

Advantiv EVAL-ADV7850 Video Evaluation Board

FEATURES

- 4 HDMI inputs, 1 HDMI output
- 1 VGA input, 1 component input
- 1 CVBS input, 1 headphone output
- 1 audio DAC output, 1 audio ADC input
- PC communication via [RS-232](#) or USB interface

EQUIPMENT NEEDED

- Computer with [RS-232](#) (or USB) I/O to
 - Send scripts to the command line interface of the board
 - Send commands to the repeater software of the board and view resulting software output
 - Control the board via Advantiv video evaluation software (AVES) application
 - Update the firmware of the board (if desired or necessary)

SOFTWARE NEEDED

- Windows OS for controlling the board via AVES application
- [RS-232](#) software for updating the firmware of the board (if desired or necessary)

GENERAL DESCRIPTION

The Advantiv® EVAL-ADV7850 video evaluation board (AVEB) is a low cost solution for evaluating the performance of the [ADV7850](#) HDMI transceiver.

The evaluation board contains a Blackfin® [ADSP-BF524](#) processor for system control. The evaluation board includes software (firmware) that provides a serial command interface to control the various features and functions of the board.

PHOTOGRAPH OF EVALUATION BOARD

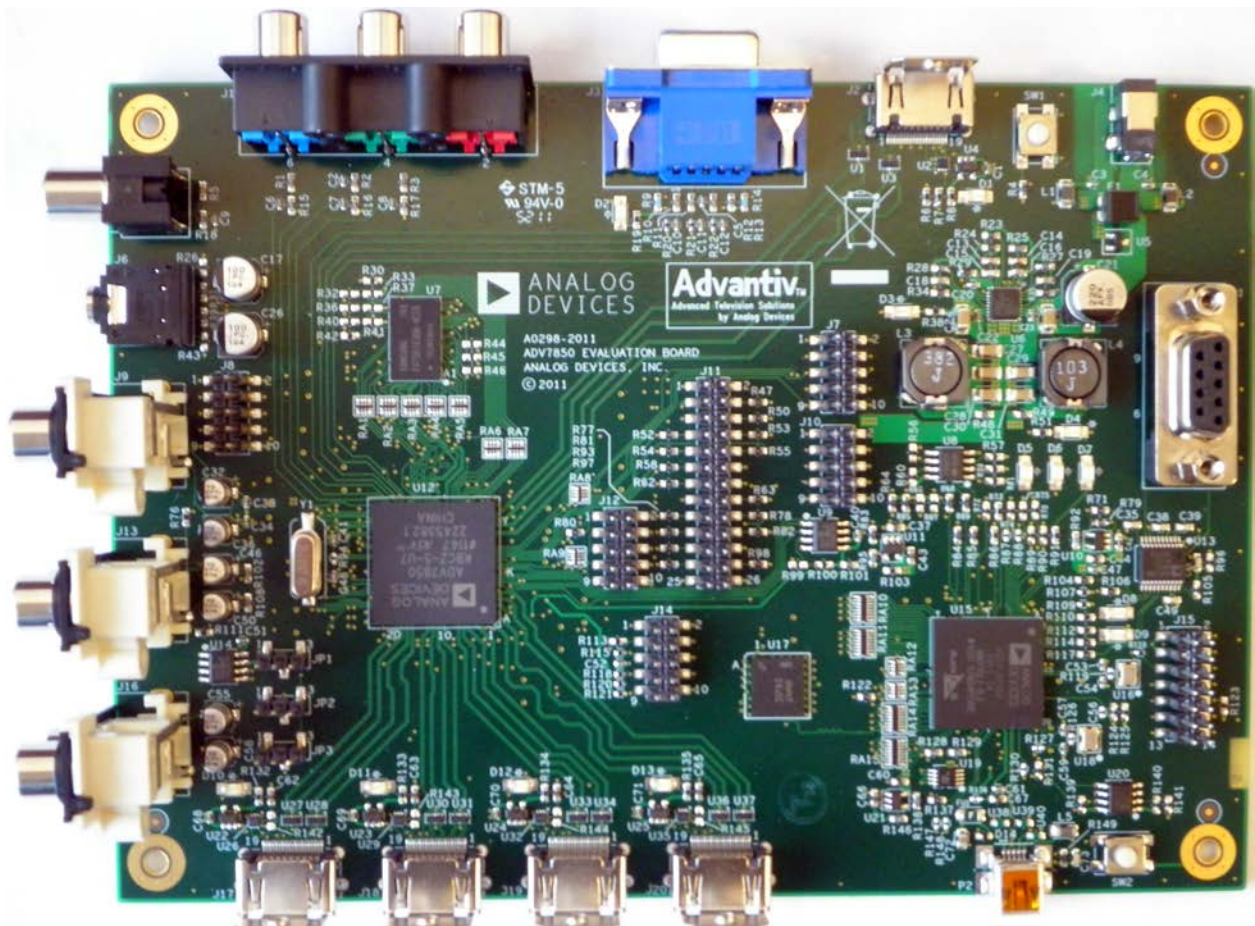


Figure 1. Advantiv EVAL-ADV7850 Video Evaluation Board with Factory Jumper Settings

10746-001

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REVISION HISTORY

7/12—Revision 0: Initial Version

TERMINOLOGY

Source

A source outputs digital audio/video over a DVI/HDMI, component, VGA, or CVBS interface. This can be a DVD/Blu-ray player, set-top box, game console, or any other device with these outputs.

Sink

A sink accepts video through a DVI/HDMI interface. In the context of this user guide, sink nearly always refers to a display with DVI/HDMI input.

Repeater

With respect to this evaluation board, a repeater refers to the software that runs on the [ADSP-BF524](#) and implements the link between a source and sink.

EVALUATION BOARD HARDWARE

EVALUATION BOARD USAGE

The evaluation board can be connected as shown in Figure 2. An HDCP license is required to purchase this board.

The [RS-232](#) command line interface operates at a 115,200 baud rate with eight data bits, no parity bit, one stop bit, and no flow control. Typing **help** via [RS-232](#) lists the commands that can be used to control the board, as well as the version of firmware and the build date.

The repeater software starts upon power-up, allowing an HDMI sink to receive content from an HDMI/HDCP source soon after it is connected.

