User's Guide
EVD1000 Developer's Kit – Digital

Introduction

EVD makes available to its customers various platforms to aid in easy evaluation of the video enhancement capabilities of the EVD1000 series chips, and to prepare for straightforward integration into the customer's own systems. These platforms consist in general of the following elements:

- Video input stage
- EVD1000 series enhancement stage
- Video output stage
- User interface controlling basic features
- USB connectivity for access to advanced features

The present document is applicable to EVD's digital Technology Demonstrator board, designed for operation with ATSC standard HDMI/DVI video input/outputs. This document contains instructions necessary to get the hardware up and running and begin processing video using the basic user interface, and provides a framework and jumping-off point for integration efforts. As noted herein below, other documents are available which cover advanced features in more detail (some under mutual Non-Disclosure Agreement); please consult the factory for additional information as required.

When beginning to evaluate the EVD1000 series chips using our Technology Demonstrator boards, it is very important to observe three points:

1. Digital-based Demonstrators necessarily contain digital receiver and transmitter chips as appropriate for standard off-board communication protocols. This and other circuitry external to the EVD1000 series chip may place limits on the video formats the Demonstrator board can handle, which are not indicative of limitations in the enhancement chip. For example, the present digital Demonstrator board can accommodate standard video up through 1080i. The EVD1500 is capable of processing 1080p.

2. The Demonstrators contain three parameter presets that allow easy access to three levels of enhancement. Since nearly every application is unique and therefore may require its own set of enhancement parameters, it is quite possible that none of the three presets perfectly suits your particular needs. The Advanced Feature interface permits the user to tune parameters to individual needs and to save these parameter sets as custom presets on the board for standalone use.

3. The physical size of Demonstrator circuit boards can be deceiving - some are (much) larger than is required due to a number of reasons; however, the EVD1000 series is a single-chip enhancement solution which is easily integrated into virtually any digital video path. Consult the datasheet and application notes for specifics.

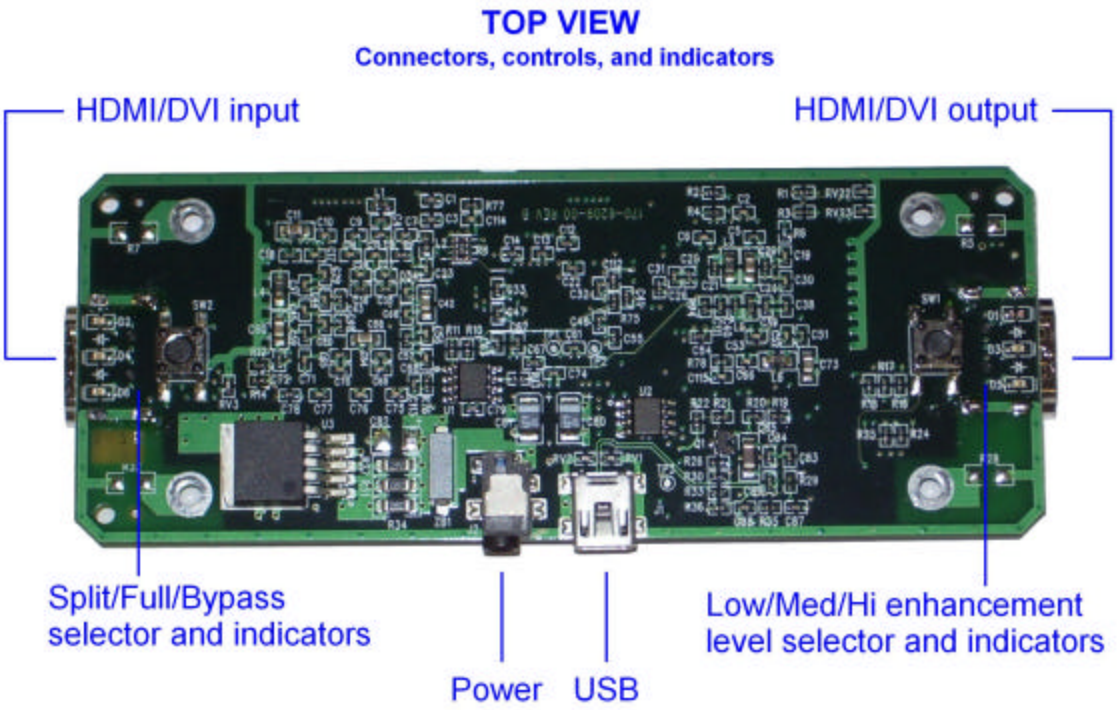
Developer's Kit Contents

The EVD1000 Developer's Kit – Digital (DKD-HDMI) contains the following:

