S1D13513

S1D13513 XGA External SDRAM Display Controller

The S1D13513 is a highly integrated display controller capable of supporting up to XGA TFT LCD panels. With the flexibility of an external SDRAM memory interface, this low cost, low power device supports a wide range of CPUs, panels, and a camera port. The S1D13513 feature set and architecture are designed to meet the requirements of today's embedded markets.

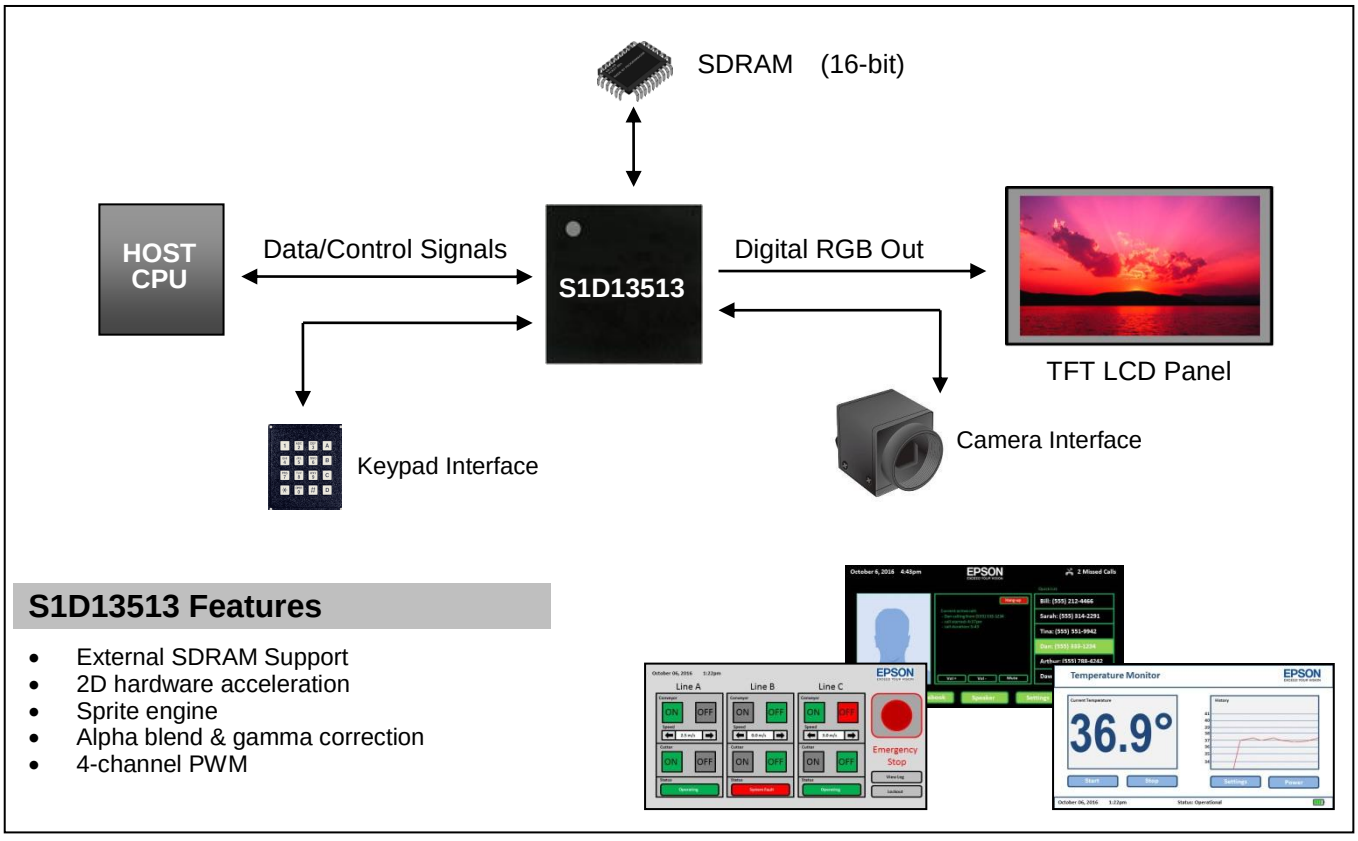
The S1D13513 features both sprite and 2D BitBLT engines designed to reduce the load on the host, while increasing the performance of graphics intensive operations. Additionally, the S1D13513 offers such features as multiple windows, alpha blending, gamma correction, and mirror/rotation functions which allow user configurability of various images on the Main/PIP1/PIP2 displays. The S1D13513's impartiality to CPU type or operating system makes it an ideal display solution for a wide variety of applications.