There are three main ways to control the board:

- Commands via [RS-232](#)
- Repeater software via [RS-232](#)
- Advantiv video evaluation software (AVES)

Commands via [RS-232](#)

This mode uses the [RS-232](#) command line interface. The [ADSP-BF524](#) powers up to a known reset state and then outputs a prompt. At this point, commands can be entered. Typing **help** shows a list of available commands. Using the appropriate commands, the user can read/write registers in the [ADV7850](#). All registers are at their reset values.

It is possible to stop the repeater software in this mode by issuing a stoprep command via the [RS-232](#). To restart the repeater software issue a startrep command via the [RS-232](#).

Repeater Software via [RS-232](#)

This mode uses the [RS-232](#) command line interface to control the repeater software and to direct reads and writes to the [ADV7850](#) registers. The repeater software outputs messages via [RS-232](#) as events, such as encryption, formats, sink, or source changes, occur. Registers can still be read/written from the command line, but anything that is written to a register can be overwritten by the repeater software if it is running.

In this mode, there are additional commands from the repeater itself. All repeater commands are in the rep xxx format, where xxx is the repeater command. Issue a rep help command to view a list of the available repeater commands. These commands provide information about the state of the repeater, source, and sink.

AVES

AVES is a Windows®-based application that runs on a PC and allows the user to read/write registers in the [ADV7850](#). The software also displays the individual bit fields for each register and allows the user to modify these individual bit fields. The software supports [RS-232](#), USB, and I²C (using the Total Phase Aardvark I²C/SPI host adapter). Information about the video evaluation board is located on the [EVAL-ADV7850](#) page on EngineerZone at ez.analog.com/docs/DOC-2152.

Additional information about the software is located at ez.analog.com/docs/DOC-1789. The latest version of the software can also be downloaded from this Web page.

HEADERS

This evaluation board has multiple 0.1 inch headers that connect to the digital audio/video signals (as well as some control signals). This provides users with easy access and maximum flexibility when evaluating devices.

Table 1 to Table 5 provide details about the physical arrangement on the board and may be useful when probing these signals.

