

General Description

The Evaluation Kit epc901 is a fully assembled and tested system for the evaluation of the the epc901 line imager. The Evaluation Kit consists of an epc901 camera module, a mainboard, cables and software.

The “Evaluation” main section is equipped with a STM32 ARM Cortex micro controller. This section provides a powerful and flexible development environment for the design engineer. It supports all the epc901 line imager camera module.

The camera module comes equipped with an epc901 line imager chip. The module includes a complete lens system and a camera cable connects it to the mainboard, allowing a flexible and convenient placement in a lab setup.

Features

- Fully functional line imager camera 1'024x1 pixel with epc901 line imager chip.
- Application software with graphical user interface to operate the epc901 chip of the camera.
- Possibility to store and reload operating configurations.
- Functionality for logging measurement data on PC.
- Complete development system for epc901 line imagers.
- PC connectivity and power supply by USB.
- Corresponding user software (PC/Mac) with visualization and logging features as part of the camera system.

Purpose

- Demonstration system for epc's line imager technology chips.
- Reference application for evaluation and design engineers.

System overview

- ① epc901 camera module connector
- ② Evaluation / application switch
- ③ STM32 ARM Cortex controller
- ④ USB connector
- ⑤ Switch USB or external supply
- ⑥ Dip switch and LED bank application
- ⑦ 10 pin debug connector

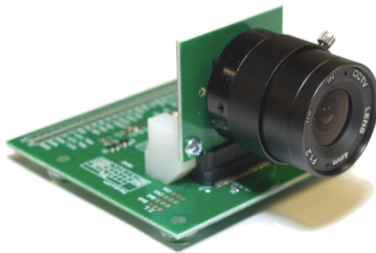


Figure 1: epc901 camera module

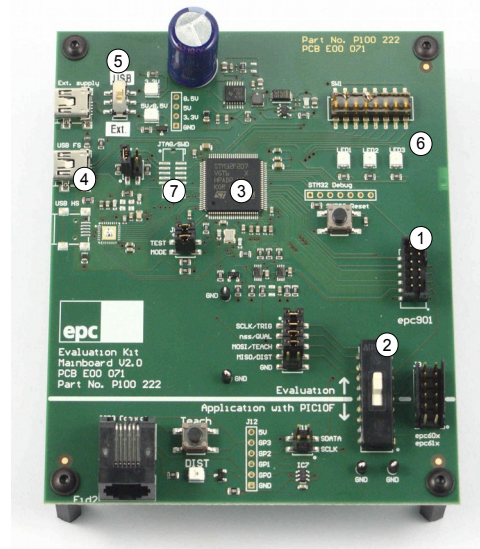


Figure 2: Mainboard V2.0

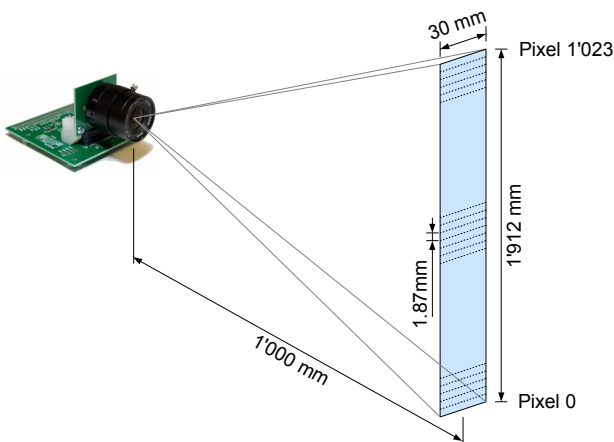


Figure 3: Field of view of the camera: 1'912 x 30 mm at 1m (87.7° x 1.7° at infinity)

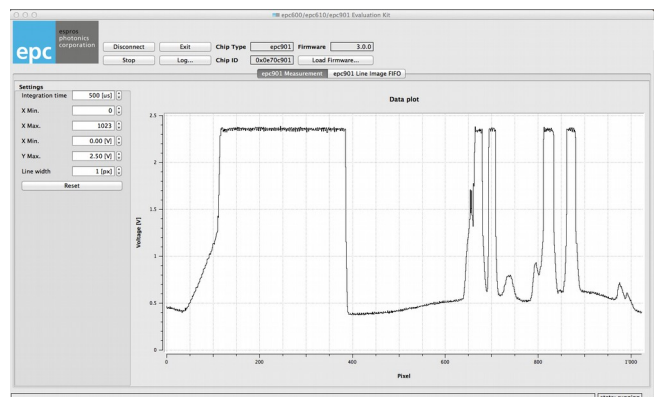


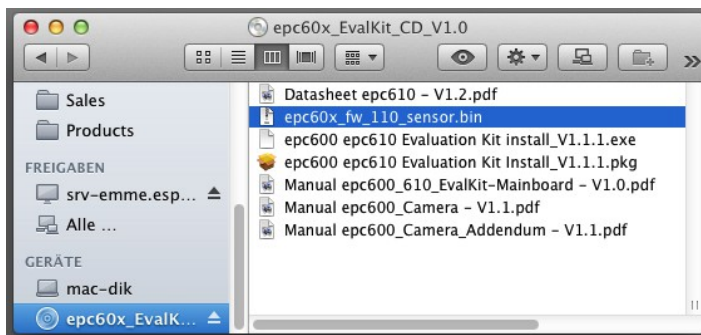
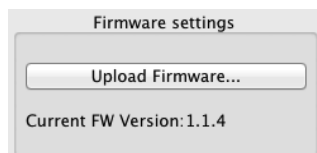
Figure 4: The main dialog of the graphical user interface

! IMPORTANT INFORMATION !

CAMERA MODULES COME WITH MATCHING FIRMWARE.

For proper operation of the Evaluation Kit upload the correct firmware from the CD ROM to the evaluation board.
Do this each time, when you are changing the camera head.

User interface:



Use the dialog "Firmware settings"

Upload the binary file e.g. "epc60x_fw_xxx_sensor"

**ALSO, MAKE SURE THAT YOU ALWAYS USE THE LATEST SOFTWARE VERSION ON YOUR MAC / PC.
USE THE APPROPRIATE INSTALLER THAT IS ALSO ON THE CD.**

! IMPORTANT INFORMATION !

THIS CAMERA COMES WITH FOCUSED OPTICS.

Do not touch the lens. Do not twist or turn the lens. Otherwise a degradation of the measurement occurs.

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1. General overview of the epc901 Evaluation Kit

The chapter gives an overview about the epc901 Evaluation Kit, which is based on this mainboard, their components and the technical data of the mainboard.

1.1. Ordering information

	Part number	Order information	Description
Kits	P100 228	epc901 Evaluation Kit V1	Evaluation kit set with an epc901 line imager chip <ul style="list-style-type: none"> - epc901 Chip Carrier board V2 - Lens Holder CS-mount - Lens FOV 76°, 1/3", CS - epc901 Evaluation Board V2 - Evaluation Kit Mainboard – V2.0

	Part number	Order information	Description
Accessories	P100 209	epc901 Chip Carrier board V2	Carrier board with epc901 line imager chip
	P100 212	Lens FOV 76°, 1/3", CS	Appropriate lens to the epc901 carrier board: epc901: FOV: H 1.7°, (V 88°)
	P100 216	Lens Holder, CS-Mount	Lens holder for CS-mount lenses
	P100 208	epc901 Evaluation Board V2	Evaluation board for the epc901 chip carrier board

Table 1: Order information overview

1.2. Scope of delivery

No	Pieces	Designation
①	1	epc901 camera module complete
②	1	Connection cable camera - mainboard
③	1	Evaluation Kit Mainboard
④	1	USB type 2 cable to connect the mainboard with a computer
⑤	1	CD-ROM with application software + documentation
	1	Manual_epc_901_Evalkit on CD-ROM

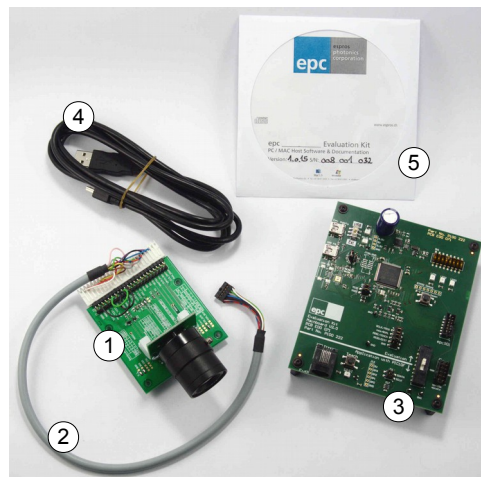


Figure 5: Material of the complete epc901 Evaluation Kit

1.3. System requirements

Description	Personal computer system	
	IBM PC or compatible	Apple (Mac)
Computer	IBM PC or compatible	Apple (Mac)
Operating system, minimum	Windows XP or higher	Mac OS X 10.7 (Lion) or higher
Graphics resolution, minimum	1024 x 768 pixel	1024 x 768 pixel
Hard-disk free space	Min. 50 MByte	Min. 50 MByte
CD-ROM drive	yes	yes
USB connection	min. USB 2.0 full speed	min. USB 2.0 full speed

