

# **Camera EI3 Extender Board Manual**

**an EZ-Extender® product**

Revision 1.0, August 2012

Part Number  
82-000351-01

Analog Devices, Inc.  
One Technology Way  
Norwood, Mass. 02062-9106



## Copyright Information

©2012 Analog Devices, Inc., ALL RIGHTS RESERVED. This document may not be reproduced in any form without prior, express written consent from Analog Devices, Inc.

Printed in the USA.

## Disclaimer

Analog Devices, Inc. reserves the right to change this product without prior notice. Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use; nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under the patent rights of Analog Devices, Inc.

## Trademark and Service Mark Notice

The Analog Devices logo, Blackfin, CrossCore, EngineerZone, EZ-Board, EZ-Extender, EZ-KIT Lite, and VisualDSP++ are registered trademarks of Analog Devices, Inc.

All other brand and product names are trademarks or service marks of their respective owners.

## Regulatory Compliance

The Camera EI3 Extender Board is designed to be used solely in a laboratory environment. The board is not intended for use as a consumer end product or as a portion of a consumer end product. The board is an open system design which does not include a shielded enclosure and therefore may cause interference to other electrical devices in close proximity. This board should not be used in or near any medical equipment or RF devices.

The Camera EI3 Extender Board is in the process of being certified to comply with the essential requirements of the European EMC directive 89/336/EEC (inclusive 93/68/EEC) and, therefore, carries the “CE” mark.



The extender board contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused extender boards in the protective shipping package.





# CONTENTS

## PREFACE

Product Overview .....	vii
Purpose of This Manual .....	viii
Intended Audience .....	viii
Manual Contents .....	ix
What's New in This Manual .....	ix
Technical Support .....	x
Supported Products .....	xi
Product Information .....	xi
Analog Devices Web Site .....	xi
EngineerZone .....	xii
Related Documents .....	xiii

## USING CAMERA EI3 EXTENDER BOARD

Package Contents .....	1-2
Supported Operating Systems .....	1-2
System Requirements .....	1-3
Camera EI3 Extender Board Installation .....	1-3
Aptina CMOS Sensor Interface .....	1-4

**Contents**

Expansion Interface III ..... 1-5

Example Programs ..... 1-6

Board Design Database ..... 1-6

**CAMERA EI3 EXTENDER BOARD HARDWARE  
REFERENCE**

System Architecture ..... 2-2

Jumpers ..... 2-3

    Camera Width Jumper (JP1) ..... 2-3

Connectors ..... 2-4

    Expansion Interface III (EI3) Connector (J1) ..... 2-5

    Sensor Connector (J2) ..... 2-5

    Sensor Connector (J3) ..... 2-5

    Power Connector (P4) ..... 2-6

**CAMERA EI3 EXTENDER BOARD BILL OF MATERIALS**

**CAMERA EI3 EXTENDER BOARD SCHEMATIC**

**INDEX**

# PREFACE

Thank you for purchasing the Camera EI3 Extender Board, an EZ-Extender<sup>®</sup> product for EZ-KIT Lite<sup>®</sup>/EZ-Board<sup>®</sup> evaluation systems with the expansion interface 3 (EI3).

The EZ-KIT Lite/EZ-Board and Camera EI3 Extender Board are designed to be used in conjunction with the CrossCore<sup>®</sup> Embedded Studio (CCES) development environment.

To learn more about Analog Devices development software, go to <http://www.analog.com/dsp/tools>.

## Product Overview

The Camera EI3 Extender Board is a separately sold daughter board that plugs onto the expansion interface 3 (EI3) of an EZ-KIT Lite/EZ-Board evaluation system. The extender board aids the design and prototyping phases of embedded processor-targeted applications.

The board extends the capabilities of the evaluation system by providing a connection between the parallel peripheral interface (PPI) of the processor and an Aptina CMOS sensor headboard. The two-wire interface (TWI) port of the processor is used to communicate to the CMOS sensor on the extender.

## Purpose of This Manual

The following is a list of the Camera EI3 Extender Board interfaces.

- Video interface
  - Connects to Aptina headboards
- Video connectors
  - One  $13 \times 2$  IDC for 8-, 10- and 12-bit sensors
  - One  $13 \times 1$  IDC for 12-bit sensors; used in conjunction with the  $13 \times 2$  connector
- No power supply required: derives power from the EZ-KIT Lite/EZ-Board
- Jumper for selecting CMOS sensor bus width
- CE certified

## Purpose of This Manual

The *Camera EI3 Extender Board Manual* provides instructions for installing the product hardware (board). The text describes operation and configuration of the board components and provides guidelines for running your own code on the Camera EI3 Extender Board. Finally, a schematic and a bill of materials are provided for reference.

