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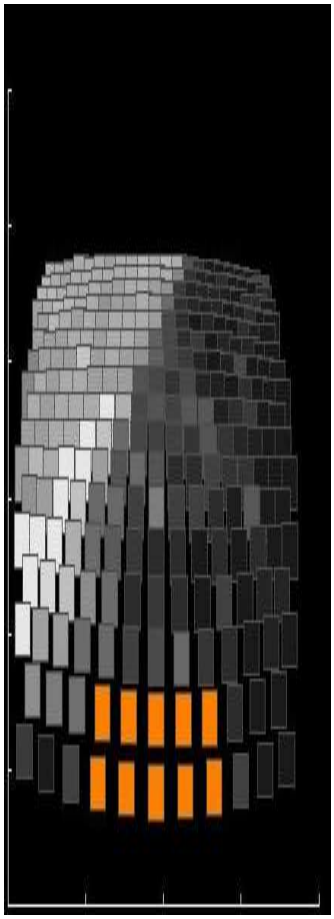

MBS270 V2

EMBEDDED VISION COMPUTER

MBS270 V2 Hardware Manual

Edition January 2009

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Revision History

Date	Revision	Description
September 2008	-001	Initial release
January 2009	-002	Modify X12 (LCD port connector) pin out: pins 18 and 19. To be considered for versions 2.1 and higher. Modify GPIO 96 default use. Correct CIF_xx directions in X10 pinout. Added pin numbering for I/O connectors. Added RTC section. Added current rating for Harwin and Hirose connectors. Added MBS270L section.

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PREFACE

This MBS270 V2 Hardware Manual describes the board's design and functions. Precise specifications for the Intel PXA270 and PXA320 processors can be found at Marvell Website www.marvell.com. Concerning software, please refer to MBS270 V2 Software Manual.

In this hardware manual, low active signals are denoted by a "!" in front of the signal name (i.e. !RESET). A "0" indicates a logic-zero or low-level signal, while a "1" represents a logic-one or high-level signal.

MOBISENSE SYSTEMS declares that MBS270 V2 complies with European directive for Electro Magnetic Conformity only in accordance to the descriptions and rules of usage indicated in this hardware manual.

MBS270 V2 embedded vision computer is designed for installation in electrical appliances or as dedicated evaluation board (i.e.: for use as a test and prototype platform for hardware/software development) in laboratory environments.

Note: MBS270 V2 lacking protective enclosure is subject to damage by ESD and, hence, may only be unpacked, handled or operated in environments in which sufficient precautionary measures have been taken in respect to ESD dangers. It is also necessary that only appropriately trained personnel (such as electricians, technicians and engineers) handle and/or operate this product. Moreover, MBS270 V2 should not be operated without protection circuitry if connections to the headers are longer than 3 meters.

I. INTRODUCTION

I.1 MBS270 V2 general presentation

MBS270 V2 is an embedded computer dedicated to control and computer vision. It is based on Intel/Marvell Technology PXA270 processor and offers multiple interfaces including digital camera.

The PXA270 processor is an integrated system-on-a-chip microprocessor for high-performance, low-power, portable, handheld and handset devices. It incorporates the Intel XScale technology with on-the-fly voltage and frequency scaling and sophisticated power management to provide industry-leading MIPS/mW performance. The PXA27x processor complies with the ARM Architecture V5TE instruction set (excluding floating point instructions) and follows the ARM programmer's model. The PXA27x processor also supports Intel Wireless MMX integer instructions in applications such as those that accelerate audio and video processing. It offers many peripherals such as 3 UARTs, 3 SSP, I2C, USB host and client controllers, external memory devices interfaces, 4 PWM and digital camera interface.

MBS270 V2 is a single-board computer bringing the richness and performance of PXA270 processor to robot and embedded control designers:

- A ready-to-run digital camera interface enables real-time image processing and vision control. Color and grey-level images can be acquired in various formats. Images are transferred to memory without CPU intervention via DMA.
- Many communication ports are available to interface with other systems: UART, SSP, I2C, USB host, Ethernet, SDIO.
- Additional peripherals are available: PWM, ADC, GPIO and timers, LCD with touchscreen, audio input and output.
- microSD card and USB flash drive can be added to extend storage capacity.
- All interfaces are easily accessible through convenient and reliable connectors.

MBS270 V2 has been designed for optimal performance in embedded systems:

- light and small: 35 or 46 grams[1], 50mm x 72mm board size
- low power: 1 Watt while executing 25fps image processing
- single power supply with on-board high efficiency converters.

MBS270 V2 is easy to use thanks to available software running with it:

- Linux operating system
- Video For Linux 2 (V4L2) image acquisition driver
- Intel Integrated Performance Primitives (IPP) Library including many WMMX optimized routines for signal and image processing.
- MOBISENSE SYSTEMS additional drivers
- gdb and Eclipse
- Open source software from OpenEmbedded, Angstrom distribution…

[1] MBS270 V2 board with Colibri module only.

I.2 MBS270 V2 features

I.2.1 Intel/Marvell PXA270 embedded computer

- Intel/Marvell PXA270 processor running at 520MHz
- 64 Mbytes of 32 bits SDRAM
- 32 Mbytes of 32 bits Flash
- Linux 2.6.26 operating system

I.2.2 Camera interface

- Standard 10 bits digital interface with Pixel clock, Line and Frame Valid signals operating up to 26MHz
- Master clock up to 26MHz
- FFC connection: high speed signals interleaved with ground preserve signal integrity and allow sensor to be placed far away from the port.
- I2C signals
- 3V3 and 5V power supplies

I.2.3 Communication ports

- Ethernet 10/100 Mbit
- 2 x USB host 1.1 ports
- 3 x asynchronous serial ports with all signals: 2 x RS232, 1 x TTL
- 2 x synchronous serial ports SSP/SPI/Microwire/PSP compatible
- I2C
- SDIO

I.2.4 Multimedia

- 20 bits audio: stereo headphone output, stereo line input and microphone input
- up to 18 bits LCD port
- XY touch screen inputs

I.2.5 Additional peripherals

- 4 x PWM outputs
- 4 x 10bits ADC inputs
- Up to 31 GPIOs[1], 4 driving LEDs, 4 driven by micro switch
- 1 event count input
- 1 timer event output
- Battery saved real time clock RTC
- Power supervision signals

[1] Depending of multiplexed pins use.

