Application Report
SPRA932 A–August 2004

Driver Examples on the DM642 EVM

Video and Imaging Systems

ABSTRACT

The video driver example suite has twelve examples that illustrate the use of the video driver on the DM642 Evaluation Module (EVM). The examples cover all supported video capture- and display formats, and are grouped in seven project categories:

- NTSC capture and display
- PAL capture and display
- 16-bit RGB565 VGA display and NTSC/PAL capture
- 8-bit grayscale VGA display and NTSC/PAL capture
- 480p/720p/1080i High-definition display and NTSC/PAL capture
- Capture scaling using the scaling capability of the Phillips SAA7115 video decoder
- Run-time switching of video input sources

This application report explains how to build and run the examples and how to modify an existing project to support a different format.

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1 Overview

The video driver examples are located under ti\boards\evmdm642\examples\video\driver. There are five projects in the driver directory:

- ntsc.pjt for NTSC capture and display.
- pal.pjt for PAL capture and display.
- vga.pjt for 16-bit RGB565 VGA display and NTSC/PAL capture.
- hd.pjt for high-definition display and NTSC/PAL capture.
- scaling.pjt for capture scaling using the scaling capability of the Phillips SAA7115 video decoder.
- grayscale.pjt for 8-bit grayscale VGA display.
- switchcamera.pjt for run-time switching of video inputs of the SAA7115s.

Each of the first four projects has three configurations:

- DISPLAY_ONLY: Running color bars display
- LOOPBACK: Single-channel capture and display loop-back
- LOOPBACK_PIP: Dual-channel capture and picture-in-picture display loop-back

Table 1 summarizes the projects, configurations, and supported video formats. The formats in bold are default settings of the examples

Table 1. Projects, Configurations, and Supported Video Formats

		DISPLAY_ONLY	LOOPBACK	LOOPBACK_PIP
NTSC	Display	NTSC with BT.656 embedded sync. NTSC with external timing control.		
	Capture	**NTSC with BT656 embedded sync. NTSC with external timing control.**		**NTSC with BT.656 embedded sync.**
PAL	Display	PAL with BT.656 embedded sync. PAL with external timing control.		
	Capture	**PAL with BT656 embedded sync**. PAL with external timing control.		**PAL with BT.656 embedded sync.**
VGA	Display	RGB566 640x480 @60Hz RGB565 800x600 @60Hz **RGB565 1024x768 @60Hz**		
	Capture	**NTSC with BT656 embedded sync.** NTSC with external timing control.		**NTSC with BT.656 embedded sync.**
HD	Display	480p@60fps 720p@60fps **1080i@30fps**		
	Capture	**NTSC with BT656 embedded sync.** NTSC with external timing control.		**NTSC with BT.656 embedded sync.**

Table 2 summarizes the configurations and supported formats for the scaling project. The formats in bold are default settings of the examples.

Table 2. Configurations and Supported Scaling Project Formats

Video source format (camera, DVD player, etc.)	Configurations		
	scaling_NTSC	scaling_PAL	scaling_USER
NTSC	**CIF**, QCIF, SQCIF, SIF, NTSC640 (square pixel)		352x240 or any resolution that is a scale-down. The scaled frame can be either interlaced or progressive.
PAL		**CIF**, QCIF, SQCIF, SIF, PAL768 (square pixel)	Any resolution that is a scale-down.

The scaling example uses the hardware scaler in SAA7115. It can be easily modified to support different image sizes such as VGA, SIF, CIF, QCIF, and any user defined image sizes. For more information, please refer to the comments in the video_scaling.c file located at \TI_DIR\boards\evmdm642\examples\video\driver\test.

The grayscale display example illustrates how to display 8-bit grayscale image using the color look-up table of the SAA7105. By default, the input format is NTSC composite and the output format is 640x480 VGA.

The switchcamera project shows how to switch among video inputs of the SAA7115s while still keeping video source in synchronization with the DSP's video port and EDMA. This is one of the new features supported by the updated video capture driver. The default video format is NTSC, but it can be easily modified to support PAL.

2 Building and Running the Examples

2.1 Hardware Setup

To run the examples, the hardware must be set up properly.

1. The DM642 EVM must be connected to the appropriate power source
2. The XDX510/560 emulator must be connected to the JTAG pins to download the demonstration code to the board and control it from Code Composer Studio™ Integrated Development Environment (IDE).

For video input:

1. The RCA connector designated as Composite Video In must be connected to an NTSC (PAL) video source.
2. (Optional, for the LOOPBACK_PIP configurations) The RCA connector designated as Composite Video In II must be connected to NTSC (PAL) video source.