- Circuit board containing EVD1000 enhancement chip; the board is mounted on a Plexiglas plate for stability and ease of handling
- AC Plug-in power supply, provides 5VDC to the board
- This User's Guide

Circuit Board Layout

The digital Demonstrator circuit board is pictured below. Locations of all video and power connectors are shown, as are the display mode and enhancement level controls and indicators.



Connections

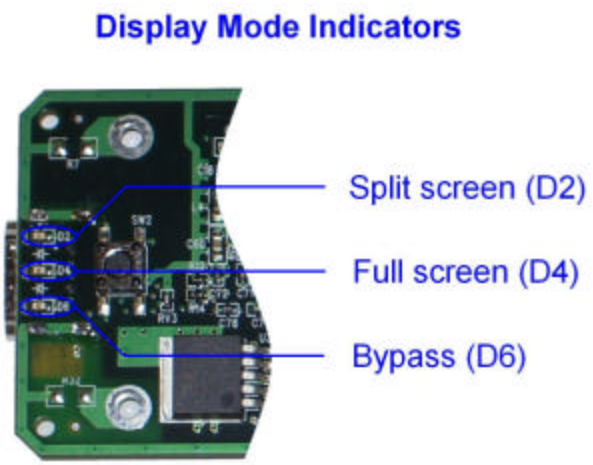
The EVD digital Demonstrator supports ATSC standard video in HDMI format, as well as in DVI format (using passive adapters available separately).

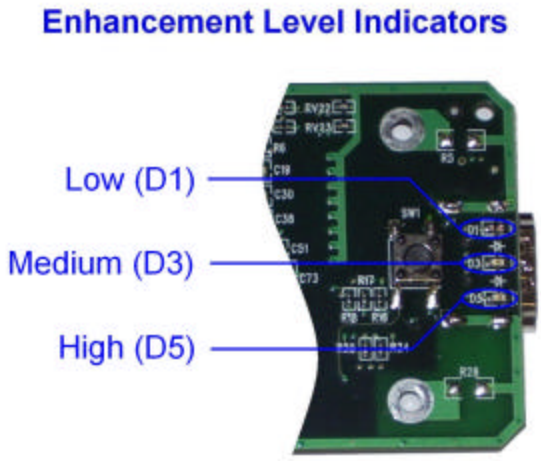
- Connect your video source to the appropriate input connector,
- connect your video display to the appropriate output connector, and
- connect the power supply cord to the power connector, and plug the AC adapter into a wall outlet.

Operation

Upon application of power and valid input video, the Demonstrator will first flash all indicators in sequence for approximately two seconds. Some indicators may then flash briefly as the source and display devices are interrogated.

Following this action, if a proper source and display are present, the hardware will begin processing video per the current settings, and update the indicators as shown in the figures below:





If at any time the hardware detects no valid video source connected at its input, it will for a period of approximately 15 seconds flash the Full Screen display mode indicator, and no video will be present at the output connector. Following this period, if there remains no valid video source at the input, the unit will enter "sleep" mode, in which all indicators are OFF and the output is inactive.

If at any time valid video is applied to the input connector, the unit will begin processing as described above.

Similarly, if at any time the hardware detects no valid display connected at its output, it will flash the Medium enhancement level indicator. Again, if at any time a valid display is connected to the board's output, the unit will continue processing as described above.

On-board User Interface

The basic user interface comprises the following controls and indicators:

Display mode switch SW2,
Display mode indicators D2, D4, and D6,
Enhancement level switch SW1, and
Enhancement level indicators D1, D3, and D5.

Refer to the illustrations above for locations of these items.

Display Mode

There are three display modes: Full Screen, Split Screen, and Bypass. Pressing the Display Mode switch cycles thru these modes and updates the indicators to show the currently selected mode.

In Full Screen mode, the entire video field is enhanced per the current parameters.

In Split Screen mode, the left half of the video field is left unenhanced (see BYPASS below) while the right half of the video field is enhanced per the current parameters. This allows a convenient method for comparing the effects of enhancement in a side-by-side manner.

