Sam460ex
power for your embedded ideas.

Sam460ex
User Guide

version 1.3 – 08 December 2012

ACube Systems S.r.l.
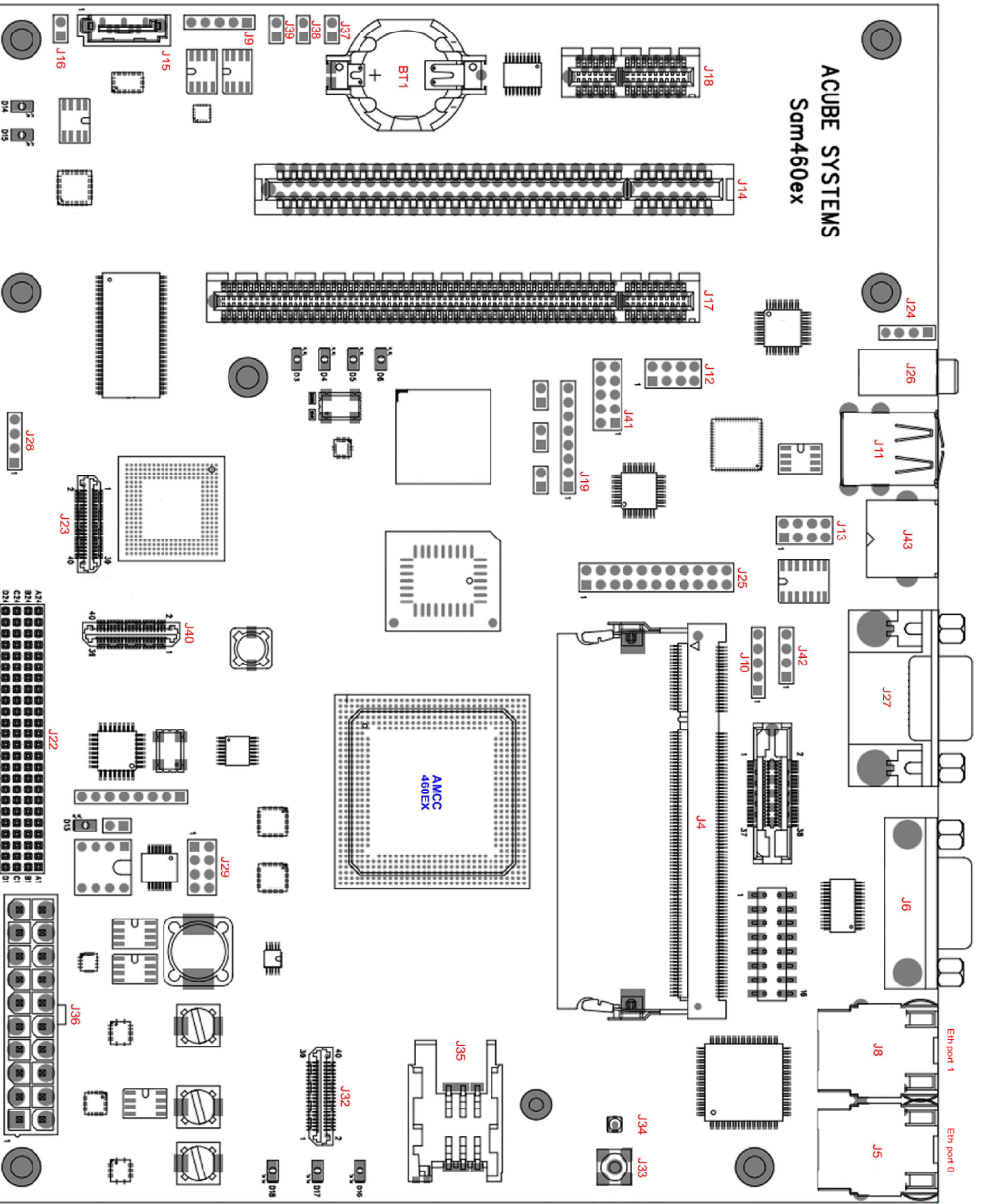Via Tabacco, 58 - 36061 Bassano del Grappa, (Vi) – Italy
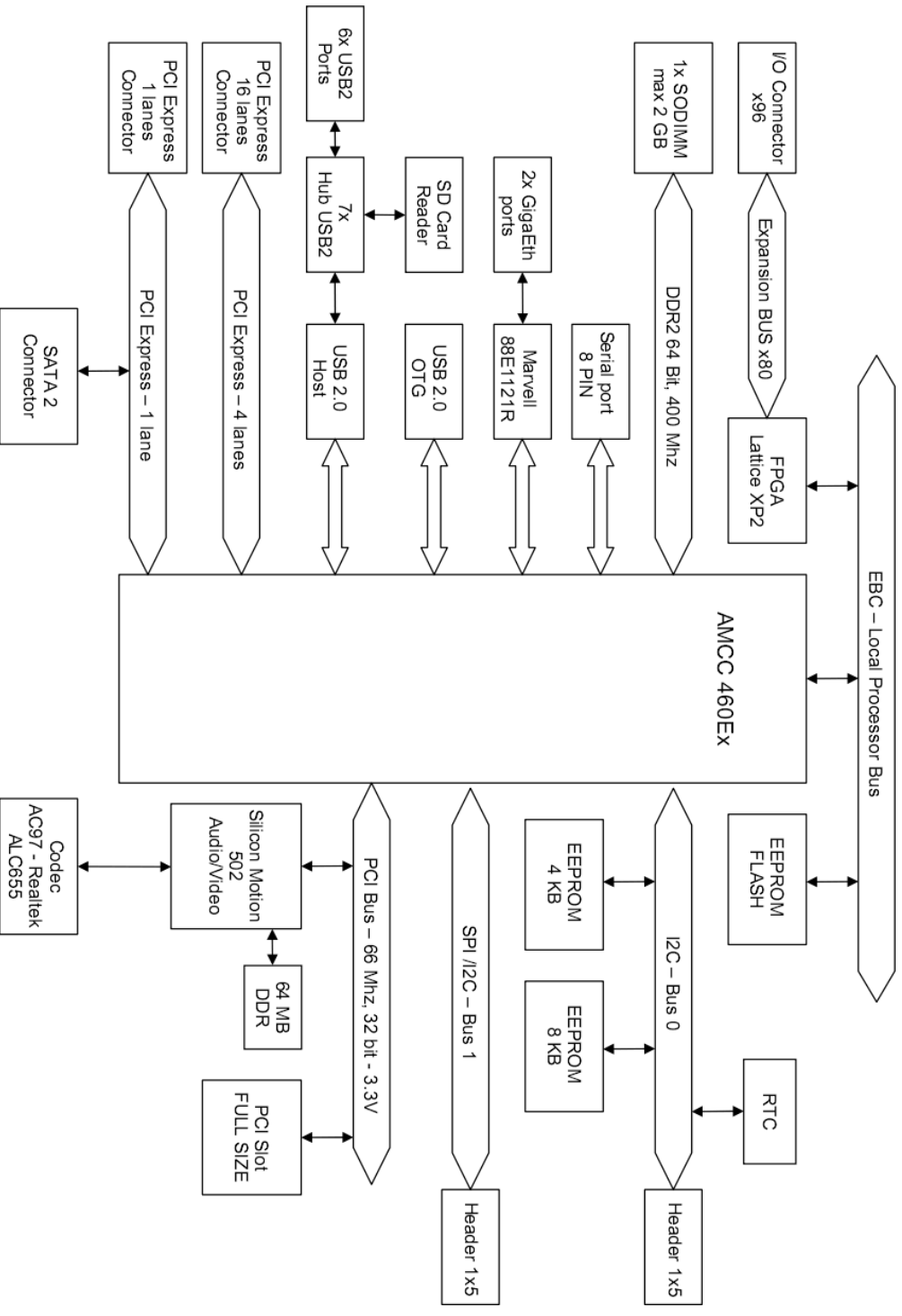Tel. +39 0424 393120 fax +39 0424 393119
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ACUBE SYSTEMS
Sam460ex

