

## S1D13746 TV-Out Graphics Engine

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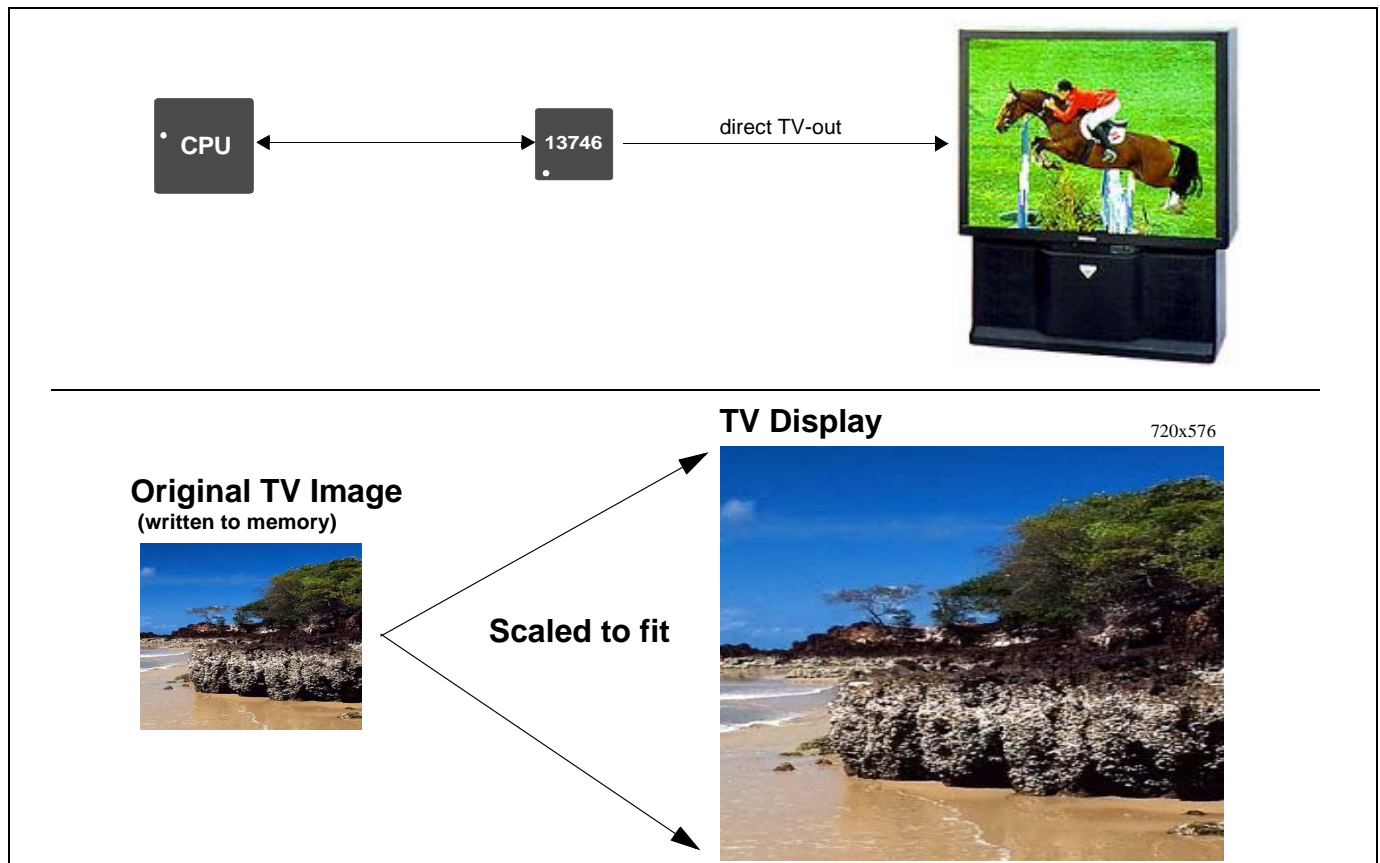
The S1D13746 is an extremely low cost, low pin-count device providing direct support for TV from a standard memory-mapped frame-buffer. Internal high quality scaling algorithms allow for low resolution input to be smoothly scaled to the full resolution as determined by either PAL or NTSC standards. The S1D13746 is the ideal solution for cellular phone markets where TV-output is a requirement.

The S1D13746 contains 312K bytes of embedded SRAM. Input data can be double-buffered, thereby acting as a frame rate converter and preventing any visual tearing during streaming input. The minimal feature set and high level of integration (embedded high output DAC) provides a low cost, low power, single chip solution to meet the demands of embedded markets requiring Digital Video, such as Mobile Communications devices.