I.3 Block Diagram

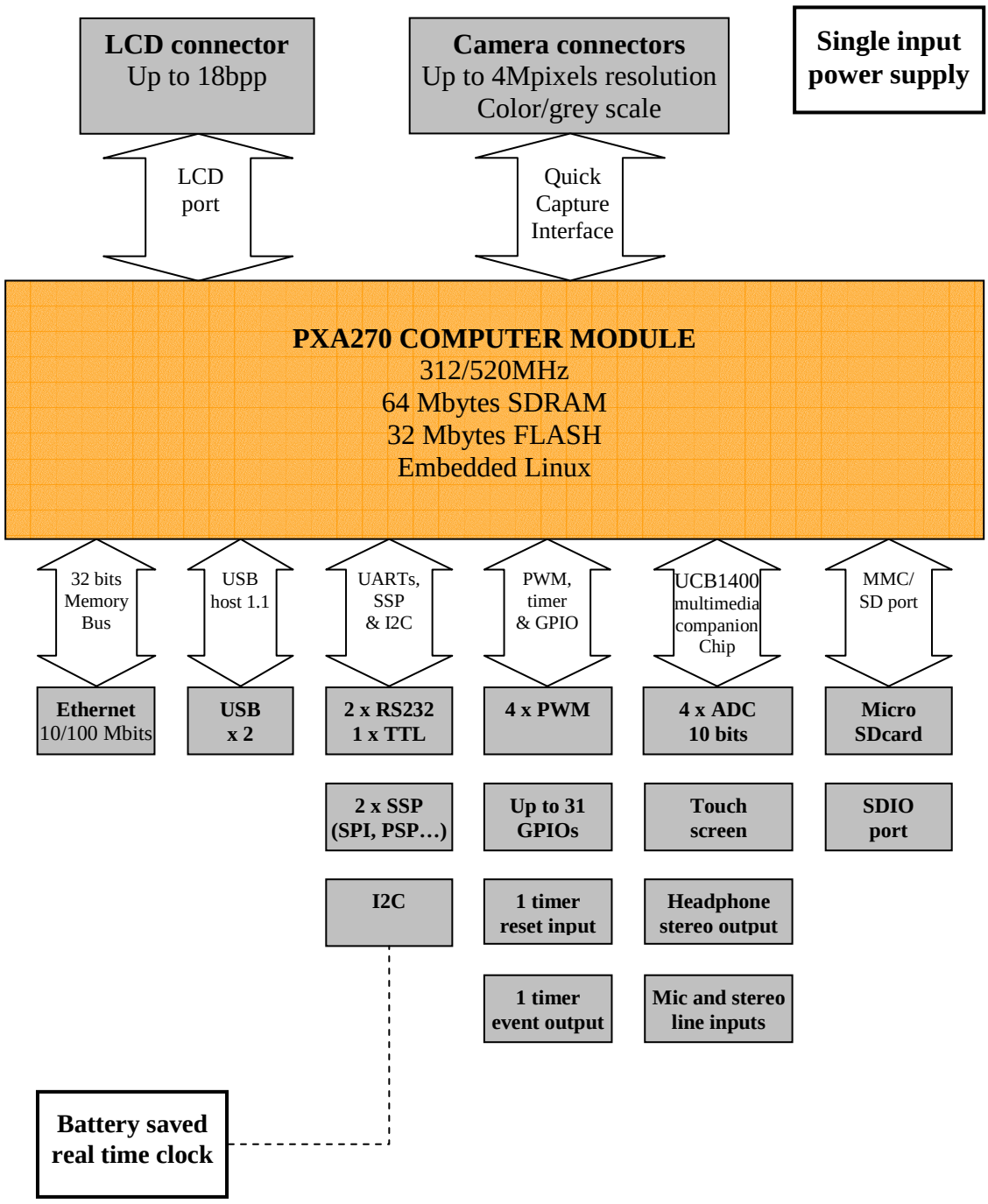

Figure 1: Block diagram

I.4 Views of MBS270 V2

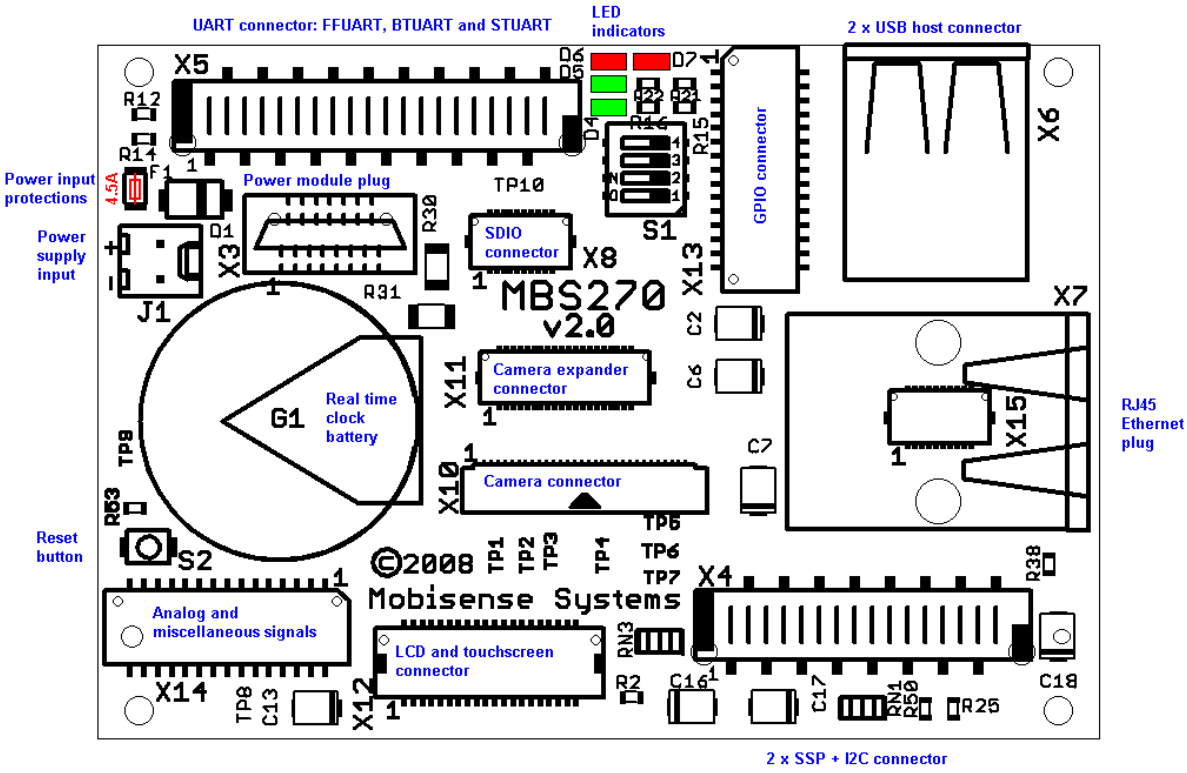

Figure 2: connector locations top side

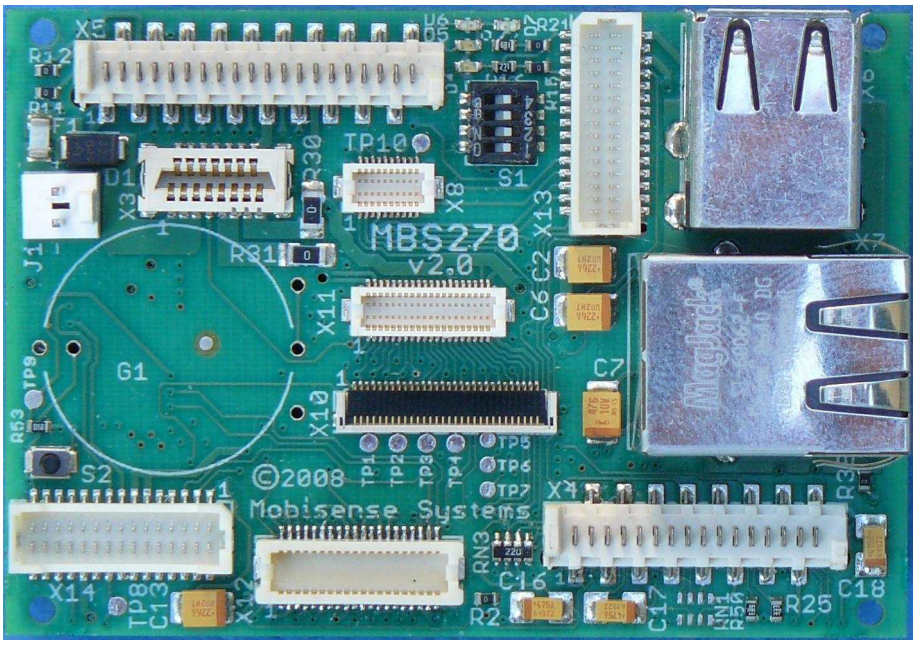

Figure 3: MBS270 V2 top view

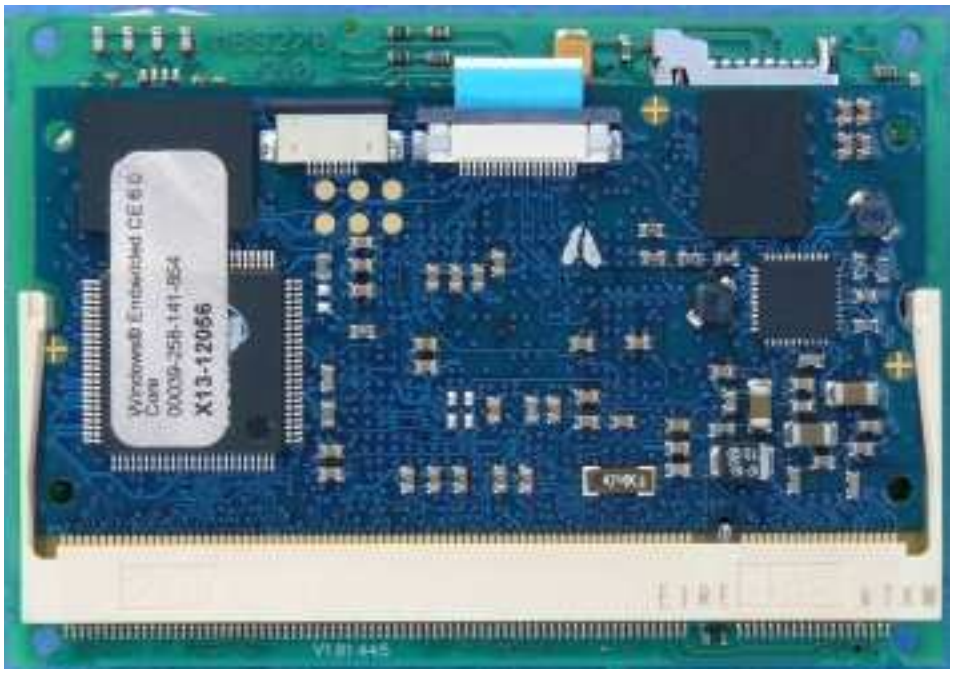

Figure 4: MBS270 V2 bottom view

I.5 Weight optimized version MBS270L

This version is specially designed for flying robots or any weight constrained application. The PCB is thinner (0.8mm vs 1.55mm) and RJ45 connector can be removed. This makes the total weight down to 35grams.

***Note 1**: extra care must be taken when plugging/unplugging connectors because the PCB is thinner.*
***Note 2**: the removable RJ45 is for static development purpose only. Reliable connection can not be guaranteed if the board is moved.*

Figure 5: MBS270L without and with RJ45 plug

II. CONNECTORS

II.1 Internal connectors

For correct operation, computer module connectors (SODIMM 200 and FCC 18) shall not be disconnected. If maintenance is needed, please contact MOBISENSE SYSTEMS.

II.2 Power input

The power input connector J1 is a Molex 2.54mm pitch KK header (6410 series).
