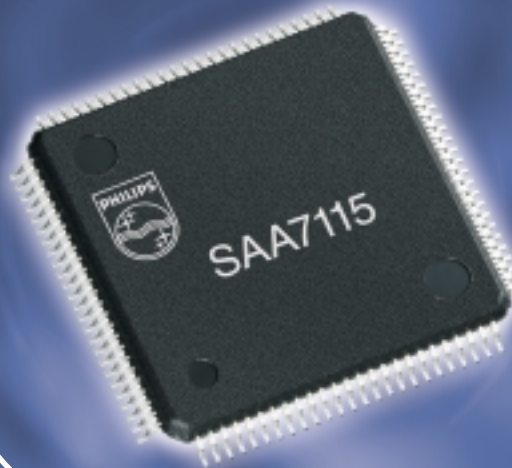


**SAA7115**  
**NTSC/PAL/SECAM**  
**9-bit Video Decoder**

*With adaptive 4-line comb filter, universal VBI slicer,  
pixel accurate scaler and enhanced Macrovision® detection*

**COMB FILTER • Universal VBI Slicer • Macrovision®**



The SAA7115 provides the front-end digitization and processing of analog video inputs for next-generation set-top boxes, digital televisions, video projectors, personal video, and DVD recorders. A single-chip 9-bit video decoder with 2x-oversampling, the SAA7115 provides video capture for a range of applications including advanced large-screen devices such as LCD projectors and HDTVs. Decoding NTSC, PAL and SECAM signals using fully automatic standard detection, the SAA7115 also includes a pixel accurate H/V scaler, a frame accurate audio clock and an optional square pixel output rate.

Designed with service providers in mind the SAA7115 complies with Macrovision's Copy Protection Detect Specification Revision 1.00 and is also well suited for video surveillance systems requiring ultra-fast frame switching. In addition, it is fully pin-to-pin compatible with Philips' highly successful SAA7114 Video Decoder, making it the ideal solution for a multitude of applications.

### Product highlights

The SAA7115 from Philips Semiconductors is a feature-packed video-capture device, offering these major benefits:

- Dual 9-bit low noise analog-to-digital converters with 2x-oversampling
- Worldwide NTSC/PAL/SECAM decoding with full auto-detection
- 6 analog inputs allow flexible combinations of CVBS and S-Video
- Best-in-class dynamically adaptive worldwide 4-line comb filter
- High performance, pixel-accurate, horizontal and vertical scaler
- Automatic VCR detection and optimization
- Optional square pixel output rate
- Universal VBI data slicer including WST 525/625 Teletext, VPS, US/European Close Captioning (CC), WSS 525/625 (CGMS), US NABTS, VITC 525/625, Gemstar® 1x/2x and Moji Japanese Teletext
- Flexible VBI read back via industry standard I<sup>2</sup>C-bus
- Comprehensive three-level hardware Macrovision® detection certification
- Ultra fast field-lock for advanced video surveillance and security applications
- Patented real-time control (RTC) for video editing and time-shift applications
- LQFP100 package, pin-to-pin compatible with Philips highly successful SAA7114.

### Targeting next generation digital video applications

For superior performance in today's PC and consumer video products, as well as tomorrow's hot new digital video applications, check out the SAA7115 for the following:

- PC video capture and editing
- Personal Video Recorders (time shifting)
- Cable, terrestrial, and satellite set-top boxes
- Video projectors
- Flat Panel Displays
- DVD recorders
- Digital televisions
- Line doublers and scan converters
- Video surveillance and security
- Video editing and post production
- Video conferencing
- Digital VCRs.

