Camera EI3 Extender Board Support Package (BSP) v1.0.0 Release Notes

Thank you for installing the Camera EI3 Extender Board Support Package (BSP). The BSP provides software and documentation in support of the Camera EI3 Extender Board.

The Camera EI3 Extender Board connects to an Analog Devices EZ-Board by means of the Expansion Interface 3 (EI3) interface. The EZ-Board is designed for use with CrossCore® Embedded Studio (CCES) for Analog Devices Processors software development tools. The CCES development environment aids advanced application code development and debug, such as:

- Create, compile, assemble, and link application programs written in C++, C, and assembly
- Load, run, step, halt, and set breakpoints in application programs
- Read and write data and program memory
- Read and write core and peripheral registers
- Plot memory

For more details on CCES, please visit www.analog.com/cces.

For more information on the Camera EI3 Extender Board, please visit www.analog.com/EX3-Camera.

For more information on the ADSP-BF609 EZ-Board, please visit www.analog.com/BF609EZBoard.

The Camera EI3 Extender BSP provides comprehensive software support for the Camera EI3 Extender Board. Specifically, drivers, examples and code sketches are included for the following components:

- MT9V024 Aptina sensor.
- MT9M114 Aptina sensor.

The CCES Help environment provides complete hardware and software documentation.

Installation Logging

The installer does not create a log file by default. If you encounter installation issues, you can generate an installation log file by running the installer from the command prompt.

Change to the directory containing downloaded installer executable and run the following from the command prompt:

```
ADI_Camera_EI3_Extender_Board-Rel1.0.0.exe /v"/l*v c:\temp\installer.log"
```

Support and Assistance

There are several options for contacting support:

- Submit your questions online at:

  http://www.analog.com/support

- E-mail your Processor and DSP software and development tools questions from within CrossCore Embedded Studio:

  Go to "Help->E-mail Support…". This will create a new e-mail addressed to processor.tools.support@analog.com, and will automatically attach your CrossCore Embedded Studio version information (ProductInfo.html).

- E-mail your Processors and DSP applications and processor questions to:
  - processor.support@analog.com OR
  - processor.china@analog.com (Greater China support)

- Post your questions in the Processors and DSP online technical support community in Engineer Zone at:

  http://ez.analog.com/community/dsp

Supported Processors

Although the Camera EI3 Extender is designed to work with any EZ-Board that supports the Expansion Interface 3, this release of the BSP supports only the ADSP-BF60x family of Blackfin processors.

Software Requirements

To build the example projects included in the Camera EI3 Extender Board BSP the following packages are required:

- CrossCore Embedded Studio version 1.0.0 or later.
- WVGA/LCD EI3 Extender Board support package version 1.0.0 or later.
- Video Encoder EI3 Extender Board support package version 1.0.0 or later.

NOTE: If CrossCore Embedded Studio version 1.0.1 is used, it is also necessary to use version 1.0.1 of the WVGA/LCD EI3 Extender BSP.

Test Configurations

The software versions used to test are:

1.0.0 CCES with 1.0.0 WVGA/LCD EI3 Extender BSP and 1.0.0 Video Encoder EI3 Extender BSP

1.0.1 CCES with 1.0.1 WVGA/LCD EI3 Extender BSP and 1.0.0 Video Encoder EI3 Extender BSP

At the time of release, the tested hardware revisions are:

- ADSP-BF609 EZ-Board PCB Revision 1.0 BOM Revision 1.2
- WVGA/LCD EI3 Extender Board PCB Revision 1.0 BOM Revision 1.2
- Video Encoder EI3 Extender Board PCB Revision 1.0 BOM Revision 1.0
- Camera EI3 Extender Board PCB Revision 0.1 BOM Revision 1.0
- MT9M114 Demo Headboard Revison 2
- MT9V024 Demo Headboard Revision 1R

Getting Started

Adding a Driver to a Project

When adding a Camera EI3 Driver to your project, the IDE will add the sources for the driver to the CCES Project folders, starting at "system/Camera_EI3". There will be a folder specific to the driver(s) you have added under this folder.

Creating a project which includes an Camera EI3 driver

In order to create a project you should follow the instructions provided in the CrossCore Embedded Studio help. As part of the project creation, the page "Add-in selection" contains a list of all the available add-ins for the project that you are creating based on the installed products and the project's chosen processor and type. You can see the drivers in support of the Camera EI3 under the "Device Drivers and System Services" category. Within this category you will see "Camera EI3 Extender Board Drivers".

The Camera EI3 add-in generates a call to adi_initComponents(). For more information on adi_initComponents(), please refer to the CCES help section:

CrossCore® Embedded Studio 1.0.0 > Graphical Development Environment > System Configuration

Adding a Camera EI3 driver to an existing project

Every CrossCore Embedded Studio project contains a System Configuration file called `system.svc` which is located in the root of the project. The file is the IDE's interface for managing the various pre-written software components used in the "system" implemented by a project. Double-clicking any `system.svc` file in a navigation view opens that file in the System Configuration Utility which allows you to see the add-ins that you currently have in your project. Click on "Add..." and select the Sensor (MT9V024) or Sensor (MT9M114) driver from the Camera EI3 Extender Board Drivers add-in which is under the "Device Drivers and System Services".

Notes:

- If the IDE detects that `adi_initComponents()` is not yet present in `main()`, it prompts you to add it and offers to insert it for you.