Table 1. J11 Off-Board I²S

Pin	Function	Pin	Function
1	3.3 V	2	3.3 V
3	GND	4	HA_AP4
5	GND	6	HA_AP5
7	HA_APO	8	HA_SCLK
9	HA_AP1	10	HA_MCLKOUT
11	HA_AP2	12	GND
13	HA_AP3	14	GND
15	GND	16	AC_MCLK
17	AC_SDI	18	AC_LRCLK
19	AC_SCLK	20	SPDIF_IN
21	NC	22	GND
23	SCL	24	SDA
25	GND	26	GND

Table 2. JP1, JP2, JP3

Pins Shorted	Function
JP1-1, JP1-2	DDC_5V to EDID PROM
JP2-1, JP2-2	DDC_SCL to EDID PROM
JP3-1, JP3-2	DDC_SDA to EDID PROM
JP1-2, JP1-3	Board 3.3 V to EDID PROM
JP2-2, JP2-3	Board SCL to EDID PROM
JP3-2, JP3-3	Board SDA to EDID PROM

Table 3. J12 TTX

Pin	Function	Pin	Function
1	HA_AP3	2	GND
3	TTX_SCLK	4	GND
5	TTX_MOSI	6	GND
7	TTX_MISO	8	GND
9	TTX_CSB11	10	GND

Table 4. J14 Resets/Interrupts

Pin	Function	Pin	Function
1	RESET_BUTTONn	2	GND
3	BF524_RESETh	4	GND
5	ADV7850_RESETh	6	GND
7	ADV7850_INT1	8	GND
9	ADV7850INT2	10	GND

Table 5. J10 General-Purpose Input/Output

Pin	Function	Pin	Function
1	GPIO_PFO	2	GND
3	GPIO_PF1	4	GND
5	GPIO_PF2	6	GND
7	GPIO_PF3	8	GND
9	GPIO_PF4	10	GND

AUDIO CODEC FUNCTIONALITY

The audio codec requires an external MCLK. Insert the desired clock signal into J11-16 with CMOS-compliant amplitudes. Reference the Hardware Manual Paragraph 11.3 in [DOC-2152](#) for nominal frequencies.

EVALUATION BOARD SOFTWARE

UPGRADING THE FIRMWARE

The software (firmware) on the evaluation board can be upgraded using the standard Blackfin development tools.

- VisualDSP++ 5.0 Update 8
- JTAG debugger for Blackfin processors (HPUSB-ICE or ICE-100B) connected to the JTAG connector (J7)

Using these tools, you can connect the evaluation board to the [ADSP-BF524](#) processor, run a script, and program the SPI flash memory device (U10).

Most evaluation boards for Blackfin processors are shipped with the Das U-Boot boot loader firmware, and you can upgrade the firmware using only an [RS-232](#) cable and software. If you see the following output after resetting the board or applying power, your evaluation board has U-Boot:

```
U-Boot 2010.06 (ADI-2010R1-RC2) (Jan 12 2011
- 15:53:34)
```

```
CPU:   ADSP bf524-0.2 (Detected Rev: 0.2)
(spi flash boot)

Board: ADI Advantiv™ Video Evaluation Board
      Support: http://ez.analog.com

Clock: VCO: 300 MHz, Core: 300 MHz, System:
100 MHz

RAM:   8 MiB

SF: Detected M25P80 with page size 256,
total 1 MiB

In:    serial
Out:   serial
Err:   serial

KGDB: [on serial] ready

Hit any key to stop autoboot:
```

If your evaluation board has U-Boot, you can use the following steps to upgrade the application firmware of your board (if you determine that this is necessary). These instructions assume that you are using the latest version of Tera Term for Windows (which is free to download and use), but any [RS-232](#) software with YMODEM upload capability should also work.

1. After you see the **hit any key to stop autoboot** prompt, press a key during the countdown. You should then see a prompt, **bfin >**.
2. At the prompt, type the following command:

```
sf probe 0:1
```

You should see the following:

```
SF: Detected M25P80 with page size 256,
total 1 MiB

1024 KiB M25P80 at 0:1 is now current
device

bfin>
```

3. At the prompt, type the following command:

```
loady
```

You should see the following output:

```
## Ready for binary (ymodem) download to
0x00100000 at 115200 bps...

C
```