Table 2: System requirements for the host computer

1.4. Technical data epc901 camera

Description	Data	Remarks
Type	epc901 Evaluation Hardware V2	incl. optics
Sensor chip	epc901, 1'024x1 pixel	
Communication	Analog video interface I ² C interface (Chip configuration)	max. 11MHz bandwidth max. 400kbit/s max. cable length: 0.5m
Receiver: focal length f_0	4.0 mm	
Receiver: f-stop	1.4	
Operating wavelength	550 - 860nm	
Dimensions (length x width x height)	110 x 65 x 48mm	
Temperature range; Humidity	0° ... 45°C; 20% ... 80% RH	

Table 3: Technical data epc901 camera

1.5. Technical data Evaluation Kit Mainboard

Description	Data	Remarks
Processor 1: STM32F207VG (ST Microelectronics)	<ul style="list-style-type: none"> ■ Core: ARM 32bit Cortex – M3 120MHz / 150DMIPS ■ Program memory Flash: 1024 kByte ■ Data memory RAM: 132 kByte 	Evaluation and visualization system for epc901 cameras
Processor 2: PIC 10F206 (Microchip)	<ul style="list-style-type: none"> ■ Program memory Flash: 512 word ■ Data memory RAM: 24 byte 	Not used
Supply voltage USB-connection: external:	+5V DC ± 5% +5V DC ± 5%, 1'000mA	by USB computer connection by external USB power supply
Power consumption	typ. 0.8W typ. 0.6W	with an epc 901 camera module without camera module
Communication PC – evaluation board	USB 2.0 full speed	max. cable length: 2m
Communication evaluation board - camera	Analog video interface I ² C interface (Chip configuration)	max. 11MHz bandwidth max. 400kbit/s max. cable length: 0.5m
Dimensions (length x width x height)	120 x 100 x 15mm	
Temperature range; Humidity	0° ... 45°C; 20% ... 80% RH	
CE certificate	The Evaluation Kit is designed as a module level device. Therefore it is not a CE certified device. It is the users responsibility to operate the hardware in compliance with the CE regulations.	
RoHS	Fulfills 2002/95/EC	

Table 4: Technical data mainboard

1.6. Support and technical contact

If you need more information, please contact us at info@espros.com.

2. Hardware

2.1. Block diagram

The system consists of 3 main parts: A personal computer, the mainboard of the Evaluation Kit and a camera module, refer to Figure 1 - Figure 4 and Figure 6.

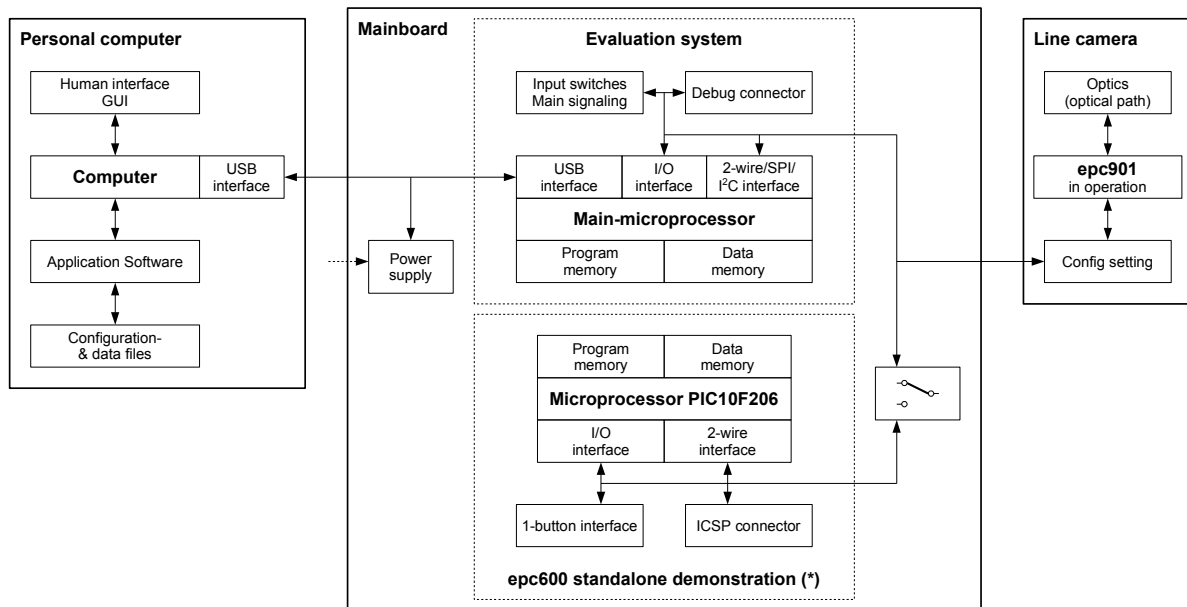


Figure 6: Block diagram (* not implemented)

Personal computer

- Windows PC compatible or Apple (Mac).
- User interface (GUI) for operation and visualization of the evaluation system.
- Runs the application software.
- Stores, reads and writes configuration and data files for the application.
- Host system for ST ARM 32bit Cortex microprocessor software development.

Mainboard

- Two sections with independent microprocessor systems:
 - Main section “Evaluation System”.
 - Section „epc600 standalone demonstration – NOT USED
- A main switch selects which section will be connected to the camera module. Always leave this on „Evaluation“.
- The mainboard/system is connected to the computer by a USB cable for data communication and power supply.
- The power supply generates all of the necessary supply voltages from the USB connection. An additional external USB power supply can be added if the PC USB interface is not capable of delivering the necessary power (ca. 1'000mA).
- The “evaluation system” section supports and gives access to the full functionality epc901 device.
 - Connects video output and 2-wire bus.
 - Reads the picture data from the camera and sends it via USB to the computer.
 - A “debug connector” allows advanced users to download their own application. For more information, refer to the manual of the corresponding processor.

Camera module

- Is a fully functional module with an epc901 chip and optics.
- Connects to the mainboard for power supply, data communication and configuration reading.
- Provides solder pads to set chip configuration according to the datasheet.
- Appropriate optics allow for the demonstration of the functionality epc901 device.

Goals and objectives of this Evaluation Kit

- Easy-to-use, plug and play demonstrator to show how epc's TOF products and line imager work and which possibilities they offer.
- Test kit for engineers, enabling first contact with epc's products.
- Reference design kit for design and development engineers.
- Supports the user during development and testing of his own hard- and software.

Not in scope

- The kit is a demonstrator. It is not designed for verification of datasheet parameters. Such tests need a dedicated test environment.
- Not designed for use in final applications.

2.2. epc901 chip

Refer to the Datasheet epc901 for any details concerning the epc901 chip and its operation.

2.3. epc901 camera module (epc901 evaluation hardware)

As a epc901 camera, epc offers a chip carrier board and an evaluation board for an easy test setup. It simplifies the use of epc's 1024x1pixel CCD line sensor. The Chip Carrier Board holds the chip and offers an easy lens mount possibility.

The Evaluation Board carries the Chip Carrier Board and defines the operating configuration of the epc901 by respective pin configuration. It offers also the connection to the customer application.

M12 and C-Mount lens holders and a small assortment of lenses are available separately.

In the minimal setup, only a 3V supply as well as the READ, SHUTTER and CLR_PIX signals are necessary, to use this kit in the default configuration.

The default configuration of the Evaluation Board V2 is as follows (as per datasheet epc901) :

- Mode: single mode
- Bandwidth: 1MHz
- I2C Address: 0101b
- Region of interest (ROI_SEL): 0 .. 1023
- Gain: 1
- Read direction (RD_DIR): 1023 ... 0
- Horizontal binning (HOR_BIN): 1 pixel

For alternative configurations – i.e. for low readout noise operation refer to the epc901 datasheet.

Figure 7 show the combination of the evaluation hardware with the chip carrier board ① inserted into the edge connector socket of the evaluation board ②. Figure 8 and Figure 9 depict the hardware with optional lens mount and lens, respectively.