It accepts up to 4A which is sufficient for MBS270 V2 and its peripherals. If more power is necessary, an independent supply shall be provided.
The power input is protected against reverse polarity with a low forward voltage drop Schottky diode (D1).
The power input is protected against over-current and short-circuit with a 4.5A rated fuse (F1). Check it if no power is present on the board.

II.3 Power module plug

Power modules are connected to X3, a FCI Conan 15 ways receptacle. Conan connectors are polarized to prevent backward connection.
Given an input voltage, power modules convert it to 3.3V and 5V. Power modules are designed to deliver up to 1.5A on each output. Please consult power modules datasheets for details.

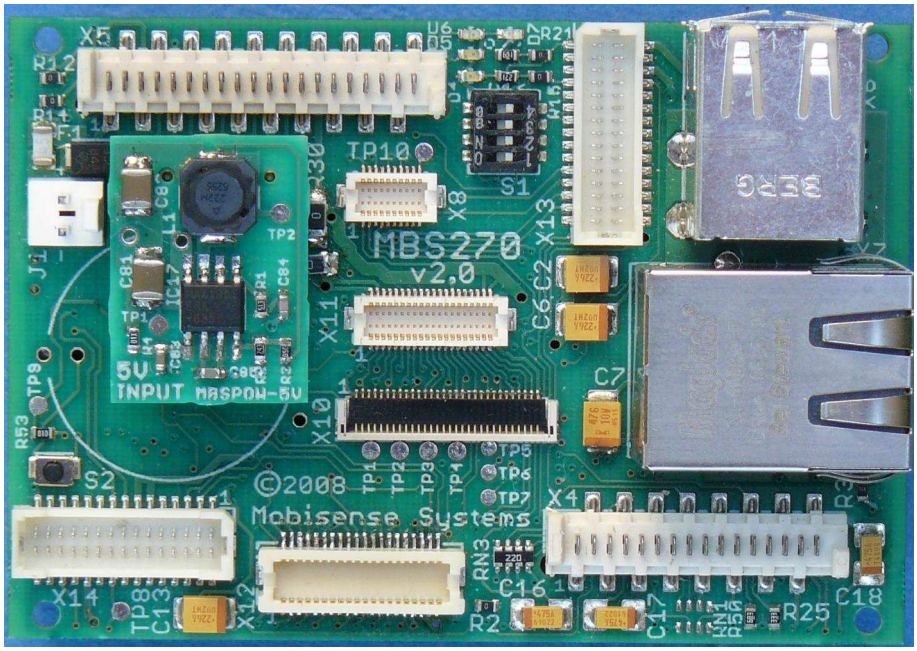

Figure 6: MBS270 V2 with MBSPOW-5V power module

2 LEDs on the bottom side indicate power supply output status:

- the green LED indicates 3.3V supply is on,
- the red LED indicates 5V supply is on.

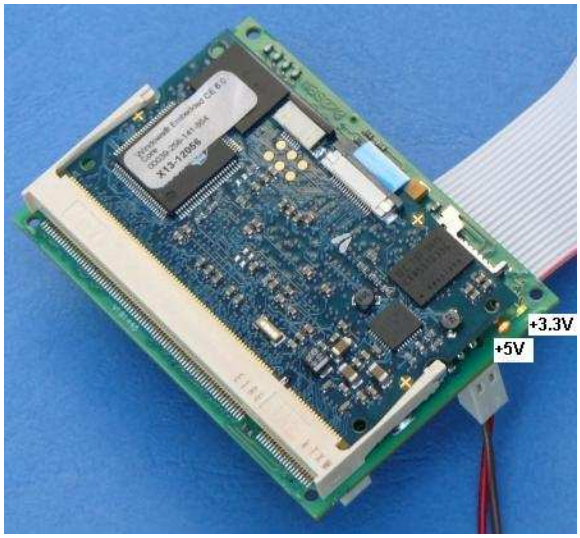

Figure 7: Power status LEDs of MBS270 V2

Signals on X3 are:

Pin Nr.	Signal name	IO Type	Voltage
1,2,3,4,5	Vin	PWR	Input voltage (depends on power module)
6, 8, 10, 12, 14	GND	PWR	0V
9,11	3V3	PWR	+3.3V
13, 15	5V	PWR	+5V
7	/5V_EN	I	0V/+3.3V