## Intended Audience

The primary audience for this manual is a programmer who is familiar with Analog Devices processors. This manual assumes that the audience has a working knowledge of the appropriate processor architecture, instruction set, and C/C++ programming languages.



Programmers who are unfamiliar with Analog Devices processors can use this manual, but should supplement it with other texts that describe your target architecture and hardware development tools.

Programmers who are unfamiliar with the CrossCore Embedded Studio programming environment or the mating evaluation board should refer to the CCES online help.

## Manual Contents

The manual consists of:

- Chapter 1, “[Using Camera EI3 Extender Board](#)” on page 1-1  
Provides basic product information.
- Chapter 2, “[Camera EI3 Extender Board Hardware Reference](#)” on [page 2-1](#)  
Provides information about the product’s hardware components.
- Appendix A, “[Camera EI3 Extender Board Bill Of Materials](#)” on [page A-1](#)  
Provides a list of hardware components used to manufacture the board.
- Appendix B, “[Camera EI3 Extender Board Schematic](#)” on page B-1  
Provides all circuits on the extender board.

## What’s New in This Manual

This is the first revision of the *Camera EI3 Extender Board Manual*.

# Technical Support

You can reach Analog Devices processors and DSP technical support in the following ways:

- Post your questions in the processors and DSP support community at EngineerZone<sup>®</sup>:  
<http://ez.analog.com/community/dsp>
- Submit your questions to technical support directly at:  
<http://www.analog.com/support>
- E-mail your questions about processors, DSPs, and tools development software from **CrossCore Embedded Studio** or **VisualDSP++<sup>®</sup>**:

Choose **Help > Email Support**. This creates an e-mail to [processor.tools.support@analog.com](mailto:processor.tools.support@analog.com) and automatically attaches your **CrossCore Embedded Studio** or **VisualDSP++** version information and `license.dat` file.

- E-mail your questions about processors and processor applications to:  
[processor.support@analog.com](mailto:processor.support@analog.com) or  
[processor.china@analog.com](mailto:processor.china@analog.com) (Greater China support)
- In the USA only, call 1-800-ANALOGD (1-800-262-5643)
- Contact your Analog Devices sales office or authorized distributor. Locate one at:  
[www.analog.com/adi-sales](http://www.analog.com/adi-sales)

- Send questions by mail to:  
Processors and DSP Technical Support  
Analog Devices, Inc.  
Three Technology Way  
P.O. Box 9106  
Norwood, MA 02062-9106  
USA

## Supported Products

This extender board supports EZ-KIT Lite/EZ-Board evaluation systems with the expansion interface 3.

## Product Information

Product information can be obtained from the Analog Devices Web site and the CCES online help system.

## Analog Devices Web Site

The Analog Devices Web site, [www.analog.com](http://www.analog.com), provides information about a broad range of products—analogue integrated circuits, amplifiers, converters, and digital signal processors.

To access a complete technical library for each processor family, go to [http://www.analog.com/processors/technical\\_library](http://www.analog.com/processors/technical_library). The manuals selection opens a list of current manuals related to the product as well as a link to the previous revisions of the manuals. When locating your manual title, note a possible errata check mark next to the title that leads to the current correction report against the manual.

Also note, [myAnalog](#) is a free feature of the Analog Devices Web site that allows customization of a Web page to display only the latest information

## Product Information

about products you are interested in. You can choose to receive weekly e-mail notifications containing updates to the Web pages that meet your interests, including documentation errata against all manuals.

[myAnalog](#) provides access to books, application notes, data sheets, code examples, and more.

Visit [myAnalog](#) (found on the Analog Devices home page) to sign up. If you are a registered user, just log on. Your user name is your e-mail address.

## EngineerZone

EngineerZone is a technical support forum from Analog Devices. It allows you direct access to ADI technical support engineers. You can search FAQs and technical information to get quick answers to your embedded processing and DSP design questions.

Use EngineerZone to connect with other DSP developers who face similar design challenges. You can also use this open forum to share knowledge and collaborate with the ADI support team and your peers. Visit <http://ez.analog.com> to sign up.

## Related Documents

For additional information about the processor, refer to the following publications.

Table 1. Related Processor Publications

Title	Description
<i>Processor Data Sheet</i>	General functional description, pinout, and timing of the processor
<i>Processor Hardware Reference</i>	Description of the internal processor architecture and all register functions
<i>Blackfin Processor Programming Reference</i>	Description of all allowed processor assembly instructions

## Related Documents

# 1 USING CAMERA EI3 EXTENDER BOARD

This chapter provides the setup procedure for the Camera EI3 Extender Board and describes the interfaces the extender supports.

The information is presented in the following order.

