ANALOG DEVICES

EVAL-ADV7281AMEBZ User Guide

UG-1173

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Evaluation Board for the ADV7281A-M 10-Bit, 4× 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

EVALUATION BOARD KIT CONTENTS

EVAL-ADV7281AMEBZ evaluation board
7.5 V power supply block
USB cable

HARDWARE NEEDED

Source of one or more of the following video inputs: single-ended CVBS, differential CVBS, S-Video (Y/C), and/or component (YPbPr)
PC
MIPI CSI-2 Tx analyzer
CVBS input cable(s)
S-Video cable(s)
Component cable(s)
SMA cables

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

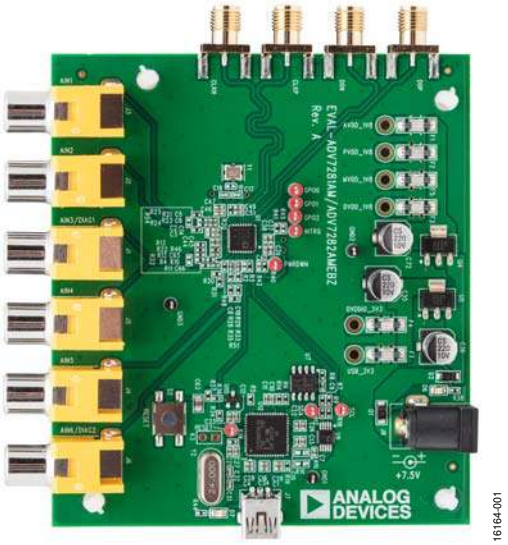

Figure 1.

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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 ($A_{IN}1$ to $A_{IN}6$) 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 $A_{IN}5$ and $A_{IN}6$ for Single-Ended CVBS

To configure the $A_{IN}5$ and $A_{IN}6$ 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 $A_{IN}1$ and $A_{IN}2$ for Differential CVBS

To configure $A_{IN}1$ and $A_{IN}2$ 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 $A_{IN}1$ and the negative input to $A_{IN}2$.

Configuring $A_{IN}3$ and $A_{IN}4$ for Differential CVBS

To configure $A_{IN}3$ and $A_{IN}4$ 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 $A_{IN}3$ and the negative input to $A_{IN}4$.

Configuring $A_{IN}5$ and $A_{IN}6$ for S-Video (Y/C)

To configure $A_{IN}2$, $A_{IN}3$, and $A_{IN}4$ 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 $A_{IN}5$ and the chroma channel (C) to $A_{IN}6$.

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

Configuration	$A_{IN}1$	$A_{IN}2$	$A_{IN}3$	$A_{IN}4$	$A_{IN}5$	$A_{IN}6$
Default	Single-Ended CVBS Input 1	Single-Ended CVBS Input 2	Single-Ended CVBS Input 3	Single-Ended CVBS Input 4	Differential CVBS Input 1, positive channel	Differential CVBS Input 1, negative channel
Single-Ended CVBS	Default	Default	Default	Default	See the Configuring $A_{IN}5$ and $A_{IN}6$ for Single-Ended CVBS section	See the Configuring $A_{IN}5$ and $A_{IN}6$ for Single-Ended CVBS section
Differential CVBS	See the Configuring $A_{IN}1$ and $A_{IN}2$ for Differential CVBS section	See the Configuring $A_{IN}1$ and $A_{IN}2$ for Differential CVBS section	See the Configuring $A_{IN}3$ and $A_{IN}4$ for Differential CVBS section	See the Configuring $A_{IN}3$ and $A_{IN}4$ for Differential CVBS section	Default	Default
S-Video (Y/C)	S-Video Input 1 (Y channel)	S-Video Input 1 (C channel)	S-Video Input 2 (Y channel)	S-Video Input 2 (C channel)	See the Configuring $A_{IN}5$ and $A_{IN}6$ for S-Video (Y/C) section	See the Configuring $A_{IN}5$ and $A_{IN}6$ for S-Video (Y/C) section
YPrPb	YPrPb Input 1 (Y channel)	YPrPb Input 1 (Pb channel)	YPrPb Input 1 (Pr channel)	Not applicable	Not applicable	Not applicable

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 ($A_{IN}1$ to $A_{IN}6$) 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 I^2C 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.

