RAA278840

LCD Video Processor with Decoder, LVDS, TTL, MIPI, Improved Upscaling Engine, and Video Integrity Diagnostic

The RAA278840 is a highly integrated LCD video processor that incorporates many of the features required to create a cost-effective multipurpose LCD system. The features include a high-quality 2D comb NTSC/PAL/SECAM video decoder that supports single-ended or differential composite video inputs, two TTL digital input interfaces, two LVDS Open LDI input interfaces, a MIPI-CSI2 input interface, and an EEPROM/SPI interface. The outputs include a dual-channel LVDS Open LDI panel interface and a separate MIPI-CSI2. This device can support input resolutions up to 1080p and can drive LCD panels up to 1920x1080. The video processing capabilities include arbitrary H/V scaling using a high-quality scaler and de-interlacer engine, panoramic scaling, image mirroring, image adjustment and enhancement using 10-bit per color processing, black and white stretch, a versatile OSD, and much more. Also, the RAA278840 has a multi-feature image integrity diagnostic capability to dynamically determine if the input video is corrupted. The feature set and versatility of this device make it an ideal solution for automotive LCD applications.

Applications

- Automotive display
- Industrial/military displays
- Portable/consumer displays

Related Literature

For a full list of related documents, visit our website:

- RAA278840 device pages

Features

Analog Video Decoder

- Supports NTSC (M, 4.43) and PAL (B, D, G, H, I, M, N, N combination), PAL (60), SECAM with automatic format detection
- High quality adaptive 2D comb filter for both NTSC and PAL inputs
- 10-bit ADC and analog clamping circuit
- Fully programmable static gain or automatic gain control for the CVBS channel
- Programmable white peak control for the CVBS channel
- Four single-ended or two differential CVBS input
- PAL delay line for color phase error correction
- Image enhancement with 2D dynamic peaking/CTI
- Digital subcarrier PLL for accurate color decoding
- Programmable hue, brightness, saturation, contrast, and sharpness
- Digital horizontal PLL and advanced synchronization processing for superior VCR playback and weak signal performance

Digital Input Support

- Supports two parallel digital input ports up to 32 bits total, with many combinations such as 24 + 8, 16 + 16
- Supports BT.656, 8-bit and 16-bit BT.601, and BT.1120 video formats
- Supports YCbCr/RGB 24-bit input up to 1080p resolution
- Dual channel LVDS open LDI inputs - up to 150MHz per channel or in Dual mode (75MHz per channel)
- MIPI-CSI2 input
  - One four lane single channel MIPI-CSI2 input port (1Gb/lane)
  - Dual two lane channel MIPI-CSI2 input port (1Gb/lane)
- Supports 1.8 ~ 3.3V logic thresholds

TFT Panel Support

- Supports 3, 4, 6, or 8 bits per pixel up to 16.8 million colors with built-in dithering engine

- Supports single channel LVDS panels up to 1920x1080 resolution (150MHz)
- Supports dual channel LVDS up to 1920x1080 resolution (150MHz)

MIPI-CSI2 Output

- Four lane MIPI-CSI2 output port (1.2Gb/lane)
- Supports YUV422 and 24-bit RGB data formats

Font Based On-Screen Display

- Four windows font OSD with bordering/shadow
- 13824 bytes programmable font RAM and 1024 characters display RAM
- 1/2/3/4 bits per pixel
- Supports variable width (12/16), height (2~32)

SPI Flash Based On-Screen Display

- Supports fast register initialization by SPI-DMA
- Nine bitmap-based OSD windows in two layers through SPI with alpha blending between layers
- Supports 4/6/8 bits/pixel
- Supports RLE decompression for two windows
- Shares pins with EEPROM interface

EEPROM Interface

- EEPROM interface for fast boot register initialization
- Shares pins with SPI Flash memory interface

Image Processing

- A high quality scaler with both up/down scaling support
- Built-in 2D de-interlacing function
- Supports programmable cropping of input video and graphics
- Independent RGB gain and offset controls
- 10-bit per color processing
- 10-bit image enhancement processing and 10-bit Gamma correction

Clock Generation

- Spread spectrum PLL integrated to each scaler path
- Programmable modulation frequency and spread width