In Bypass mode, the enhancement parameters are all set to unity gain such that the data output from the EVD1000 exactly matches the data input to it. Note that in this mode, the enhancement level indicators are OFF; also, note that the data still passes through the input and output conversion stages.

Preset Enhancement Levels

There are three preset enhancement levels that are selectable on the Demonstrator board: low, medium, and high. Note that these names do not necessarily indicate relative levels, since it is possible to store virtually any combination of enhancement parameters in each of the three preset positions, see below; however, the factory default settings do correspond to general "low," "medium," and "high" levels of enhancement. Pressing the Enhancement Level switch cycles thru these presets and updates the indicators to show the currently selected level (unless, as indicated above, the current Display Mode is set to BYPASS).

Advanced Feature Interface

For further investigation of the EVD1000 series capabilities, including the numerous enhancement parameters which control the detailed characteristics of the processing performed, the registers in the EVD1000 on the Demonstrator board can be accessed directly via an external PC connected to the board by means of a standard USB cable. EVD provides VideoTuner, a Windows®-based (Windows 2000, XP, and Vista) application for this purpose. The latest version can be downloaded from EVD on the web. Installation is generally straightforward and performed in the usual manner. Detailed installation instructions for this application can also be found in a separate Application Note.

The EVD application contains the ability to control each of the registers in the EVD1000 series chips using on-screen sliders. A panel is provided which, by default, contains sliders for several of the parameters which we have found most often adjusted in customizing the chip's performance to specific applications and in tailoring the enhancement to suit a particular customer's image processing preferences. The user can create custom sets of such sliders, as well as initial values for those parameters, and save and restore these using the local PC hard drive. An Application Note describing the use of this application in accessing these and other advanced operational features is available, as well as the EVD1000/1500 data sheet which discusses the available parameters.

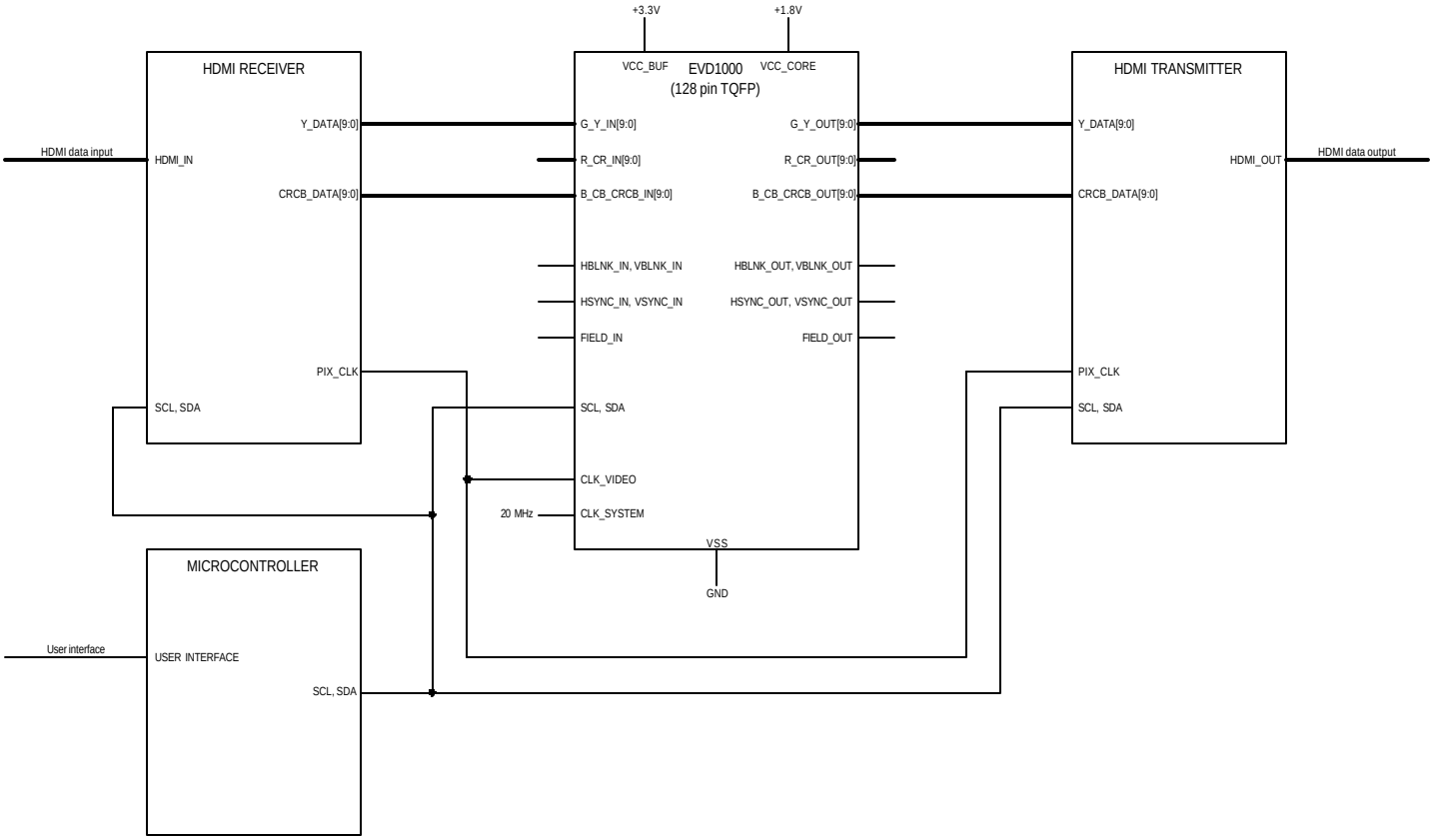
Advanced users can also write their own software to control the setting of EVD1000 series parameters on the Demonstrator board; commanding protocol information is available from the factory. This can be done, for example, as a precursor to the user-developed software running in a microprocessor on a customer's board designed for a specific application.