### Multistandard video decoding, scaling, and data processing on one IC

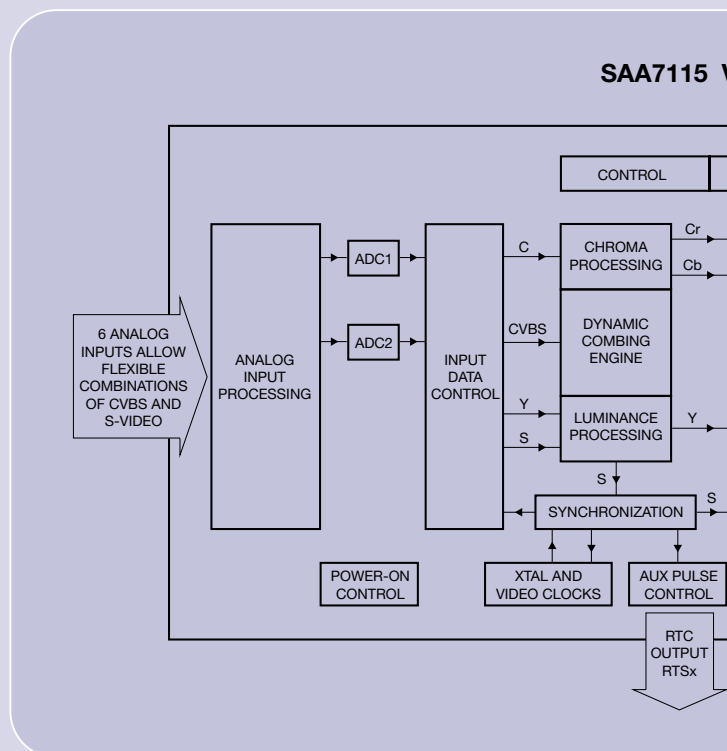
When a video application demands high quality decoding – flexible scaling and robust data processing – look to the SAA7115 video decoder. Highly integrated and supporting worldwide video standards, the SAA7115 is designed to provide a digital video stream for any video-input application. This includes input to the image port of a VGA controller, for capture to system memory, or to provide digital baseband video to any MPEG encoder, LCD scaler or picture-improvement processor.

The SAA7115 features a two-channel analog preprocessing circuit, dual Clock Generation Circuits (CGCs), a digital multistandard decoder and a high-performance pixel-accurate scaler. It accurately decodes all variations of PAL, SECAM, and NTSC signals into standard ITU-601 compatible component colour values. It accepts CVBS or S-Video (Y+C) from TV or VCR sources as analog inputs – including weak and distorted signals – as well as digital video via an integrated bi-directional expansion port (X Port).

At its image port (I Port), the SAA7115 supports scaled 8- or 16-bit output data with auxiliary reference data for interfacing to VGA controllers. For capturing serially coded data in the vertical blanking interval (VBI data), the SAA7115 can use its scaler for interpolating raw video samples to the required data output. Programmable on a line-by-line basis to one of 15 data types, the versatile data slicer can also output through the image port or via the industry standard I<sup>2</sup>C-bus.

The SAA7115 incorporates frame-locked audio clock generation, to ensure the same number of audio samples is always associated with a frame, or a set of fields. This prevents loss of synchronization between video and audio during capture or playback. Furthermore the second, integrated CGC can be optionally used to enhance this audio clock for an ultra low jitter frame-locked audio clock.

Controlled via the I<sup>2</sup>C-bus, the SAA7115 offers full write-read capability for all programming registers, at up to 400 kbits/s.