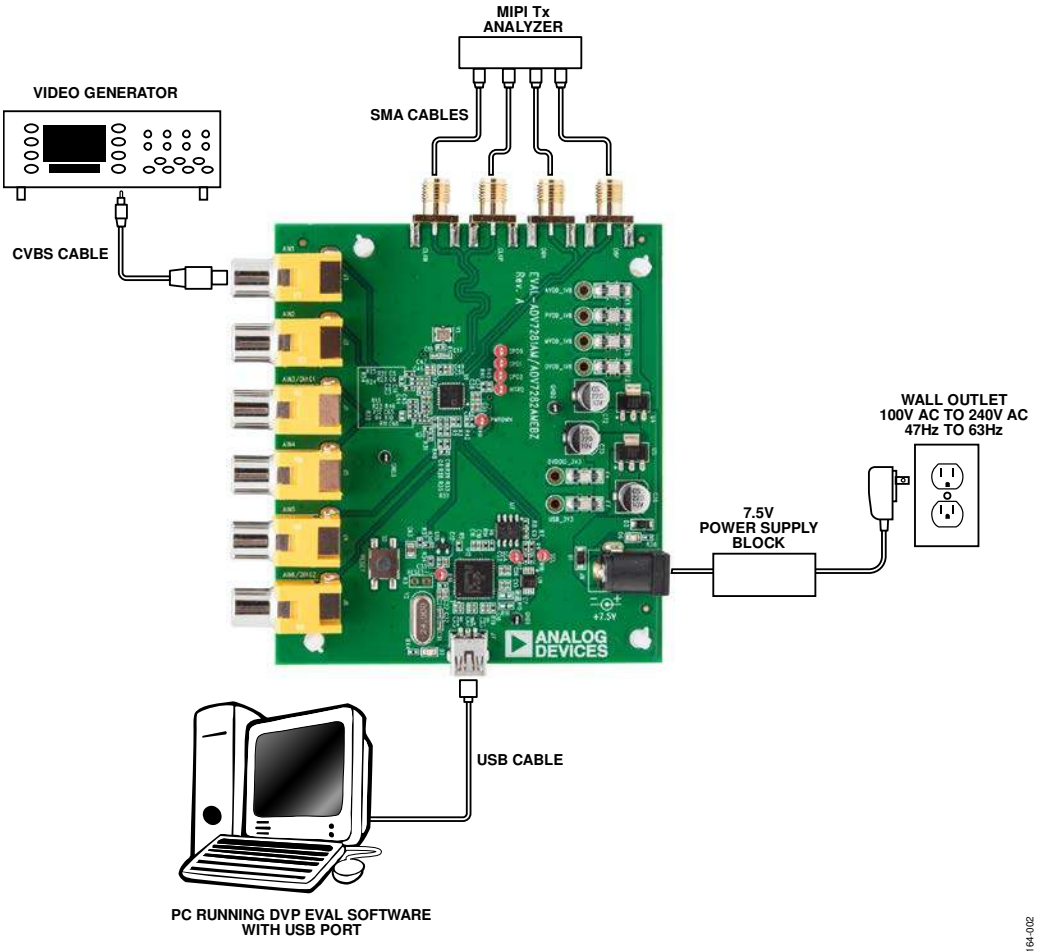

Figure 2. Outline of Evaluation Board Connections

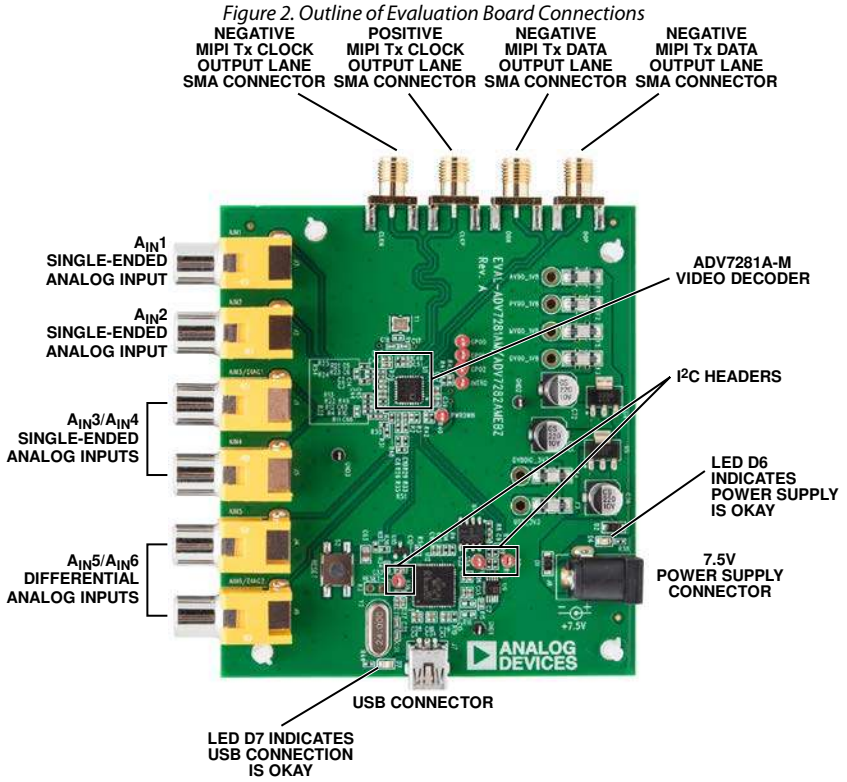

Figure 3. ADV7281A-M Evaluation Board

Table 2. Important Evaluation Board Components

Reference Designator	Function	Description
J1 to J6	Analog video inputs	Analog video inputs ($A_{IN}1$ to $A_{IN}6$) connected to the ADV7281A-M video decoder.
D0N, D0P, CLKN, CLKP	MIPI Tx outputs	MIPI Tx data (D0P and D0N) and clock (CLKP and CLKN) outputs.
J8	Power	Connection for 7.5 V power supply. A 7.5 V power supply block is included in the EVAL-ADV7281AMEBZ evaluation kit.
D6	Power enabled LED	The LED illuminates when the 7.5 V supply is connected and enabled.
J7	USB	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.
D7	USB connected LED	The LED illuminates when the USB cable is connected between an active USB port on a PC and the evaluation board.

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

Table 3. Additional Evaluation Board Components

Reference Designator	Function	Description
$\overline{\text{INTRQ}}$	INTRQ output	Interrupt output from the ADV7281A-M.
Reset and S2	Reset	The evaluation board can be reset by pressing and releasing the push button "S2." The evaluation board can also be reset by momentarily connecting the "Reset" test point to 0 V.
SDA and SCL	I^2C communication bus	Test points. The SDA (I^2C data) and SCL (I^2C clock) test points provide access to the I^2C communication bus on the evaluation board. This allows an external I^2C master to be connected instead of using a PC to configure the evaluation board.
GPO0, GP01, GP02	General purpose output	General purpose output test points.
K3	EEPROM Programming	Never short Jumper K3 and only employ K3 during initial programming. K3 can disable the USB interface on the evaluation board.

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
2. Download the **Install DVP Eval Latest Source 10-14-11.exe.zip** file.
3. Unzip the **Install DVP Eval Latest Source 10-14-11.exe.zip** file.

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.zip**.
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.