J16
J15
J9
J39
J38
J37
BT1
J18

J14

J17

J24
J26
J28
J12
J41
J11
J19
J13
J43
J23
J25
J40
J10
J42
J27
J22
AMCC
460EX
J4
J29
J6
J36
J8
Eth port 1
J35
J32
J34
J33
J5
Eth port 0

D14
D15
D3
D4
D5
D6
D9
D8
D7
D16

- PCI Express 1 lanes Connector
- PCI Express 16 lanes Connector
- 6x USB2 Ports
- 1x SODIMM max 2 GB
- I/O Connector x96
- SD Card Reader
- 2x GigaEth ports
- 7x Hub USB2
- SATA 2 Connector
- PCI Express – 1 lane
- PCI Express – 4 lanes
- USB 2.0 Host
- USB 2.0 OTG
- Marvell 88E1121R
- Serial port 8 PIN
- DDR2 64 Bit, 400 Mhz
- Expansion BUS x80
- FPGA Lattice XP2
- EBC – Local Processor Bus
- AMCC 460Ex
- Codec AC97 - Realtek ALC655
- Silicon Motion 502 Audio/Video
- 64 MB DDR
- PCI Bus – 66 Mhz, 32 bit - 3.3V
- SPI /I2C – Bus 1
- EEPROM 4 KB
- EEPROM 8 KB
- EEPROM FLASH
- I2C – Bus 0
- RTC
- PCI Slot FULL SIZE
- Header 1x5
- Header 1x5

Introduction

Your Sam460ex board is ready to go.