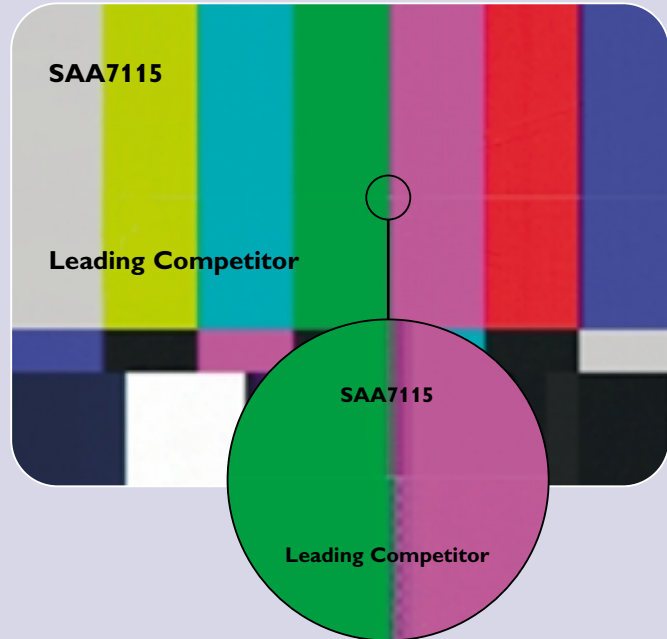


## Video acquisition and clock generation features

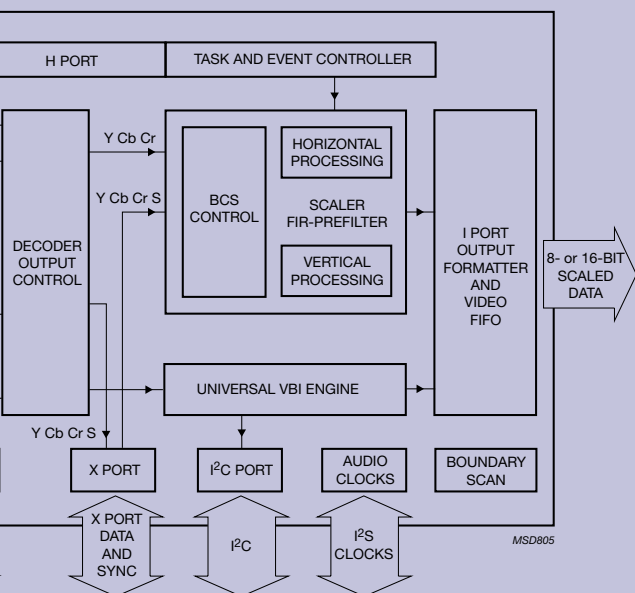
The analog pre-processing circuit incorporates source selection, anti-aliasing filters and two low-noise analog-to-digital converters. This sub-system includes input clamps, white-peak control and user-selectable automatic or fully programmable gain control to match specific signal properties. The 9-bit low-noise CMOS analog-to-digital converters provide high performance with oversampling at 27 MHz – twice the ITU-601 standard. On-chip line-locked clock generation also complies with ITU-601 and offers free-running capability with horizontal and vertical synchronization generation.

- Six analog inputs with internal analog source selectors, e.g. 6x CVBS or (2 x YC and 2 x CVBS) or (1 x YC and 4 x CVBS)
- Two built in analog anti-aliasing filters
- Dual 9-bit low noise analog-to-digital converters with 2x-oversampling
- Fully programmable static gain or automatic gain control (AGC) for the selected CVBS or Y/C channel
- Automatic Clamp Control (ACC) for CVBS, Y and C
- Switchable white peak control
- Requires only one crystal (32.11 MHz or 24.576 MHz) for all standards
- Independent gain and offset adjustment for raw data path
- On-chip line locked clock generation according to ITU-601
- Generation of a frame locked audio master clock to support a constant number of audio clocks per video field
- Second onboard analog PLL can be used for:
  - on-chip line-locked square pixel clock generation for PAL and NTSC square pixel video output or
  - optional generation of a low jitter frame-locked audio clock from the audio master clock, through reuse of the analog square pixel PLL. Supports audio clock frequencies of  $256 \cdot fs$ ,  $384 \cdot fs$  and  $512 \cdot fs$  ( $fs = 32 \text{ kHz}$ ,  $44.1 \text{ kHz}$  or  $48 \text{ kHz}$ ).
- Versatile universal VBI-data decoder, slicer, clock regeneration and byte synchronization for:
  - WST 525/625 Teletext
  - VPS

- US/European Close Captioning (CC)
- WSS 525/625 (CGMS)
- US NABTS
- VITC 525/625
- Gemstar® 1x/2x
- Moji Japanese Teletext.
- Flexible VBI read back via industry standard I<sup>2</sup>C-bus of the following decoded data types:
  - US/European Close Captioning (CC)
  - WSS 525/625 (CGMS)
  - Gemstar® 1x/2x.



