Evaluation Board for the ADV7281A-M 10-Bit, 4x Oversampled SDTV Video Decoder with Differential Inputs

FEATURES
Six video input ports capable of accepting any of the following formats: single-ended CVBS, differential CVBS, S-Video (Y/C), and component (YPbPr)
MIPI CSI-2 Tx output

SOFTWARE NEEDED
DVP Evaluation Software
ADV7281A-M script
Windows OS

GENERAL DESCRIPTION
The EVAL-ADV7281AMEBZ evaluation kit is the platform provided by Analog Devices, Inc., to evaluate the ADV7281A-M video decoder. The EVAL-ADV7281AMEBZ evaluation kit contains an EVAL-ADV7281AMEBZ evaluation board and all of its necessary peripherals.

This user guide provides a detailed overview of the EVAL-ADV7281AMEBZ evaluation board hardware and the software required to use it.

The ADV7281A-M data sheet and the ADV7280A/ADV7281A/ADV7282A Device Manual should be consulted in conjunction with this user guide when using the EVAL-ADV7281AMEBZ evaluation board.

EngineerZone can be accessed to find additional information on the ADV7281A-M.

PHOTOGRAPH OF THE EVAL-ADV7281AMEBZ EVALUATION BOARD

Figure 1.
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# REVISION HISTORY

9/2017—Revision 0: Initial Version
EVALUATION BOARD HARDWARE

EVALUATION BOARD OVERVIEW

The EVAL-ADV7281AMEBZ evaluation board features an ADV7281A-M video decoder and a bank of subminiature version A (SMA) connectors. Six analog video inputs (AIN1 to AIN6) are connected to the ADV7281A-M video decoder. The ADV7281A-M can receive analog video in several different formats; hardware configuration changes can be required to support certain configurations for example, single-ended CVBS vs. differential CVBS (see Table 1). The ADV7281A-M converts the analog video received into a mobile industry processor interface (MIPI®) CSI-2 Tx (MIPI Tx) digital stream. The ADV7281A-M MIPI Tx output consists of one differential data channel (D0P and D0N) and one differential clock channel (CLKP and CLKN); both channels are available at the SMA connectors on the evaluation board.

Analog Video Input Format Configurations

Configuring AIN5 and AIN6 for Single-Ended CVBS
To configure the AIN5 and AIN6 inputs to receive single-ended CVBS, make the following resistor changes on the evaluation board:
1. Remove Resistor R51.
2. Replace Resistor R33 and Resistor R35 with 24 Ω resistors.
3. Replace Resistor R28 and Resistor R29 with 51 Ω resistors.

Configuring AIN1 and AIN2 for Differential CVBS
To configure AIN1 and AIN2 to receive differential CVBS, make the following resistor changes on the evaluation board:
1. Replace Resistor R24 and Resistor R25 with 1.3 kΩ resistors.
2. Replace Resistor R21 and Resistor R23 with 430 Ω resistors.
3. Replace Resistor R54 with a 75 Ω resistor for pseudo differential CVBS or with a 150 Ω resistor for fully differential CVBS.
4. Connect the positive input to AIN1 and the negative input to AIN2.

Configuring AIN3 and AIN4 for Differential CVBS
To configure AIN3 and AIN4 to receive differential CVBS, make the following resistor changes on the evaluation board:
1. Replace Resistor R11 and Resistor R12 with 1.3 kΩ resistors.
2. Replace Resistor R4 and Resistor R10 with 430 Ω resistors.
3. Replace Resistor R32 with a 75 Ω resistor for pseudo differential CVBS or with a 150 Ω resistor for fully differential CVBS.
4. Connect the positive input to AIN3 and the negative input to AIN4.

Configuring AIN5 and AIN6 for S-Video (Y/C)
To configure AIN5 and AIN6 to receive YPrPb, make the following resistor changes on the evaluation board:
1. Remove Resistor R51.
2. Replace Resistor R33 and Resistor R35 with 24 Ω resistors.
3. Replace Resistor R28 and Resistor R29 with 51 Ω resistors.
4. Connect the luma channel (Y) to AIN5 and the chroma channel (C) to AIN6.