### ■ FEATURES

- Embedded 312K byte SRAM
- Double-buffered for streaming video
- Low Operating Voltage
- Serial / Parallel Host Interface
- Parallel RGB Interface
- Multiple Input Data formats
- High Output DAC
- Input Image Rotation (SwivelView™ 90/180/270°)
- Bi-Cubic Scalar from input to output
- PAL and NTSC output
- Automatic Border
- Auto-Centering
- Destructive Windows (Overlays) with transparency function
- Software Initiated Power Save Mode
- Internal PLL or Digital Clock Input

### ■ SYSTEM BLOCK DIAGRAM



## S1D13746

### DESCRIPTION

#### Integrated Frame Buffer

- 312K byte SRAM

#### CPU Interface

- Parallel Indirect Interface (Intel 80)
- Serial Interface
  - 3-wire (9-bit)
  - 4-wire (8-bit SPI)
- Parallel RGB Interface

#### Input Formats

- RGB: 3:3:2, 5:6:5, 6:6:6, 8:8:8
- YUV: 4:2:0, 4:2:2
- All input formats are converted and stored as YUV 4:2:0
- Input image can be rotated (SwivelView 90/180/270°)

#### Input Scalar

- Bi-Cubic, 9-bit, non-integer based
- Arbitrary Horizontal / Vertical settings
- Automatic scaling based on input/output window settings

#### TV Output

- Composite PAL/NTSC output
- S-Video PAL/NTSC output
- Programmable Chrominance / Luminance Filters
- 3x3 Pixel filter
- Auto-Border / Auto-Center
- Wide-Screen Signalling Support (ETSI EN 300 294 compliant)
- Closed Caption Support (CEA-608-B)
- Macrovision Protection support (bond out option)
- Test Pattern Generator
- Supports Destructive Windows (overlays) with transparency function

#### Miscellaneous

- Internal PLL or digital clock input
- Software initiated power save mode
- CORE<sub>VDD</sub> 1.5 Volts and IO<sub>VDD</sub> 1.8 to 3.3 Volts
- Package: PFBGA 100-pin (7mm x 7mm)

### THEORY OF OPERATION

The S1D13746 contains its own frame-buffer memory where image data can be stored and displayed from. Input images larger than the memory size are automatically scaled down using a Bi-cubic method before being stored. All images can be stored using a double-buffered architecture to prevent any visual tearing and act as a rate converter. All stored images can be further scaled up/down for display on the TV. If the resulting scaled image does not fit the maximum resolution as defined by the TV standard, the image is auto-centered and bordered. The 3x3 pixel filter and programmable chrominance / luminance filters are provided to generate a high quality resulting image.

The S1D13746 supports Wide-Screen Signalling, Closed Captioning, includes a built-in Test Pattern Generator, and has a bond-out option available for Macrovision Protection

### CONTACT YOUR SALES REPRESENTATIVE FOR THESE COMPREHENSIVE DESIGN TOOLS

- S1D13746 Technical Documentation
- CPU Independent Software Utilities
- S1D13746 Evaluation Boards
- Royalty Free source level driver code

#### Japan

Seiko Epson Corporation  
IC International Sales Group  
421-8, Hino, Hino-shi  
Tokyo 191-8501, Japan  
Tel: 042-587-5812  
Fax: 042-587-5564  
<http://www.epson.co.jp/>

#### Hong Kong

Epson Hong Kong Ltd.  
20/F., Harbour Centre  
25 Harbour Road  
Wanchai, Hong Kong  
Tel: 2585-4600  
Fax: 2827-4346  
<http://www.epson.com.hk/>

#### North America

Epson Electronics America, Inc.  
2580 Orchard Parkway  
San Jose, CA 95131, USA  
Tel: (408) 922-0200  
Fax: (408) 922-0238  
<http://www.eea.epson.com/>

#### Europe

Epson Europe Electronics GmbH  
Riesstrasse 15  
80992 Munich, Germany  
Tel: 089-14005-0  
Fax: 089-14005-110  
<http://www.epson-electronics.de/>

#### Taiwan

Epson Taiwan Technology & Trading Ltd.  
14F, No. 7  
Song Ren Road  
Taipei 110  
Tel: 02-8786-6688  
Fax: 02-8786-6677  
<http://www.epson.com.tw/>

#### Singapore

Epson Singapore Pte Ltd  
1 HarbourFront Place #03-02  
HarbourFront Tower One  
Singapore, 098633  
Tel: (65) 6586-5500  
Fax: (65) 6271-3182  
<http://www.epson.com.sg/>

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