Table 1: Power module connector X3 pin out

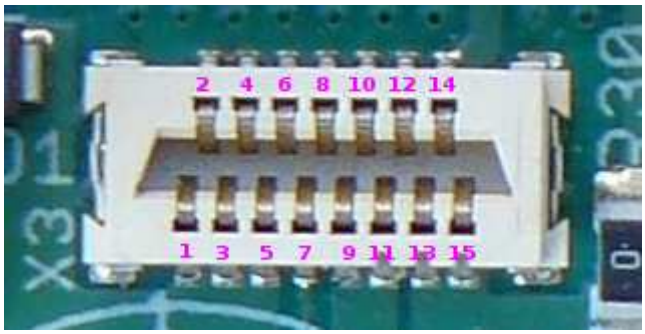

Figure 8: Power module connector X3 pin numbering

For some power modules, it is possible to switch off the 5V output to save power by driving the /5V_EN input high. This input is connected to GPIO56 of PXA270. Thus it is possible to control the 5V output via software.
The 5V output can be switched off in any application that has no 5V powered device. There is no 5V powered device on MBS270 V2: switching off the 5V output will have no effect on operation.
The 5V output is mandatory for USB devices. It can also be necessary for some camera modules, LCD or other peripheral. Please consult the peripheral datasheet for details.

II.4 Ethernet

MBS270 V2 Ethernet connector X7 is an RJ45 with integrated magnetic for 10/100Mbit/s speed.
Use RJ45 straight cable to connect MBS270 V2 with a hub.
Use RJ45 crossed cable to connect MBS270 V2 with another computer network adapter.
Please refer to MBS270 V2 Software Manual for networking setup.

II.5 USB

X6 includes two USB host 1.1 ports with type A plugs that can accept any compatible client such as:

- Mass storage device for extended data storage. It is recommended to use this kind of device or an SDcard for applications requiring large storage capacities and intensive writes rather than on board flash which may run out prematurely due to limited write cycles.
- Wireless communication dongles.
- GSM/GPRS modems.

USB specifications require that the host shall be able to deliver up to 500mA per USB port. MBS270 V2 and its power modules are designed to fully satisfy this requirement. Of course, an appropriate power supply is necessary to deliver the requested current.

II.6 Asynchronous serial ports (UARTs)

3 serial ports are accessible with X5 connector: FFUART, BTUART and STUART.
X5 is a Picoflex 20 ways header from Molex. It is polarized to prevent backward connection. This compact connection system brings all UART signals and power on a standard 1.27mm (.050") ribbon cable. The other end of the cable can be easily connected with similar Picoflex connector or any other connection system such as popular HE10, Tyco Micro-Match, etc. Direct connection to wires is also possible for prototypes.
All signals are at logic level, FFUART and BTUART can be translated to RS232 level with adapters (see MBS wiring kit datasheet for details).
All UART signals are accessible, enabling connection to high speed modems with full control flow.

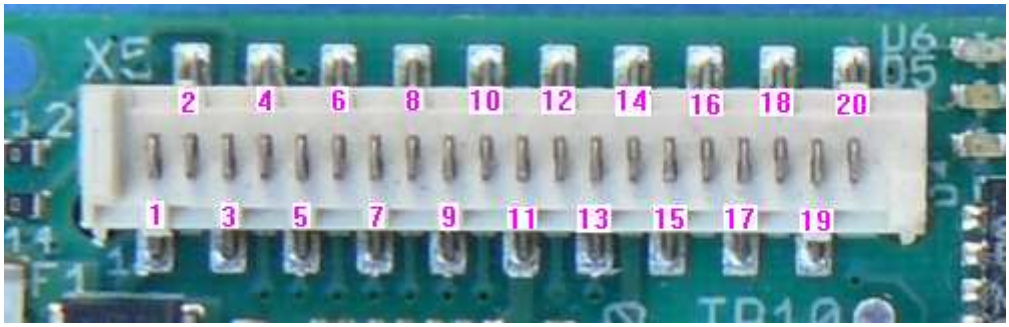

Figure 9: UARTs connector X5 pin numbering

Pin Nr.	Signal name	IO Type	Voltage
1	STD_VCC	PWR	+3.3V
2	STD_RXD	I	0V/+3.3V
3	STD_GND	PWR	0V
4	STD_TXD	O	0V/+3.3V
5	FF_DTR	O	0V/+3.3V
6	FF_CTS	I	0V/+3.3V
7	FF_RTS	O	0V/+3.3V
8	FF_DSR	I	0V/+3.3V
9	FF_DCD	I	0V/+3.3V
10	FF_RXD	I	0V/+3.3V
11	FF_GND	PWR	0V
12	FF_TXD	O	0V/+3.3V
13	FF_RI	I	0V/+3.3V
14	STD_VCC	PWR	+3.3V
15	BT_VCC	PWR	+3.3V
16	BT_CTS	I	0V/+3.3V
17	BT_RTS	O	0V/+3.3V
18	BT_RXD	I	0V/+3.3V
19	BT_GND	PWR	0V
20	BT_TXD	O	0V/+3.3V

Table 2: UARTs connector X5 pin out

II.7 Synchronous serial ports (SSP)

SSP is a synchronous serial interface that connect to a variety of external analog-to digital (A/D) converters, audio and telecommunication Codecs, and many other devices that use serial protocols for data transfer.

The SSP ports provide support for the following protocols:

- Texas Instruments (TI) Synchronous Serial Protocol
- Motorola Serial Peripheral Interface (SPI) protocol
- National Semiconductor Microwire
- Programmable Serial Protocol (PSP)

The SSP ports operate as full-duplex devices for the TI Synchronous Serial Protocol, SPI, and PSP protocols and as a half-duplex device for the Microwire protocol.

Two synchronous serial ports are available on connector X4 with I2C signals.

X4 is a Picoflex 16 ways header from Molex. It is polarized to prevent backward connection. This compact connection system brings all signals and power on a standard 1.27mm (.050") ribbon cable. The other end of the cable can be easily connected with similar Picoflex connector or any other connection system such as popular HE10, Tyco Micro-Match, etc. Direct connection to wires is also possible for prototypes.

Note: to communicate with a 5V device, level adaptation may be necessary.

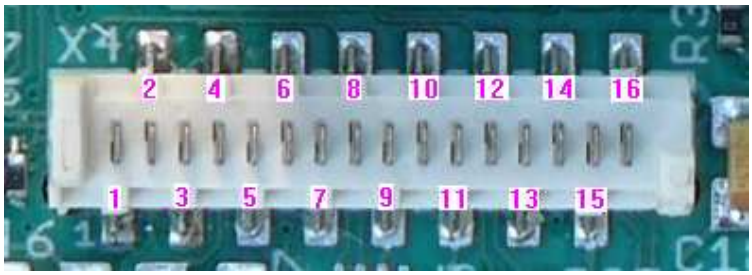

Figure 10: SSP-I2C connector X4 pin numbering

Pin Nr.	Signal name	IO Type	Voltage
1	SSPSFRM1	I/O	0V / 3.3V
2	SSPSCLK1	I/O	0V / 3.3V
3	SSP_GND1	PWR	0V
4	SSPRXD1	I	0V / 3.3V
5	SSPTXD1	O	0V / 3.3V
6	SSP_VCC1	PWR	3.3V
7	SSP_VCC2	PWR	3.3V
8	SSPSFRM2	I/O	0V / 3.3V
9	SSPRXD2	I	0V / 3.3V
10	SSP_GND2	PWR	0V
11	SSPTXD2	O	0V / 3.3V
12	SSPSCLK2	I/O	0V / 3.3V
13	I2C_VCC	PWR	3.3V
14	I2C_SDA	I/O	0V / 3.3V
15	I2C_GND	PWR	0V
16	I2C_SCL	I/O	0V / 3.3V