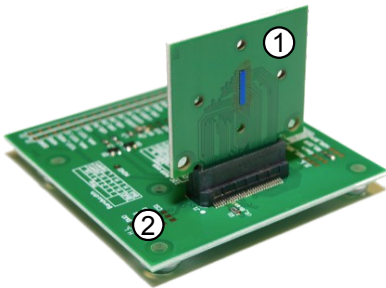


Figure 7: Carrier board on Evaluation board

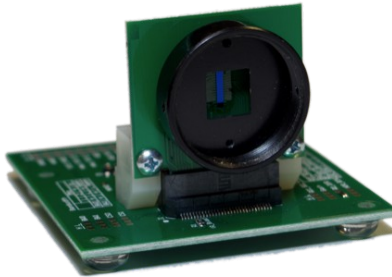


Figure 8: Lens holder M12 on carrier board

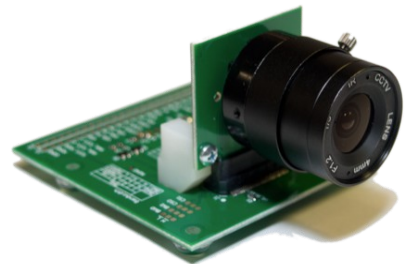


Figure 9: System with lens

2.4. epc901 Chip Carrier Board V2

2.4.1. Schematics

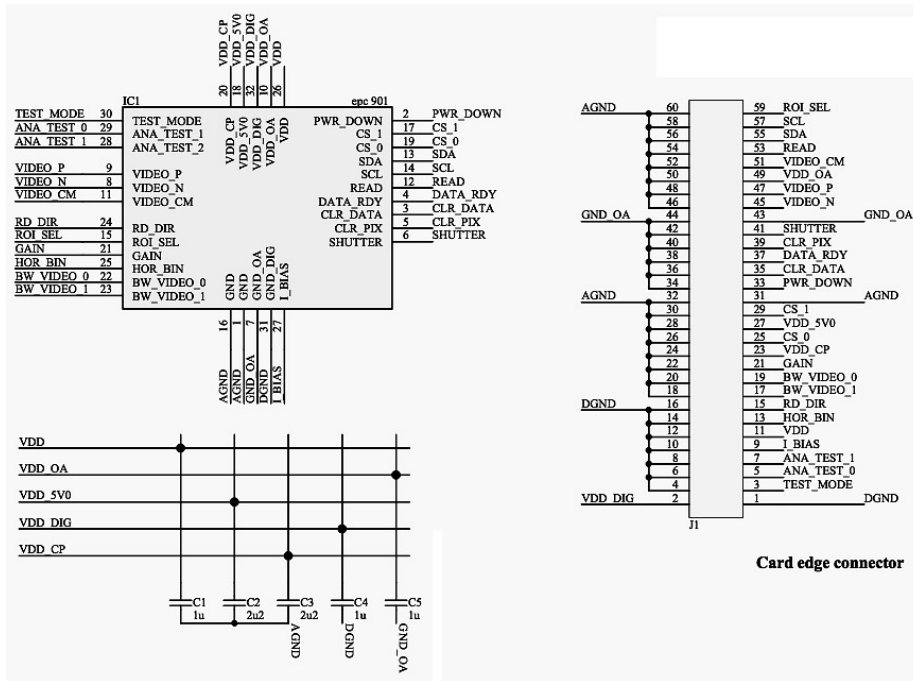


Figure 10: Schematics of the epc901 Chip Carrier Board V2

2.4.2. Board layout

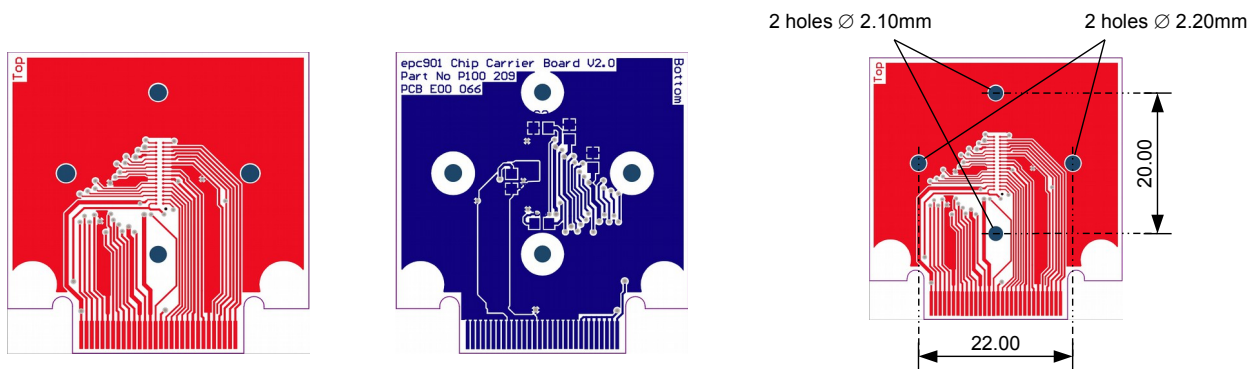


Figure 11: Layout of the Chip Carrier Board V2

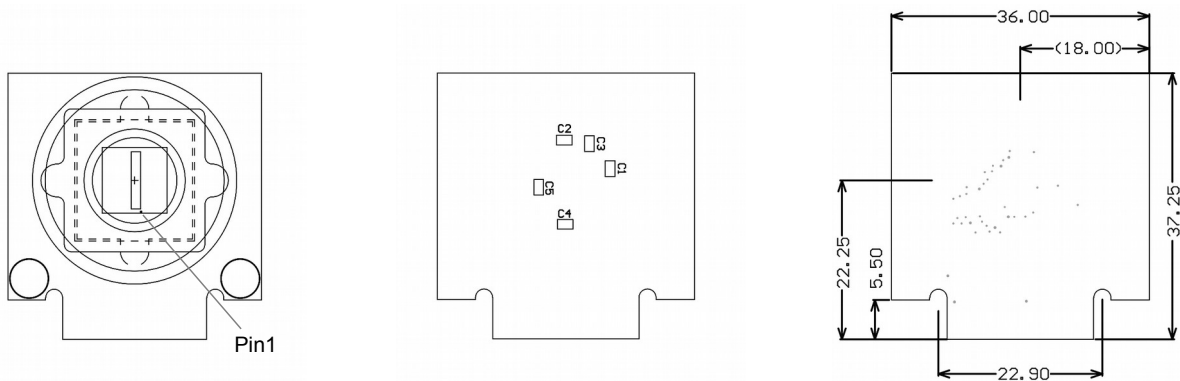


Figure 12: Assembly of the Chip Carrier Board V2: top / bottom / dimensions

2.4.3. PCB card connector

Figure 13 and Figure 14 show possible card connectors for interfacing the chip carrier board with the user's application board e.g. SAMTEC MEC6-130-02-L-DV-A / -RA1

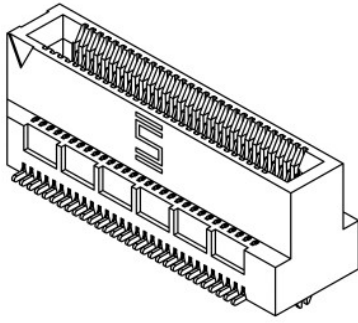


Figure 13: Vertical mount mini-edge card connector

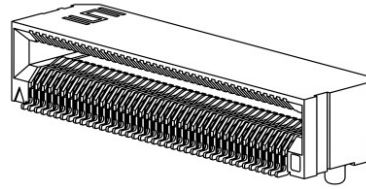


Figure 14: Right angle mini-card connector (Source: Samtec)

