The Video System Chain

From Analog to Digital and Back Again

J.B. Fowler, Video Systems Applications
Marc Pyne, Digital Video Applications
Objectives

• Understand the Video Chain
  – Security based Digital Video Recorder Example

• Recognize TI’s Components to the Video Chain
  – Front-End (Video Decoders and ADCs)
  – Middle (Digital Media Processors)
  – Back-End (Video Encoders and DACs)

• What are the Design Considerations for developing a Video System
  – Software
  – Hardware
• Overview of Video Systems
• Hardware Overview
  – Video Decoder & Video ADC
  – Digital Media Processors
  – Video Encoder & Video DAC
  – Interfacing These Components
• Software Overview
  – Digital Media Processor Drivers
  – Video Decoder & Video ADC configuration
• Design Considerations
• Evaluation Modules
• Wrap-Up
TI Expertise Covers Full Digital Video Spectrum

Digital Still Camera
Personal Media Players
Cell Phones
Video Security
Automotive Entertainment & NAV
Automotive Vision
Machine Vision
Video Phones
Set-top Box & Digital TV
Video Conferencing
Medical Imaging
Video Infrastructure

Technology for Innovators

Texas Instruments
Defining the Video Chain

**Capture**
- Acquisition and encode of original video content

**Process**
- Captured video content is encoded, transcoded, and transrated

**Deliver**
- Content is transported locally or delivered through a service provider

**Receive**
- Received content is stored or decoded and/or transcoded

**View**
- Content is accessible through a viewing mechanism
Enabling Intelligent Video Provides Superior Surveillance Capability

1. **Capture**
   - IP security cameras

2. **Process**
   - Router
   - D1
   - CIF

3. **Deliver**
   - IP Network to DVR

4. **Receive**
   - IP Network to live view

5. **View**
   - HD TV
   - Monitor
   - PDA or cell phone

**Video Security Intelligence:**
- Image capture
- Control
- Pre-processing
- Video encoding
- Audio encoding
- Networking
- Video analysis
- Motion detection
- Remote PTZ control
Typical Digital Video Recorder/Server

Capture  Process  Deliver  Receive  View

[Diagram showing the flow of capture, process, deliver, receive, and view stages in a digital video recorder/server system]
Agenda

• Overview of Video Systems
• Hardware Overview
  – Video Decoder & Video ADC
  – Digital Media Processors
  – Video Encoder & Video DAC
  – Interfacing These Components
• Software Overview
  – Digital Media Processor Drivers
  – Video Decoder & Video ADC configuration
• Design Considerations
• Evaluation Modules
• Wrap-Up
A Video Decoder takes in analog video and:

- Decodes common formats (NTSC, PAL, SECAM and variants like PAL-M)
- Digitizes it after signal conditioning
- Detects and locks to its syncs
- Performs luma/chroma (Y/C) separation
- Formats and outputs digital component video
Why Is a Good Decoder Important?

- **Monitor Quality**: small CRT or large HDTV
  - Monitor size and quality will show/hide video quality/artifacts
- **Source Quality can widely vary**:
  - older VCRs
  - low-quality cameras
  - long cable runs
  - weak terrestrial broadcast
Source Quality $\rightarrow$ Decoder Quality

- **Y/C Separation**
  - Differentiation occurs here…

- **Digitization and Signal Conditioning**
  - Noise doesn’t compress well !!!
  - $\uparrow$ ADC bits =
    - $\downarrow$ contouring
    - $\downarrow$ noise floor

- **Sync Detection and Locking**
  - VCR unstable syncs especially in trick modes
  - Nonstandard number of lines
  - Very important for weak/noisy tuner or camera signals
Why Is a Good Decoder Important?

- **Y/C Separation** is a key differentiator
- No comb filtering will have False Color, especially in high frequency content (like multiburst)
- Non-adaptive comb filtering can have Hanging Dots on horizontal color transitions
- Number of lines used for comb filter will impact video quality
- 3-D comb is better than 2-D comb
• TI provides a broad range of Video Decoders to fit every application and quality requirement.