Miscellaneous

- Fast mode plus I^2C interface up to 1.2Mbps with zero hold time
- Short diagnostics
  - Short to battery
  - Short to ground
- Up to four 10-bit PWMs
- GPIOs
- Programmable drive strength for LVTTL and LVDS
- Pin swapping (MSB ↔ LSB)
- Two separate input measurement engines with continuous measurement and hardware interrupt capability
- Smooth input switching via shadow registers
- 1.2V internal operation
- 1.8/3.3V I/O support
- Single 27MHz crystal
- 128 Ld LQFP with exposed thermal pad
- The RAA2788403HFP#AA0 is AEC-Q100 qualified

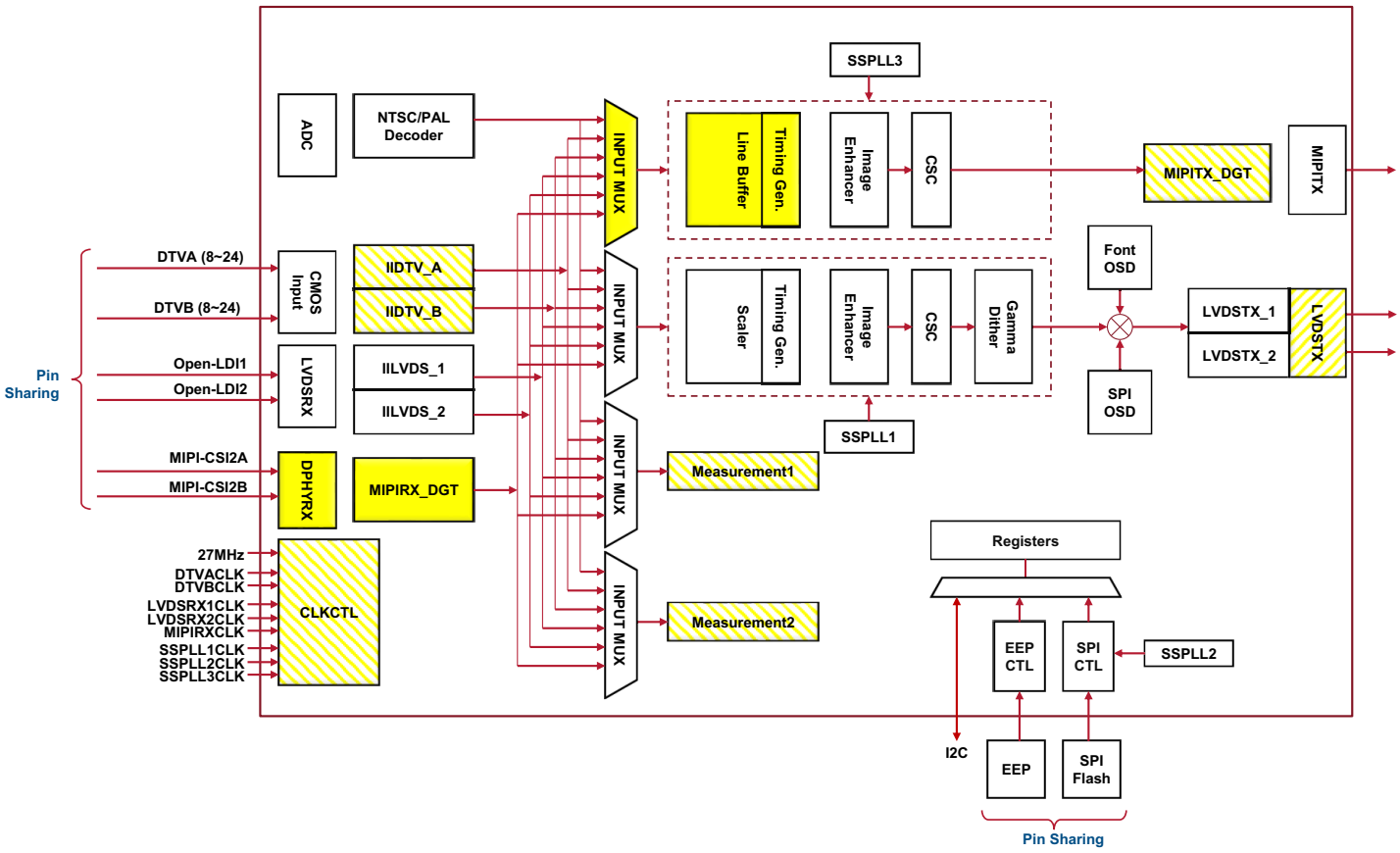


Figure 1. RAA278840 Functional Block Diagram

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