SAA6713
XGA Dual-input
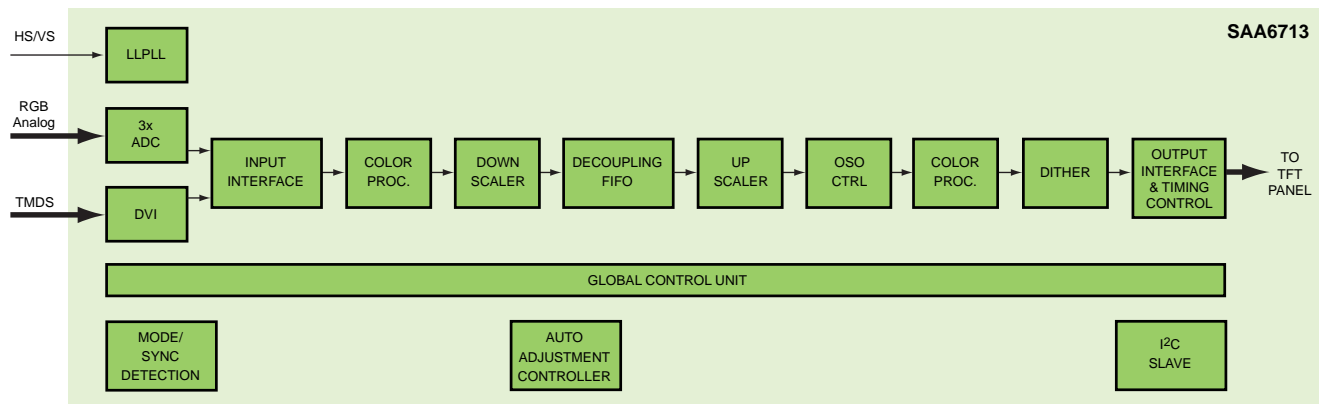## TFT-Display Controller

Description

The Philips SAA6713 is a highly integrated, dual-input LCD controller IC. It inputs analog VGA and DVI 1.0-compliant TMDS signals and performs all needed signal processing and measurement before output to an XGA LCD panel.

The SAA6713 incorporates many high-performance features to enhance picture quality and optimize contrast. A programmable polyphase filter enables picture adjustment from smoothing to sharpening during upscaling. Sophisticated color management features include a programmable color matrix, 10-bit gamma correction and temporal dithering for 10 bits of virtual precision on 8- and 6-bit displays.

Integrated, feature-rich on-screen display (OSD) functionality facilitates creation of a smart and user-friendly graphical user interface. Both character-based OSD features—including prede-fined and programmable fonts—as well as a bitmapped graphical OSD are supported.

In addition to support for single (24 bit) or double (48 bit) pixel/clock digital RGB output, the SAA6713 can directly interface with the row and column drivers of virtually any manu-facturer by integrating a programmable panel timing controller (TCON). It is controlled through a standard 3.4-Mbit I^2C bus and comes in an easy-to-use PQFP160 package.

Features

Input Interfaces

*   DVI 1.0-compliant TMDS input including high-bandwidth digital content protection (HDCP), 110 MHz
*   Analog VGA input with clamp and automatic gain control, 110 MHz
*   Maximum resolution 1280x1024 pixels

Input Auto Detection

*   Detection of presence and polarities of sync signals
*   Measurement of horizontal and vertical update frequencies
*   Statistical measurements assist in adjustment of sample clock frequency, vertical and horizontal sample offset, and ADC parameters

Input Processing

*   Advanced color processing for luminance, separate color saturation and R, G, and B contrast and brightness
*   Phase-correct downscaling of any input data

Output Processing

*   Upscaler with independent vertical/horizontal parameters
*   Arbitrary upscale ratio from 1 to 64
*   Programmable polyphase filter supports picture adjustments from smoothing to sharpening
*   Color correction look-up table (256x10 bits, e.g. for gamma correction)
*   Temporal dithering for 10-bit virtual precision on 8- and 6-bit displays

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SAA6713 Block Diagram

SAA6713

HS/VS → LLPLL

RGB Analog → 3x ADC

TMDS → DVI

INPUT INTERFACE → COLOR PROC. → DOWN SCALER → DECOUPLING FIFO → UP SCALER → OSO CTRL → COLOR PROC. → DITHER → OUTPUT INTERFACE & TIMING CONTROL → TO TFT PANEL

GLOBAL CONTROL UNIT

MODE/ SYNC DETECTION

AUTO ADJUSTMENT CONTROLLER

I²C SLAVE

(Features continued)
On-screen Display (OSD)

- Programmable character size from 8x8 to 32x32

- Predefined character ROM including 256 characters (icons, etc.)

- 144 built-in character size-independent generators for borders and sliders

- Built-in 4-kB memory for up to 512 additional user definable/downloadable characters of up to 4 colors

- Selectable true-color sets for characters and bit-mapped OSD

- Four-kB bitmapped image RAM, 2 to 16 colors (e.g. for backdrop or company logo)

- Programmable Alpha blending for OSD window and image window

- Double-buffered cursor/pointer RAM (enables MS Windows®-like cursor) for animation

- Text attributes such as shadowing, blinking, inversion and foreground/ background transparency

Output Interface

- Single pixel/clock (24-bit) or double pixel/clock (48-bit) digital RGB output

- Selectable 6-bit or 8-bit per color mode

- Generation of synchronization and validation signals for TFT displays

- Programmable output timing supports displays of virtually any manufacturer

- Interfaces directly to row and column drivers (TCON)

- Panel interface drive strength is programmable for EM1 reduction

- Maximum resolution 1024x768 pixels

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