• The TVP51xx Family of Products:
  - TVP5150AM1
  - TVP5146M2
  - TVP5147M1
  - TVP5160
  - TVP5154
<table>
<thead>
<tr>
<th>Feature</th>
<th>TVP5150AM1</th>
<th>TVP5147M1</th>
<th>TVP5146M2</th>
<th>TVP5160</th>
<th>TVP5154</th>
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<tbody>
<tr>
<td>Video Decoders</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Inputs</td>
<td>2</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>8 (2/decoder)</td>
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<tr>
<td>ADC Resolution</td>
<td>9 Bit</td>
<td>11 Bit</td>
<td>11 Bit</td>
<td>11 Bit</td>
<td>9 Bit</td>
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<td>Outputs</td>
<td>8 Bit 4:2:2</td>
<td>10/20 Bit</td>
<td>10/20 Bit</td>
<td>10/20 Bit</td>
<td>8 Bit</td>
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<td>2D Comb Filter</td>
<td>4-Line</td>
<td>5-Line</td>
<td>5-Line</td>
<td>5-Line</td>
<td>4-Line</td>
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<td>3D Comb Filter</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
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<td>Adv. Video Processing</td>
<td>—</td>
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<td>—</td>
<td>—</td>
<td>Yes</td>
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<tr>
<td>V &amp; H Downscaling</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Typical Power</td>
<td>115 mW</td>
<td>490 mW</td>
<td>730 mW</td>
<td>582 mW</td>
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<td>Package Size</td>
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### Which Decoder To Use?

<table>
<thead>
<tr>
<th>Category</th>
<th>Segment</th>
<th>Decoders</th>
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<tr>
<td>DVD-Recorder</td>
<td>Low-End</td>
<td>5150AM1</td>
</tr>
<tr>
<td></td>
<td>Mid-Range</td>
<td>5146M2, 5147M1</td>
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<tr>
<td></td>
<td>High-End</td>
<td>5160</td>
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<tr>
<td>TV</td>
<td>Low-End</td>
<td>5150AM1, 5146M2, 5147M1</td>
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<td></td>
<td>Mid- to High-End</td>
<td>5146M2, 5147M1, 5160</td>
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<td></td>
<td>Sub-Channel (PIP)</td>
<td>5150AM1, 5146M2, 5147M1, 5160</td>
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<td></td>
<td>Low-Cost VBI Slicer</td>
<td>5150AM1</td>
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<tr>
<td>Set-Top Box</td>
<td>HD and High-End</td>
<td>5146M2, 5160</td>
</tr>
<tr>
<td>Business Projector</td>
<td>Low-End</td>
<td>5150AM1</td>
</tr>
<tr>
<td></td>
<td>Mid-Range</td>
<td>5146M2, 5147M1</td>
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<tr>
<td></td>
<td>High-End</td>
<td>5160</td>
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<td>Portable Video Player</td>
<td>DVD-Player</td>
<td>5150AM1</td>
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<tr>
<td></td>
<td>Mobile Phone</td>
<td>5150AM1</td>
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<tr>
<td></td>
<td>Port. Multimedia Player</td>
<td>5150AM1</td>
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<td>Security/Surveillance</td>
<td>Single Channel</td>
<td>5150AM1, 5147M1</td>
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<td>Multiple Channel</td>
<td>5150AM1, 5154</td>
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**Deciding Factors include:**
1) Datapath Resolution, 2) Features, 3) # of Inputs, 4) Size, 5) Cost/Performance Tradeoff
• 4-channel Analog to Digital video decoder
  – Developed for multi-input video applications
    • Security / surveillance
    • Video Wall
    • Video Server

• Architecture based on TVP5150AM1 decoder
  – Market/Field proven solution w/ updated performance

• NTSC, PAL, SECAM support
  – Auto-detection / Auto switching

• Accepts 8 inputs (2 per decoder core)
• Patented technology for weak, noisy, unstable signals
• Exceptional support for non-standard video signals
• Four Independent Horizontal / Vertical Down-Scalers
• Fast Lock mode – within 3 fields
• Four dedicated I²C addresses
  – Route one I²C bus for four TVP5154s = 32 total inputs
• Small 128-pin LQFP package
• App Notes include: PCB Layout Guidelines, Scaler Programming, Indirect Registers, and more.

Simplifies Design and Saves Power, Board Space and Cost
Video Triple Analog-to-Digital Converters (ADC)

- Complete Video Digitizing Solution
  - PC VESA Graphics
  - Component SDTV/HDTV inputs
  - Digital YCbCr/RGB video outputs
    - Pixel clock generation.