NOTE: S2D13513 is also available and meets automotive specifications.

FEATURES

- Direct and indirect CPU interfaces
- Serial host interface
- Memory interface for x16 or x32 external SDRAM (x32 available on S1D13513 PBGA only)
- Programmable resolutions and color depths
- Support for single RGB panel with serial command interface
- Clocks can be selected from two embedded PLLs or digital clock input
- Two Crystal inputs
- Dual port camera i/f with resize function
- Sprite engine
- 2D hardware acceleration engine
- Overlay features
- Gamma correction
- 4-channel PWM for backlight control
- Keypad interface with 5x5 matrix support
- Software initiated power save mode
- COREVDD: 1.8V, IOVDD: 3.3V
- Package: PBGA 256-pin and QFP 208-pin (QFP does not support all features)

SYSTEM BLOCK DIAGRAM



S1D13513 Features

- External SDRAM Support
- 2D hardware acceleration
- Sprite engine
- Alpha blend & gamma correction
- 4-channel PWM

S1D13513

EPSON
EXCEED YOUR VISION

DESCRIPTION

External Display Buffer

- Uses external SDRAM or mobile SDRAM as display buffer
- Supports x16 / x32 SDRAM interface (size: 8 MB, 16 MB, 32 MB or 64 MB) (x32 and 32/64 MB not supported for QFP package)
- SDRAM clock: 100MHz maximum

Display Support

- Example resolutions
  - 1024x768@16bpp (x32 SDRAM only)
  - 800x600@16bpp (x32 SDRAM only)
  - 640x480@ 32bpp (x32 SDRAM only)
- RGB interface single panel
  - 16/18/24-bit color TFT(24-bit not supported on QFP)
- 8-bit mono/color passive panels
- Color depths up to 32 bpp

Display Features

- Multiple window (layer) support
- Mirror and 180° rotation functions
- Alpha blending
- Gamma correction
- Pseudo color expansion
- Hardware cursor support via the sprite engine
- Interrupts available:
  - Maskable non-display (Vsync) interrupt
  - Delayed version of Vsync Interrupt

Acceleration

- 2D BitBLT engine (read, write, move, and fill BLTs)
- 2D sprite engine (up to 16 sprites)
- Unified command FIFO for both BitBLT and sprite

CPU Interface

- Direct and indirect as well as serial host interface support for most popular CPU interfaces
- Registers are memory-mapped - M/R# input selects between memory and register address space

Digital Video

- Dual camera / video input port can be configured as 2x 8-bit camera ports
  - Supports resize function of the video in stream
  - Supports raw JPEG capture from JPEG capable camera
- Captures YUV data into SDRAM as YUV 4:2:2 format (Max. 16.6Mhz camera pixel clock)
- View image can be displayed to LCD
- Resize function built-in for both view and capture path

Miscellaneous

- Internal system clock: 50MHz max. (half of SDRAM clock)
- 4-channel PWM for backlight control
- I2C Interface (typically used for camera)
- Keypad Interface with 5 x 5 matrix support
- Software initiated power save mode
- Multiple general purpose input/output pins
- Flexible clock structure with two embedded PLLs:
  - Two embedded PLLS
  - Two built-in crystal inputs
  - Four digital clock inputs
  - Clocks dynamically turned off when modules are not needed
- $CORE_{VDD}$ 1.8 volts and IO_{VDD} 3.3 volts
- Operating Temperature: -40 to +85°C
- Package: PBGA 256-pin and QFP 208-pin

For more information on the S1D13513 and other Epson Display Controllers, visit the Epson Global website.

https://global.epson.com/products_and_drivers/semicon/products/display_controllers/

For Sales and Technical Support, contact the Epson representative for your region.

https://global.epson.com/products_and_drivers/semicon/information/support.html

Document code: X78B-C-001-02.3