Table 1. Analog Video Input Format Configurations for the EVAL-ADV7281AMEBZ Evaluation Board

<table>
<thead>
<tr>
<th>Configuration</th>
<th>( A_{IN1} )</th>
<th>( A_{IN2} )</th>
<th>( A_{IN3} )</th>
<th>( A_{IN4} )</th>
<th>( A_{IN5} )</th>
<th>( A_{IN6} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Ended CVBS</td>
<td>Default</td>
<td>Default</td>
<td>Default</td>
<td>Default</td>
<td>See the Configuring ( A_{IN5} ) and ( A_{IN6} ) for Single-Ended CVBS section</td>
<td>See the Configuring ( A_{IN5} ) and ( A_{IN6} ) for Single-Ended CVBS section</td>
</tr>
<tr>
<td>Differential CVBS</td>
<td>See the Configuring ( A_{IN1} ) and ( A_{IN2} ) for Differential CVBS section</td>
<td>See the Configuring ( A_{IN1} ) and ( A_{IN2} ) for Differential CVBS section</td>
<td>See the Configuring ( A_{IN3} ) and ( A_{IN4} ) for Differential CVBS section</td>
<td>See the Configuring ( A_{IN3} ) and ( A_{IN4} ) for Differential CVBS section</td>
<td>See the Configuring ( A_{IN3} ) and ( A_{IN4} ) for Differential CVBS section</td>
<td>See the Configuring ( A_{IN3} ) and ( A_{IN4} ) for Differential CVBS section</td>
</tr>
<tr>
<td>S-Video (Y/C)</td>
<td>S-Video Input 1 (Y channel)</td>
<td>S-Video Input 1 (C channel)</td>
<td>S-Video Input 2 (Y channel)</td>
<td>S-Video Input 2 (C channel)</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>YPrPb</td>
<td>YPrPb Input 1 (Y channel)</td>
<td>YPrPb Input 1 (Pb channel)</td>
<td>YPrPb Input 1 (Pr channel)</td>
<td>YPrPb Input 1 (Pb channel)</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
EVALUATION BOARD DESCRIPTION

This section outlines how to power up, communicate with, and use the evaluation board. For an outline of the evaluation board connections, see Figure 2.

Power Supply

To power up the evaluation board, connect a mains cable to the 7.5 V power supply block included in the EVAL-ADV7281AMEBZ evaluation kit. Connect the output jack of the 7.5 V power supply block to the input power connector (J8) on the evaluation board. LED D6 illuminates when the power supply is enabled and successfully connects to the evaluation board.

Only use the 7.5 V power supply block provided with the evaluation kit to power the evaluation board.

Communicating with the Evaluation Board

To establish communication with the evaluation board, connect the USB cable included in the EVAL-ADV7281AMEBZ evaluation kit to a computer with DVP Eval Software installed. Connect the USB cable to the USB connector (J7) on the evaluation board. LED D7 illuminates when the USB cable successfully connects between an active USB port and the evaluation board.

Connecting Input Video

Connect an analog video input(s) to the desired analog input (A0 to A5) of the evaluation board. Refer to Table 1 to determine how different types of input (for example, single-ended CVBS and S-Video) connect to the evaluation board. Refer also to the ADV7281A-M data sheet and the ADV7280A/ADV7281A/ADV7282A Device Manual for more information on input muxing options.

Connecting Output Video

To observe the output of the evaluation board, connect the MIPI Tx output SMA connectors to a MIPI Tx compatible receiver.

Other Considerations

The 28.63636 MHz crystal (Y1) on the evaluation board does not oscillate until the ADV7281A-M is configured (see the Configuring the Evaluation Board section). The I2C master works independently of the crystal, using a ring-oscillator in the ADV7281A-M.

Specific important components on the evaluation board are outlined in Table 2 and highlighted in Figure 3. Additional details on components are outlined in Table 3.
Figure 2. Outline of Evaluation Board Connections

Figure 3. ADV7281A-M Evaluation Board
### Table 2. Important Evaluation Board Components

<table>
<thead>
<tr>
<th>Reference Designator</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1 to J6</td>
<td>Analog video inputs</td>
<td>Analog video inputs (A01 to A66) connected to the ADV7281A-M video decoder.</td>
</tr>
<tr>
<td>D0N, D0P, CLKN, CLKP</td>
<td>MIPI Tx outputs</td>
<td>MIPI Tx data (D0P and D0N) and clock (CLKP and CLKN) outputs.</td>
</tr>
<tr>
<td>J8</td>
<td>Power</td>
<td>Connection for 7.5 V power supply. A 7.5 V power supply block is included in the EVAL-ADV7281AMEBZ evaluation kit.</td>
</tr>
<tr>
<td>D6</td>
<td>Power enabled LED</td>
<td>The LED illuminates when the 7.5 V supply is connected and enabled.</td>
</tr>
<tr>
<td>J7</td>
<td>USB</td>
<td>Connecting a USB cable between this connector and a PC with DVP Eval Software and ADV7281A-M scripts ¹ installed allows control of the evaluation board. See the Evaluation Board Software section for more information on DVP Eval Software and ADV7281A-M scripts.</td>
</tr>
<tr>
<td>D7</td>
<td>USB connected LED</td>
<td>The LED illuminates when the USB cable is connected between an active USB port on a PC and the evaluation board.</td>
</tr>
</tbody>
</table>

¹ These scripts enable control of the ADV7281A-M video decoder.