- TVP7000
- TVP7001
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<tr>
<th>Feature</th>
<th>TVP7000</th>
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<tr>
<td>Resolution Bits</td>
<td>10</td>
<td>10</td>
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<td>Sample Rate (MSPS)</td>
<td>110 or 150</td>
<td>110 or 165</td>
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<td>Programmable Clamping Timing</td>
<td>Yes</td>
<td>Yes</td>
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<td>Programmable Gain Amplitude</td>
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<td>Yes</td>
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<td>Programmable ADC Sampling Phase</td>
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<td>Line-Locked Digital PLL</td>
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<td>Yes</td>
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<td><strong>Output Formats:</strong></td>
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<tr>
<td>16/20-Bit YUV 4:2:2</td>
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<td>Yes</td>
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<tr>
<td>24/30-Bit RGB 4:4:4</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>30-Bit RGB 4:4:4</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Maximum PC VESA Resolution</td>
<td>1280x1024@75Hz</td>
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<tr>
<td>Support all HDTV inputs incl. 1080p 50/60Hz</td>
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<td>Yes</td>
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<td>Package Size</td>
<td>16 x 16mm</td>
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**TVP5170** – Complete front-end solution – Available March 2007
• Overview of Video Systems
• Hardware Overview
  – Video Decoder & Video ADC
  – Digital Media Processors
  – Video Encoder & Video DAC
  – Interfacing These Components
• Software Overview
  – Digital Media Processor Drivers
  – Video Decoder & Video ADC configuration
• Design Considerations
• Evaluation Modules
• Wrap-Up
• What is a DMP vs. DSP?
• What are the different DMP processors?
• Which one do I choose?
DMP vs. DSP

• **Digital Signal Processor**
  – A specialized microprocessor designed specifically for real-time digital signal processing

• **Digital Media Processor**
  – DSP with peripherals specific to audio and video media interfaces, e.g. video ports, audio serial ports, Ethernet, etc.
### Available DMPs

<table>
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<th>DM642</th>
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<td><strong>VICP</strong></td>
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<td><strong>MHz</strong></td>
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<td><strong>MMACS</strong></td>
<td>2000/2400/2880</td>
<td>2000/2400</td>
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<td>1600</td>
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<td><strong>L1 KB</strong></td>
<td>16D / 16P</td>
<td>16D / 16P</td>
<td>16D / 16P</td>
<td>16D / 16P</td>
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<td><strong>L2 KB</strong></td>
<td>256</td>
<td>256</td>
<td>128</td>
<td>128</td>
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<td><strong>Video Ports</strong></td>
<td>3 (20 bits)</td>
<td>2 (20 bits)</td>
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<td>1 (8 bits)</td>
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<td><strong>McASP</strong></td>
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<td>4-Link</td>
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<td><strong>HPI</strong></td>
<td>32-Bit</td>
<td>32-Bit</td>
<td>16-Bit</td>
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<td><strong>PCI</strong></td>
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<tr>
<td><strong>EMIF MHz</strong></td>
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<td>133 (64b)</td>
<td>133 (32b)</td>
<td>133 (32b)</td>
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<td><strong>Price 10KU</strong></td>
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<td>$28.76/$31.45</td>
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<td>DM6446</td>
<td>DM6437</td>
<td>DM6435</td>
<td>DM6431</td>
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<td>------------------</td>
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<td>--------</td>
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<tr>
<td>VICP</td>
<td>VICP</td>
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<tr>
<td>DSP MHz</td>
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<td>300</td>
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<td>DSP MMACCS</td>
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<td>ARM MHz</td>
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<tr>
<td>L1 KB</td>
<td>112 / DSP 40 / ARM</td>
<td>80D / 32P</td>
<td>80D / 32P</td>
<td>32D / 32P</td>
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<tr>
<td>L2 KB</td>
<td>64 / DSP 16 / ARM</td>
<td>128</td>
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<td>64</td>
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<td>Video In</td>
<td>1VP (16 bits) VPSS</td>
<td>1VP (16 bits) VPSS</td>
<td>1VP (16 bits) VPSS</td>
<td>1VP (10 bits)</td>
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<td>Video Out</td>
<td>VPSS: w/OSD 4 10 bit DACs</td>
<td>VPSS: w/OSD 4 10 bit DACs</td>
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<td>EMIF MHz</td>
<td>DDR2 333 (32b)</td>
<td>DDR2 333 (32b)</td>
<td>DDR2 333 (32b)</td>
<td>DDR2 333 (16b)</td>
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<td>Connectivity</td>
<td>USB 2.0, VLYNQ, EMAC w/MDIO</td>
<td>PCI or VLYNQ/EMAC, HPI or EMIF</td>
<td>VLYNQ/EMAC, HPI or EMIF</td>
<td>EMAC or EMIF</td>
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<td>Peripherals</td>
<td>McASP, I²C, SPI, UART (3)</td>
<td>McBSP or McASP, I²C, CAN, UART(2), SPI</td>
<td>McASP, I²C, CAN, UART (2), SPI</td>
<td>McASP, I²C, CAN, UART, SPI</td>
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<td>Now</td>
<td>Samples Now Production Q207</td>
<td>Samples Now Production Q207</td>
<td>Samples Now Production Q207</td>
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Available DaVinci™ based DMPs
What is DaVinci™???