For video output:

1. For NTST and PAL examples (ntsc.pjt and pal.pjt), the RCA connector designated as Composite Video Out (Blue) must be connected to an NTSC and/or a PAL-compatible TV monitor.
2. For VGA examples (vga.pjt), the D-Sub 15 connector designated as RGB Video Out must be connected to a regular computer monitor that supports XGA, SVGA, and VGA resolutions at 60 Hz.

3. For high definition examples (hd.pjt), all three RCA connector designated as Component Out Y/G, Component Out Pr/R and Component Out Pb/B, respectively, must be connected to a high definition TV monitor that can support the 480p, 720p, and 1080i resolutions.

Figure 1 shows the setup to run NTSC/PAL examples in DISPLAY_ONLY and LOOPBACK configurations.

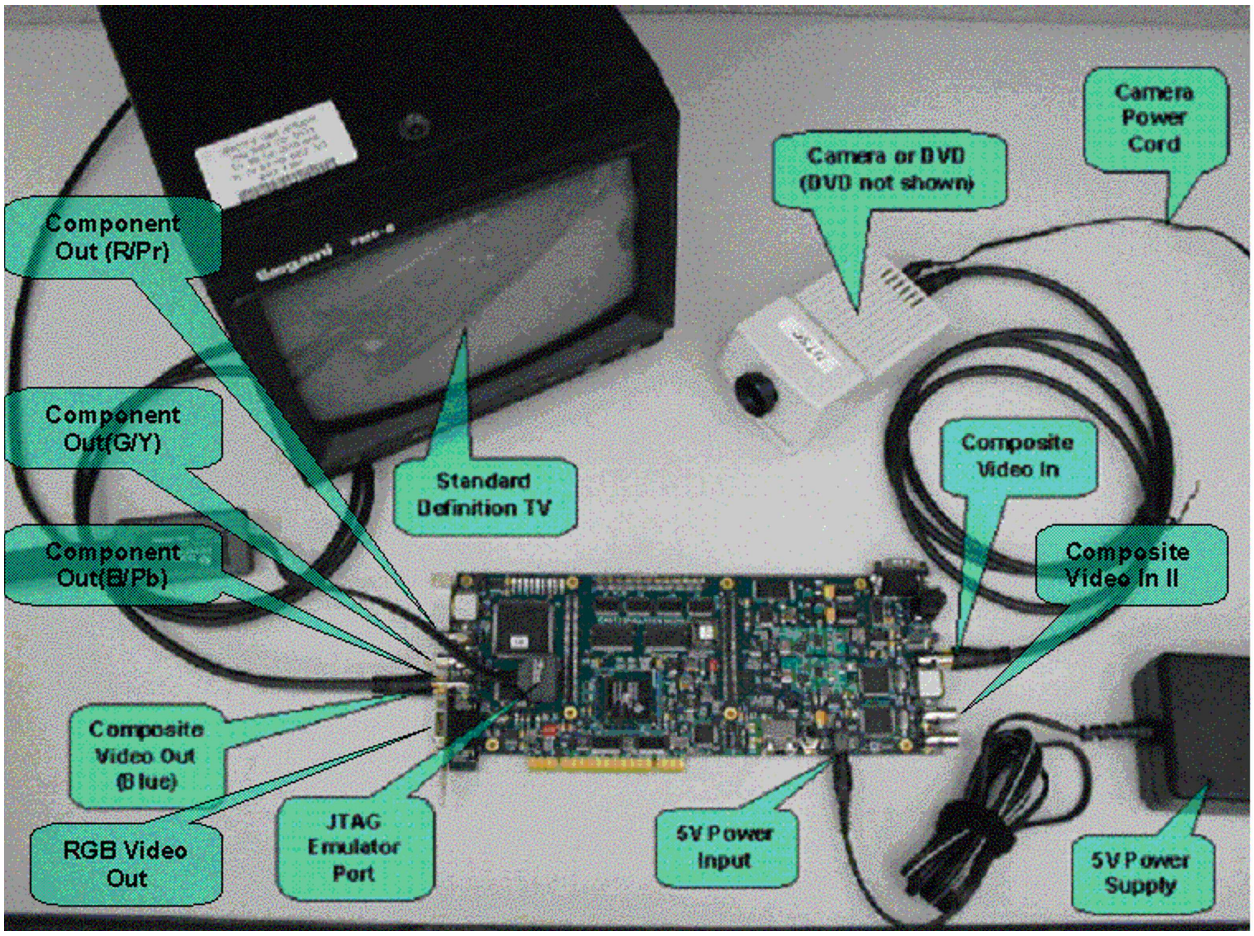

Figure 1. Hardware Setup

2.2 Building the Examples

The simplest way to build all examples is to run the build.bat file in the driver directory from the Windows command interpreter. Use the “-a” option for rebuild all.