2.5. epc901 Evaluation Board V2

2.6. Schematics

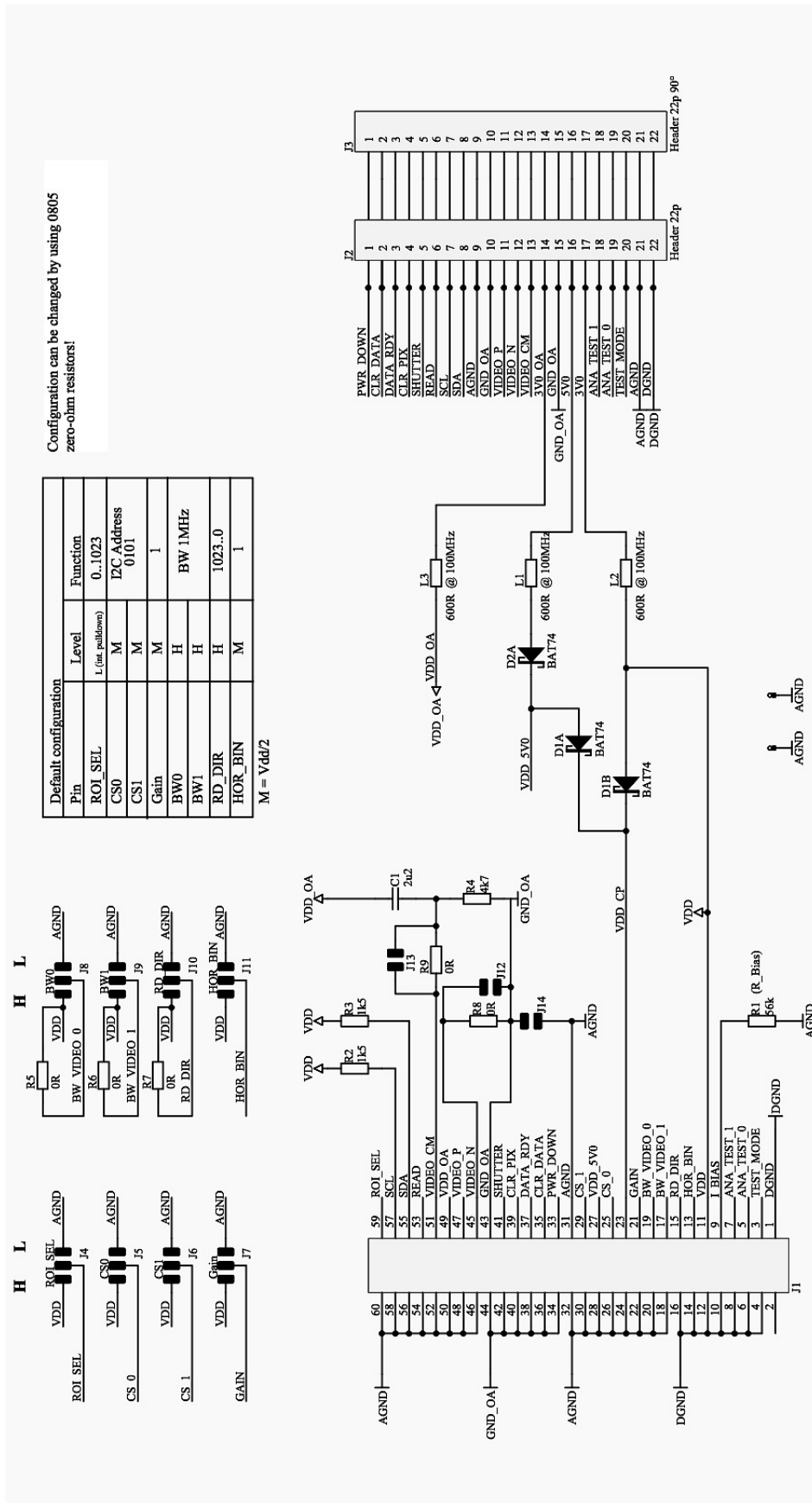


Figure 15: Schematics of the epc901 Evaluation Board V2

2.6.1. Board layout

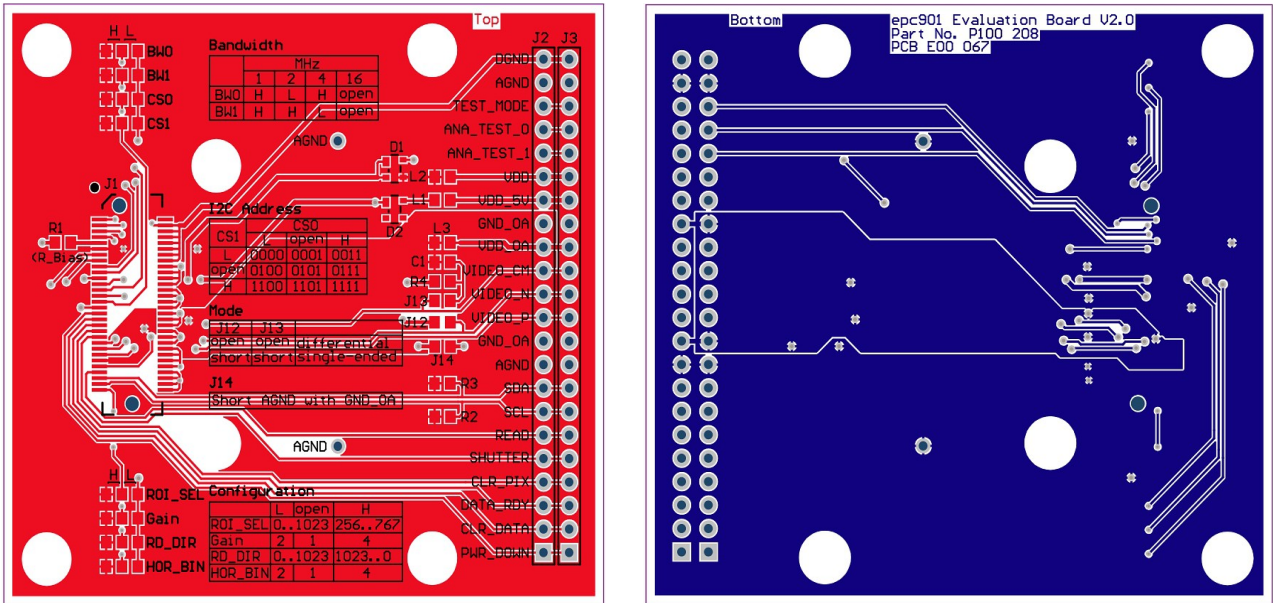


Figure 16: Layout of the Evaluation Board V2

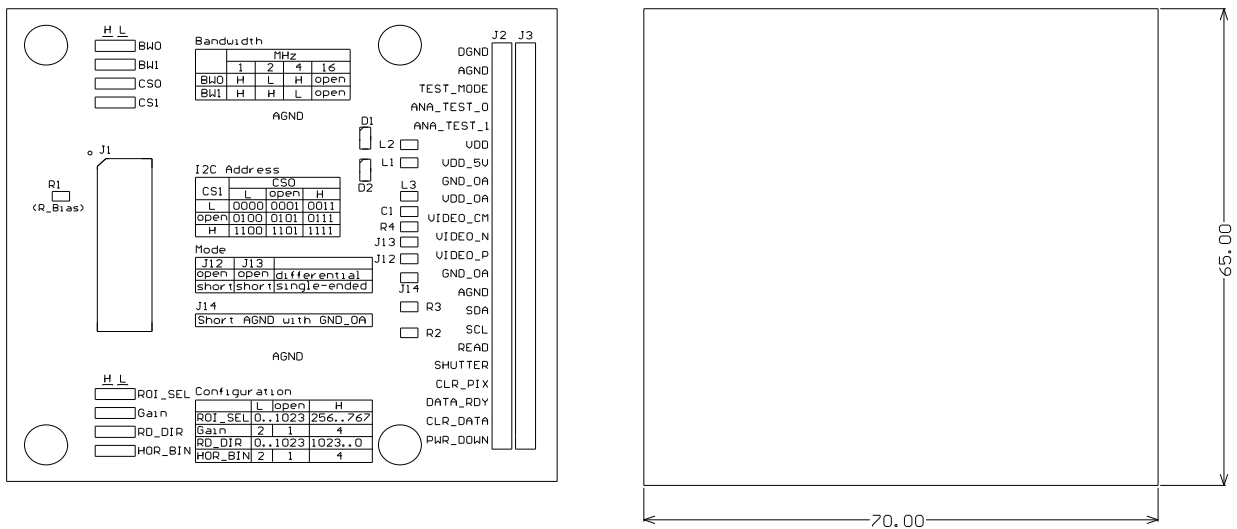


Figure 17: Assembly of the Evaluation Board V2: top / bottom incl. Dimensions

2.6.2. Set-up

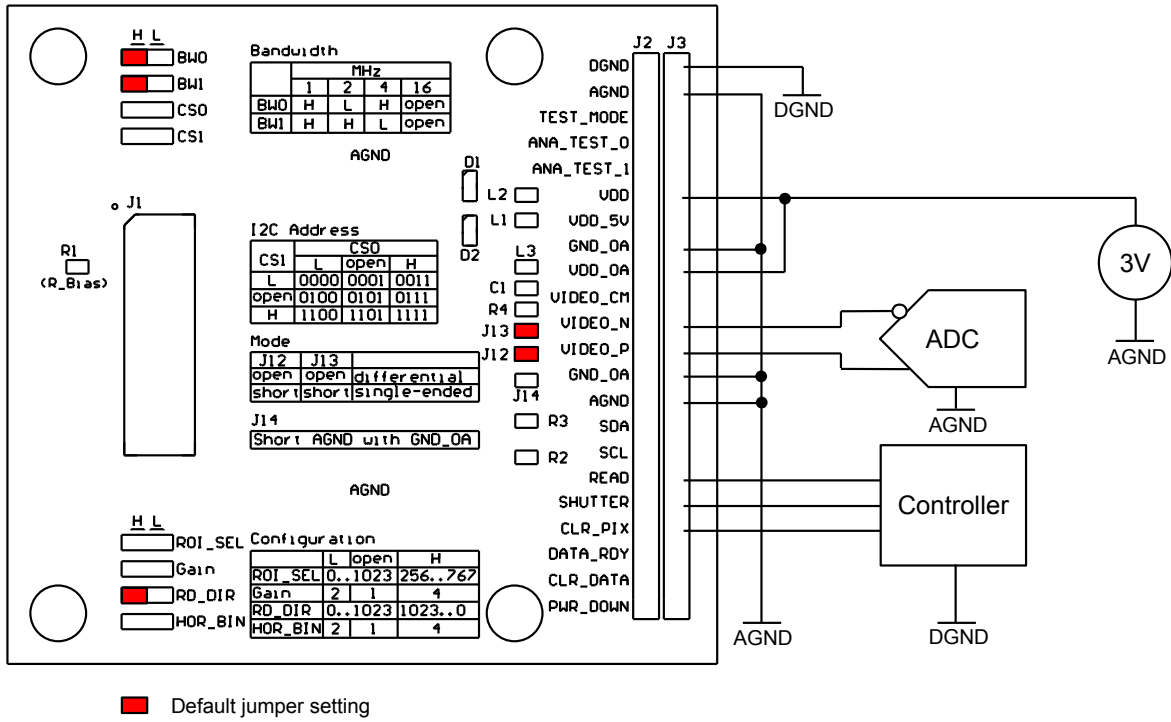


Figure 18: Minimal set-up with 3V supply (standalone, default configuration)

Notes:

Low power operation:

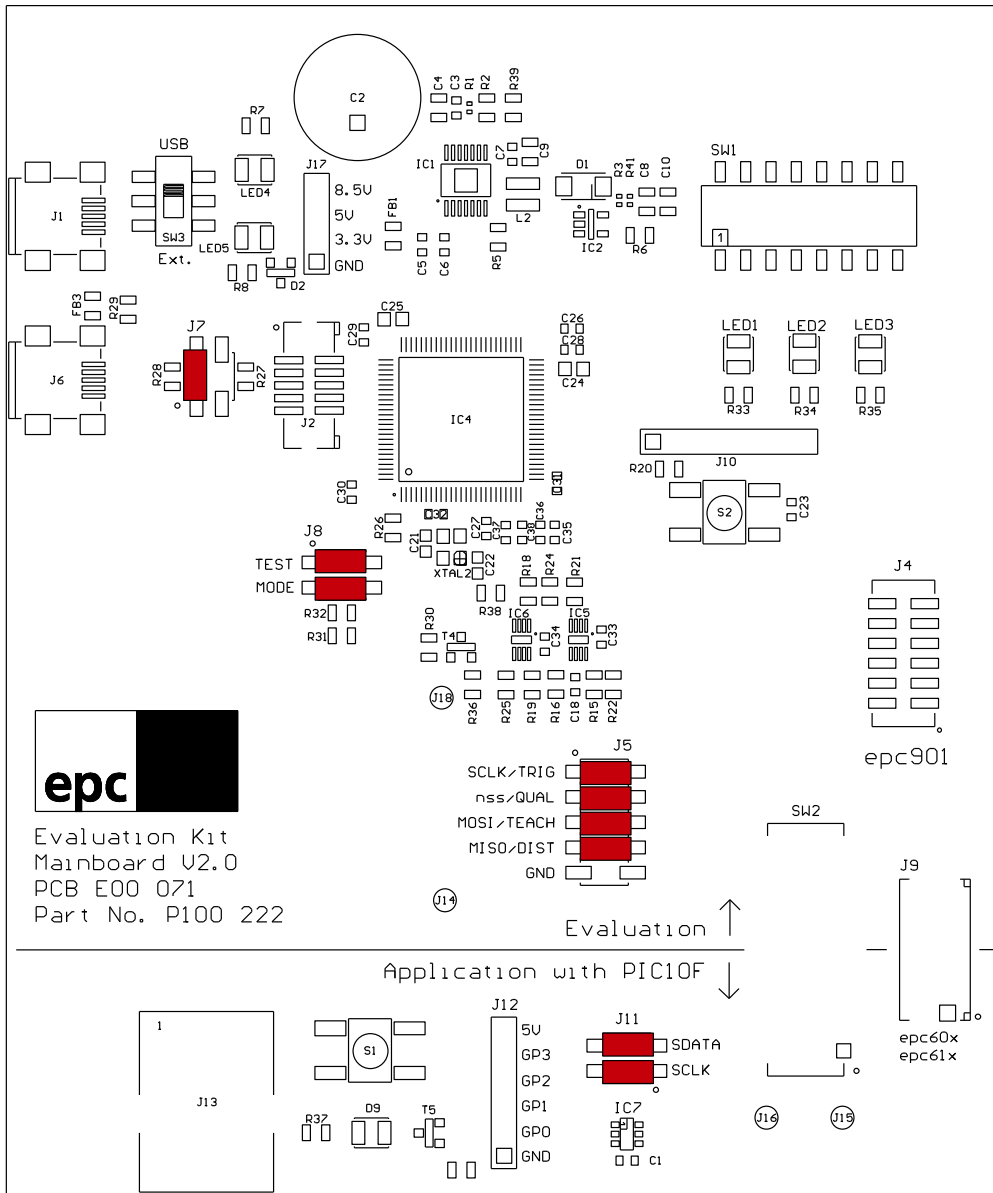
Change the configuration of the epc901:

use external 3V and 5V supply, refer to the epc901 datasheet.

use respective I2C commands

or solder zero-ohm resistors according to the table printed on the Evaluation Board.

2.8. Assembly & part list




 Default jumper setting

Figure 22: Assembly and default jumper setting

Device	Value (typical)	Comment
C1, C3, C6, C7, C12, C13, C16, C18, C23, C27, C28, C29, C30, C31, C32, C33, C34, C36, C38	100 nF	Capacitor, X7R, 10%, 10V
C4, C9, C10	10 μ F	Capacitor, X5R, 10%, 10V
C5, C11, C14, C26	4.7 μ F	Capacitor, polarized
C8	220 pF	Capacitor, 10%
C15	4.7 nF	Capacitor, NPO, 10%, 50V
C17	1 nF	Capacitor, NPO, 5%, 25V
C34, C37	1 μ F	Capacitor, 50V
C19, C20, C21, C22	18 pF	Capacitor, 5%
C24, C25	2.2 μ F	Capacitor Polarised
C2	2'200 μ F	Capacitor, 16V
D1	B340	Diode, 40V, 3A
D2	BZX84-B5V6	Zenerdiode
LED1, LED4, LED5, D9	LS T67K	LED red 2mA 1.9V
LED2, LED3	LG T67K	LED green 2mA 1.9V
FB1, FB2, FB3	1'000 Ohm @ 100MHz	Ferrit bead
IC1	TPS2151	LDO and switch with dual current control
IC2	LMR64010x	1A step up SIMPLE SWITCHER
IC4	STM32F207VG	32bit ARM controller with FPU
IC5, IC6	TXB0102DCU	2-bit bidirectional voltage level translator
IC7	PIC10F206	PIC10F20x, SOT23-6 Package
T4, T5	BC846B	Transistor
XTAL2	10 MHz	Quartz Crystal, SMT
R1	47 kOhm	Resistor, 5%, 63mW
R2, R6	15 kOhm	Resistor, 5%, 125mW
R3	100 kOhm	Resistor, 5%, 63mW
R5, R20, R27, R28, R31, R32, R36	10 kOhm	Resistor, 1%, 1/8W
R7, R29, R33, R34, R35, R37, R40	1 kOhm	Resistor, 5%, 125mW
R8	560 Ohm	Resistor, 5%, 125mW
R15, R38	0 Ohm	Resistor, 5%, 1/8W
R17	12 kOhm	Resistor, 5%, 125mW
R18, R19, R21, R22, R24, R25	47 Ohm	Resistor, 5%, 1/8W
R23	1 MOhm	Resistor, 1%, 1/8W
R26	470 Ohm	Resistor, 5%, 1/8W
R41	1 MOhm	Resistor, 5%, 1/8W
L2	33 μ H	Inductor
J1, J6	USB Mini B	USB Mini B receptacle
J2	JTAG/SWD	1.27mm dual row header
J4	Molex 12 pin	Header male, 12 pin, 2mm, Molex
J5	Header 5X2	Header, 5-Pin, Dual row
J7, J8, J11	Header 2X2	Header, 2-Pin, Dual row
J9	Dubox 2x6	Header, 6-Pin, Dual row

Table 5: Part list

2.9. Mainboard overview

The mainboard is divided into two areas with independent functionality.

In the „Evaluation“ area (the upper part of the board) is the “epc901 evaluation system” It contains the USB interface, the main-microprocessor of the evaluation system. There are also communication and I/O lines on the 3.3V level to the epc901 device. There are other parts which are not used for this application.

The „Application with PIC10F“ area (the bottom part of the board) is not used for the Evaluation Kit currently.

General purpose functions are the power supply on the top of the board, the camera connector and the evaluation/application switch in between the two main areas.

2.10. General purpose functions on the Mainboard

2.10.1. Board supply

Usually, the mainboard is supplied by the host (Personal computer or USB Hub) over the USB cable (Figure 23, J6/USB FS).

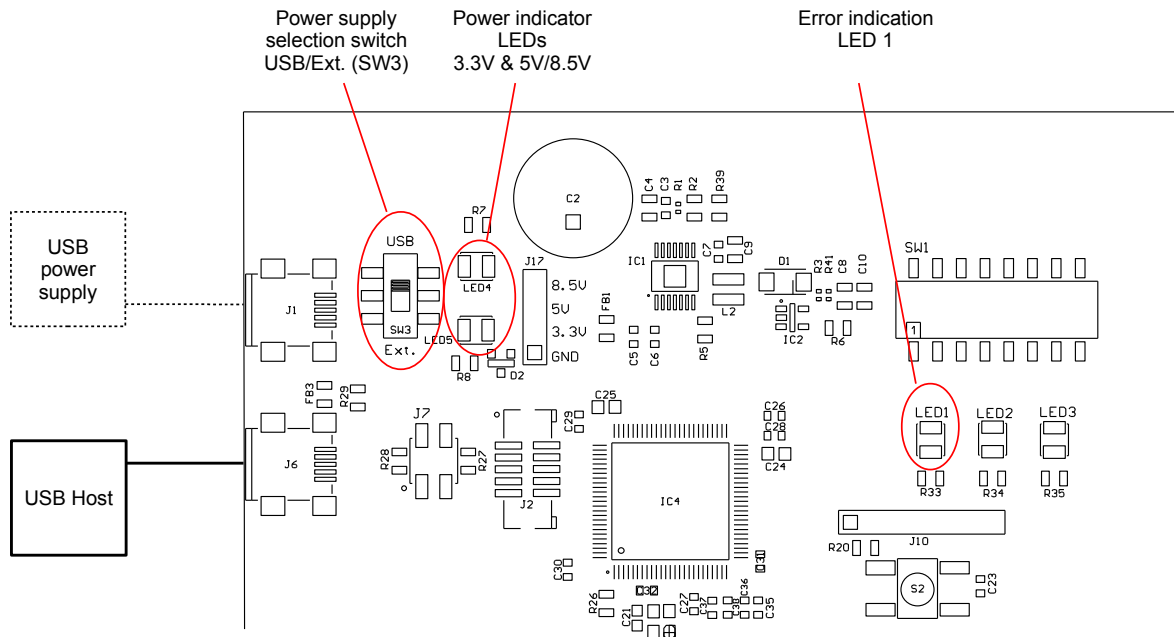


Figure 23: Mainboard: Power supply function

A integrated power management module with a built in power switch is used to manage the supply of the board. As soon as the board is connected to a USB interface or to an external USB supply, the main-microprocessor is supplied with 3.3V. The switch is initially open and the 5V or 8.5V supplies are not available until the main-microprocessor had asked the host for high-power devices and has closed the switch.