- Processors
  - Tuned for any video application

- Software
  - Optimized and ready to go

- Tools
  - Speed time to market

- Systems Expertise & Support

- Video Security
- Automotive Infotainment
- Video Phones
- Future Video Products
- Camera
- IP Set-Top Box
- Portable Video

Technology for Innovators™
Which one do we chose?

**End-Points**
- DM644x
- DM643x

**Infrastructure**
- DM642
- DM64x+ Next
Digital Media - Peripherals

• Video Ports
  – Standard
    • BT.656, BT.1120, BT.601, SMPTE297M, etc.
  – Video Processing Sub-Systems
    • Standard Interfaces
    • Integrated Resizers
    • Integrated Color Space Conversions
    • On-Screen Display Engines

1- See Presentation “A Look at the Algorithms and Tuning that Enable the DaVinci Image Pipeline”, by Jianping Zhou (Session ID: S285109)
Digital Media - Peripherals

- Audio
  - Audio Serial Ports
  - Multi-Channel Audio Serial Ports
  - Multi-Channel Buffered Serial Ports
  - I²S, TDM
- Ethernet Connectivity
  - MII, RMII, etc.
- Media Cards, ATA
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Internal Encoders

• DM6446/3 and DM643x devices have up to four built-in encoders
  – Composite Video NTSC/PAL
  – Component Video 525i / 625i
  – Component Video 480p / 576p

• Must use an external Op-Amp to drive 75 ohm loads
  – OPA361
  – OPA357
FEATURES

- INTERNAL GAIN: 5.2V/V
- SUPPORTS TV-DETECTION
- 2-POLE RECONSTRUCTION FILTER
- INPUT RANGE INCLUDES GROUND
  - DC-Coupled Input
- INTEGRATED LEVEL SHIFTER
  - DC-Coupled Output(1)
  - No Output Capacitors Needed
- RAIL-TO-RAIL OUTPUT
- LOW QUIESCENT CURRENT: 5.3mA
- SHUTDOWN CURRENT: 1.5A
- SINGLE-SUPPLY: 2.5V to 3.3V
- SC70-6 PACKAGE: 2.0mm x 2.1mm
- RoHS COMPLIANT
Op-Amps – OPA357

FEATURES

• UNITY-GAIN BANDWIDTH: 250MHz
• WIDE BANDWIDTH: 100MHz GBW
• HIGH SLEW RATE: 150V/s
• LOW NOISE: 6.5nV/√Hz
• RAIL-TO-RAIL I/O
• HIGH OUTPUT CURRENT: > 100mA
• EXCELLENT VIDEO PERFORMANCE:
  – Diff Gain: 0.02%, Diff Phase: 0.09
  – 0.1dB Gain Flatness: 40MHz
• LOW INPUT BIAS CURRENT: 3pA
• QUIESCENT CURRENT: 4.9mA
• THERMAL SHUTDOWN
• SUPPLY RANGE: 2.5V to 5.5V
• SHUTDOWN IQ < 6A
Video Triple Digital-to-Analog Converters (DAC)

- Inputs digital YCbCr/RGB video data
- Outputs
  - PC VESA
  - RGB
  - SDTV/HDTV video formats
  - Sync timing generation and insertion