Just connect a hard drive, monitor, mouse and keyboard, and switch it on!
It can be housed into a flex-ATX, micro-ATX or full ATX computer case.
The use of a good quality ATX power supply is strongly advised for a correct operation of the board.

Sam460ex Hardware Specifications

- flex-ATX form factor (21.6 x 17 cm)
- 8 layers PCB
- AMCC 460ex SoC – upto 1.150 Ghz
- max 2 GB DDR2 Ram – 200-pin SODIMM
- Silicon Motion SM502 embedded MoC (audio/video) max 64MB Gfx RAM
- Audio 5.1 Realtek ALC655 codec
- PCI-express 4x lanes slot (16x mechanical connector)
- PCI-express 1x lane slot (* check notes)
- PCI slot, 32 bits, 33/66 Mhz, 3.3V
- 1x SATA2 port (* check notes)
- 6x USB2 EHCI/OHCI ports + 1 USB1.1 port
- 1x 10/100/1000 Ethernet port (another 10/100/1000 Ethernet port is optional)
- Lattice XP2 FPGA with 80 I/O pins expansion connector (connector is optional)
- UMTS/GSM module (optional requires add-on card)
- 512 MB NAND Flash (optional)
- integrated SD card reader
- RTC clock
- Serial port, 8-wires
- I2C and SPI/I2C buses
- passive cooling
- U-Boot 2010.06

Connectors

Case panel connector (near the ATX Power connector) - J29

> 1-2 HD led
> 3-4 Power led
> 5-6 Power Switch
> 7-8 Reset Switch

Note: on computer cases with a single switch off/reset button, connect the button to pins 5-6 on J29. To reset the board, press shortly the button. To switch it off, keep pressed the button for 2-3 seconds.

ATX Power connector - J36

RAM (DDR2 - 200-pin SODIMM) max 2 GB – J4 (we suggest the use of a 667/800 Mhz module)

USB

J11 - External USB ports (EHCI/OHCI)
J12, J13 - Internal USB ports (EHCI/OHCI)
J28 - Internal USB Port (OHCI)

J12a (port 3)	J12b (port 4)	J13a (port 5)	J13b (port 6)	J28 (port 7)
1 – VCC	2 – VCC	1 – VCC	2 – VCC	1 – VCC
3 – D-	4 – D-	3 – D-	4 – D-	2 – D-
5 – D+	6 – D+	5 – D+	6 – D+	3 – D+
7 – GND	8 – GND	7 – GND	8 – GND	4 – GND

Video

J23 - LVDS
J27 - VGA
J40 - Zoom Video port
J42 - add-on card
J43 - SVideo in-out (requires add-on card)

Audio

J24 - Audio in (DVD/CD)
J25 - Audio expansion port

1 – 3.3 V	2 – 5 V
3 – SPDIFI	4 – SPDIFO
5 – MIC1	6 – LINE_IN_L
7 – JD0	8 – JD2
9 – MIC2	10 – LINE_IN_R
11 – SURR_L	12 – PCIM_OUT
13 – SURR_R	14 – PCIM_IN
15 – AUX_L	16 – CEN_OUT
17 – AUX_R	18 – LFE_OUT
19 – FMIC	20 – VREFOUT
21 – GND	22 – GND

J26 - Audio out (stereo jack)
J41 - Audio front panel AC97

1 - Mic	2 - GND
3 - VREF OUT	4 - NC
5 - Right	6 - Line in L
7 - NC	8 - NC
9 - Left	10 - Line in R

Ethernet

J5, J8 - Dual 10/100/1000 Ethernet ports

SATA2

J15 - SATA2 port
J16 - SATA2 or PCI-e 1x selector

Miscellaneous

J6 - Serial port (8-wires)

J9 – I2C bus port	J10 - SPI/I2C bus port
1 – SCLK	1 – I2C SCLK / SPI SCL
2 – 3.3V	2 – 3.3V
3 – SDATA	3 – I2C SDATA / SPI SDA
4 – GND	4 – GND
5 – NC	5 – SPI SDO

