

The CS7665 forms the heart of a four chip digital CCD Camera. The four chips include the CCD imager, the CS7615 CCD digitizer, the CS7665 color space processor, and a vertical drive interface-chip for the CCD imager. Most four-phase CCD imagers (and their associated vertical drives) can be used with the

CS7615 digitizer and the CS7665 processor to form a simple and cost-effective YCrCb output format digital camera. The CS7615 and CS7665 together support imager formats ranging from 175x175 pixels up to 1000x1000 pixels. Timing control is located in the CS7615 analog processor, while the CS7665 synchronizes itself to the CS7615 data stream by decoding the timing queues embedded in the CS7615 data stream. Alternately, the CS7665 accepts horizontal and vertical timing signals on pin inputs.

CS7615 CS7665

FAQs

1) What are the key applications for this solution? What markets, high/low end, will it address?

A: Our first camera electronics chipset will address industrial applications such as security, medical imaging, dental and endoscopic cameras, from traffic monitoring down to baby monitors and doorbell security. This chipset will address the price structures for industrial applications from the high to the low end.

2) Will there be follow-on products to this family? What is the timeline for these products?

A: Yes. This will be a family of products that will address the growing number of video interfaces that are emerging today. However, we cannot comment on products that have not been announced.

3) Who are the competitors for this product, and how do their products compare?

A: Many of the large Japanese companies such as Sony, Sharp, etc. integrate their CCD cameras with camera electronic chipsets. While we may compete with their current solutions, in the long run we believe that the CSD delivers a more cost-effective chipset to process CCD electronics. Thus, our competitors in this segment can also become our partners, especially in cost sensitive applications.

4) Isn't CCD considered an old technology for imaging devices? Will there be a market for CCD cameras?

A: CCD provides a much better noise performance over other types of imagers. CCD cameras perform better in low light conditions and have superior image quality that will continue to drive professional applications such as endoscopic and other medical imaging cameras.

5) Aren't CMOS and CMD imaging chips superior to CCD imaging devices?

A: Not necessarily. It depends on the application. CMOS imagers are good for office lighting environments and brightly lit areas. CCD imagers are a better choice in low light conditions where devices such as high-end security systems must operate. More visual details are available to the viewer in this situation.

6) What are the tradeoffs between CMOS and CMD imaging chips compared to CCD devices?

A: We see a coexistence for awhile based on application and operating conditions. Besides the bright light/low light considerations, the designer will look at power dissipation, integration and cost. CCDs require a bit more design work in the power supply and power dissipation could be an issue. CMOS chips can be more cost effective and therefore hold promise for a highly-integrated single-chip camera. On the downside, CMOS won't pass the image quality test with CCDs anytime soon. We believe professional applications are probably going to stick with CCDs for now, with many cost-sensitive applications utilizing CMOS technology.

7) How does our imaging technology enable such low cost devices that can, in turn, equate to a very competitively priced end product?

A: Cirrus Logic's, Crystal Semiconductor Products Division has good low-cost manufacturing capabilities that certainly play a pricing role in a product such as this. Additionally, we put an entire camera subsystem on a chip set so the designer doesn't need to architect an elaborate system; he doesn't need extra support chips to make it work. We've done most of the design work for him in our devices.

8) How does this solution achieve image quality and how does this compare to other products on the market?

A: Crystal has implemented on-chip antialiasing filters which in many cases eliminate the need for an external low-pass filter block. We also, use a 10-bit A/D converter in the image processing to convert the analog data to digital. We then use a variable width processing channel to ensure that there's no truncation of the imaging data.

9) What is so simple about the designing with the CS7615/7665?

A: We have combined many functions into our chipset that would have required several support chips, e.g. crystals, filters, etc. By doing this, we have reduced the design time necessary from months to a matter of hours.

Ordering Information

CS7615-KQ	0°C to +70°C, 44-pin TQFP (10 mm x 10 mm x 1.6 mm)
CS7665-KQ	0°C to +70°C, 64-pin TQFP (10 mm x 10 mm x 1.4 mm)

If you have any questions, please contact the undersigned by phone or by email. Also, visit our website “www.crystal.com” or call our literature department (800) 888-5016 ext. 3594 or (512) 912-3594 for data sheets and application notes.

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