Table 3: SSP-I2C connector X4 pin out

II.8 I2C bus

The serial I2C bus has a two-pin interface. The serial data and address (SDA) data pin serves I/O functions, and the serial clock line (SCL) clock pin controls and references the I2C bus. The I2C interface allows the PXA27x processor to serve only as a master device on the I2C bus because of camera control.
The I2C interface enables the PXA27x processor to communicate with I2C peripherals and microcontrollers for system-management functions. The I2C bus requires a minimum of hardware to relay status, reliability, and control information between devices.
Because of its wide use, I2C bus is available on several connectors:

- on X4 as a generic connection with external devices (see Table 3 for pin out),
- on X10 and X11 for camera control,
- on X12 for LCD extended control.

I2C bus is also used on board to communicate with the real time clock chip.

Note: I2C bus runs with open-collector pins. SDA and SCL are pulled-up to 3.3V onboard with 4.7kohms resistors. 3.3V pull-up may be sufficient for 5V devices. If it is not, use I2C bus level adapter such as Philips/NXP PCA9517.

II.9 GPIO

GPIOs can be programmed as inputs or outputs by software. Interrupts can be associated with each input. After reset, all GPIOs are configured as inputs.

Up to 31 GPIOs are available on MBS270 V2 but some of them are used for multiple purpose. Table 4 lists GPIOs available on X13, the GPIO connector. Other GPIOs are accessible via X14 connector (see Table 5).

X13 is a Harwin M40-302 30 ways header accepting plugs for wire to board connection. This makes connection with peripherals very flexible and reliable. The connector is polarized to prevent mis-mating. Current rating is 1A with 28AWG wires (proposed in wiring kits). Note this current rating is for power pins only, PXA270 pins can not draw such currents.

Pin Nr.	Signal name	IO Type	Voltage	Default use[1]
1	GPIO 9	I/O	0V / 3.3V	LED D7
2	GPIO 13	I/O	0V / 3.3V	LED D6
3	GPIO 21	I/O	0V / 3.3V	LED D5
4	GPIO 22	I/O	0V / 3.3V	LED D4
5	GPIO 90	I/O	0V / 3.3V	S1 way 4
6	GPIO 91	I/O	0V / 3.3V	S1 way 3
7	GPIO 93	I/O	0V / 3.3V	S1 way 2
8	GPIO 94	I/O	0V / 3.3V	S1 way 1
9	GPIO 96	I/O	0V / 3.3V	SD card detect
10	GPIO 56	I/O	0V / 3.3V	5V output enable (/5V_EN)
11	GPIO 82	I/O	0V / 3.3V	Camera expander GPIO 4
12	GPIO 20	I/O	0V / 3.3V	Camera expander GPIO 3
13	GPIO 19	I/O	0V / 3.3V	Camera expander GPIO 1
14	GPIO 14	I/O	0V / 3.3V	Camera expander GPIO 2
15	GPIO 104	I/O	0V / 3.3V	LCD backlight ON
16	GND	PWR	0V	
17	GPIO 57	I/O	0V / 3.3V	
18	GPIO 116	I/O	0V / 3.3V	
19	GPIO 115	I/O	0V / 3.3V	Also PWM1 on X14
20	GPIO 108	I/O	0V / 3.3V	
21	GPIO 105	I/O	0V / 3.3V	
22	GPIO 103	I/O	0V / 3.3V	
23	GPIO 102	I/O	0V / 3.3V	
24	GPIO 101	I/O	0V / 3.3V	
25	GPIO 99	I/O	0V / 3.3V	
26	GPIO 97	I/O	0V / 3.3V	
27	GPIO 36	I/O	0V / 3.3V	
28	3V3	PWR	3.3V	
29	5V	PWR	5V	
30	GND	PWR	0V	

Table 4: GPIO connector X13 pin out

[1] A GPIO with a default use can be used as a GPIO when its default use is not concerned. For example, GPIO104 can be used as a GPIO if no LCD is connected to MBS270 V2.

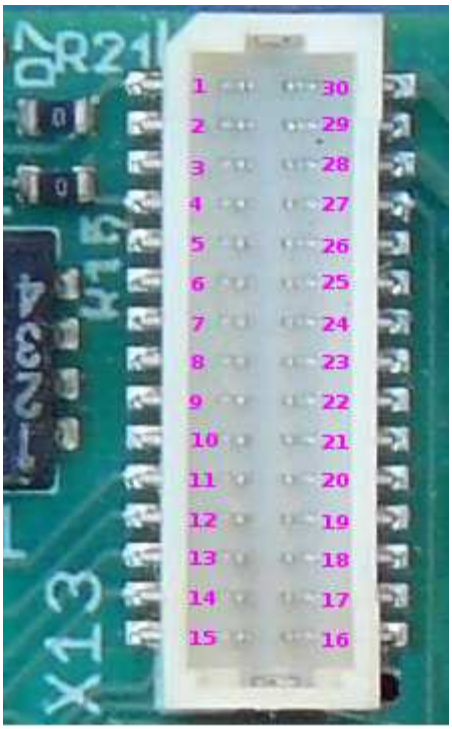

Figure 11: GPIO connector X13 pin numbering

II.9.1 LED output circuit

The following circuit shows that it is possible to drive additional input while driving the LEDs. However, it is recommended to limit the total output current below 10mA.