- “Package Contents” on page 1-2
- “Supported Operating Systems” on page 1-2
- “System Requirements” on page 1-3
- “Camera EI3 Extender Board Installation” on page 1-3
- “Aptina CMOS Sensor Interface” on page 1-4
- “Expansion Interface III” on page 1-5
- “Example Programs” on page 1-6
- “Board Design Database” on page 1-6

# Package Contents

Your Camera EI3 Extender Board package contains the following items.

- Camera EI3 Extender Board
- A bag containing hardware for securing the extender board on the EZ-KIT Lite/EZ-Board
- Release note containing information about the product download

Contact the vendor where you purchased your extender board or contact Analog Devices, Inc. if any item is missing.

## Supported Operating Systems

CCES is supported on the following operating systems:

- Windows<sup>®</sup> XP Professional SP3 (32-bit only)
- Windows Vista<sup>™</sup> Business, Enterprise, or Ultimate SP2 (32-bit only)
- Windows 7 Professional, Enterprise, or Ultimate (32- and 64-bit)



Windows Vista and Windows 7 users may experience User Access Control (UAC) related errors if the software is installed into a protected location, such as Program Files or Program Files (x86). We recommend installing the software in a non-UAC-protected location.



# System Requirements

Verify that your PC has these minimum requirements for the CCES installation:

- 2 GHz single-core processor
- 1 GB RAM
- 8 GB available disk space
- One open USB port



A faster disk drive decreases the build time, especially for a large amount of source files.

## Camera EI3 Extender Board Installation

Follow these instructions to ensure correct operation of the product hardware and software.

1. Attach the extender board to the EZ-KIT Lite/EZ-Board.

The J1 connector on the extender board can be connected to the P1A, P2A, or P3A connector on the EZ-KIT Lite/EZ-Board. Refer to the example program for a reference to the proper connector.

2. Use the provided hardware to secure the extender to the EZ-KIT Lite/EZ-Board. See [Figure 1-1](#).
3. Refer to the EZ-KIT Lite/EZ-Board manual for information on connecting to a personal computer (PC) and running CCES.

# Aptina CMOS Sensor Interface

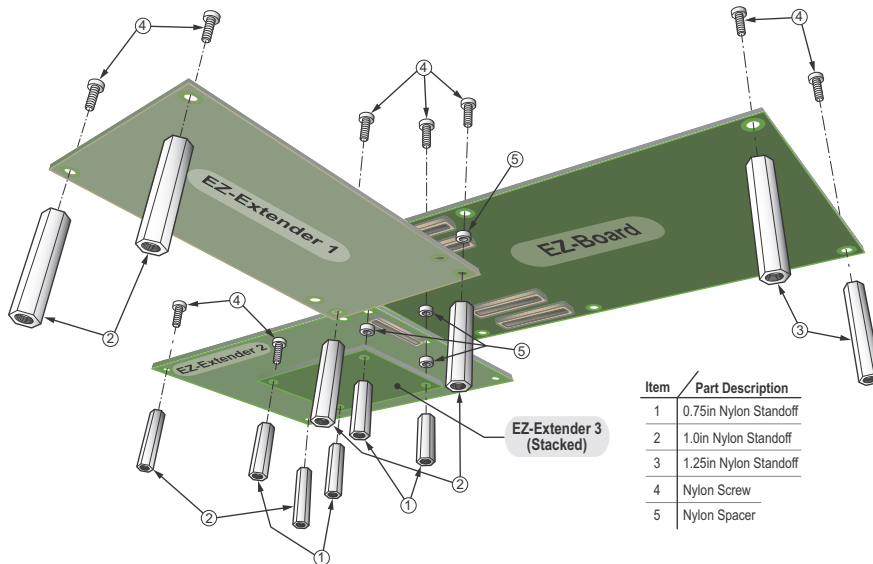


Figure 1-1. Assembled Board Diagram

## Aptina CMOS Sensor Interface

The Camera EI3 Extender Board supports interfacing with Aptina CMOS sensor headboards that have an 8-, 10- or 12-bit interface. Both image processors/SOC and sensor headboards are supported.

The interface width is configured via a jumper. Refer to [“Jumpers” on page 2-3](#) for more information.

For more information about Aptina CMOS sensors, go to [www.apertina.com](http://www.apertina.com).

An example program demonstrating capabilities via a M114 headboard is available by installing the Camera EI3 Extender Board Support Package (BSP). The headboard can be purchased through [C4AV.com](http://C4AV.com) using part number MT9M114EBLSTCZH ES.

## Expansion Interface III

The Expansion Interface III (EI3) allows an extender board to be tested across various hardware platforms that have the same expansion interface connectors.

The EI3 implemented on the Camera EI3 Extender Board contains the PPI and TWI ports. These signals are used for the peripheral on the extender. For pinout information, go to [Appendix B, “Camera EI3 Extender Board Schematic”](#). The mechanical dimensions of the expansion connectors can be obtained by contacting “[Technical Support](#)”.