4. In Tera Term, under **File**, click **Transfer** and then **YMODEM**, and select **Send...**
5. Select the application firmware (for example, **EVAL-ADV7850_v1p0_app.bin**) and click **Open**.
6. You should see the YMODEM send dialog box progress quickly from 0% to 100%. If the software stalls at Packet 1 or Packet 2 for a few seconds, you may need to cancel and retry. It is possible that you may need to repeat Step 3 through Step 5 a few times to accomplish the transfer. After the transfer is complete, you should see the following:

```
CCxyzModem - CRC mode,
0(SOH)/215(STX)/0(CAN) packets, 5 retries
## Total Size      = 0x000357fc = 219132
Bytes

bfin>
```

7. At the prompt, type the following command to erase the application area of the SPI flash memory:

```
sf erase 0x60000 0xa0000
```

You should then see the following output:

```
bfin>
```

8. At the prompt, type the following command to program the application area of the SPI flash memory:

```
sf write $(loadaddr) 0x60000 $(filesize)
```

You should then see the following output:

```
bfin>
```

9. At this point, if you reset your board and allow the countdown to complete, U-Boot should launch the application firmware that was just programmed.

EVALUATION BOARD BLOCK DIAGRAM AND ARTWORK

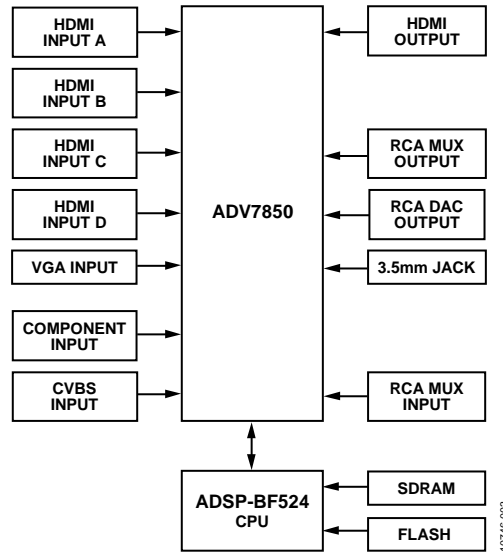


Figure 2. Block Diagram of the EVAL-ADV7850 (for the Evaluation Board Schematics, see DOC-2151)