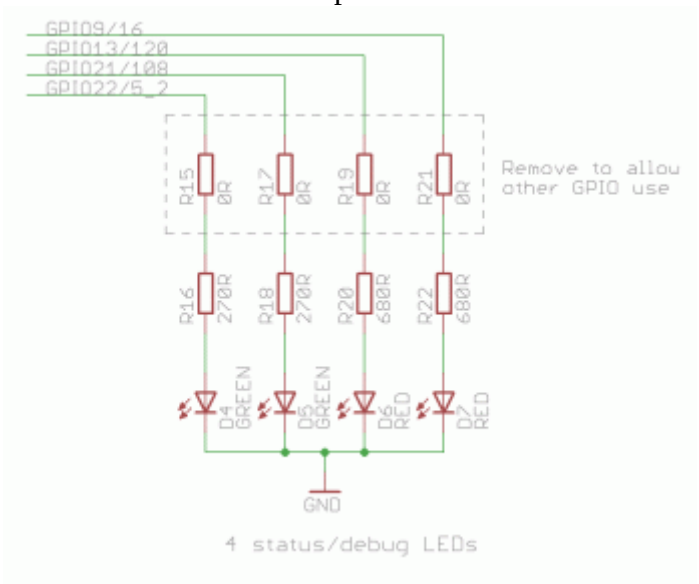

Figure 12: status/debug LEDs schematic

II.9.2 Switch input circuit

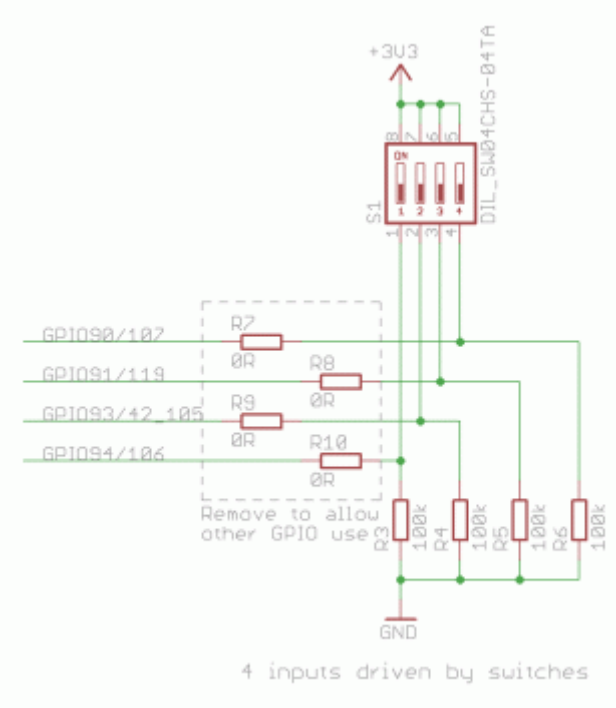

Figure 13: switch S1 schematic

II.10 Analog signals

All analog signals are accessible from X14, except touch screen signals that are grouped with LCD signals on X12. Remaining pins of X14 are used for miscellaneous signals described in II.11 and auxiliary power outputs.
X14 is a Harwin M40-302 30 ways header accepting plugs for wire to board connection. This makes connection with peripherals very flexible and reliable. The connector is polarized to prevent mis-mating. Current rating is 1A with 28AWG wires (proposed in wiring kits). Note this current rating is for power pins only, PXA270 or UCB1400 pins can not draw such currents.
Analog inputs and outputs are provided by Philips/NXP UCB1400 companion chip connected to the PXA270 processor via the AC'97 link. For detailed information, consult Philips/NXP UCB1400 datasheet.

Pin Nr.	Signal name	IO Type	Voltage	Remarks
1	WAKEUP0	I	0V / 3.3V	Connected to PXA270 GPIO 0
2	WAKEUP1	I	0V / 3.3V	Connected to PXA270 GPIO 1
3	!RESET_OUT	O	0V / 3.3V	PXA270 !RESET_OUT output
4	3V3	PWR	3.3V	
5	3V3	PWR	3.3V	
6	5V	PWR	5V	
7	5V	PWR	5V	
8	HP_R	O		Right headphone output
9	HP_L	O		Left headphone output
10	HP_GND	PWR	1.65V	Headphones ground
11	VSS_AUDIO	PWR	0V	ADC inputs ground
12	LINEIN_R	I		Right line input
13	LINEIN_L	I		Left line input
14	MIC_GND	PWR	VSS_AUDIO / Hi Z	Microphone switch to VSS_AUDIO (see UCB1400 datasheet 9.1.2 for details)
15	MIC_IN	I		Microphone input
16	AD3	I	0V / 7.63V	
17	AD2	I	0V / 7.63V	
18	AD1	I	0V / 7.63V	
19	AD0	I	0V / 7.63V	
20	VDD_AUDIO	PWR	3.3V	Analog supply
21	!RESET_EXT	I	0V / 3.3V	PXA270 !RESET_IN input Also controlled by onboard S2 button
22	PWM3	O	0V / 3.3V	Multiplexed with GPIO80 and !CS4
23	!VDD_FAULT	I	0V / 3.3V	PXA270 !VDD_FAULT input
24	!BATT_FAULT	I	0V / 3.3V	PXA270 !BATT_FAULT input
25	PWM2	O	0V / 3.3V	Multiplexed with CHOUT0, EXT_SYNC0 and GPIO11
26	PWM0	O	0V / 3.3V	Multiplexed with GPIO16
27	GND	PWR	0V	
28	GND	PWR	0V	
29	PWM1	O	0V / 3.3V	Also GPIO115, connected to X13<19>
30	VCC_BATT	PWR	3.3V	Battery input (R23 must be disconnected)

Table 5: analog and misc connector X14 pin out

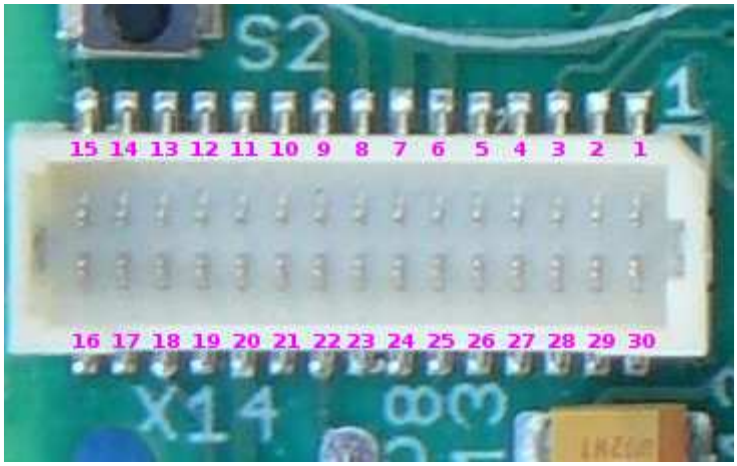

Figure 14: analog and misc connector X14 pin numbering

II.10.1 ADC inputs

MBS270 V2 Analog to Digital Converter has four analog inputs, AD0 through AD3.
Main ADC features are:

- Resolution: 10 bits
- Inputs: 4
- Input range: 0-7.63V
- Input leakage current < 10µA
- Input impedance: 77 kohms
- Differential linearity error: ±1 LSB
- Integral linearity error: ±2 LSB
- Total conversion time: 10 µs[1]

This leads to a granularity of 7.46mV/LSB.

II.10.2 Audio stereo outputs

Audio outputs are generated with a two-channel 20 bits audio DAC. 32Ω headphones can be connected directly to HP_L and HP_R outputs, ground is HP_GND.

II.10.3 Audio stereo inputs

Audio inputs are digitized with a two-channel 20 bits audio ADC. Input impedance is 10kΩ. Inputs ground is VSS_AUDIO.

II.10.4 Microphone input

The microphone input is multiplexed with the left line input, it is digitized with a 20 bits audio ADC. Input impedance is 10kΩ. Microphone ground is MIC_GND.

[1] This is the *hardware* conversion time. Software conversion time may depend of implementation and is necessarily higher because of AC'97 link to processor and driver software layers.

II.11 Miscellaneous signals

II.11.1 PWM outputs

In general, PWM outputs provide a basic digital to analog converter with an appropriate analog filter. They can also be used to drive motor speed controllers.
Four PWM outputs are available on X14 connector (See Table 5).

Note 1: PWM2 output is multiplexed with CHOUT0 timer output and EXT_SYNC0 timer input.

Note 2: When a PWM output is used to drive a high power load, it is strongly recommended to isolate logic power from load power, with an optocoupler for example.

II.11.2 Timers

Two timer related signals are available on X14 connector (See Table 5).
EXT_SYNC0 is an external timer reset. It can be used as watchdog (to monitor the status of an external device) or time measurement for example.
CHOUT0 is a timer output.

Note 1: EXT_SYNC0 timer reset input is multiplexed with PWM2 and CHOUT0.

II.11.3 !VDD_FAULT

This active-low input signals that the power main source is going out of regulation. It is accessible on X14<23> (See Table 5).

II.11.4 !BATT_FAULT

This active-low input signals that the main battery is low or removed. It is accessible on X14<24> (See Table 5).