The Camera EI3 Extender Board supports interfacing with EZ-Boards which are operating at an IO voltage of 3.3V. Other IO voltages are not supported.

The Camera EI3 Extender Board supports being powered from either the EZ-Board or through the on-board 5V power connector (P1).

For more information about other daughter boards, visit the Analog Devices Web site at [www.analog.com/processors/tools/blackfin](http://www.analog.com/processors/tools/blackfin).

Limits to current and interface speed must be taken into consideration when using the EI3. Current for the EI3 can be sourced from the EZ-KIT Lite/EZ-Board; therefore, the current should be limited to 200 mA for 5V and 300 mA for the 3.3V planes.

## Example Programs

If more current is required, then a separate power connector and a regulator must be designed on the daughter card. Additional circuitry can add extra loading to signals, decreasing their maximum effective speed.



Analog Devices does not support and is not responsible for the effects of additional circuitry.

## Example Programs

Example programs are included with the Camera EI3 Extender Board Support Package (BSP). Example programs demonstrate various capabilities of the product. The support package is installed on top of CCES. Once installed, the example programs can be found in the following directory:

```
<install_path>/Camera_EI3_Extender_Board-RelX.X.X/Camera_EI3
```

where *X.X.X* denotes the support package release number.

## Board Design Database

A .zip file containing all of the electronic information required for the design, layout, fabrication and assembly of the product is available for download from the Analog Devices board design database at [www.analog.com/board-design-database](http://www.analog.com/board-design-database).

# 2 CAMERA EI3 EXTENDER BOARD HARDWARE REFERENCE

This chapter describes the hardware design of the Camera EI3 Extender Board.

The following topics are covered.

- [“System Architecture” on page 2-2](#)  
Describes the daughter board configuration and explains how the board components interface with the processor and EZ-KIT Lite.
- [“Jumpers” on page 2-3](#)  
Describes jumper functionality.
- [“Connectors” on page 2-4](#)  
Shows the locations and provides part numbers for the on-board connectors. In addition, the manufacturer and part number information is provided for the mating parts.

# System Architecture

A block diagram of the Camera EI3 Extender Board is shown in [Figure 2-1](#).

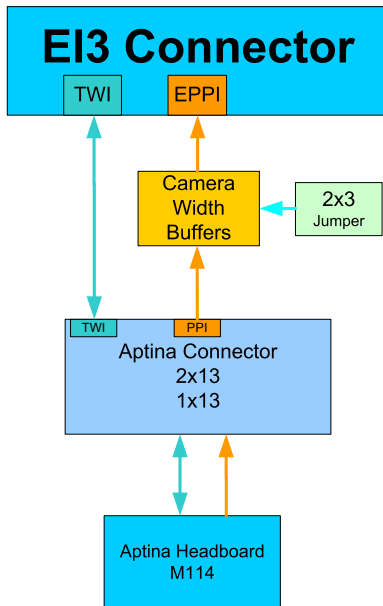


Figure 2-1. Camera EI3 Extender Board Block Diagram

## Jumpers

This section describes jumper functionality. The jumper on the Camera EI3 Extender Board is located on the back of the board.

### Camera Width Jumper (JP1)

The camera width jumper (JP1) determines whether the interface to the processors PPI is 8, 10 or 12 bits. The camera width is chosen by placing the jumper in the appropriate position. By default, 8-bit mode is selected since that is the interface that is on the M114 headboard.

Camera Mode	Shunt
8-bit	1 and 2 (default)
10-bit	3 and 4
12-bit	5 and 6

# Connectors

This section describes connector functionality and provides information about mating connectors. [Figure 2-2](#) shows the locations of all connectors on the Camera EI3 Extender Board.

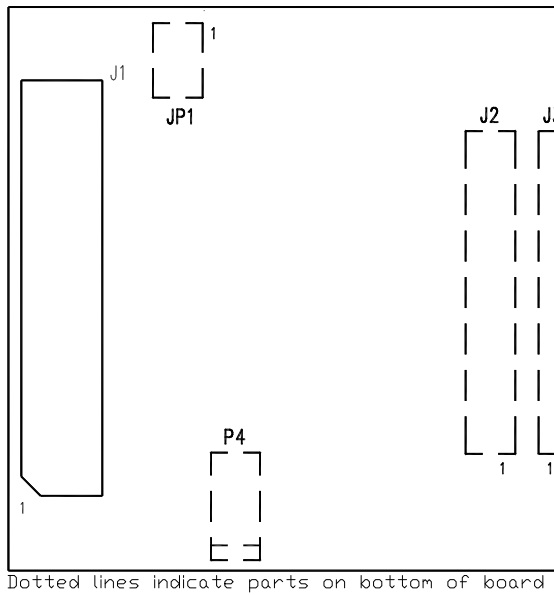


Figure 2-2. Connector and Jumper Locations



## Expansion Interface III (EI3) Connector (J1)

One board-to-board connector (J1) provides signals from the PPI and TWI ports of the processor. The connector is located on the top side of the board.