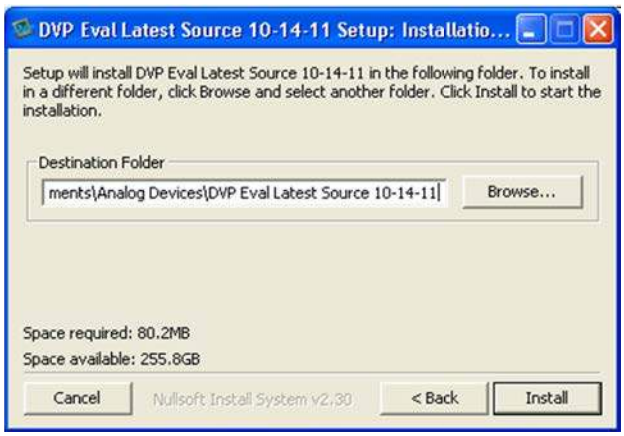

Figure 4. Installation Destination for DVP Eval Software

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).

Figure 5. Update Board Files on the DVP Eval Software

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).

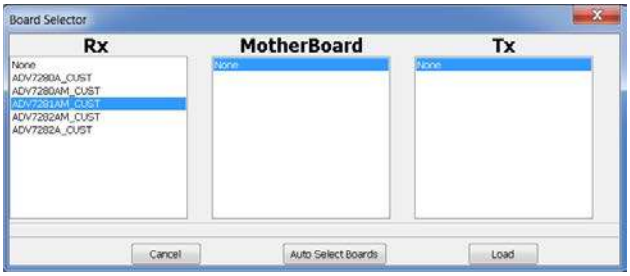

*Figure 6. **Board Selector** Window of DVP Eval Software*

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).