- THS8135
- THS8200
<table>
<thead>
<tr>
<th>Feature</th>
<th>THS8135</th>
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<tr>
<td>Resolution Bits</td>
<td>10</td>
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<tr>
<td>Sample Rate (MSPS)</td>
<td>80 or 240</td>
<td>205</td>
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<td>Input Formats:</td>
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<tr>
<td>1x10/8-Bit 4:2:2 YCbCr/RGB</td>
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<td>Yes</td>
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<td>2x10/8-Bit 4:2:2 YCbCr/RGB</td>
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<td>3x10/8-Bit 4:4:4 YCbCr/RGB</td>
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<td>Yes</td>
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<tr>
<td>15-Bit RGB, 16-Bit RGB</td>
<td>—</td>
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<tr>
<td>Output Formats:</td>
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<tr>
<td>Analog RGB / Analog YPbPr</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Generic DAC</td>
<td>Yes</td>
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<tr>
<td>Supports 2x Oversampled HDTV</td>
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<td>Yes</td>
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<tr>
<td>Color Space Converter</td>
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<tr>
<td>Programmable Sync</td>
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<tr>
<td>Internal Scaling</td>
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<tr>
<td>Max PC VESA Resolution</td>
<td>1920x1440@60Hz</td>
<td>1600x1200@75Hz</td>
</tr>
<tr>
<td>Package Size</td>
<td>9 x 9mm</td>
<td>14 x 14mm</td>
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• Direct connect
  – TVP5154 → DM642
• DM642 supports 3, 20-bit video ports
• Connect data, clock and AVID from decoder 1&2 output to Video Port 0
• Connect data, clock and AVID from decoder 2&3 output to Video port 1
• Video port 2 can be used as output
A standard DSP can not directly interface to video decoders since it does not support the digital video data formats ITU-601 (with discrete syncs) or ITU-656 (with embedded SAV/EAV codes.)

Interfacing a video decoder to a standard DSP requires glue logic to convert ITU-601 or ITU-656 data to an EMIF protocol or to RGB data.
• Application Notes:
  – *High-Resolution Video Using the DM642 DSP and the THS8200 Triple DAC (SPRA961)*
  – *Implementing HD Video Using DaVinci EVM and THS8200 Daughter Card*

See Presentation "Implementing HD Video Using DaVinci EVM and THS8200 Daughter Card", by Neal Frager & Juan Gonzales (Session ID: S284748)
Agenda

• Overview of Video Systems
• Hardware Overview
  – Video Decoder & Video ADC
  – Digital Media Processors
  – Video Encoder & Video DAC
  – Interfacing These Components
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  – Video Decoder & Video ADC configuration
• Design Considerations
• Evaluation Modules
• Wrap-Up
Basic DVR Software Stack

- DSP/BIOS
- Codecs
- Codec Engine
- Video Encode
- Video Decode
- Audio Encode
- Audio Decode
- System
- Control
- PSP Drivers
- Audio Input
- Audio Output
- Video Input
- Video Output
- TCP/IP
- Host Input
- Host Output
- RPC

Technology for Innovators™
Driver Development

See Presentation "An Overview of New Linux Drivers for the DaVinci Video Processing Subsystem", by Xiangdong Fu (Session ID: S285113)
Available Digital Media Processor Drivers

- DMP only devices
  - Video Port BIOS drivers
  - Audio Serial Port drivers
  - NDK
- SoC devices (Arm + DSP)
  - Linux based drivers
  - V4L2, FBDev, OSS
  - Resizer, Previewer, H3A
  - NDK
Video Decoder & Video ADC/DAC Configuration

• Simple to program
  – Very few I²C register writes are required

• For example, the TVP5150AM1 requires just two writes:
  – Write 0x00 to register 0x7F → Restart 5150AM1 uP
  – Write 0x03 to register 0x6F → Enable outputs

• Examples provided for all common resolutions, standards and modes.
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Design Considerations

- *High-Speed DSP Systems Design Reference Guide (SPRU889)*
  
  
  - Power Supply Decoupling
  - Layout considerations
  - Clocking and PLLs
  - Noise Immunity
  - EMI
Developing with Digital Media Processors

- Power Supplies
  - Voltage Levels
  - Current Consumption
  - Ramp Requirements
- Clocking
  - Frequencies
  - Jitter
  - Audio/Video Synchronization
- Video Interfaces
  - Analog Decoders / Encoders
  - Video ADCs / DACs
  - Digital Interfaces (BT.656, RGBxxx)
- Audio Interfaces
  - Line In/Out
  - Mic In/Out (Bias Voltages)
  - Digital (PWM, SPDIF)
- Communications
  - UART
  - SPI
  - USB
  - PCI
- Storage Concerns
  - ATA
    - Compact Flash
    - Hard Disk Drives
  - RAM / ROM
- Program / Data Memory
  - DDR
  - SDRAM
  - FLASH
- GPIO
- Level Shifters
Decoder / DAC / ADC Design
Considerations