Part Description	Manufacturer	Part Number
120-pin, 0.6 mm	HIROSE	FX8-120S-SV(21)
Mating Connector		
120-pin, 0.6 mm	HIROSE	FX8-120P-SV1(91)

## Sensor Connector (J2)

The sensor connector (J2) is a  $13 \times 2$  IDC connector which connects with an Aptina headboard directly or through a cable. This connector can be used for interfacing with Aptina CMOS sensor headboards with an 8-, 10- and 12-bit interface. The connector is located on the bottom side of the board

Part Description	Manufacturer	Part Number
.025 SQ POST SOCKET	3M	8526-4500PL

## Sensor Connector (J3)

The sensor connector (J3) is a  $13 \times 1$  IDC connector which connects with an Aptina headboard directly or through a cable. This connector is used for interfacing with Aptina CMOS sensor headboards with a 12-bit interface. The connector is located on the bottom side of the board

Part Description	Manufacturer	Part Number
.025 SQ POST SOCKET	SAMTEC	SSW-113-01-T-S

### Power Connector (P4)

Under normal circumstances, the power connector is not needed because the Camera EI3 Extender Board derives its power from the EZ-KIT Lite/EZ-Board. If the EZ-KIT Lite/Camera EI3 Extender Board is not able to supply enough power to the Camera EI3 Extender Board, then an external power supply can be connected to P4 which will power the Camera EI3 Extender Board and EZ-KIT Lite/EZ-Board. The connector is located on the bottom side of the board.

Part Description	Manufacturer	Part Number
0.65 mm power jack	CUI	045-0883R
Mating Cable		
5.0VDC@3.6A power supply	GLOBETEK	GS-1750(R)

# A CAMERA EI3 EXTENDER BOARD BILL OF MATERIALS

The bill of materials corresponds to “[Camera EI3 Extender Board Schematic](#)” on page B-1.

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
1	1	27MHZ OSC003	U4	EPSON	SG-8002CA-MP
2	3	SN74LVC16T245 TVSOP48	U1-U3	DIGI-KEY	296-21052-1-ND
3	1	PWR .65MM CON027	P4	DIGI-KEY	CP1-022PJCT-ND
4	1	1A RESETABLE 1206	F1	RAYCHEM	NANOSMDC110F-2
5	1	IDC 3X2 IDC3X2	JP1	BURG	54102-T08-03LF
6	1	.6MM 120PIN HIROSE_FX8-120S-SV(21)	J1	HIROSE	FX8-120S-SV(21)
7	1	IDC 13X2 IDC13X2	J2	SAMTEC	SSW-113-01-T-D
8	1	IDC 13X1 IDC13X1	J3	SAMTEC	SSW-113-01-T-S
9	4	10UF 6.3V 10% 0805	C2,C3,C16, C17	AVX	08056D106KAT2A
10	13	0.1UF 10V 10% 0402	C1,C4-C15	AVX	0402ZD104KAT2A
11	3	10K 1/16W 5% 0402	R2-R4	VISHAY	CRCW040210K0FKED
12	2	33 1/16W 5% 0402	R1,R5	VISHAY	CRCW040233R0JNEA
13	3	1A MBR130LSFT1G SOD-123FL	D1-D3	ON SEMI	MBR130LSFT1G



A

B

C

D

1

1

2

2

3

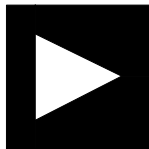
3

4

4

# Camera EI3 Extender Board

## SCHEMATIC



**ANALOG  
DEVICES**

20 Cotton Road  
Nashua, NH 03063  
PH: 1-800-ANALOGD

**Title** Camera EI3 Extender Board  
Title Sheet

<b>Size</b> C	<b>Board No.</b> A0351-2012	<b>Rev</b> 0.1
------------------	--------------------------------	-------------------

<b>Date</b> 2/28/12	<b>Sheet</b> 1 <b>of</b> 3
------------------------	----------------------------