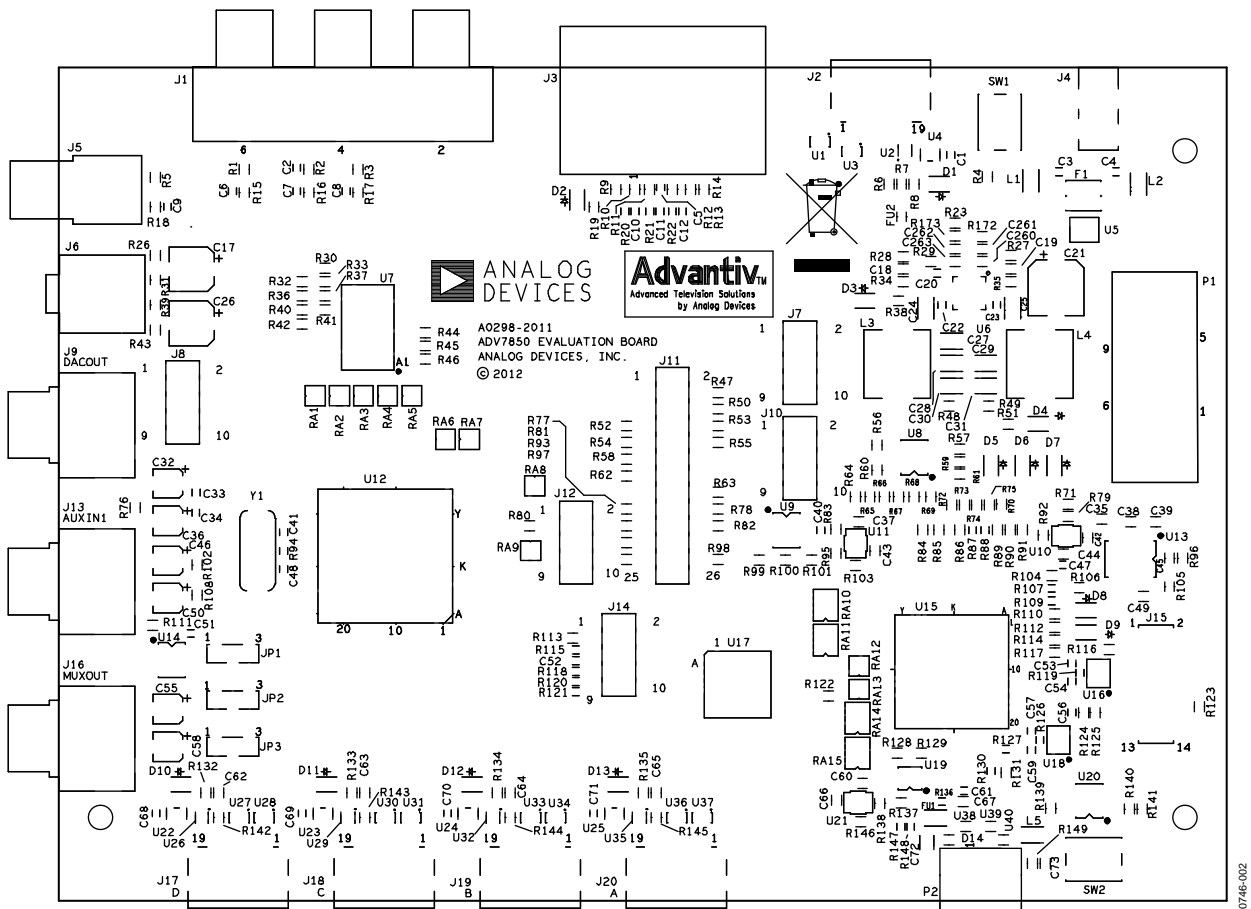


Figure 3. Assembly Drawing (Top Side) of the EVAL-ADV7850

BILL OF MATERIALS

Table 6. Evaluation Board Hardware Components

Reference Designator	Function	Description
D1	Tx HPD	Hot plug detect signal of the HDMI transmitter. Indicates status of respective HDMI HPD.
D10, D11, D12, D13	Rx HPD	Hot plug detect signal of the HDMI receiver. Indicates status of respective HDMI HPD.
D2	VGA of 5 V	Indicator of 5 V variable gain amplifier connection.
D3	1.8 V	Indicator of 1.8 V power supply.
D4	5 V	Indicator of 5 V power supply.
D5	LED	Read indicator. Illuminates when I ² C data is read from the board.
D6	LED	Write indicator. Illuminates when I ² C data is written to the board.
D7	LED	General indicators. Undefined at present.
D8	Repeater	Repeater indicator. Indicates when repeater is active.
D9	Heartbeat	Heartbeat LED. Blinks at ~0.5 Hz rate when code is running.
J1	Component input	RCA component input.
J10	GPIO	General-purpose input/output.
J11	I ² S header	I ² C digital audio header.
J12	VBI data processor header	TTX connection.
J13	Audio codec mux input	RCA stereo audio mux input.
J14	Chip reset/external interrupt header	Reset and interrupt header for external connection and monitoring.
J16	Audio codec mux output	RCA stereo jack input.
J2	HDMI output	This is the only video output connector.
J17, J18, J19, J20	HDMI inputs	J20 is HDMI Port A, J19 is HDMI Port B, J18 is HDMI Port C, J17 is HDMI Port D.
J3	VGA input	VGA input.
J4	Power	Power input 5 V, 2.5 A
J5	CVBS input	CVBS input.
J6	HPOUT	3.5 mm stereo jack output.
J7	SPI header	SPI header, Aardvark compliant.
J8	I ² C header	I ² C header, Aardvark compliant.
J9	DAC output	Stereo audio DAC output.
JP1, JP2, JP3	EDID jumpers	Jumper headers for directly connecting EDID EPROM to either Port D or I ² C bus.
P1	RS-232 port	RS-232 interface to the computer (for user control and debug output).
P2	USB port	This USB port can be used instead of RS-232 if the computer in use does not have the RS-232 interface.
SW1	Power switch	Momentary power-down switch. Emulates unplugging and plugging in the power supply.
SW2	Reset switch	Switch that resets the ADSP-BF524 .

RELATED LINKS

Resource	Description
ADV7850	Product Page, ADV7850 Complete AV Front End
ADSP-BF524	Product Page, ADSP-BF524 Low Power Blackfin Processor with Advanced Peripherals and Low Standby Power
DOC-2152	ADV7850 Design Support Files
DOC-2151	Advantiv EVAL-ADV7850EBZ Video Evaluation Board
DOC-1789	Advantiv Video Evaluation Software

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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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