Digital NTSC/PAL/SECAM Video Decoders
As consumer electronic devices increasing move to digital interfaces, there remains the requirement to support legacy interfaces such as composite video signals. This includes over-the-air broadcast, cable, and VCR inputs to end-equipment such as digital TVs, DVD-Recorders, and others. The quality of the video from these sources will be increasingly critiqued and become much more visible on larger, digital video displays. With this shift, it is imperative that providers of these end-equipments choose the right analog to digital video decoder.

Texas Instruments (TI), a worldwide leader in High-Performance Analog products, has been developing video decoder products for almost a decade and has an extensive portfolio of decoders. These decoders provide competitive features that fit numerous end-equipment requirements.

In the pages that follow, you will learn more about TI’s Mixed-Signal Video devices and how each of these meet the demanding video quality, power consumption and flexibility requirements of numerous consumer electronic products.

Complete Decoder Solutions

TI’s experience in video decoders goes back almost a decade. During this time, TI has become a leader in providing highly integrated and flexible solutions.

- Many decoders provide unparalleled flexibility by being able to be customized to end-provider requirements
- Reduction of overall product development cost is made simple by TI’s auto-switch technology that allows system providers the ability to release both NTSC and PAL models without changing the decoder
- TI’s cutting-edge silicon process technologies provide fast-to-market, low power, and small package options all at the most competitive price.

World Class Design-In Support

When developing products using TI video decoders, designers can expect extensive world-wide support throughout the entire process. TI has developed complete line of evaluation modules, software, and application reports that decrease designer’s time to market while reducing their overall design costs by avoiding unnecessary design changes during development period. A world-wide applications support structure also allows designers to receive support within their own region.

TI Mixed-Signal Video Products

TI Mixed-Signal Video solutions are at the center of today’s mixed-signal video designs. For more information about using them as the foundation for your next design, please contact your local TI field sales office (see PIC on last page). Or visit: www.ti.com/mixedsignal

Market Segments

Texas Instruments Mixed-Signal Video

- DVD-R
- DVD
- PVR
- Set-Top Box
- PC
- PC-TV Tuner
- Games

- Consumer Products
- DVD-R
- DVD
- PVR
- Set-Top Box
- PC
- PC-TV Tuner
- Games

- Mobile and Low-Power
- Digital TV Phone
- Digital Camcorder
- Mobile Display
- Security
- USB (Self Powered)

- Mixed-Signal Video Technology
- HDTV
- DLP™
- Plasma
- LCD
- CRT
- Projector

- TV, Display and Projection
- Digital TV Phone
- Digital Camcorder
- Mobile Display
- Security
- USB (Self Powered)
**TVP51xx Product Comparison**