A

B

C

D

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

B

C

D

1

1

2

3

4

A

1

2

3

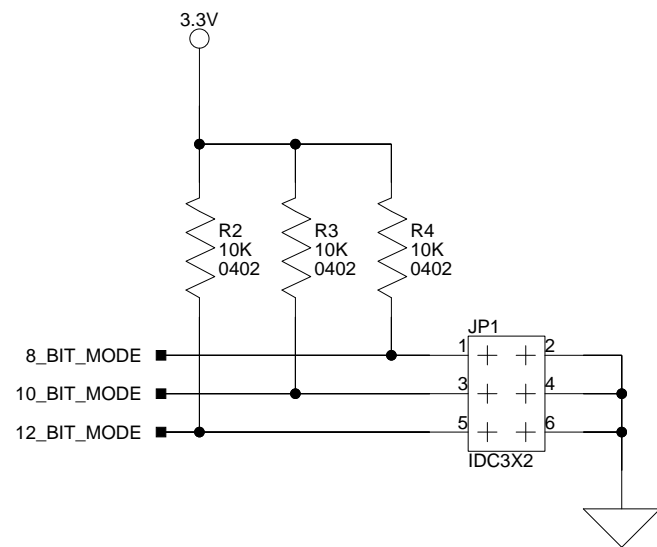
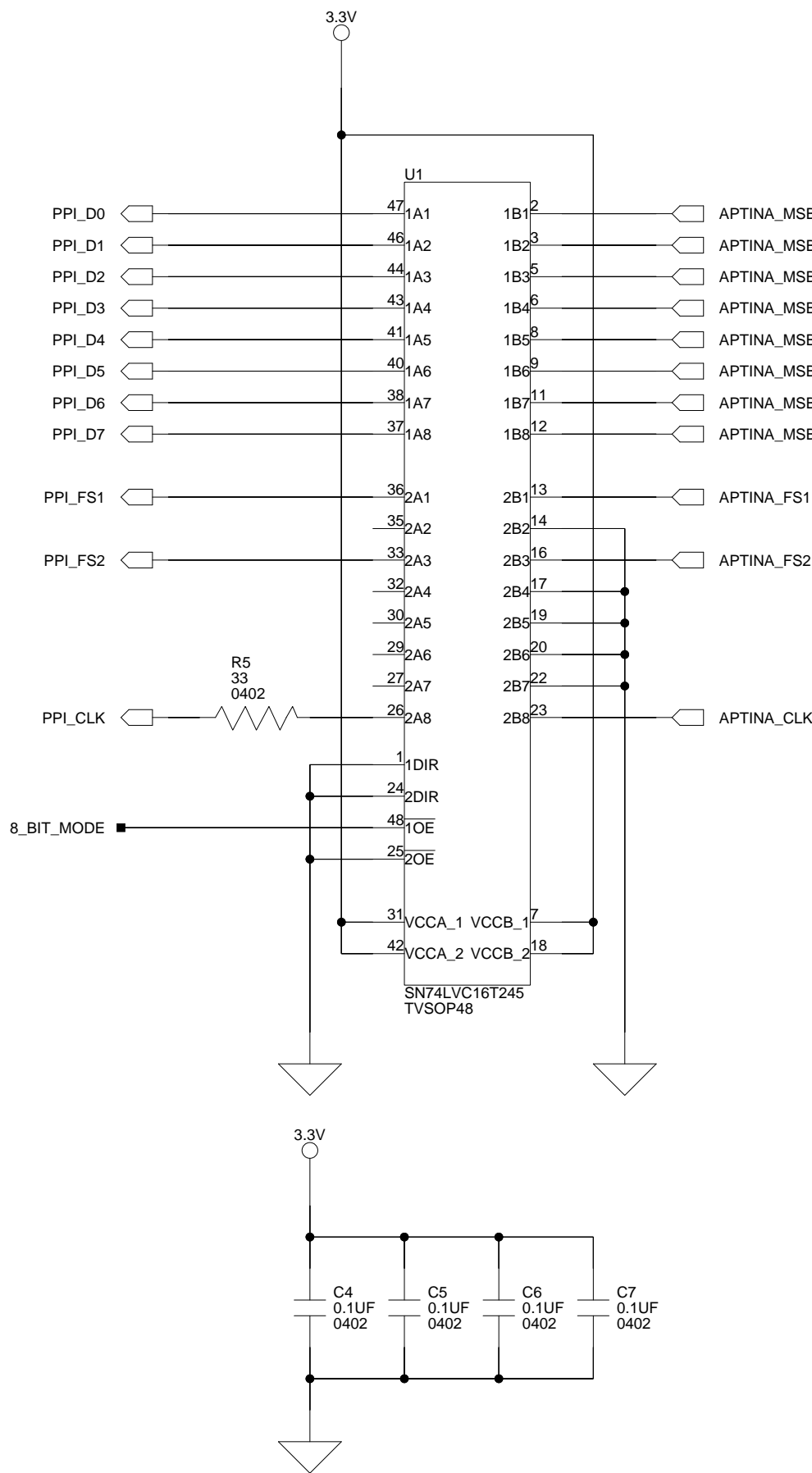
4