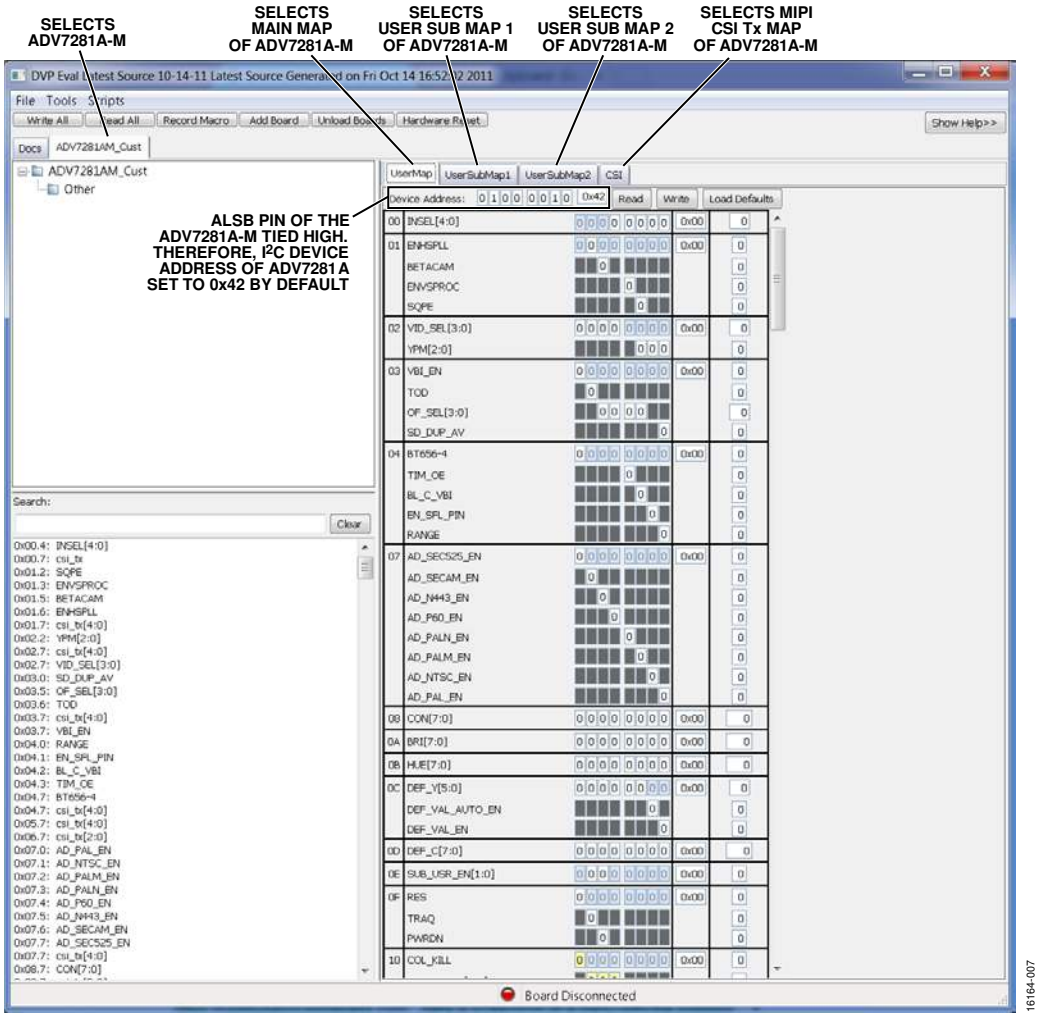

Figure 7. DVP Eval Software After Connecting the ADV7281A-M Evaluation Board

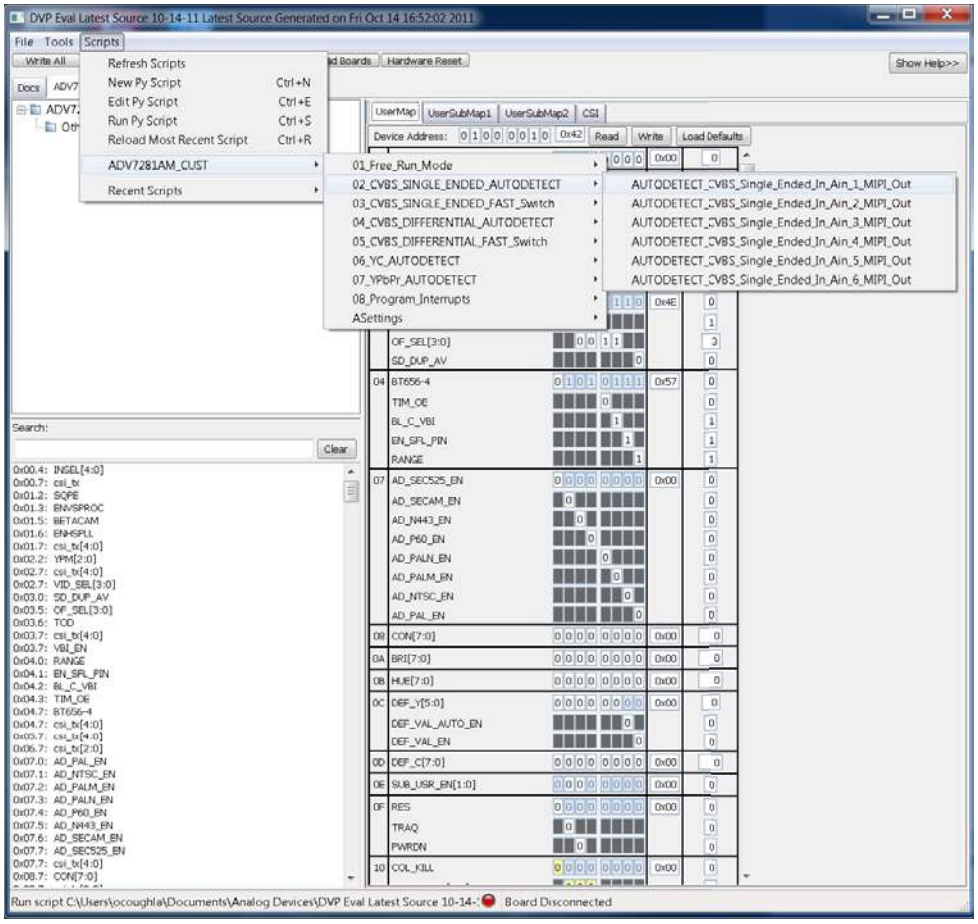

Figure 8. Running ADV7281A-M Script on DVP Eval Software

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

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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