If the host is not able to deliver the necessary power, the mainboard indicates an error by flashing LED1. In this case, or if the system is running without a host, the external USB Power Supply (5V, 1'000mA) needs to be used with the power supply selection switch USB/Ext. (SW3; see picture below) set to Ext for the external supply through connector J1.

Position	Description
USB (default)	The Evaluation Kit is supplied by the host over the USB FS connector.
Ext.	The Evaluation Kit is supplied by an external USB power supply over the Ext. suppl connector.

Table 6: Power supply selection switch SW3

LED 3.3V and LED 5V/8.5V indicate if the corresponding voltages are available.

All voltages can be accessed at the power supply test points (see Figure 23). The external circuitry may not draw more than 2.5W in total!

2.10.2. epc901 camera connector J4

The epc901 camera connects to connector J4.

Pin	Pin assignment
1	GND
2	+5V
3	SCLK
4	+3.3V
5	SDA
6	VIDEO P
7	CLR DATA
8	AGND
9	CLR PIX
10	DATA RDY
11	READ
12	SHUTTER

Table 7: Pin assignment epc901 camera connector J4

2.10.3. epc600/epc610 camera connector J9

Not used. Leave as is.

2.10.4. Selection of the working area (SW2)

With the selection switch SW2, the working area of the mainboard can be selected:

- In the upper position, the "Evaluation" area is active for the epc901 evaluation system. The camera is operated and accessed by the Evaluation Kit application software on the user's computer.
- The lower position of the switch activates the „Application with PIC10F“ option. Do not use!

Caution:

The board must be in the unpowered state when switch SW2 is changed!
Otherwise the board or camera may be damaged.

2.11. "Evaluation" working area

The "Evaluation" area offers the following options for evaluation and test purposes:

2.11.1. USB connector USB FS (J6)

This interface is the communication interface between the host (PC or Mac) and the mainboard. The main task is to transmit all the sensor information from the Evaluation Kit to the host as well as to transmit the control and status information to the sensor. Secondly, this interface is used to supply power to the board (refer to chapter 2.10.1: Board supply).

2.11.2. Header J5

Not used. Leave as is.

2.11.3. Header J7 (boot option)

Jumper J7-12 (between pin 1 and 2) is used to pull down the STM32 boot0 signal.
 Jumper J7-34 (between pin 3 and 4) is used to pull down STM32's port pin PE9.

Jumper	Status	Description	Figure
J7-12	closed (default)	Boot from user flash.	
	open	Boot using boot loader located in the system memory. Do not use this option. Use the epc boot loader.	
J7-34	closed	Boot using the epc boot loader. Use the epc boot loader if you want to reprogram the flash memory using the USB FS interface.	
	open (default)	Boot from user flash.	

Table 8: Header J9 (boot option)

For more information about boot configurations, see the STM32F207 reference manual (chapter 6.1: Related documents).

2.11.4. Header J8

Not used. Leave as is.

2.11.5. DIP Switch SW1

Not used in this version.

2.11.6. Signal LED1 ... LED3

Functionality defined by the main microprocessor firmware.

- LED1, red: Error indication
- LED2, green: If LED 2 and 3 blinking alternating, the epc boot loader is active.
- LED3, green: If LED 2 and 3 blinking alternating, the epc boot loader is active.

2.11.7. Test point J14

Test point J14 is foreseen to connect ground GND to measurement or test equipment (e.g. to a oscilloscope).

2.12. STM32 support

The mainboard also offers support for software developers writing their own applications.

2.12.1. JTAG / SWD connector (J2)

JATG / SWD pin	Name	Pin description		STM32 pin
		JTAG debug port	SW debug port	
1	3V3			
2	TMS/SWDIO	JTAG Test Mode Selection	Serial Wire Data Input/Output	PA13
3	GND			
4	TCLK/SWCLK	JTAG Test Clock	Serial Wire clock	PA14
5	GND			
6	TDO/SWO	JTAG Test Data output	TRACESWO if async trace is enabled	PB3
7	TRST	JTAG Test Reset		PB4
8	TDI	JTAG Test Data input		PA15
9	GND			
10	RESET	Debug environment reset		NRST

Table 9: JTAG / SWD connector

To program and debug the STM32, an ARM SWJ-DP interface is implemented. It is a combined JTAG and serial wire debug port that enables either a serial wire debug or a JTAG probe to be connected to the target. The port is available on the J2 connector (layout for a standard 10 pin, 1.27mm cortex debug connector, see [info center.arm.com](http://info.center.arm.com)). For more information about debug support, refer to the STM32F207 reference manual (see chapter 6.1: Related documents).

2.12.2. STM32 debug (J10)

The STM32 debug connector J10 offers access to six STM32 GPIO port pins that can be set for bug tracing or any other use.

Connector Pin	STM32 pin
1	PE10
2	PE11
3	PE12
4	PE13
5	PE14
6	PE15
7	GND

Table 10: JTAG / SWD connector

2.12.3. STM32 reset (S2)

The STM32 reset button S2 is connected to the STM32's NRST input pin. A low level (pressed button) causes a system reset of the controller (for more information refer to STM32F207 reference manual; see chapter 6.1: Related documents). Note that the reset signal is only connected to the STM32 controller.

3. Software Setup & installation

3.1. Software installation

The enclosed CD contains all necessary application files and drivers to install and run the evaluation system on your computer.

3.1.1. SW installation on PC

System requirements (refer also to Table 2): PC with Windows XP or higher

Before you start the installation process, close all running applications.

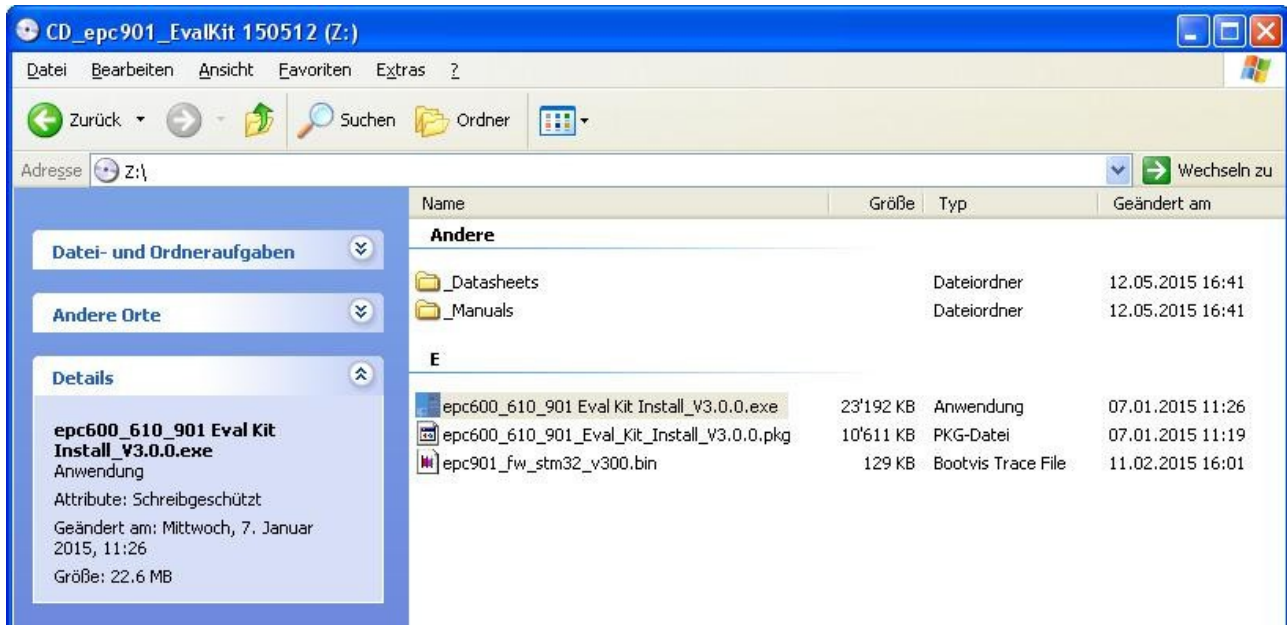


Figure 24: PC installation file on CD

Start the installation by executing the installer "epc600_610_901_Eval_Kit_Install_v3x.x.x.exe". The installer routine will load the application software as well as the necessary drivers on your system.

After completion of the software installation, connect the evaluation kit through the connector J6 USP FS to your PC with the enclosed USB cable. Make sure that the power supply selection switch on the evaluation kit is switched to "USB" (Figure 25).