A

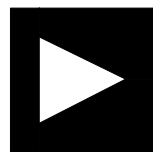
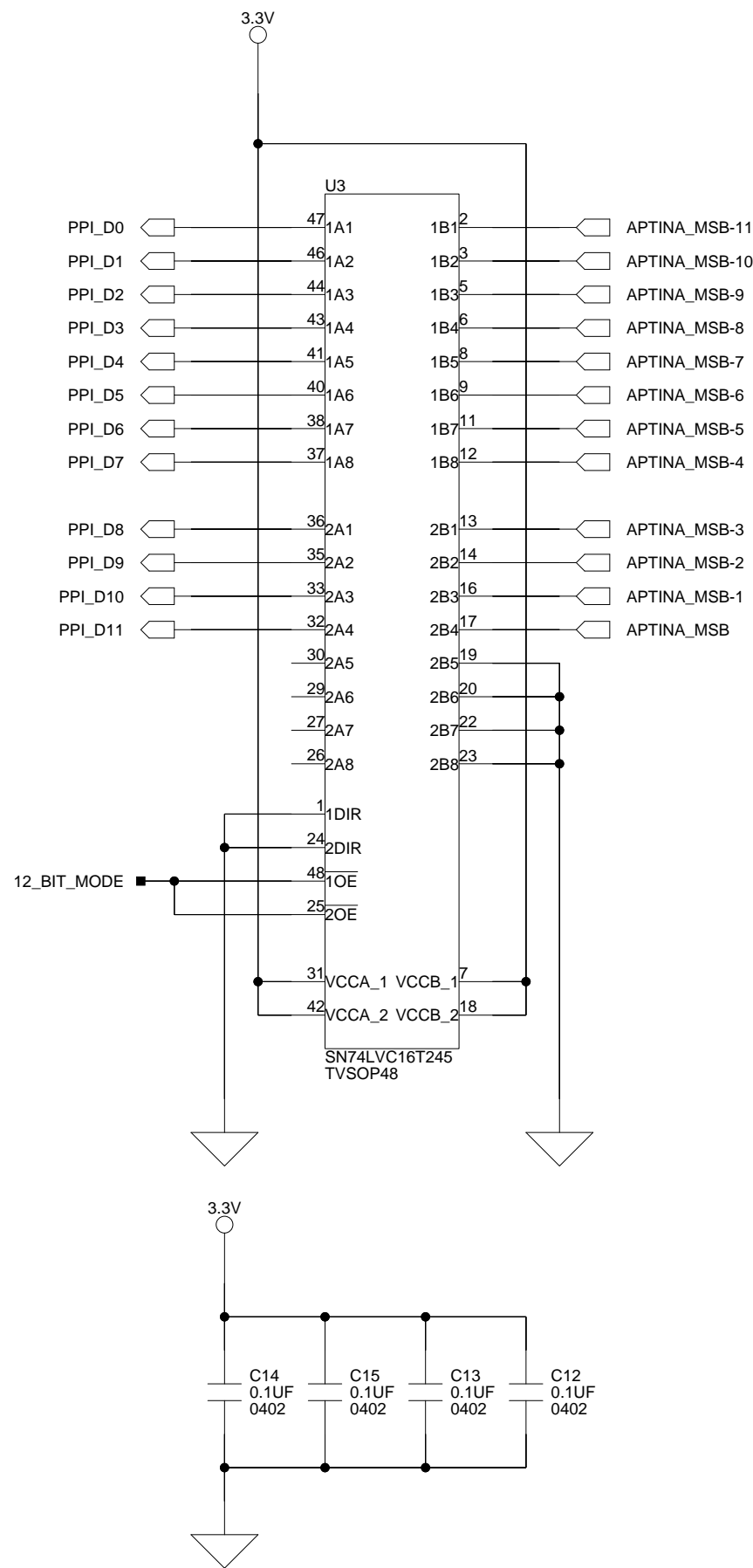
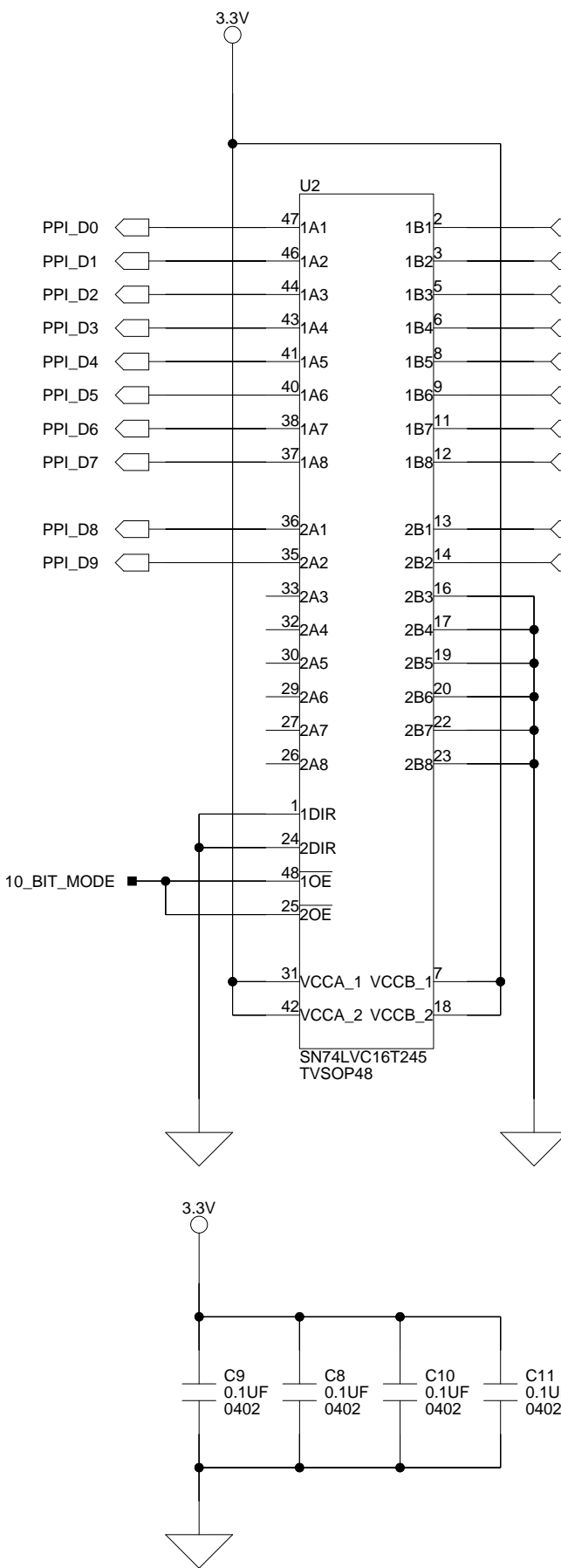
B