User-customizable Presets

The EVD application also includes a mechanism whereby parameter settings as defined on the slider panel may be stored into the three presets on the Demonstrator board, for later use with the board in stand-alone mode (without USB connection). This allows a customer to configure the board with enhancement capability of their own choosing, tailored for a specific application, and then, for example, send it out for operation in the field in compact form without the need for additional ancillary equipment. The customizable preset capability on the Demonstrator boards can also be accessed directly via the USB interface. The use of these features is also described in detail in an additional Application Note.

Circuit Implementation

The block diagram below is representative of the Demonstrator board, and also provides a simple example application for use in other existing systems. It shows all of the possible major commonly used inputs/outputs of the EVD1000, but highlights the very simple basic connections required for operation in this mode.



Here, video input and output for the EVD1000 is shown as YCrCb 4:2:2 digital data with embedded SAV and EAV codes (hence the use of blanking/sync inputs/outputs are not required). The standard receiver and transmitter handle the conversion to/from HDMI/DVI video signals which are in this case external to the board. Note that in this mode, the video data clock for all components on the board is derived from the input data stream by the HDMI receiver. As can be seen from the diagram, this is a particularly simple and easy-to-implement connection scheme, although the use of the EVD1000 with

other data formats and synchronization structures is of course possible as well, with not much greater complexity required.

In the present case, the EVD1000 is controlled via an industry-standard two-wire serial configuration bus (SCL, SDA), along with the video decoder and encoder. Power-up initialization, mode selection, and all enhancement parameter selection is accomplished using this mechanism. The microcontroller also handles the simple example user interface in this design.

As described in an Application Note (and the data sheet), it is possible to operate the EVD1000 without a microcontroller for an even simpler circuit design, through the use of suitably chosen dedicated EVD1000 pins, pull-up resistors, etc. for mode and format control and basic enhancement level selection. But in any applications (such as this example) which already include a microcontroller with serial configuration bus capability for other purposes in the customer's system design, complete control over all of the enhancement modes, parameter registers, and other advanced features is readily available with no additional components or hardware effort.

A more detailed schematic for the digital Demonstrator board is also available from EVD. The presently shown application and a number of other connection methods are described in more detail in a series of Application Notes as well as in the data sheet.

Conclusion

As can be seen, circuit implementation for integration of the EVD1000 series chips in a customer design is very straightforward. Familiarization with the operation and selection of enhancement parameters for various applications is facilitated by the use of the Demonstrator board, and software development can occur in parallel to customer board design and construction. Numerous application and design aids are available from EVD to help guide all phases of the process.

For further questions or clarifications, contact your sales representative or the factory for additional support.

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