• No color or intermittent color? – **Crystal circuit** design is critical
  – Small variations in reference clock frequency will cause color to become intermittent or to go away altogether
  – Use the correct frequency parallel-resonant crystal and follow crystal guidelines.
  – Keep digital and analog signals away from crystal on every layer

• Faint vertical lines throughout picture? – **Aliased noise**
  – Anti-alias filtering is recommended any time significant out-of-band noise will be present on the inputs of the TVP51xx decoder or ADC.
  – Use reconstruction filter on DAC output.
Decoder / DAC / ADC Design Considerations

• Avoid long traces for analog signals
  – Use guard (ground) trace when possible
  – Avoid clock and bus daisy-chaining

• Place decoupling capacitors close to the power pins of the ICs.
  – Typically, 0.1uF capacitors are used
  – Use 0.1uF caps for video AC coupling

• Maintain recommended nominal supply levels, especially for high frequency applications

• Keep digital and analog portions of PCB isolated as much as possible
• Avoid routing traces under the Power Pad
  – Connect Power Pad to GND.

• Maintain good insulation between channels to minimize introduction of crosstalk

• Design/Layout Guidelines and many Application Notes are available
  – See device specific product folders
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**Decoder and ADC/DAC EVMs**

- All TI Decoders, ADCs and DACs have EVMs
  - Provides complete evaluation platform
- Excellent source of schematic and layout for video devices and supporting components
- Common interface allows boards to be interchanged
- Windows-based GUI software controls all devices through I²C.

**Property Sheets**

**DM642 Control**

**Edit Registers**

**Minds in Motion**

**Technology for Innovators**
Comprehensive Digital Media Tools
Ease Development

Tools & Software
- Code Composer Studio™ IDE
- DSP/BIOS™ Real-Time Scalable Kernel
- Device Driver Kit
- Reference Frameworks

Hardware
- DM642 EVM Evaluation Module based on 720 MHz DM642
- High-Performance, PCI-Based XDS560 Emulation Adaptor Board

Application Demos
- Video Application Demos
- Executable Demos

Camera
- NTSC or PAL Camera
- Video Cables
**DaVinci™ Digital Video Evaluation Module**

### Hardware
- Based on the DM6446
- Additional including hardware components:
  - NTSC/PAL video camera
  - 5.6-inch LCD screen
  - Speakers and microphone
  - IR remote
  - Hard disk drive (2.5-inch 40G)

### Software
- Codec evaluation and demos including:
  - H.264, MPEG-4, MPEG-2, AAC+, G.711
  - Multimedia APIs & frameworks
  - MontaVista 2.6.10 Linux support package

### Connectivity
- Connectivity capabilities:
  - USB 2.0, 10/100 EMAC
  - Multiple on-board memory types: CompactFlash, ATA, SD, DDR
  - Video input via NTSC/PAL
  - Video output via NTSC/PAL & YPbPr/RGB
  - CD-quality audio input and output
  - Daughter-card connections to peripheral interfaces

### Development tools and support
- Linux development tools
- Reference guidelines for high-speed video board design, DDR2 layout, etc.
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Typical Digital Video Recorder/Server

Capture

Process

Deliver

Receive

View

Minds in Motion

Technology for Innovators™
TI Has All the System Building Blocks for Next Generation Video Architecture

- TI has over 10 years of experience in providing digital video functional blocks
- Best in class performance in many areas
- Mixed signal/Analog/DSP expertise with the latest process nodes
• Drivers developed to speed up system integration

• Video Decoders/ADCs/DACs are simple to program
Design Considerations

- **High-Speed DSP Systems Design Reference Guide (SPRU889)**
  

- Video Decoder/ADC/DAC Application Notes and Design/Layout Guidelines Available
Objectives

- Understand the Video Chain
  - Security based Digital Video Recorder Example
- Recognize TI’s Components to the Video Chain
  - Front-End (Video Decoders and ADCs)
  - Middle (Digital Media Processors)
  - Back-End (Video Encoders and DACs)
- What are the Design Considerations for developing a Video System
  - Software
  - Hardware
The Video System Chain

From Analog to Digital and Back Again

J.B. Fowler – jbfowler@ti.com
Marc Pyne - marc-pyne@ti.com