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<th>Feature</th>
<th>TVP5150A</th>
<th>TVP5147</th>
<th>TVP5146</th>
<th>TVP5160</th>
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<tbody>
<tr>
<td>Inputs</td>
<td>2 Inputs</td>
<td>10 Inputs</td>
<td>10 Inputs</td>
<td>12 Inputs</td>
</tr>
<tr>
<td>Analog to Digital ADC</td>
<td>9 Bit (30 MHz)</td>
<td>11 Bit (30 MHz)</td>
<td>11 Bit (30 MHz)</td>
<td>11 Bit (54M Hz)</td>
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<tr>
<td>Outputs</td>
<td>8 Bit 4:2:2</td>
<td>10/20 Bit 4:2:2</td>
<td>10/20 Bit 4:2:2</td>
<td>10/20 Bit 4:2:2</td>
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<tr>
<td>TVP5146 Pin compatible</td>
<td>—</td>
<td>✔</td>
<td>✔</td>
<td>—</td>
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<tr>
<td>Component Input</td>
<td>—</td>
<td>✔</td>
<td>✔</td>
<td>—</td>
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<tr>
<td>SCART Fast Switching Support</td>
<td>—</td>
<td>—</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>PC RGB Analog Inputs</td>
<td>—</td>
<td>—</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>1 Analog Output</td>
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<td>✔</td>
<td>—</td>
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<tr>
<td>480p (525p) &amp; 576p (625p) Support</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>3D Comb Filter</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3D Noise Reduction</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>IF Compensation</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Time-Base Correction All Inputs</td>
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<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Improved 2D Comb Filter</td>
<td>—</td>
<td>—</td>
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<td>—</td>
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<tr>
<td>Improved RGB Overlay Switching</td>
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<tr>
<td>NTSC, PAL, SECAM &amp; S-Video Support</td>
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<tr>
<td>Auto Detect &amp; Switch Inputs</td>
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<td>✔</td>
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<td>✔</td>
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<tr>
<td>Weak/Non-Standard Signal Support</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Auto VCR Detect &amp; Trick Mode</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>VBI Slicing</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Macrovision Detection &amp; Certification</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Package</td>
<td>32-Pin TQFP</td>
<td>80-Pin TQFP</td>
<td>80-Pin TQFP</td>
<td>128-Pin TQFP</td>
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<td>Size</td>
<td>5 mm X 5 mm</td>
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<td>14 mm X 14 mm</td>
<td>16 mm X 16 mm</td>
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<td>Power (Typical All ADC Active)</td>
<td>115 mW</td>
<td>490 mW</td>
<td>730 mW</td>
<td>750 mW</td>
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<tr>
<td>Production Availability</td>
<td>NOW</td>
<td>NOW</td>
<td>NOW</td>
<td>January 2005</td>
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**Application Usage**

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<thead>
<tr>
<th>Category</th>
<th>Segment</th>
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<th>TVP5147</th>
<th>TVP5146</th>
<th>TVP5160</th>
</tr>
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<tbody>
<tr>
<td>DVD Recorder</td>
<td>Low-End</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Mid-Range NA, Japan, China</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>High-End &amp; Europe Applications</td>
<td>✔</td>
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<td>✔</td>
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<td>CRT TV</td>
<td>&gt;=29&quot; Mid-Range NA, Japan, China</td>
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<td>✔</td>
<td>✔</td>
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<tr>
<td></td>
<td>&gt;=29&quot; High-End &amp; Europe Applications</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>LCD TV</td>
<td>Mid-Range NA, Japan</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td></td>
<td>High-End &amp; Europe Applications</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Plasma TV</td>
<td>Mid-Range NA, Japan, China</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>High-End &amp; Europe Applications</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>DLP™ TV</td>
<td>Mid-Range NA, Japan, China</td>
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<tr>
<td></td>
<td>High-End &amp; Europe Applications</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Set-Top Box</td>
<td>High Definition &amp; High-End</td>
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<td>✔</td>
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<td>Projector</td>
<td>Business &amp; Home Theater Worldwide</td>
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<tr>
<td>TV</td>
<td>Picture-In-Picture, 2nd TV Tuner</td>
<td>✔</td>
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<tr>
<td></td>
<td>Low-Cost VBI slicer</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
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<tr>
<td>Security</td>
<td>Commercial &amp; Home Surveillance</td>
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<tr>
<td>PC</td>
<td>USB Video Capture</td>
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<tr>
<td></td>
<td>PC TV Card</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td></td>
<td>Multimedia Laptop &amp; PC</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Portable</td>
<td>DVD Player Digital &amp; Analog Panel</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td></td>
<td>Mobile Phone Analog TV</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td></td>
<td>Digital Camcorder</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td></td>
<td>Portable Multimedia Player</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
With a picture quality that has no rival, digital televisions are eclipsing analog models as the television of choice. The digital television market is surging as the world continues to accelerate the transition from analog to digital TV transmission.