II.11.5 !RESET_EXT

This active-low input resets the processor. It is accessible on X14<21> (See Table 5).
!RESET_EXT can also be activated with S2 onboard pushbutton.

II.11.6 !RESET_OUT

This active-low output is asserted when !RESET_EXT is asserted, it deasserts after !RESET_EXT is deasserted but before the first instruction fetch occurs. !RESET_OUT is asserted during power-on, hardware, watchdog and sleep-exit resets. It is configurable for GPIO reset.
!RESET_OUT is accessible on X14<3> (See Table 5).

II.12 Camera connector

X10 is a FCI 30 positions FFC[1] connector. It is a high retention version (VLL series) making camera connection reliable even when the camera position changes.
To insert a FFC into the connector, follow the procedure as illustrated in Figure 15:

- Lift up the flip to enable insertion
- Insert FFC. FFC is visible inside the connector to make sure it is well inserted.
- Shut down the flip to secure the FFC.

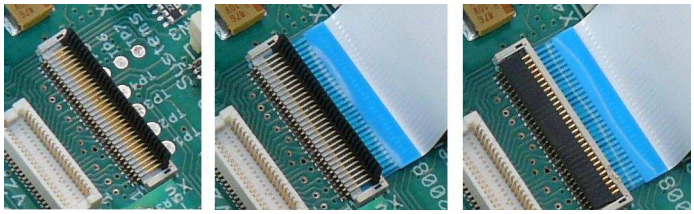

Figure 15: Camera FFC insertion

Pin Nr.	Signal name	IO Type	Voltage
1	3V3	PWR	3.3V
2	CIF_DD7	I	0V/3.3V
3	GND	PWR	0V
4	CIF_DD9	I	0V/3.3V
5	GND	PWR	0V
6	CIF_DD6	I	0V/3.3V
7	GND	PWR	0V
8	CIF_DD0	I	0V/3.3V
9	GND	PWR	0V
10	CIF_MCLK	O	0V/3.3V
11	GND	PWR	0V
12	CIF_DD4	I	0V/3.3V
13	CIF_FV	I/O	0V/3.3V
14	GND	PWR	0V
15	CIF_DD8	I	0V/3.3V
16	GND	PWR	0V
17	CIF_LV	I/O	0V/3.3V
18	CIF_DD5	I	0V/3.3V
19	GND	PWR	0V
20	CIF_PCLK	I/O	0V/3.3V
21	GND	PWR	0V
22	CIF_DD2	I	0V/3.3V
23	GND	PWR	0V
24	CIF_DD3	I	0V/3.3V
25	GND	PWR	0V
26	CIF_DD1	I	0V/3.3V
27	GND	PWR	0V
28	I2C_SCL	I/O	0V / 3.3V
29	I2C_SDA	I/O	0V / 3.3V
30	5V	PWR	5V

Table 6: Camera connector pin out

[1] Flat Flexible Cable

II.13 LCD connector

All LCD related signals are accessible via X12 connector. This includes:

- 18 LCD Display Data lines
- synchronization signals: L_FCLK, L_LCLK, L_PCLK and L_BIAS
- touchscreen analog inputs
- Backlight ON output
- I2C bus for auxiliary expansion device
- 3.3V and 5V power.

It is a generic connection intended to interface any LCD with a connector adapter.
X12 is a Hirose 0.65mm pitch 40 pins header (DF15 series). Note it is not polarized and care should be taken when plugging. Current rating is 0.3A for each pin which is sufficient to power a portable LCD.

Pin Nr.	Signal name	IO Type	Voltage
1	TSMX	I	0-1.89V
2	TSPX	I	0-1.89V
3	LDD9	O	0V/3.3V
4	LDD11	O	0V/3.3V
5	GND	PWR	0V
6	LDD13	O	0V/3.3V
7	LDD3	O	0V/3.3V
8	GND	PWR	0V
9	LDD2	O	0V/3.3V
10	LDD8	O	0V/3.3V
11	LDD14	O	0V/3.3V
12	GND	PWR	0V
13	LDD1	O	0V/3.3V
14	LDD10	O	0V/3.3V
15	GND	PWR	0V
16	LDD4	O	0V/3.3V
17	L_FCLK	O	0V/3.3V
18	3V3	PWR	3.3V
19	5V	PWR	5V
20	BL_ON	O	0V/3.3V
21	I2C_SCL	I/O	0V / 3.3V
22	I2C_SDA	I/O	0V / 3.3V
23	GND	PWR	0V
24	L_PCLK	O	0V/3.3V
25	LDD0	O	0V/3.3V
26	GND	PWR	0V
27	LDD5	O	0V/3.3V
28	L_LCLK	O	0V/3.3V
29	GND	PWR	0V
30	LDD15	O	0V/3.3V
31	LDD17	O	0V/3.3V
32	LDD16	O	0V/3.3V
33	GND	PWR	0V
34	L_PCLK	O	0V/3.3V
35	LDD12	O	0V/3.3V
36	GND	PWR	0V
37	LDD7	O	0V/3.3V
38	L_BIAS	O	0V/3.3V
39	TSPY	I	0-1.89V
40	TSMY	I	0-1.89V

Table 7: LCD connector X12 pin out

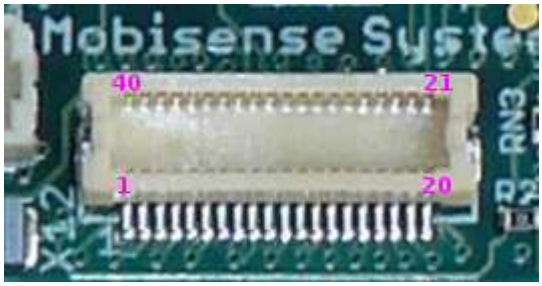

Figure 16: LCD connector X12 pin numbering

II.14 microSD card connector

The microSD card connector is situated on the bottom side of MBS270, below X5 UART connector. It accepts microSD/TransFlash memory cards.
It is a push-push type connector with 1mm push stroke and 3.3mm card eject length:

- To insert a card, push it inside the connector until it is locked.
- To eject a card, push to unlock, the internal mechanism ejects partially the card then pull it manually.