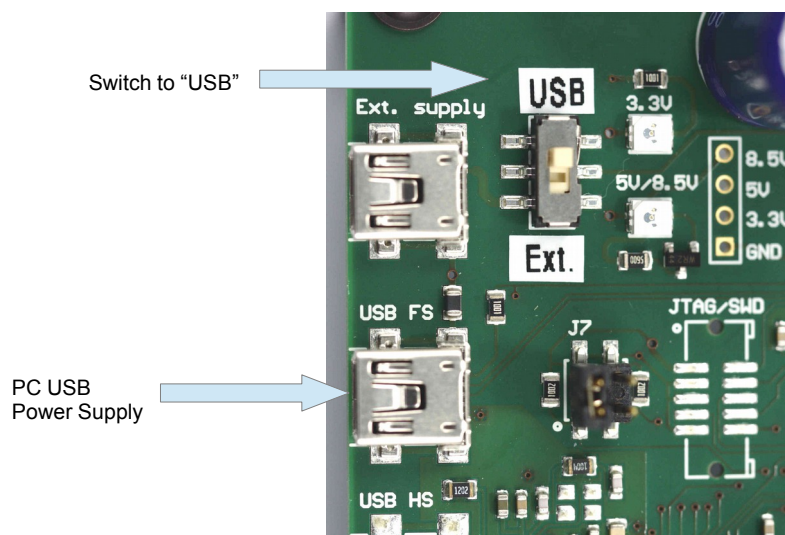


Figure 25: PC USB power supply setting

The PC will detect the new hardware and start the Windows hardware installation assistant. Choose the default option "Install software automatically" to complete the installation.

Start the application with the link "epc600_610_901_Evaluation_Kit" that has been added to your program shortcut menu.

Disconnect the USB cable before attaching a camera module and proceed with chapter 3.2. Running the epc901 application.

3.1.2. SW installation on Mac

System requirements (refer also to Table 2): Mac OS X 10.6 or higher

Before you start the installation process, close all running applications.

Copy the installer file “epc600_610_901_Eval_Kit_Install_vx.x.x.pkg” from the CD to the desktop. Start the installation by executing the installer “epc600_610_901_Eval_Kit_Install_vx.x.x.pkg”. The installer routine will load the application software as well as the necessary drivers on your system. Delete the installer file after successful installation.

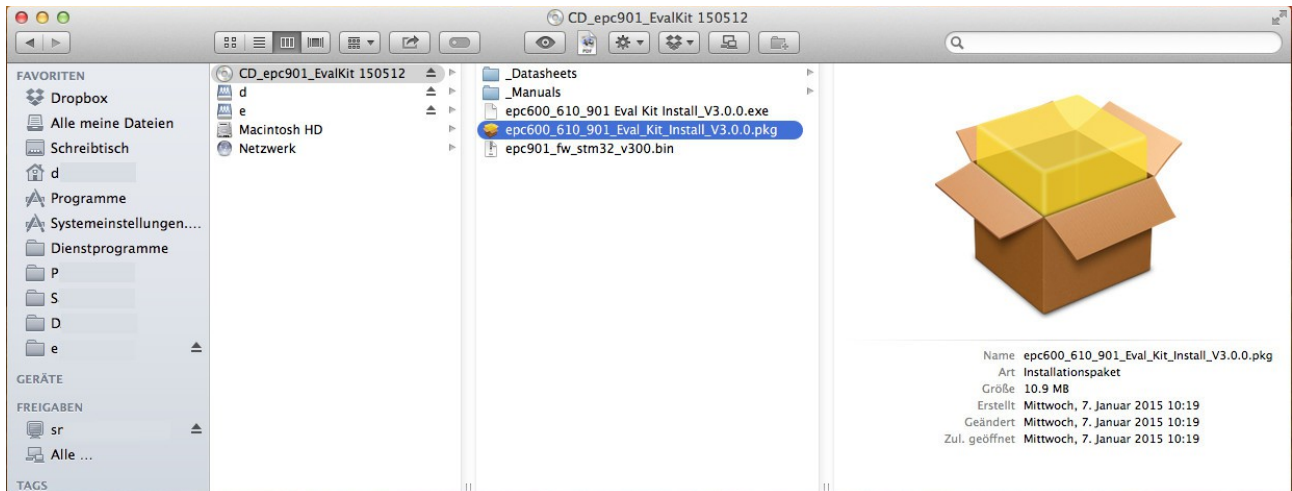


Figure 26: Mac installation file on CD

After completion of the software installation, connect the evaluation kit through the connector J6 USP FS to your PC with the enclosed USB cable. Make sure that the power supply selection switch on the evaluation kit is switched to “USB” (Figure 25).

Start the application with the link “epc600_610_901_Evaluation_Kit” that has been added to your program folder.

Notice:

The USB driver or the Evaluation Board can hang-up due to insufficient current driving capability. In this case, connect an external supply for powering the Evaluation Board.

Disconnect the USB cable and proceed with chapter 3.2. Running the epc901 application.

3.2. Running the epc901 application

This mode is the actual developer mode which gives access to the full functionality of the epc901 camera module.

It requires a host PC that has the application software installed and running. Check if the application software is installed correctly on the personal computer according to chapter 3.1.: Software installation. The software release must be the one delivered with the camera or higher.

Remark:

After a change of the camera, the upload of the corresponding firmware is necessary to operate it correctly. The firmware is on the CD enclosed in the camera package. Refer to chapter 4.1.4. Firmware settings.

Caution:

The board must be in the unpowered state when the camera is connected to the mainboard and switch SW2 is changed! Otherwise the board or camera may be damaged.

Connect the camera module to the cable and the other side of the cable to the mainboard.

Set the operation switch SW2 to “Evaluation” (see Figure 27). This will set the evaluation system into the epc901 evaluation mode and allows for the operation through the application software on the computer.

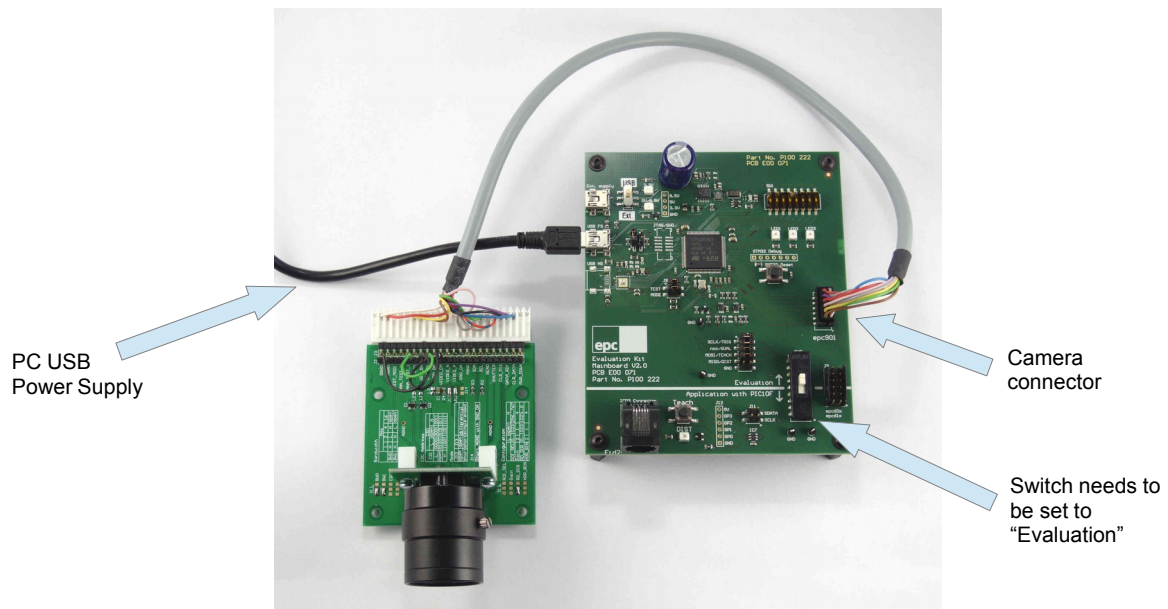


Figure 27: Hooking up USB connection and camera module

Connect with the USB cable the computer to the Evaluation Board and set switch SW3 to USB. The board is now powered up by USB. On power up, the system loads the microprocessor software and checks which type of camera module is connected. The system configures itself automatically according to the connected camera module. Start the application software on your computer and press the “Connect” button on your main screen to connect the application software to the evaluation system. Press the button “Start” to start the evaluation software.

Refer to next chapter 4. Software “epc901 evaluation system” and user interface for detailed operating instructions.

4. Software “epc901 evaluation system” and user interface

4.1. Overview

This chapter describes the epc901 Evaluation Kit software (SW) and graphical user interface (GUI). The user interface is designed as a dialog based application. The software operates the epc901 camera module, reads the data delivered by the module and allows for data logging.

4.1.1. User Interface Overview

Figure 28 shows a snapshot of the user interface. All the windows are identical both for the Mac and PC. Table 11 provides a brief description of the different user interface elements.