Digital tuners are being integrated into the sets, allowing consumers to experience the picture and sound quality of the digital world. Crisp, vivid pictures and the overall experience of digital TV are convincing a growing number of consumers to go digital. Technology also is improving the way the digital picture is delivered. As a result, sales of digital television sets are beginning to soar. Researchers estimate that 3.4 million digital TV units which include high-end CRT (>29"), LCD, Plasma displays and DLP™ and 30.6 million set-top boxes will be sold around the world in 2004. By 2008, 17.6 million digital TV units and 100 million set-top boxes are expected to be sold.

The improved picture of digital television can be attributed to the development of the 3DYC comb filter. Using a three-frame filter, it looks at a cube of pixels of the chroma and luma signals for motion instead of a square of pixels that a 2D comb filter would scan. The improvement of 3D filtering is dramatic, especially on highly detailed images or screen displays that use sharp graphics that can confuse conventional 2D filters.
Texas Instruments' (TI) newest addition to an already market proven portfolio of video decoders provides an unparalleled video quality to cost advantage never found in other decoder devices. The TVP5160 device, a high-quality, high-performance digital video decoder (NTSC/ PAL/SECAM) digitizes and decodes all popular baseband analog video formats into digital component video.

By implementing a 3D comb filter, the TVP5160 provides the highest quality video available today. The 3D comb filter, which separates the composite signal into both Y and C channels to reduce both cross-luma and cross-chroma artifacts, is applied on both NTSC and PAL video inputs. Through a highly sophisticated motion detection algorithm, the TVP5160 successfully applies TI's patented 2D, 5-line comb filter to those portions of the image that are moving but also utilizes TI's 3D comb filter to provide cleaner, crisper images to the static portions of the image. For more information, www.ti.com/TVP5160

Key Features
• NTSC/PAL 3D comb filter
• Concurrent 3D noise reduction
• 480 p/576 p
• IF compensation
• Time-based correction (TBC)
• Improved 2D, 5-line comb filter
• Weak and non-standard signal support
• Robust VCR performance

Applications
• Digital TV
• LCD, plasma and DLP™ displays
• High-end CRT (>29")
• Set-top box

TVP5160 Block Diagram
While video and audio quality, the amount of DVD content available and price declines drove the DVD player to become the most popular consumer electronics product ever, the DVD recorder (DVD-R) is about to follow the same path.

Introduced to the market in 2002, more DVD-Rs are appearing on the market, and prices are dropping to points that make them affordable for consumers. As more DVD-Rs are shipped, the lineup of features and increasing ease of use will continue to make the products attractive to consumers. In 2007, more than 50 million DVD-Rs are expected to be shipped throughout the world.

Digital TV tuners, 1394 connectivity, electronic program guides, memory card slots, hard drives, high-speed recording capabilities, networking capabilities, DVD Audio, Super Audio CD (SACD) playback and write/rewrite capabilities will help drive consumer demand for DVD-Rs. While DVD players typically sit alongside the VCR in most homes, integrating DVD-Rs into other products, such as home theater in a box, television sets or even VCRs will also help drive adoption rates for the machines.

In order for manufacturers to meet cost, performance, and other region specific needs such as video inputs and formats, it is imperative to choose components that meet these dynamic market requirements.
5-Line Comb Filter NTSC/PAL/SECAM Video Decoder—TVP5146

The TVP5146, a high-quality, high-performance digital video decoder (NTSC/PAL/SECAM), digitizes and decodes all popular baseband analog video formats into digital component video. The TVP5146 includes 10-bit, 30-MSPS analog-to-digital converters. A new robust sync detector provides superior performance in VCR trick modes, nonstandard number of lines and weak signals. The 5-line CF provides the highest 2-D quality in V/C separation. A total of 10 video inputs can be configured to combination of CVBS, S-video YPbPr, RGB, or SCART video inputs multisource connection. SCART and analog RGB inputs makes the TVP5146 a perfect solution for international devices. For more information, www.ti.com/sc/device/TVP5146