J19 - Lattice XP2 FPGA JTAG

J22 - Lattice XP2 FPGA expansion connector (80 I/O pins available)
J31 - SD card: (solder side)
J32 - UMTS module
J33, J34 - Antenna (UMTS)
J35 - SIM socket (UMTS)

J37 - service (factory setting: open)
J38 - service (factory setting: closed)
J39 - service (factory setting: closed)

Boot

The current U-Boot version supports booting from the following devices:

- SATA hard disk connected on the onboard SATA2 controller port J15 (* check notes)
- PATA hard disk and/or DVD connected to a Silicon Image 0680 controller on PCI slot (*)
- SATA hard disk and/or DVD connected to a Silicon Image 3512 controller on PCI slot (*)
- SATA hard disk and/or DVD connected to a Silicon Image 3114 controller on PCI slot (*)
- USB mass storage
- internal SD card reader J31
- Network

(*) check page 7 on how to recognize a suitable PCI card for your Sam460ex

Video output

The current U-Boot version supports video output from:

- onboard SM502 VGA port
- Radeon card on PCI slot
- Radeon card on PCI-Express slot

To change the preferred video output, select it from the "Video Option" U-Boot menu.

To suppress most of the boot messages, select "Silent" in the "Console" U-Boot menu.

Notes

1 - the SATA2 port and the PCI-e 1x slot are mutually exclusive, only one of them can be used at a time:

- to use the SATA2 port, close **J16** with a jumper, and select the corresponding entry in the
  "PCI-E 1x / SATA-2" U-Boot menu.
- to use the PCI-e 1x slot, remove the **J16** jumper, and select the corresponding entry in the
  "PCI-E 1x / SATA-2" U-Boot menu.

A reboot is required.

2 - the Sam460ex board is built to work standalone in a fanless enviroment but particular care must be taken when housing the board in a closed metalic cabinet with other electronic devices (such as hard drives, CD/DVD, DC-DC converter etc..)
In these cases, ensure to have free circulation of fresh air inside the cabinet, via holes or a small fan.

3 - when using a PCI-Express graphic card, we suggest to use a Radeon HD2400 or newer models. Older models like X600, X800 are not fully compatible with the Sam460ex and may not work. Some X1550 cards are reported to work OK.

4 – after switching OFF the board, it's **strongly advised** to wait at least **15 seconds** before switching it ON again, otherwise the onboard devices may not work correctly. The current firmware doesn't allow to switch on the board again after 3 seconds.

5 – the onboard graphic card has a maximum resolution of 1280x1024 pixels (4:3) or 1440x900 pixels (16:9).
Supports DDC, 2D hardware acceleration, hardware sprites (3 colors) and PIP.
There is no support for 3D or compositing.
Some operating systems may limit the color resolution to 8 and 16 bits.

6 – We suggest that you use RAM modules which are CL 6 (Cas Latency).

Frequently Asked Questions

How to use more than one SATA drive?

The Sam460ex is made both for embedded and consumer markets. It can be adapted to different needs. As an example, a customer who wants a board for home use will probably choose to add a SATA controller on a PCI card. This will allow up to four SATA drives. ACube may provide such expansion boards.
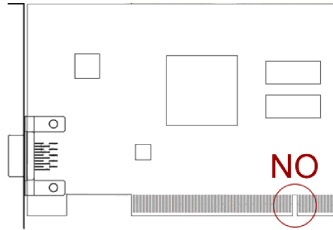
How can the operating system be loaded?

It is possible to load the operating system from a PATA/SATA harddisk, a CDROM connected on PATA/SATA, an USB key, a SD card or from the network.
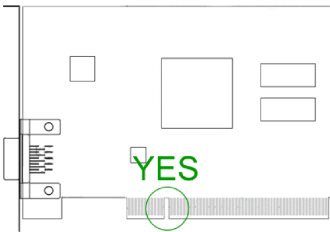
How to enable DMA for SATA devices?

Check the documentation which comes with the operating system on how to enable DMA for SATA devices. By default, all devices are set to PIO mode (slow).
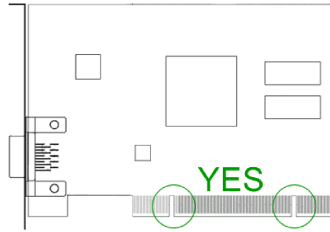
Warning: the PCI slot is compatible with 3.3V PCI card **only**. Inserting a 5.0V PCI card will damage the Sam460ex board !!
Do not try to reverse a 5.0V PCI board to fit it into the 3.3V PCI slot, it will damage your board !!

NO

5V compatible PCI card – DON'T use it

YES

3,3V compatible PCI card – OK

YES

3,3V and 5V compatible PCI card – OK

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