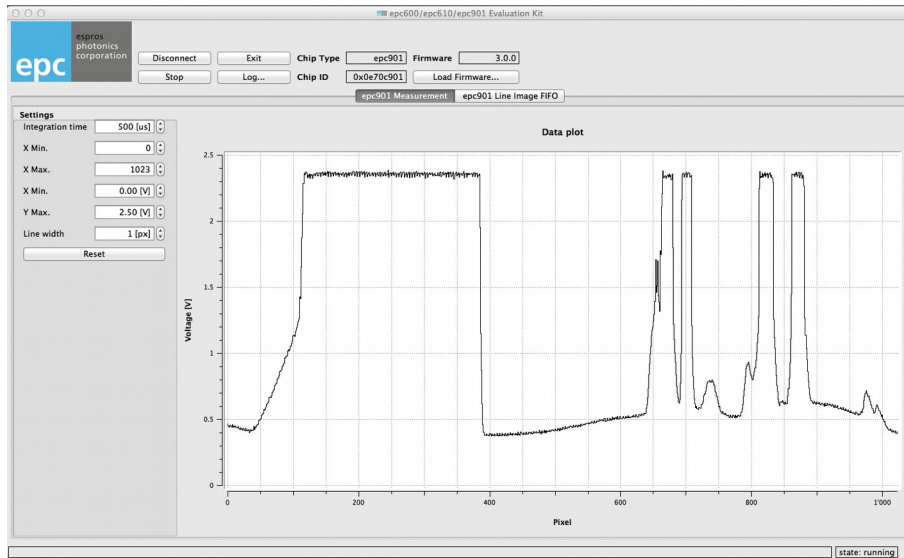


Figure 28: User Interfaces epc901 application software

Area	Description
Logo area	epc logo, a double-click opens the “About” dialog”
Main button group	Buttons for the basic handling of the system:
Connect / Disconnect	Connects / disconnects the application to / from the Evaluation Kit hardware. Always use this first before you start any other operation.
Start / Stop	Starts or stops the data acquisition. Use after the Evaluation Kit hardware has been connected.
Exit	Quits the application.
Log	Data logging for offline analysis. A dialog window allows the selection of log data and file type.
System info	This group shows the camera system type and the status infos of the system.
Chip Type	Shows the type of the connected camera system (epc600, epc610 or epc901). This information is read from the connected camera module.
Firmware	Shows Firmware version
Chip ID	Shows the serial number of the chip
Load firmware	Calls the firmware download dialog
App. Type	Shows the type of the connected camera module.
epc901 Measurement	Represents data as measured values
epc901 Line image FIFO	Shows data as greyscale line image

Table 11: Functionality of the basic application layout

Area	Description
Settings	Imager and display run-time settings
Integration time	Set the exposure time
X, Y Min., X, Y Max.	Scaling of the image axis
Line width	Sets line thickness
Reset	Sets X, Y Min., X, Y Max. and Line width to default values

Table 11 cont: Functionality of the basic application layout

4.1.2. Basic operation

Before any measurements can be taken, the data link between the camera module and the mainboard needs to be established by pressing the “Connect” button. If the camera module is detected, the type of camera module is displayed. The actual measurement can now be started with the “Start” button.

The measurement runs continuously and the values will be displayed in real-time. For offline data processing, there is a logging option available. The “Log...” button will open a dialog window that allows setting of specific logging options and to start the logging.

4.1.3. Graph “Data plot” and greyscale image

This is the representation of the measured values per pixel.

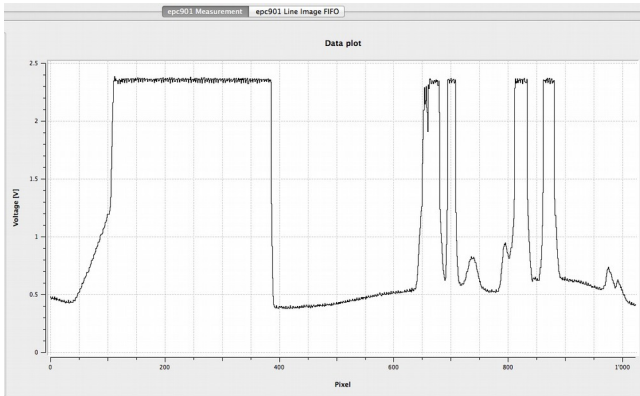


Figure 29: Mode “Data plot”: Steps

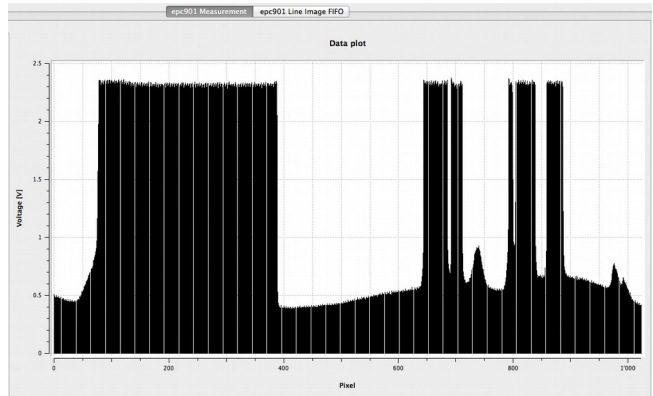


Figure 30: Mode “Data plot”: Sticks

The graph shows on the x-axis the pixel number and on the y-axis the corresponding read-out value (voltage) of the pixel. To switch between Steps and Sticks mode, use the right mouse button.

The measured values can also be presented as a greyscale line image:

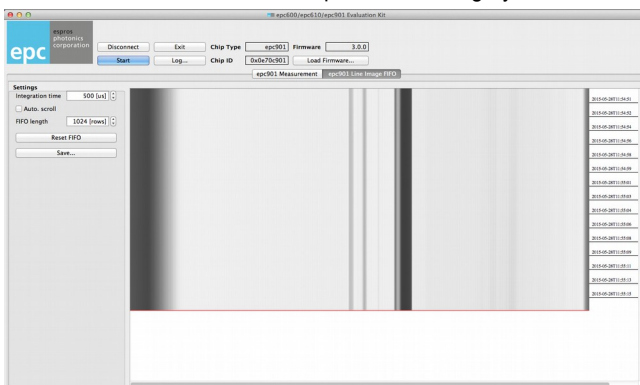


Figure 31: Menu epc901 Line Image FIFO

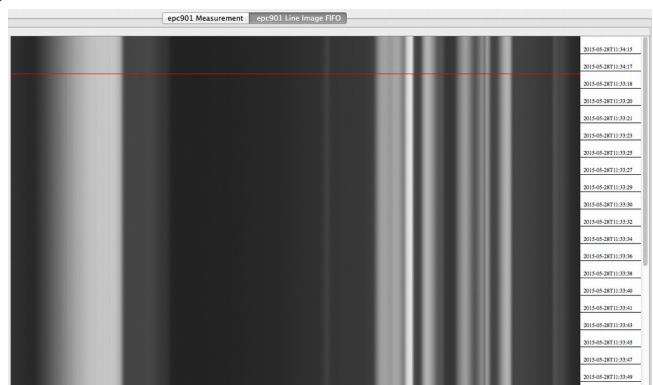


Figure 32: Line image

4.1.4. Firmware settings

The Evaluation Kit requires firmware that runs on the ARM controller. This firmware configures the chip, performs the measurements, calculates the result values, interfaces to the computer software and much more. As the development around the epc901 device is ongoing, there will be regular updates of this software. By using the “Upload Firmware” button, it is possible to flash such updated versions on the Evaluation Kit.

Chip Type	<input type="text" value="epc901"/>	Firmware	<input type="text" value="3.0.0"/>
Chip ID	<input type="text" value="0x0e70c901"/>	<input type="button" value="Load Firmware..."/>	

Figure 33: Firmware settings

Remark:
 After a change of the camera, the upload of the corresponding firmware is necessary to operate it correctly.
 The firmware is on the CD enclosed in the camera package.

4.1.5. Log dialog

This function allows data logging for offline analysis of epc901 chip read-out data. The data stream can be collected either by number of measurement counts or by a logging time.

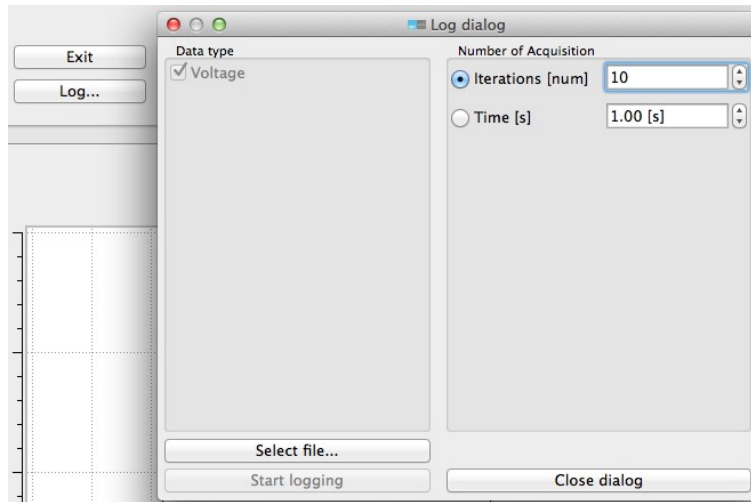


Figure 34: The log dialog

5. Maintenance and disposal

5.1. Maintenance

The components of the evaluation kit do not need regular maintenance. A functional check is recommended each time the kit is taken into operation:

- Check the mounting position and the detection area of the sensor with respect to the operational conditions. Also check that there is no hazardous situation.
- From time to time, clean the sensor with a soft towel and with a little soapy water to remove dust or dirt.

5.2. Disposal

Disposal should be done using the most up-to-date recycling technologies for electronic components according to the local regulations and laws. The design and manufacture of the kit's components are done in compliance with the RoHS legal regulations. Traces of dangerous materials may be found in the electronic components, but not in harmful quantities.

6. Addendum

6.1. Related documents

- Datasheet epc901, ESPROS photonics corp., 2014
- STM32F205xx, STM32F207xx, STM32F215xx and STM32F217xx advanced ARM-based 32-bit MCUs, Reference manual, ST Micro-electronics corp., 2011

6.2. Links

www.espros.com

<http://infocenter.arm.com>

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