Key Features

• 10-bit, 30-M SPs analog-to-digital converters
• 10 inputs including SCART
• 5-line comb filter
• New robust sync detector
• VBI data processor
• Macrovision™ copy protection detection

Applications

• Digital TV
• Analog CRT TV
• LCD TV and monitor
• DVD-R
• PVR/DVR

Low-Cost Video Decoder Alternative—TVP5147

Texas Instruments’ (TI) TVP5147 device, a high-quality, high-performance digital video decoder (NTSC/PAL/SECAM), a low cost alternative to the TVP5146, provides a pin-for-pin and software compatible solution for those devices that do not require SCART or analog RGB inputs. Additionally, the device also provides an analog out function. For more information, www.ti.com/sc/device/TVP5147

Key Features

• 10-bit, 30-M SPs analog-to-digital converters
• 10 inputs, one shared analog output
• New robust sync detector
• Improved 2D 5-line adaptive comb filter
• VBI data processor
• Macrovision™ copy protection detection
• Pin and software compatibility with TVP5146

Applications

• Digital TV
• Analog CRT TV
• LCD TV and monitor
• DVD-R
• PVR/DVR
Mobile telephones, personal multimedia players, and portable DVD players are rapidly becoming popular vehicles to view, share, and record live or previously recorded video content. Historically, power consumption and display sizes have hampered the demand for such products.

But with advances in technologies throughout the signal chain, portable digital TV is becoming a reality. Today, consumers can view their favorite television program wherever they are.

Major improvements in antennas, power requirements, tuner size, picture quality and to video decoders, processors and the other underlying components will allow equipment manufacturers to integrate the most up-to-date technologies to their products and improve TV reception to smaller devices.
Ultra-Low-Power NTSC/PAL/SECAM Video Decoder

The TVP5150A digital video decoder (NTSC/PAL/SECAM) offers the industry’s lowest power, smallest size and lowest cost. The device is a highly integrated video decoder with optimized architecture that allows for very low power consumption. Its very low-power stand-by operation of 100 µA further reduces power consumption, increasing battery life in portable applications. The device outputs standard 8-bit ITU-R.BT601 or ITU-R.BT656 digital video data. Using a 14.31818-MHz clock, the device supports NTSC, PAL and SECAM ITU-R.BT601 sampling output data rates. For more information go to www.ti.com/sc/device/TVP5150A

Key Features
- Accepts two composite or one S-video input
- Ultra-low-power (115 mW)
- Cost-optimized for portable multimedia applications
- New robust sync detector
- VBI data processor
- Macrovision™ copy protection detection
- Packaging: 32-pin TQFP or 48-ball MicroStar Junior™ BGA (industry’s smallest available video decoder)

Applications
- USB video capture
- Mobile phone
- Portable DVD player
- Digital camcorder
- Security and surveillance
- Low-end DVD recorder
- TV 2nd channel for PIP function
- Low-cost VBI slicer

TVP5150A Block Diagram
In today’s safety conscious world, video security and surveillance is everywhere. In order to provide security to patrons and employees, video security systems are being installed at a record rate. According to market research, the Digital Video Recorder (DVR) market is anticipated to grow over 10 million units by 2008. Video systems generally support 4, 8, 16, or more video capture devices. These requirements demand at least 4 video decoders per system. Due to the number of decoders needed, video quality, component size, and cost are key. Providers must delicately balance these features in order to provide the optimal solution. By providing an ultra-small (4x4mm) package and a competitive price, the TVP5150A is a perfect candidate for video security and surveillance applications. In the future, TI will continue to provide devices that are focused on supporting this expanding market.
USB Video Capture Block Diagram

Digital Camcorder Block Diagram

Portable DVD Player Block Diagram
To assist in your mixed-signal video design efforts, the below resources are available:

- Product Bulletins
- Datasheets
- Application Reports
- User Guides
- Evaluation Modules
- Software Tools

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- Software Tools

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