C

D



Jumper	Mode
1&2	8-bit
3&4	10-bit
5&6	12-bit



**ANALOG  
DEVICES**

20 Cotton Road  
Nashua, NH 03063  
PH: 1-800-ANALOGD

Title Camera EI3 Extender Board Configuration

Size  
C

Board No.

A0351-2012

Rev  
0.1

Date

2/28/12

Sheet

3

of

3

A

B

C

D

1

2

3

4

# I INDEX

## A

Aptina CMOS sensor interface, [1-4](#)  
architecture, of Camera EI3 Extender Board,  
[2-2](#)  
assembled board diagram, [1-4](#)

## B

bill of materials, [A-1](#)  
block diagram  
    assembled board, [1-4](#)  
    Camera EI3 Extender Board, [2-2](#)  
board design, [1-6](#)  
board schematic (Camera EI3 Extender Board),  
    [B-1](#)

## C

camera width jumper (JP1), [2-3](#)  
connectors, [2-4](#)  
    diagram of locations, [2-4](#)  
    IDC, [2-5](#)  
    J1 (EI3), [2-5](#)  
    J2 (sensor), [2-5](#)  
    J3 (sensor), [2-5](#)  
    P4 (power), [2-6](#)  
contents, of this Extender Board package, [1-2](#)

## E

EngineerZone, [xiii](#)  
expansion interface III (EI3)  
    connector (J1), [2-5](#)  
    overview, [1-5](#)  
extender board block diagram, [2-2](#)

## I

IDC connector, [2-5](#)  
installation, of this Extender Board, [1-3](#)

## J

jumpers, [2-3](#)  
    camera width (JP1), [2-3](#)  
    diagram of locations, [2-4](#)

## O

operating systems, supported, [1-2](#)

## P

package contents, [1-2](#)  
power  
    connector (P4), [2-6](#)  
product overview, [vii](#)



# Index

## R

related documents, [xiii](#)

## S

schematic, of Camera EI3 Extender Board,  
[B-1](#)

sensor connector (J2), [2-5](#)

sensor connector (J3), [2-5](#)

supported operating systems, [1-2](#)

supported products, [xi](#)

system architecture, [2-2](#)

system requirements, [1-3](#)

## T

technical support, [x](#)

# AMEYA360

Components Supply Platform

Authorized Distribution Brand :



Website :

Welcome to visit [www.ameya360.com](http://www.ameya360.com)

Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd  
Minhang District, Shanghai , China

➤ Sales :

Direct     +86 (21) 6401-6692  
  
Email       amall@ameya360.com  
  
QQ         800077892  
  
Skype      ameyasales1 ameyasales2

➤ Customer Service :

Email       service@ameya360.com

➤ Partnership :

Tel         +86 (21) 64016692-8333  
  
Email      mkt@ameya360.com