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# TFT Flat Panel Controller with Built-in 3D Video Decoder, Triple ADCs, Dual PIP and 16-bit OSD Support

## TW8823

The TW8823 incorporates many of the features required to create multi-purpose in-car LCD display system in a single package. It integrates a high quality 3D comb NTSC/PAL/SECAM video decoder, triple high speed RGB ADCs, high quality scaler, bit-mapped OSD, triple DACs and images enhancement functions which include Black and White Stretch, favorite color enhancement and etc. It also supports panoramic scaling for conversion to wide screen display. On the input side, it supports a rich combination of CVBS, S-video, analog RGB as well as digital YCbCr/RGB inputs. On the output side, it supports both digital and analog panel type with its built-in timing controller and analog RGB output. It also support LVDS type panel.

TW8823 also has two PIPs (Picture in Picture) function that can display three display sources simultaneously on one single window. It also has built-in bit-mapped OSD with 16-bit color depth and acceleration function. It can also accept 18-bit external OSD input. In addition, TW8823 has built-in high performance microcontroller with cache. Its SPI interface supports various serial flash types.

## Features

### Analog Video Decoder

- NTSC (M, 4.43) and PAL (B, D, G, H, I, M, N, N combination), PAL (60), SECAM with automatic format detection
- Two 10-bit ADCs and analog clamping circuit
- Fully programmable static gain or automatic gain control for the Y or CVBS channel
- Programmable white peak control for the Y or CVBS channel
- Software selectable analog inputs allows either composite or S-video input
- High quality motion adaptive 3D comb filter for both NTSC and PAL with concurrent 3D noise reduction
- PAL delay line for color phase error correction
- Image enhancement with 2D dynamic peaking and CTI
- Digital sub-carrier PLL for accurate color decoding
- Digital horizontal PLL and Advanced synchronization processing for VCR playback and weak signal performance.
- Programmable hue, brightness, saturation, contrast, sharpness
- High quality horizontal and vertical filtered down scaling with arbitrary scale down ratio

### Analog RGB Inputs

- Triple high speed 10-bit ADCs with clamping and programmable gain amplifier.
- SOG and H/V sync support for YPbPr or RGB input
- Built-in line locked PLL with sync separator
- Support analog input resolution up to 1080i or WXGA

### Dual Digital Inputs Support

- Dual channel digital inputs support with following combination:
  - 1 channel 18/16-bits inputs and 1 channel 8-bits inputs
  - 1 channel 24 bits digital RGB/YCbCr inputs
- Supports both 656 and 601 video formats
- Allows connection to external HDMI receiver

### Built-In Microcontroller

- Built-in 8052 MCU up to 72MHz clock
- Built-in code cache memory to enhance CPU performance.
- Support Single/Dual/Quad IO SPI Flash
- System programming through UART
- Support SPI DMA Read/Write to OSD memory
- Support I2C Master interface with GPIO
- Support two UART interface up to 115200bps
- Support IR receiver and interrupt output

### TFT Panel Support

- Built-in both analog and digital timing controller with programmability.
- Supports optional single channel LVDS panel with resolution up to WXGA, 80Mhz
- Supports 3, 4, 6 or 8 bits per pixel up to 16.8 million colors with built-in dithering engine
- Supports analog panel with resolution up to WQVGA, 20Mhz

### On Screen Display

- Supports three window bitmapped OSD, one 16 bits and two 8 bits bitmap OSD
- Built-in OSD controller with Bit blit Engine
- Supports variety functions included like blinking, transparency and blending.
- Supports External OSD with external alpha blending control
- Supports OSD compression

## Image Processing

- High quality scaler with both up/down and nonlinear scaling support
- Built-in 2D de-interlacing function
- Programmable hue, brightness, saturation, contrast
- Sharpness control with vertical peaking up to +12db Programmable color transient improvement control
- Supports programmable cropping of input video and graphics
- Independent RGB gain and offset controls
- Panorama / Water-glass scaling
- DTV hue adjustment
- Programmable 10-bit Gamma correction for each color
- Operated in Frame Sync mode only
- Black/White Stretch
- Programmable favorite color enhancement

## PIP Function

- Two independent PIPs
- Variable sub window size
- POP with alpha blending
- Supports both 16-bit YPbPr and RGB data format
- Built-in high quality up and down scaling engine for PIP

## DDR-SDRAM

- Supports 16 bits 155MHz DDR-SDRAM up to 256 Mb

## Host Interface

- Supports 2-wire serial bus interface
- Supports 8-bits Parallel Host Interface

## Clock Generation

- Frequency synthesizer with spread spectrum generate DDR memory and display clocks
- Spread spectrum profile based on triangular modulation with center spread
- Modulation frequency and spread width can be selectable

## Power Management

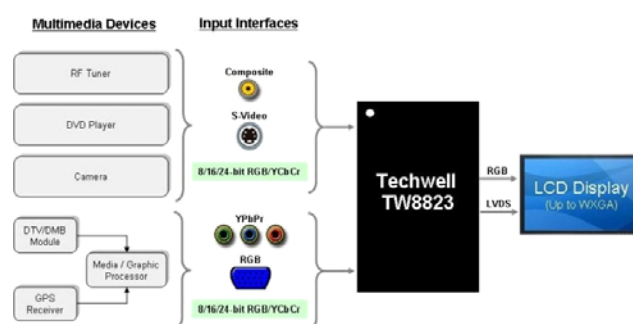
- Supports Panel power sequencing.
- Supports DPMS for monitor power management.
- 1.8 / 2.5V / 3.3 V operation

## Miscellaneous

- Built-in single CCFL back light controller
- Built-in single LED back light controller
- Built-in Touch screen controller with 12-bit ADC
- LVR, provides 100~200 msec low voltage reset
- Power-down mode
- Single 27MHz crystal
- 216-pin LQFP package

## Applications

- In-car display controller
- Portable DVD and DVRs players
- Portable media player



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