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To rebuild an individual example:

1. Start Code Composer Studio™ IDE on your PC.
2. Select Project-> Open to open the project to be rebuilt from the examples\video\driver folder.
3. Select the configuration that needs to be rebuilt from the configuration drop-down list. The default configuration is XXXX_DISPLAY_ONLY.

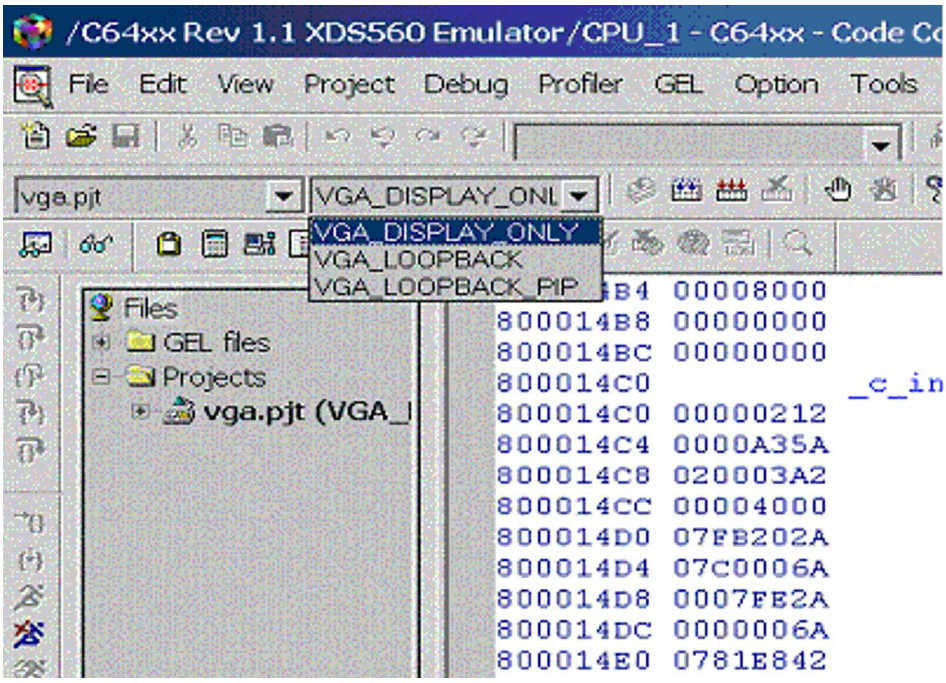

Figure 2. Configuration Drop-Down List

4. Select Project -> Build or Project -> Rebuild All to re-build the project for the selected configuration

2.3 Modifying a Project to Support a Different Video Format

As an example, the following steps explain how to change the video display format in the VGA project (vga.pjt) from the default XGA(1024x768) format to SVGA(800x600) format.

1. Follow steps 1, 2, and 3 in Section 2.2 above to open the vga.pjt project under the examples/video/driver directory and select the configuration to be modified.
2. In line 64, change EVMDM642_DIS_PARAMS_CHAN_RGB565_DEFAULT(XGA) to EVMDM642_DIS_PARAMS_CHAN_RGB565_DEFAULT(SVGA).
3. In line 67, change EVMDM642_DIS_PARAMS_SAA7105_RGB565_DEFAULT(XGA) to EVMDM642_DIS_PARAMS_SAA7105_RGB565_DEFAULT(SVGA)
4. Select Project -> Build or Project -> Build to build the new executable.

For the scaling project, the following steps change the captured image size from the default CIF resolution to QCIF resolution.

1. Follow steps 1, 2, and 3 in Section 2.2 above to open the scaling.pjt project under the examples/video/driver directory and select the configuration scaling_NTSC or scaling_PAL.
2. Select Project->Build Options, in the pop-up window, and select Preprocessor, under Category.
3. Change _CIF in the text box labeled as defined symbols to _QCIF. Click OK.
4. Rebuild the project.

For the scaling project, to change the image resolution to a non-standard size, such as 480 x480:

1. Follow steps 1, 2, and 3 in Section 2.2 to open the scaling.pjt project under the examples/video/driver directory and select the configuration scaling_USER.
2. Open the evmdm642_capParamsSDTVDefault.h file under examples\video\driver\settings\drivers\include\evmdm642_capParamsSDTVDefault.h.
3. Search for USER_LINE_SZ, USER_NUM_LINES_PER_FLD and USER_INTERLACED, modify the values of those as necessary. For example, change USER_LINE_SZ from 352 to 560, change NUM_LINES_PER_FLD from (240>>1) to (360>>1), and change USER_INTERLACED from FALSE to TRUE.
4. Save the file. Rebuild the project.

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