### Table 3. Additional Evaluation Board Components

<table>
<thead>
<tr>
<th>Reference Designator</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRQ</td>
<td>INTRQ output</td>
<td>Interrupt output from the ADV7281A-M.</td>
</tr>
<tr>
<td>Reset and S2</td>
<td>Reset</td>
<td>The evaluation board can be reset by pressing and releasing the push button “S2.”</td>
</tr>
<tr>
<td>SDA and SCL</td>
<td>I²C communication bus</td>
<td>Test points. The SDA (I²C data) and SCL (I²C clock) test points provide access to the I²C communication bus on the evaluation board. This allows an external I²C master to be connected instead of using a PC to configure the evaluation board.</td>
</tr>
<tr>
<td>GPO0, GP01, GP02</td>
<td>General purpose output</td>
<td>General purpose output test points.</td>
</tr>
<tr>
<td>K3</td>
<td>EEPROM Programming</td>
<td>Never short Jumper K3 and only employ K3 during initial programming. K3 can disable the USB interface on the evaluation board.</td>
</tr>
</tbody>
</table>

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EVALUATION BOARD SOFTWARE
SOFTWARE REQUIRED
To complete the initial setup of the evaluation board, it is necessary
to download the following:
- ADV7281A-M script files
- DVP Eval Software

DOWNLOADING THE ADV7281A-M SCRIPT FILES
To download the ADV7281A-M script files, complete the
following steps:
1. Go to the ADV7281A-M product page.
2. Download the ADV7281AM_Cust.zip file.
3. Unzip the ADV7281AM_Cust.zip file.

DOWNLOADING THE DVP EVAL SOFTWARE
To download the DVP Eval Software, complete the following
steps:
1. Open the Install DVP Eval Software thread on
EngineerZone

INSTALLING DVP EVALUATION SOFTWARE
To install the DVP Eval Software, complete the following steps:
1. Run the executable file Install DVP Eval Latest Source 10-14-11.exe.
2. Read the Software License Agreement. If in agreement,
click the I Agree button.
3. Select the desired Desktop or Start Menu shortcuts, and
click the Next button.
4. Select an installation destination folder and click the
Install button (see Figure 4). It is recommended to use the
default destination folder. Selecting a different destination
folder can cause compatibility issues with some versions of
Windows’ OS.
5. Restart the PC after installing the DVP Eval Software.

LOADING THE ADV7281A-M SCRIPT FILES
This section describes how to combine the ADV7281A-M script
files with the DVP Evaluation Software.
1. If possible, disconnect the PC from the internet, as some
automatic backup agents can interfere with the script file
loading process.
2. Copy the unzipped ADV7281AM_Cust folder to the
following directory: C:\Documents and
Settings\USER_NAME\My Documents\Analog
Devices\DVP Eval Latest Source 10-14-11\xml\New
Boards
3. The location of this folder is influenced by the install
location of the DVP Eval Software, and USER_NAME
must be defined by the user).
4. Open the DVP Eval Software by selecting Start > All
Programs > Analog Devices > DVP Eval Latest Source
10-14-11.
5. Select File > Update Boards to combine the ADV7281A-M
script files with the DVP Eval Software (see Figure 5).
6. After the Update Boards process completes, click OK on
the Update Boards Successful window. The PC can now
reconnect to the internet if it is disconnected.
CONFIGURING THE EVALUATION BOARD

After connecting and powering up the hardware and downloading and installing the software, begin using the evaluation board.

To configure the evaluation board, complete the following steps:

1. Select **Start** > **All Programs** > **Analog Devices** > **DVP Eval Latest Source 10-14-11**.
2. Click the **Choose Board** button in the top left corner of the DVP Eval Software window to open the **Board Selector** window (see Figure 6).
3. Select **ADV7281AM_CUST** in the **Rx** list box of the **Board Selector** window, select **None** in the **MotherBoard** list box, and select **None** in the **Tx** list box.
4. Click the **Load** button. A window similar to Figure 7 appears.
5. Select **Scripts** > **ADV7281AM_CUST** to select and run a script to configure the evaluation board (see Figure 8).
6. To monitor the registers of the ADV7281A-M, click on the associated device tab within the DVP Eval Software (see Figure 8).
ALSB PIN OF THE ADV7281A-M TIED HIGH. THEREFORE, I2C DEVICE ADDRESS OF ADV7281A SET TO 0x42 BY DEFAULT.

Figure 7. DVP Eval Software After Connecting the ADV7281A-M Evaluation Board
Figure 8. Running ADV7281A-M Script on DVP Eval Software

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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