Configuration

There are no Camera EI3 driver configuration options available in the IDE.

Interrupts

CrossCore Embedded Studio provides a coherent interrupt management mechanism which allows for the same interface to be used in RTOS and non-RTOS applications. This means that interrupt service routines in all applications must be written in C and use the adi_int interface. Any thread-safety requirements or interactions with tasks are handled by the adi_int interface. For more information on the adi_int API, in CrossCore Embedded Studio go to Help > Search and enter adi_int.

Examples of the usage of this interrupt management mechanism are the System Services and Device Drivers provided with Crosscore Embedded Studio. By using the adi_int interface, the same services and drivers can be used in all applications regardless of whether an operating system is used.

Sketches and Examples

Sketches

CrossCore Embedded Studio provides a mechanism by which small code fragments, called sketches, can be generated with parameterized input provided by the user. The resulting code can then be copied and pasted to a project. Camera EI3 BSP related sketches are provided. To locate the sketches specific to the Camera EI3 Extender BSP, open up the example browser (Help -> Browse Examples) and then select Camera EI3 Extender Board product in the "Product:" pulldown.

Examples

In addition to the code sketches, the Camera EI3 Extender BSP provides examples which show how to use each of the drivers included in the BSP.

The following examples are available in this release: (For more information on the examples see the README file.)

1. Videoloopback from MT9V024 sensor to LCD.
2. FrameCapture from MT9V024 sensor to LCD.
3. VideoLoopbackYUV from MT9M114 sensor to Video Encoder.
4. VideoLoopbackRGB from MT9M114 sensor to LCD.

Note:

- The Videoloopback, FrameCapture, VideoLoopbackRGB examples requires WVGA/LCD EI3 Extender board and its corresponding BSP.
- The VideoLoopbackYUV example requires Video Encoder EI3 Extender Board and its corresponding BSP.

Location

In order to locate the Camera EI3 Extender BSP examples and sketches, you can use the following:

- Open CrossCore Embedded Studio's Example Browser which can be found in CrossCore Embedded Studio under Help. Select in the Product section "Camera EI3 Extender Board v1.0.0" for a full list of examples and sketches.
- Import projects located in your Camera EI3 Extender BSP installation folder under the example directory in product installation
  `(<Camera_ei3_installation_root>\Camera_EI3\Blackfin\Examples\ADSP-BF609).`

Documentation

Hardware Manual and API documentation for the drivers included in the Camera EI3 Extender BSP can be found in CCES Help.

General information on the driver model can be found in CCES help under

   CrossCore® Embedded Studio 1.0.0 > System Runtime Documentation > System Services and Device Drivers

Integration with CrossCore Embedded Studio

System View

CrossCore Embedded Studio provides the System View which is used by the Camera EI3 Extender BSP. Use the System Configuration Overview tab to add Camera EI3 Extender BSP driver sources into a CrossCore Embedded Studio project.

To access the System Configuration Overview tab, do one of the following:

- In a navigation view, double-click the `system.svc` file of a project. The System Configuration utility appears with the overview tab selected.
- If the utility is already open, select the Overview tab.

As well as being able to add, remove and upgrade add-ins from this window, you will also be provided a list of examples and sketches associated with the selected add-in.

For more information about the System Configuration utility, see the CrossCore Embedded Studio help.

MISRA-C Support

MISRA C is a software development standard for the C programming language developed by the Motor Industry Software Reliability Association (MISRA). Its aims are to facilitate code safety, portability, and reliability in the context of embedded systems, specifically those systems programmed in ANSI C. The compiler detects violations of the MISRA rules at compile-time, link-time, and run-time.

System Services and Device Driver Thread Safety

All system services and device drivers (SSDD) use mutexes and semaphores to ensure thread-safety. If an RTOS is present then the SSDD will use the RTOS mutex and semaphores. If an RTOS is not present then the SSDD will use a non-RTOS implementation of mutexes and semaphores (spin locks).

Known issues with the Camera EI3 Extender Board Support Package (BSP)

1. The VideoLoopback example does not work in real time. The update of the LCD screen may take several seconds after scene change pointed by the camera. This is due to the software based color conversion from Bayer to RGB required for displaying the output image from the sensor. The software based algorithm is currently not optimized. An optimized version of the algorithm will be added in the future releases of the Camera EI3 BSP.
2. The FrameCapture example can display a distorted image if the frame is captured when the subject is in motion.
3. The Camera extender card supports 8, 10 and 12 bit interfaces, but currently the BSP supports only 8bit (MT9M114) and 10bit sensor (MT9V024).
4. The MT9V024 and MT9M114 drivers only support parallel output mode.
5. Occasionally the screen will remain white and the executable will not exit.
6. Removing an Add-in component from a project and building the project may result in a build error, as the underlying Makefile dependencies have not been re-generated. If a build error is encountered, clean the project (Project > Clean) before trying to build the project again.
7. After opening an example via the Example Browser (Help > Browse Examples), semantic errors may be listed in the Problems View (Window > Show View > Problems). Some of these errors may not be real errors and may be misleading. To clean-up the problems listed:

   - Right-click on your project and select Index > Rebuild
   - Right-click on your project and select Index > Update with Modified Files

   Or

   - Right-click on your project and Close Project
   - Right-click on your project and Open Project