



## NTSC/PAL/SECAM Video Decoder for Multimedia Applications

### Features

# TW9920

Multi-Standard Video Decoder and Encoder

### Target Applications

- Digital Camcorder
- Portable Media Player (PMP)
- Mobile Phone and PDA

### Video Decoder

- NTSC (M, 4.43) and PAL (B, D, G, H, I, M, N, N combination), PAL (60), SECAM support with automatic format detection
- Software selectable analog inputs allows any of the following combinations, e.g. 4 CVBS or (3 CVBS and 1 Y/C).
- Two 9-bit ADCs and analog clamping circuit.
- Fully programmable static gain or automatic gain control for the Y channel
- Programmable white peak control for the Y or CVBS channel
- 4-H adaptive comb filter Y/C separation
- PAL delay line for color phase error correction
- Image enhancement with 2D peaking and CTI.
- Digital sub-carrier PLL for accurate color decoding
- Digital Horizontal PLL for synchronization processing and pixel sampling
- Advanced synchronization processing and sync detection for handling non-standard and weak signal
- Programmable hue, brightness, saturation, contrast, sharpness, and noise suppression
- Automatic color control and color killer
- Detection of level of copy protection according to Macrovision standard
- Programmable output cropping
- ITU-R 601 or ITU-R 656 compatible YCbCr(4:2:2) output format

**The TW9920 is a multi-standard video decoder and encoder chip that is designed for multimedia applications.** It uses the mixed-signal 2.5V CMOS technology to provide a low-power integrated solution.

The video encoder is used to encode digital YcbCr input into analog CVBS or S-video output. With five built-in DACs, it can simultaneously support analog YcbCr output in addition to S-video output for various applications.

It can support both NTSC (60Hz) and PAL (50Hz) output. A stable crystal generated 27MHz clock is used for all necessary sub-carrier generation. It accepts ITU-R 656 compatible digital input externally. The video decoder decodes the analog CVBS or S-video signals into digital YcbCr for output.

It consists of analog front-end with input source selection, variable gain amplifier and analog-to-digital converters, Y/C separation circuit, multi-standard color decoder (PAL BGHI, PAL M, PAL N, combination PAL N, NTSC M, NTSC 4.43 and SECAM) and synchronization circuitry. The Y/C separation is done with highly adaptive 4H comb filter for reduced cross color and cross luminance.

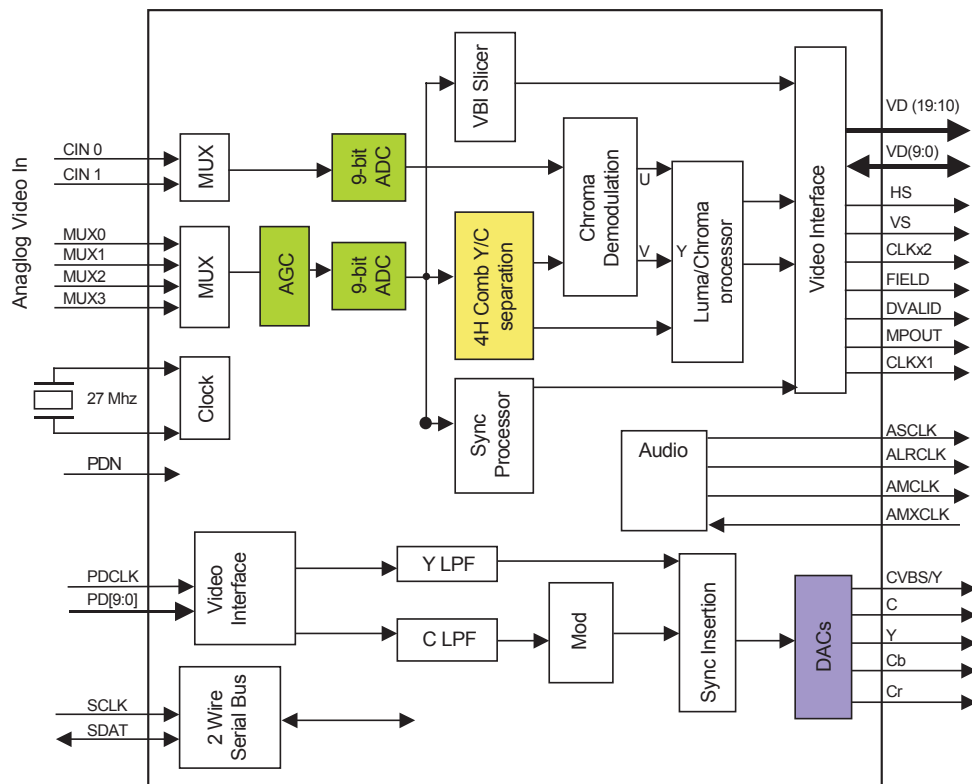
The advanced synchronization processing circuitry can produce stable pictures for non-standard signal as well as weak signal. A video scaler is provided to arbitrarily scale down the output video. The output of the decoder is formatted to the ITU-R 656 compatible output.

It includes various control circuits like brightness, contrast, saturation, dynamic aperture correction for best video quality. A 2-wire serial MPU interface is used to simplify system integration. All the functions can be controlled through this interface.

### Video Scaler

- High quality horizontal filtered scaling with arbitrary scale down ratio
- Phase accuracy better than 1/32 pixel
- Selectable anti-alias filter
- Vertical down scaling by line dropping

## TW9920 Block Diagram



### Video Encoder

- Support NTSC/PAL and its sub-standard format output
- ITU-R 656 compatible video interface
- Luminance and chrominance filter
- Stable 27MHz crystal clock for subcarrier generation
- Five 10-bit Digital-to-Analog Converters at 27Mhz sample rate for generating CVBS or Y/C and YcbCr simultaneously

### Miscellaneous

- Two wire MPU serial bus interface
- Power-down mode
- Field locked audio clock generation
- Typical power consumption TBD
- Single 27MHz crystal for all standards
- Supports 24.54MHz and 29.5MHz crystal for high resolution square pixel format decoding
- 3V tolerant I/O
- 2.5/3.3 V power supply
- 100 pin BGA package