## VIDEO DECODER



## Video decoder features

The decoder in the SAA7115 is based on the principle of line-locked clock decoding, yielding the highest quality video with maximum discrimination and automation. The decoder features advanced two-dimensional chrominance/luminance separation using a dynamically adaptive comb filter.

- Digital PLL for synchronization and clock generation for all standards and from non-standard video sources, e.g. consumer grade VCR
- Automatic detection of 50 Hz / 60 Hz field frequency, and automatic recognition of all common broadcast standards
- Enhanced horizontal and vertical sync detection
- Luminance and chrominance signal processing for PAL BGDHIN, combination-PAL N, PAL M, NTSC M, NTSC-Japan, NTSC 4.43 and SECAM (50 Hz / 60 Hz)
- High performance 2/4-line comb filter for two-dimensional chrominance/luminance-separation operating with dynamically adaptive comb filter parameters
- Independent Brightness Contrast Saturation (BCS) adjustment
- User programmable sharpness control
- Automatic TV/VCR detection
- X-port video output as:
  - noise shaped 8-bit ITU-656 video or
  - full 10-bit ITU-656 interface (DC-performance 9-bit).
- Certification for detection of copy protected input signals:
  - according to Macrovision's Copy Protection Detect Specification Revision 1.00
  - indicating level of protection.

## Video scaler features

The versatile scaler provides variable horizontal and vertical up- and down-scaling to randomly sized windows and has independent brightness, contrast and saturation control for scaled outputs. Vertical scaling offers linear phase interpolation; 6-bit phase accuracy and an accumulating filter for anti-aliasing. Horizontal phase-correct up- and down-scaling means improved signal quality of scaled data, especially for compression and video conferencing applications. This scaling, at 6-bit phase accuracy (1.2 ns step width), uses an anti-aliasing and accumulating filter.

- Horizontal and vertical down-scaling and up-scaling to randomly sized windows
- Horizontal and vertical scaling range: variable zoom to 1/64 (icon) (Note: H and V zoom are restricted by the transfer data rates)
- Vertical scaling with linear phase interpolation and accumulating filter for anti-aliasing (6 bit phase accuracy)
- Conversion to square pixel format
- Generation of a video output stream with improved synchronization grid at the I-Port
- Two independent programming sets (tasks) for scaler, which define two "ranges" per field or two sequences over frames
- Fieldwise switching between decoder and expansion port (X-port) input
- Brightness, contrast and saturation controls for scaled outputs.

## Additional features

The SAA7115 provides flexibility for easy, cost-effective design of today's video applications.

- Generation of an audio serial and left/right (channel) clock signal
- Real-time signal port includes continuous line-locked reference clock and real-time status information to support RTC level 3.1 standard
- Power-on control
- CMOS 3.3 V device with 5 V tolerant digital inputs and I/O ports
- Software controlled power-saving standby modes
- Programming via serial I<sup>2</sup>C-bus; full read-back by an external controller, at a rate of up to 400 kbits/s
- Boundary-scan test circuit conforming to IEEE-1149.b1-1994
- Available in LQFP100 (SOT407-CD5) package
- Pin-to-Pin compatible with Philips Semiconductors SAA7114 video decoder.

## Philips Semiconductors

Philips Semiconductors is a worldwide company with over 100 sales offices in more than 50 countries. For a complete up-to-date list of our sales offices please e-mail [sales.addresses@www.semiconductors.philips.com](mailto:sales.addresses@www.semiconductors.philips.com). A complete list will be sent to you automatically.

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