Figure 17: microSD card connector

III. TECHNICAL SPECIFICATIONS

III.1 Mechanical drawings

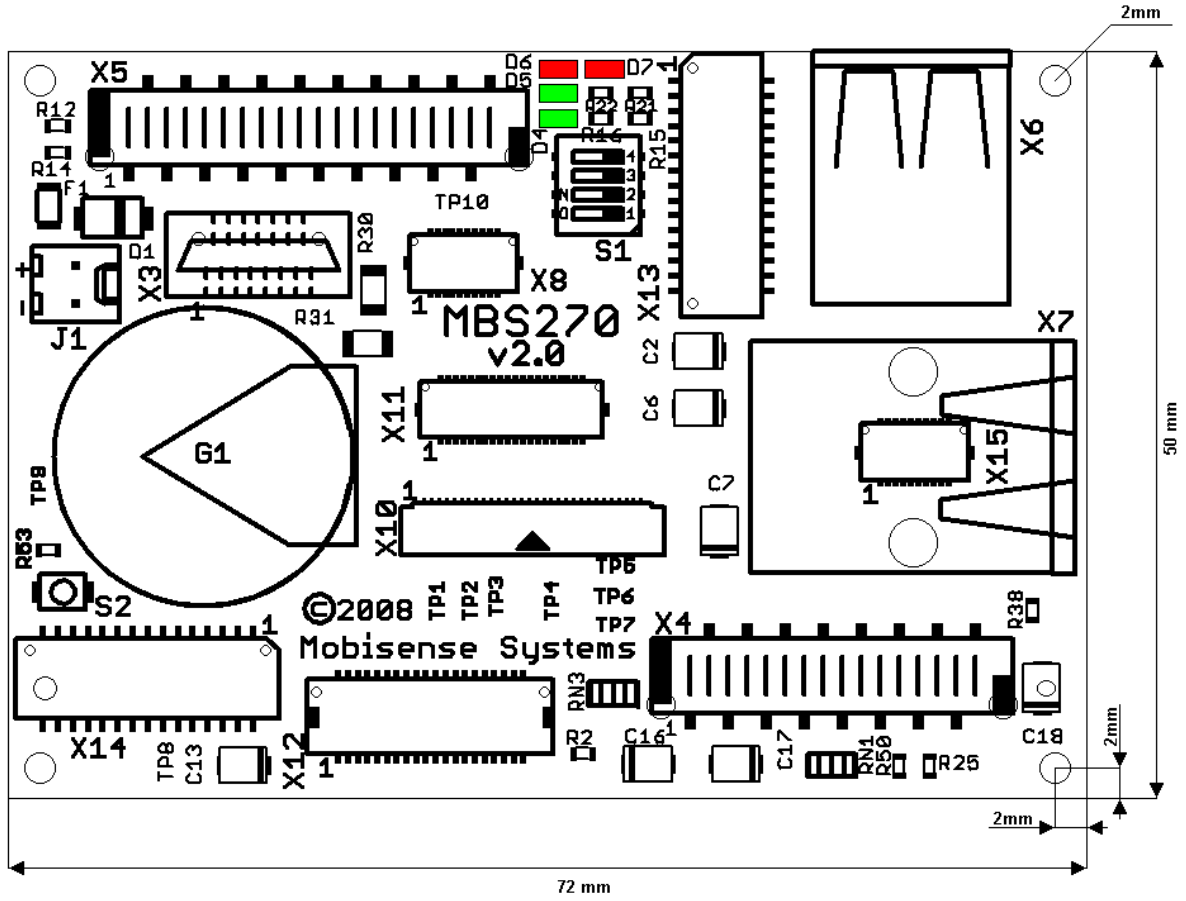

Figure 18: mechanical drawing, top view

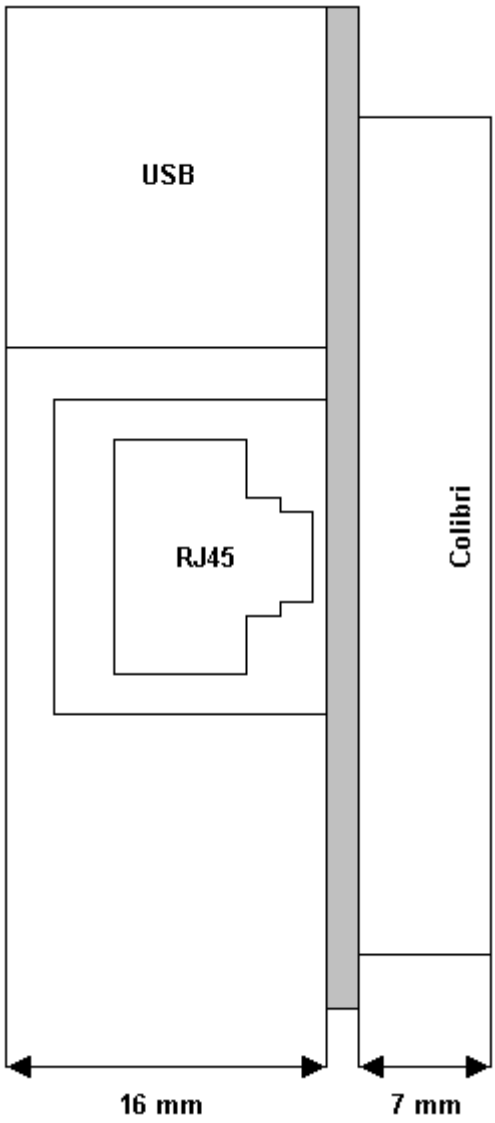

Figure 19: mechanical drawings, camera and Ethernet sides

III.2 Additional specifications

- Dimensions: 72mm x 50mm
- Height: 25mm
- Weight:
  - Standard version: 46g
  - Light version: 35g
- Storage temperature: -10 to +70°C
- Operating temperature: -10 to +70°C

III.3 Power consumption

Power consumption depends on devices connected to the board. However, it is very low even under high computation load thanks to PXA270 XScale architecture. It is typically below 1W

while processing images at full speed. User can evaluate power consumption on a specific board configuration and a specific task by running demo software.

III.4 Real time clock

All MBS270 boards are equipped with an ultra low power external real time clock. When the board is not powered, the RTC chip can be powered with an optional Lithium battery located at G1.
The battery is a BR2032 type, specifically designed to deliver constant voltage over the longest time for better accuracy. A 10 years retention is guaranteed with this battery.
For details about the management of RTC clock and system time, please consult the software manual.

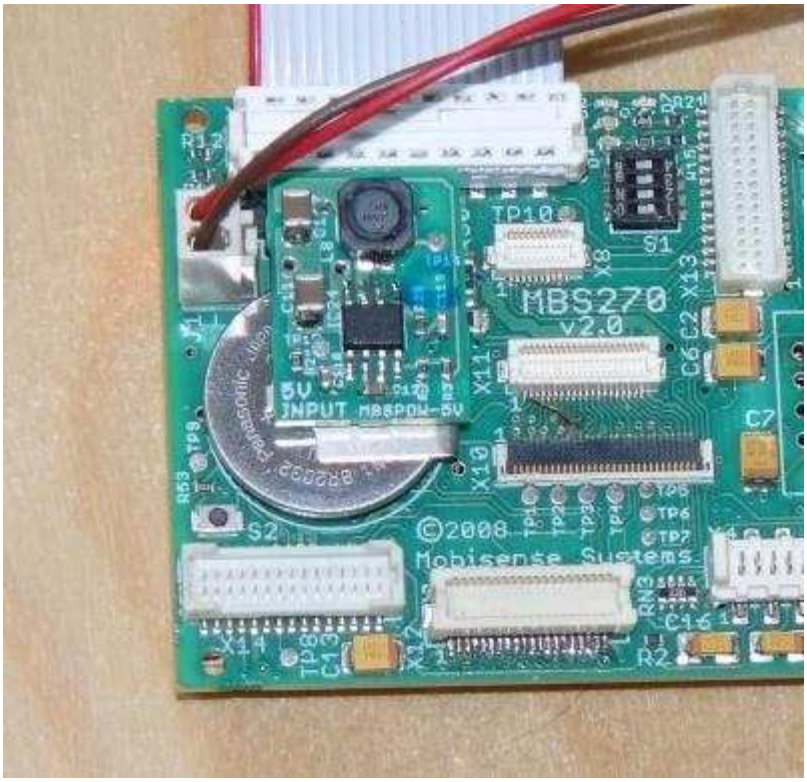

Figure 20: real-time clock Lithium battery

IV. HINTS FOR HANDLING THE MODULE

- When plugging or unplugging connectors, user must be very cautious not break the PCB.

- MBS270 V2 is an electrostatic sensitive device. It may only be unpacked, handled or operated in environments in which sufficient precautionary measures have been taken in respect to ESD dangers. It is also necessary that only appropriately trained personnel (such as electricians, technicians and engineers) handle and/or operate this product.